

## Binge Drinking in the Oldest Wine Country: Evidence from the Noncommunicable Disease Risk Factor Surveillance

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### Abstract

**Background:** The country of Georgia is arguably the oldest producer of wine in the world. In Georgia, consumption of home-made alcohol defines interpersonal relationships and behavioral norms and expectations. Prevalence of binge drinking in Georgia may be fatal and costly for the society. This study examined the correlates and prevalence of binge drinking in Georgia providing an essential foundation for evidence-based policy making.

**Methods:** This was a cross-sectional study using a nationally representative sample of the adult population ages 18-65 obtained from the WHO Georgia STEPS Survey 2010 database. Primary measurements in the study included frequencies of binge drinking and a number of sociodemographic correlates obtained from the database. Multiple logistic regression analyses were used to estimate the odds of binge drinking in adult men and women.

**Results:** In 2010, the prevalence rate of binge drinking in Georgia among the adult population was almost three times higher than in 2003 (30% vs. 11%), and five times higher in males than in females. Georgians appear to have higher odds of binge drinking than other ethnic groups living in Georgia. The likelihood of binge drinking was directly related to smoking, education, occupation, and unemployment; however, the strongest positive association was found among binge drinking and smoking. The odds of binge drinking among smokers in the general population were 5.30 (95% CI 4.35- 6.46), for males the odds were 3.09 (95% CI 2.41- 3.97), and for female smokers the odds were 3.00 (95% CI 1.84- 4.89).

**Conclusions:** Our study has important implications for future research and informing policy makers pointing to the magnitude of binge drinking in Georgia. Policies that influence distribution and taxation on alcoholic beverages, education programs and public interventions focusing on harmful effects of excessive drinking and smoking to discourage these unhealthy behaviors, deserve further consideration by the authorities in the country of Georgia.

**Keywords:** Alcoholism-Binge Drinking-Smoking-Risk Factors-Georgia

## Introduction

The country of Georgia is arguably the oldest producer of wine in the world and, currently, a major producer of alcohol among the Former Soviet Republics. Similar to many other countries, alcohol consumption defines interpersonal relationships and behavioral norms and expectations in the country of Georgia (Otiashvili et al., 2012; Rehm et al., 2010). However, as a former Soviet state, Georgia has had to endure the upheaval and psychological distress of economic

reforms and significant conflicts with its larger neighbor, Russia (Robert et al. 2014; World Bank 2013). The early 1990s and the late 2000, secessionist movements in Georgia led to almost a half million internally displaced persons (IDPs) in a country with less than 4 million. By 2013, almost 270,000 IDPs remained affected by lingering upheavals related to 2008 war with Russia (World Bank, 2013). Georgia's wine culture and the country's recent tumultuous history, which play important roles in the amount and pattern of alcohol use in the population, deserve further studies (de Jong, 2002; de Jong et al., 2003; IASC, 2007; Johnson, 1996; Porter & Haslam, 2005; Steel et al., 2009; UNHCR, 2013; UNHCR WHO, 2008; Robert et al., 2014). Nonetheless, promoting the wine industry and raising wine exports are official policy priorities in Georgia (Anderson, 2013). Wine, food and tobacco add up to 46% in rural and 39% in urban total household expenditures (Anderson, 2013).

There have been no systematic studies to date examining binge drinking in Georgia, despite a history of wine culture, excessive alcohol use, two decades of tumultuous transitions from a Soviet state to a market economy, and a large number of IDPs. In this respect, our study using the 2010 World Health Organization's (WHO's) Noncommunicable Disease Risk Factor Survey provides a unique opportunity to fill this void and shed light on the problem of binge drinking in Georgia. Policy makers, concerned with the consequences of excessive alcohol use, face numerous dilemmas related to their inherent interest in the above mentioned historical objectives. Substantive studies that rely on detailed survey data of binge drinking are of significant interest to the national policy makers. While alcohol abuse is a well-known cause of higher rates of morbidity and mortality, country-specific studies of alcohol use are fundamental

for instigating policy designs that may curtail alcohol abuse in the underlying society (NIAAA, 2015; Bouchery et al., 2006; Rehm et al., 2010; Hingson & Zha, 2009; Otiashvili et al., 2013).

Binge drinking is defined as an excessive alcohol drinking on one occasion (or within a two-hour period), consisting of five or more standard drinks for men and four or more standard drinks for women (CDC, 2014; NIAAA, 2015). A standard drink in the US is 14 grams of pure alcohol found in 12 ounces of regular beer or 5 ounces of wine, and 1.5 ounces of distilled spirits (NIAAA, 2015). It may lead to alcohol poisoning, injuries, sexually transmitted diseases, unintended pregnancy, cardiovascular and liver disease, neurological problems, and poor diabetes control, which are fatal and costly for any society (CDC, 2014; Kanny, et al., 2015; WHO, 2012). In 2012, the World Health Organization (WHO) estimated that 5.9% (3.3 million) of all deaths worldwide were related to alcohol use, and the burden of alcohol related diseases, injuries and disability was 5.1% in disability-adjusted life years (139 million DALYs) (WHO 2014).

In 2010, per capita alcohol consumption in the country of Georgia (henceforth, Georgia) was 7.7 liters of pure alcohol, which exceeded the reported worldwide average consumption of 6.2 liters of pure alcohol per person aged 50 and older, as well as consumption in the two other neighboring countries in the Caucasus region, Armenia (5.3 liters) and Azerbaijan (2.3 liters) (WHO, 2014). Georgians consume 24% more alcohol per person than the average person worldwide, 45% more than Armenians and 335% more than Azerbaijanis (WHO, 2014). Recent studies on alcohol use in Georgia, which limited their samples to the Internally Displaced Persons (IDPs) or students, found that a growing number of Georgians have alcohol-use related disorder (Baramidze et al., 2009; Robert et al., 2014). Our study, based on a representative

sample of the population, has a unique opportunity for studying pervasive alcohol consumption and binge drinking problem in the greater Georgian society.

In the United States, one in ten adults (aged 20–64 years) die because of excessive alcohol use, and alcohol poisoning from binge drinking has been identified as a major culprit in more than half of all deaths and in three fourths of all economic costs (Kanny et al., 2015). A comparison of the CDC analyzed data for 2010–2012 from the US National Vital Statistics System show that alcohol related death rates in the US have increased from 3.2% in 2000 to 5.9% in 2012, raising the disease burden from 4% of DALYs in 2000 to 5.1% in 2012 (Kanny et al., 2015; WHO, 2014). In Georgia, given a substantial number of adults aged 18-65 drink on a monthly basis, alcohol use remains a serious public health problem (STEPS, 2012). Prevalence and other correlates of binge drinking among the population of Georgia that have been identified by research, constitute an actual step forward towards informing national policies and setting the stage for prevention strategies similar to those in the United States and in the other developed countries (National Prevention Council, 2011; Javakhishvili, et al., 2011). In the present study, we conducted a multivariate logistic regression analysis of data collected from the National WHO Survey implemented in Georgia in 2010.

The STEPS Noncommunicable Disease Risk Factor Survey, a part of the STEPwise Approach to Surveillance (STEPS) Project conducted by the WHO, is a survey methodology to help countries develop their own surveillance system to monitor and fight noncommunicable diseases (STEPS, 2012). The three steps incorporated in the STEPS methodology are: questionnaire, physical measurements and biochemical measurements, which include core items, core variables, and

optional modules. The database contains information on major themes covered by most surveys such as demographics, health status, and health behaviors, as well as socioeconomic, metabolic, nutritional, and lifestyle risk factors.

## **Methods**

### **Study Data**

Based on history and culture of drinking, there is a dearth of evidence on alcohol use coming from the countries located in the South Caucasus region, such as Armenia, Azerbaijan, and Georgia (Nichol, 2014). The STEPS database provided a representative sample to our study including primary observations and information on frequency and quantities (standard drinks) of consumed alcohol in addition to other sociodemographic facts. Sampling together with survey research is a commonly used approach in data collection, which later becomes the preferred source of evidence for statistical analysis, estimation and building models (STEPS, 2012). The STEPS provided behavioral information of interest about alcohol consumption during the life course, within the past 12 months, and the past 30 days. A multi-stage clustered sampling approach used in the STEPS, with a 95% participation rate in the final survey, ensures that the final sample is representative of the target population. The sample size  $n = 6,497$  targeted men and women aged 18- 65 who lived in Georgia between August and December, 2010.

### **Statistical Analysis**

The methods adopted in a sample analysis comprised of descriptive statistics on alcohol consumption by gender and the sampling design weights, which helped to calculate the weighted standard deviation (SD) and Chi-square for each reported estimate. Descriptive statistics

included ethnicity, household size, age, education, marital status, employment, income, and smoking habits of the survey respondents.

All statistical calculations were performed using specialized 'survey' commands in SAS software version 9.4 (SAS, Inc., Cary, NC. USA). The logistic regression analysis was conducted on the full sample (n = 6,497) and the sample broken down by gender, males (n = 1,887) and females (n = 4,610), to build models and to estimate the likelihood (odds) of binge drinking in Georgia. We used 95% Confidence Intervals (95% CI) and the corresponding p-values < 0.05 for each estimated parameter. The analysis of the STEPS survey data provided a valuable opportunity in this study to gauge the prevalence and to identify the correlates of binge drinking among the adults aged 18-65 living in Georgia.

## Results

Table 1 demonstrated descriptive statistics on alcohol consumption in the population, and Table 2 presented breakdown data by gender, ethnicity, household size, age, education, marital status, employment, income, and smoking habit of respondents. These tables also showed the weighted frequencies, the weighted standard deviations (SD), and Rao-Scott Chi-squared statistics. Reported Chi-squared tests in Table 2 show that apart from some cases related to the very low-income individuals (earning less than 200 GEL), other demographic correlates also achieve statistical significance (defined by  $p < 0.05$ ). Table 3 provided estimated odds ratios of binge drinking in Georgia using multivariate logistic regression analysis.

## Descriptive Analysis

### Alcohol Consumption

Table 1 shows that 78% of sample respondents (78.47%, SD = 1.35) consumed alcohol (beer, wine, and other spirits) during their lifetime. Among them, 82% (81.57%, SD = 0.97), consumed alcohol within the past 12 months, and 65 percent (64.90%, SD = 1.55) in the past month (30 days). The proportion of those who drank alcohol in the past month was 42% (= 78% x 82% x 65%). Almost one-third of all the participants reported binge drinking (30.06%, SD = 1.34) as defined by five or more standard drinks for men, or four or more standard drinks for women, in a single drinking occasion during the last 30 days. While no measures of blood alcohol concentration were available, the pattern of heavy drinking seemed to be in line with the NIAAA recognition of binge drinking as drinking that brings a person's blood alcohol concentration (BAC) to 0.08 grams percent or above, which typically happens when men consume 5 or more drinks, and women consume 4 or more drinks in about 2 hours (NIAAA, 2004).

A breakdown by gender showed that about half of males (49.66%, SD = 2.09) and one-in-ten females (10.21%, SD = 0.88) engaged in binge drinking during the past 30 days. Hence, prevalence of binge drinking among male respondents was five times that of female respondents.

### Ethnicity

More than one quarter (26.73%, SD = 1.32) of respondents who identified themselves as Georgians engaged in binge drinking (Table 2). Less than two percent of Azerbaijanis (1.94%, SD = 0.81) and Armenians (1.23%, SD = 0.52) reported binge drinking. A breakdown by gender,



showed that binge drinking among Georgian males (43%, SD=2.29) was more than four times higher than among Georgian females (9.81%, SD =0.86).

### **Household Size**

Frequency of binge drinkers was the highest among three-member households (9.15%, SD = 0.74), and drinking among males (15.08%, SD = 1.26) and among females (3.15%, SD = 0.44) supported this finding.

### **Age**

Younger age groups (18 -25 and 26 -35) had higher rate of binge drinking (7.18%, SD = 0.67 and 8.49%, SD =0.73 respectively) than older age groups. Prevalence of binge drinking was the highest for males (14.47%, SD = 1.37) aged 26 – 35 and for females (3.15%, SD = 0.47) aged 18 – 25.

### **Marital Status**

The prevalence of binge drinking was higher among those who were married or cohabitating (19.71%, SD = 1.04) than among those who have never married (9.43%, SD = 0.75). The prevalence of binge drinking for males who were married/cohabiting (32.36%, SD = 1.73) or have never married (16.00%, SD = 1.39) was five times higher than for their female counterparts (6.89%, SD = 0.65 and 2.77%, SD = 0.44).

### **Smoking Status**

One in three respondents (30.24%, SD = 0.97) reported smoking. More than half of male respondents (55.42%, SD =1.43) were smokers and only one-in-twenty female respondents (4.75%, SD = 0.53) smoked. Over half of smokers (17.97%, SD = 0.96) reported binge drinking. Prevalence of binge drinking was substantially higher among male smokers (34.65%, SD = 1.72) than among female smokers (1.07%, SD = 0.22).

### **Education**

The highest prevalence of binge drinking was found among individuals who have completed high school (15.5%, SD = 1.06), and among the male respondents (25.77%, SD = 1.76) was five times higher than among the female respondents (5.18%, SD =0.58). College or higher educated males (19.98%, SD = 1.25) and females (4.04%, SD 0.52) showed higher prevalence of binge drinking compared to those with secondary or lower level of education.

### **Employment**

Among unemployed, (10.92%, SD = 0.74) particularly in males (20.43%, SD = 1.43), the prevalence of binge drinking was the highest, but then female homemakers had the highest prevalence of binge drinking (4.28%, SD = 0.53). By occupation, non-paid workers had the lowest prevalence of binge drinking.

### **Monthly Household Income**

By distribution of household income, about half of the respondents (52.22%, SD = 1.55) had earnings of 200 GEL (about \$110) or less per month in the last quarter of 2010. (Georgian Lari,

GEL, is the official currency of the Republic of Georgia, and in October 2010 1 Lari = 0.55 US dollar). This group of low-income individuals had the highest prevalence of binge drinking (15.2%, SD 1.09), with 24.21% (SD = 1.66) among males and 6.15% among females (6.15%, SD =0.78). The statistics for individuals who fell in the higher income category invariably supported the lower prevalence of binge drinking.

### **Logistic Regressions Results**

As depicted in Table 3, the logistic regression analysis took into account the sampling design weights in the final odds estimates and related statistics based on the full sample (n = 6,497), which included male (n = 1,887), and female respondents (n = 4,610). The percentage of concordance between observed and predicted values in the full sample was 77% (males 68%, and females 66%), which was fairly high and reflective of the goodness-of-fit and the rank correlation for the estimated models.

### **Total Sample**

Table 3 showed that ethnicity, marital status, smoking, occupation, and income play a significant statistical role ( $p < 0.05$ ) in binge drinking in Georgia. In particular, Russian ethnicity widowed, smokers, government employees, nongovernment employees, self-employed, students, unemployed, and those with an income within the range of 800- 1600 GEL were all statistically significant ( $p < 0.05$ ) in their correlation with the likelihood (probability) of binge drinking. Ethnically Russians (odds = 0.24) had lower odds of binge drinking than Georgians (control group), widowed individuals (odds = 0.35) were less likely to binge drink than married or cohabiting couples. Smokers (odds = 5.30) were five times more likely than non-smokers to

engage in binge drinking. Government employees (odds = 2.20), nongovernment employees (odds = 3.06), self-employed (odds = 3.59), students (odds = 2.12), and unemployed (odds = 2.57) were two to three times more likely than homemakers to binge drink. Those with an income in the range of 800 - 1600 GEL (odds = 0.58) were half as likely to binge drink as those with an income of less than 200 GEL.

### **Male Sample**

Binge drinking among males was significantly correlated ( $p < 0.05$ ) with those who were smokers. Smokers (odds = 3.09) were three times more likely than non-smokers to engage in binge drinking.

### **Female Sample**

Azerbaijani female respondents who were between 46 – 55 and 55 – 65 years of age, widowed, smokers, with a secondary education or less, retired, unemployed, and with a monthly household income of 200- 400 GEL and 400- 800 GEL showed a significant ( $p < 0.05$ ) correlation with the likelihood of binge drinking.

Females who were 46 – 55 years old (odds = 0.56) and 55 – 65 years old (odds = 0.46), were about half as likely to binge drink as females in 18 – 25 age group. Widowed females were almost half as likely to binge drink (odds = 0.45) than married or cohabiting couples. Female smokers (odds = 3.00) were three times as likely to binge drink as non-smokers. Females with a secondary level of education or less (odds = 2.00) were twice as likely to binge drink as those with high school diplomas. Unemployed females (odds = 0.48) were about half as less likely to

binge than homemakers. Similarly, females from households with an income of 200- 400 GEL (odds = 0.49) and 400 - 800 GEL (odds = 0.52) per month were about half as likely to binge drink as females living in households with less than 200 GEL per month.

## Discussion

The 2003 World Health Survey (WHS) implemented by WHO in partnership with 70 countries demonstrated that 33% of Georgian adults, including 11% of males and 51% of females, were lifetime abstainers from alcohol (Ustun et al., 2003). In 2010, only 22% of the Georgia adult population aged 18-65, including 10% of males and 34% of females, were lifetime abstainers from alcohol, which indicated a sharp decrease in less than a decade. Another study focusing on internally displaced ethnic Georgians, showed similar results (Ustun et al., 2003). A more recent study from 2010 found that 90% of 15-16 year old Georgian students had already tried drinking alcohol, which may indicate a shrinking number of the future lifetime abstainers among the adult Georgia population (Sturua et al., 2010). About 82% of Georgian adults in 2010, including 89% of males and 71% of females, consumed at least one standard drink of alcohol in the past 12 months. In 2003, the proportions of adult males and females who consumed alcohol in the past 12 months were 88% and 64%, respectively (EAR, 2001). Combination of a fairly stable proportion of males (89% in 2010 vs. 88% in 2003) and a higher proportion of females (71% in 2010 vs. 64% in 2003) is suggestive of a rising use of alcohol among females. In comparison with US statistics, the prevalence of past-12-months drinking among Georgian adults (82%) was more than 10% higher than that in US adults (70%) (Esser et al., 2014).

In 2010, the prevalence rate of binge drinking among Georgian adults was 30%, and the proportion of male and female respondents was 50% and 10%, respectively. These findings indicate that binge drinking in Georgia has increased many folds relative to 2003, when it was 11% among general population (22% among males and 1% among females), and only 3% higher than that in the US (27%) for the same period (Esser et al., 2014). However, a breakdown by gender indicated that the proportion of Georgian males engaging in binge drinking (50%) was 16% higher as compared to their US counterparts (34%). Conversely, the prevalence of binge drinking among Georgian females (10%) was 11 percent lower than among their US counterparts (21%) (Esser et al., 2014).

Studies that focus on the Former Soviet Union (FSU), including Georgia, associated increased alcohol use to social upheavals and psychological stress in these societies (Mehta & Elo, 2012; Roberts, et al., 2014). Given periods of civil unrest, difficult economic reforms and 2008 war between Russia and Georgia which led to massive dislocation of people, one might expect alcohol use to be on the rise (de Jong, 2002; de Jong et al., 2003; IASC, 2007; Johnson, 1996; Porter & Haslam, 2005; Steel et al., 2009; UNHCR, 2013; UNHCR WHO, 2008; Robert et al., 2014). In a cross-sectional survey of 3,600 randomly selected IDPs due to war in Georgia, 71% of men and 16% of women were classified as drinkers. Of these, 28% of men and 1% of women drank often, while 12% of men and 2% of women were episodic heavy drinkers (Robert et al., 2014). An additional factor instigating higher alcohol use is due to the Georgian policies that promote large scale wine production for export. The efficiencies gained in alcohol production invariably lower domestic alcohol prices resulting in higher alcohol consumption (Leon et al., 1997; Shkolnikov et al., 1998). Psychological stress and economic motivations (lower prices)

coupled with Georgian wine culture (excessive drinking as a social norm) have provided background and causal factors for the observed increased alcohol use in Georgia (Anderson, 2013; Otiashvili et al., 2012; Rehm et al., 2010).

In terms of alcohol use among women, economics and culture are the underlying factors that distinguish Georgian women from their US counterparts. In practice, Georgian women do not enjoy the same access to economic resources as those of their US counterparts, and a young Georgian woman often lives in a house that belongs to her father-in-law. Strict cultural public status codes preclude women from making independent decisions (including those related to drinking) without incurring huge costs compared to men or women in the US. In Georgia, man almost by default is considered the head of the household and the decision-maker, and woman often does not make decisions about household related expenditure and services (OECD, 2014). Cultural norms discourage women from leading festive ritual drinking or bingeing in public (Goldstein, 1999). Except occasional dominance of woman as the toast master (*tamada*) in the Georgian ritual of hospitality and drinking (*supra*), the public performance is usually that of man. Men are also in charge of wine production, and have higher income. Proximity to alcohol, income, and culture appear to be the long-term drivers of alcohol use among men in Georgia.

In the study, a breakdown by ethnicity, household size, age and marital status demonstrated that binge drinkers (30%) were mainly Georgian males (43%), followed by Georgian females (10%), individuals living in households with two or more members (29%), younger than 55 years of age (28%), and either married or cohabiting (20%). Roughly 18% of smokers engaged in binge drinking. A further breakdown by gender revealed that 35% of male smokers and 1% of female

smokers engaged in binge drinking. The prevalence rate of binge drinking by gender exhibited some variations across breakdowns by education, occupation and income categories. The higher prevalence rate was among those with a high school diploma (16%) or college or higher degree (12%), among males with a high school (26%) or college degree (20%) than among females with a high school (5%) or college degree (4%). The rate of binge drinking among unemployed individuals (11%), particularly unemployed males (20%) were indicative of a strong association between unemployed status and binge drinking. Similarly, the prevalence rate of binge drinking was fairly high among those with a low monthly household income (200 GEL or less) (15%). A breakdown by gender indicated that the rate of binge drinking was four times higher for males (24%) than for females (6%). Multivariate correlates of binge drinking showed that ethnicity, smoking, secondary schooling or less, retired, unemployed, and respondents in certain income brackets, all had high likelihood (odds > 1) of engaging in binge drinking.

Despite the known alcohol use among Russians, ethnic Russian group in Georgia had lower odds of binge drinking in our study (odds = 0.24), as compared to their Georgians counterpart (control group). In other ethnic groups, Azerbaijani females (odds = 0.8) had a lower likelihood of binge drinking than Georgian females. Middle age (odds = 0.46) and older females (odds = 0.56) were half as likely to binge drink as the youngest females between 18 - 25 years of age. Widowed males (odds = 0.35) were less likely to binge drink than married or cohabiting couples. Also, widowed females (odds = 0.45) were less likely to binge drink than their married or cohabiting counterparts. Females with low education were twice as likely (odds = 2.00) to binge drink than their counterparts who had completed high school. Unemployed females and high income earning females are half as likely to binge than the homemakers or low income earning females,



respectively. In particular, unemployed females (odds = 0.48), and those females earning between 200- 400 GEL (odds = 0.49) and 400 - 800 GEL (odds = 0.52) were half as likely to binge relative to their counterparts who were homemakers or earn less than 200 GEL per month. Individuals in all other occupations, including the government employees (odds = 2.20), nongovernment employees (odds = 3.06), self-employed (odds = 3.59), students (odds = 2.12), and unemployed (odds = 2.57) had two to three times higher likelihood of bingeing on alcohol than homemakers. Individuals in lower monthly income group, earning less than 200 GEL, were more likely to binge drink than those with income in the range of 800 - 1600 GEL (odds = 0.58). However, smokers (odds = 5.30) were five times more likely than non-smokers to engage in binge drinking. The most significant correlate of binge drinking among males appears to be smoking Georgia, who were three times more likely (odds = 3.09) than non-smokers to engage in binge drinking. Individuals who smoked (odds = 5.30), male smokers (odds = 3.09) and female smokers (odds = 1.43) had a much higher likelihood of binge drinking than their non-smoking counterparts.

A culture of drinking alcohol that defines relationships and behavioral norms interacts with an economic expediency that promotes production and consumption of alcohol in Georgia. Official policy for endorsing wine industry is seen as an important component in growing income and raising employment in Georgia. Mass home-produced wine, informal markets, and availability of low-priced alcoholic drinks, made alcohol a popular element in lives of people strained with war and dislocation. However, studies based on detailed data from population surveys that are of significant interest to policy makers, are scarce in Georgia. Country-specific studies of alcohol use and alcohol abuse are the foundation for designing interventions that may curtail the harms

of alcohol abuse in the underlying societies (NIAAA, 2015; Bouchery et al., 2006; Rehm et al., 2010; Hingson & Zha , 2009; Otiashvili et al., 2013).

## Conclusion

More than one quarter of Georgian adults (30%) aged 18-65 engage in binge drinking on regular basis, and there has been a sharp increase in the prevalence rate of binge drinking over the last decade. Promotion of the wine industry that is a priority in Georgia has been based on economic motivation, and historical wine culture with excessive drinking as an accepted social norm.

This study examined correlates and prevalence of binge drinking among men and women in Georgia. A probabilistic model demonstrated that smoking, education, occupation, and unemployment significantly associate with the likelihood of binge drinking.

Prior research indicated lack of specific public interventions. Our study has important implications for policy makers and future research. Informing and pointing the magnitude of the problem, may provide foundation for designing public education programs and preventive interventions centered on reducing binge drinking and smoking, as well as effective excise taxation policy on all forms of alcohol in Georgia.

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#### **Conflict of Interest Statement**

We declare that we have no proprietary, financial, professional or other personal interest of any nature or kind in any product, service and/or company that could be construed as influencing the position presented in, or the review of, the manuscript entitled *Binge Drinking in the Oldest Wine Country: Evidence from the Noncommunicable Disease Risk Factor Surveillance*.

## Tables

**Table 1. Prevalence of Drinking Pattern among Adults Aged 18 – 65 in Georgia, by Gender**

	Full Sample (n = 6497)			Male (n = 1887)			Female (n = 4610)		
	Full Sample			Male			Female		
Consumed Alcohol	%	STD	Chi-Square	%	STD	Chi-Square	%	STD	Chi-Square
Ever	78.47	1.35	634.25*	90.44	1.17	552.50*	66.35	2.07	55.86*
In past 12 months	81.57	0.97	83.36*	89.3	1.03	114.07*	70.9	1.48	164.07*
In past 30 days	64.9	1.55	185.94*	73.59	1.95	0.02	49.79	1.92	0.01
Bing Drinking	30.06	1.34	184.97*	49.66	2.09	0.01	10.21	0.88	743.59*

Data: WHO's STEPwise Approach to Noncommunicable Disease Risk Factor Surveillance (STEPS)

SD: Standard Deviation; Chi-square: Rao-Scott Chi-Squared statistics.

Software: SAS (Surveyfreq Procedure)

Note: Binge Drinking is defined by drinking 5 or more standard drinks for men, or 4 or more for women in a single drinking occasion.

\*: Statistically different from 0 by  $p < 0.05$ .

**Table 2. Prevalence of Drinking Pattern among Adults Aged 18 – 65 in Georgia, by Sociodemographic Characteristics**

	Full Sample (n = 6497)						Male (n = 1887)						Female (n = 4610)					
	Full Sample			Binge Drinker			Male			Binge Drinker			Female			Binge Drinker		
	%	STD	Chi_ square	%	STD	Chi_ square	%	STD	Chi_ square	%	STD	Chi_ square	%	STD	Chi_ square	%	STD	Chi_ square
<b>Ethnicity</b>																		
Georgian	86.1	2.1	146.1	26.7	1.3	71.9	84.5	2.7	84.9	43.5	2.3	55.8	87.8	1.8	188.0	9.8	0.9	83.7
Ossetian	0.7	0.2	1213.6	0.2	0.1	400.7	0.7	0.3	794.9	0.4	0.3	306.5	0.7	0.2	1247.2	0.0	0.0	671.6
Azerbaijani	7.4	1.9	132.9	1.9	0.8	67.3	8.8	2.6	81.8	3.8	1.6	54.1	6.0	1.7	161.6	0.1	0.1	247.6
Armenian	5.0	1.1	313.8	1.2	0.5	117.0	5.7	1.5	196.0	2.2	1.0	96.6	4.4	0.9	399.6	0.3	0.2	60.7
Russian	0.5	0.1	7258.0	0.1	0.0	1185.0	0.2	0.1	2455.8	0.0	0.0	1551.7	0.8	0.2	3722.9	0.1	0.1	174.6
<b>Household Size</b>																		
One	6.3	0.5	2195.7	1.6	0.2	932.0	5.2	0.6	1296.3	2.2	0.3	777.4	7.4	0.5	1908.9	0.9	0.2	403.4
Two	24.8	1.0	473.6	6.7	0.5	248.2	24.0	1.4	258.1	11.0	0.9	198.5	25.7	1.0	432.2	2.2	0.3	81.6
Three	28.5	1.0	364.1	9.2	0.7	77.6	27.3	1.5	174.7	15.1	1.3	68.6	29.8	1.0	340.3	3.2	0.4	28.7
Four	23.8	1.1	440.3	7.9	0.7	114.7	27.2	1.8	126.7	13.5	1.3	79.7	20.3	1.0	629.7	2.2	0.4	57.7
Five or more	16.3	1.0	620.0	5.0	0.6	176.4	16.1	1.6	255.5	8.0	1.2	131.8	16.5	1.1	478.4	1.9	0.4	54.7
<b>Age</b>																		
18 - 25	22.8	1.0	492.1	7.2	0.7	158.7	24.3	1.5	204.2	11.2	1.2	123.7	21.2	1.2	397.0	3.2	0.5	30.2
26 - 35	24.7	1.0	530.2	8.5	0.7	110.1	27.0	1.5	177.1	14.5	1.4	72.3	22.5	0.9	641.9	2.4	0.4	54.5

36 - 45	19.2	0.7	1245.9	5.9	0.5	259.4	17.6	1.1	534.2	9.5	0.9	206.8	20.8	0.8	855.1	2.2	0.3	98.3
46 - 55	21.5	0.7	1046.6	6.0	0.4	345.4	19.9	1.1	449.3	10.1	0.8	250.2	23.1	0.8	812.1	1.9	0.3	147.1
56 - 65	11.8	0.5	2390.8	2.6	0.2	1020.2	11.3	0.7	1240.3	4.6	0.4	793.7	12.4	0.6	1924.0	0.6	0.1	427.1
<b>Marital Status</b>																		
Never married	25.5	0.9	524.2	9.4	0.8	77.0	32.0	1.5	123.1	16.0	1.4	51.1	18.9	1.0	609.2	2.8	0.4	40.1
Separated	1.4	0.2	4683.3	0.2	0.1	1798.7	1.2	0.2	2098.4	0.3	0.1	1348.6	1.5	0.2	4794.2	1.4	0.2	391.9
Divorced	2.2	0.2	3894.5	0.4	0.1	692.6	1.2	0.3	1209.1	0.6	0.3	460.4	3.2	0.3	2820.3	0.2	0.1	356.0
Widowed	4.5	0.3	5417.4	0.4	0.1	1691.2	1.3	0.2	3103.3	0.5	0.1	1122.3	7.8	0.4	2687.2	0.3	0.1	509.7
Married	66.1	1.0	253.4	19.7	1.0	48.7	64.1	1.5	76.8	32.4	1.7	35.1	68.2	1.0	262.7	6.9	0.7	24.4
<b>Maternal Status</b>																		
Pregnant	1.4	0.2	3497.8	0.1	0.1	1006.6							2.8	0.4	1643.7	0.3	0.1	162.0
<b>Smoker</b>																		
Smoker	30.2	1.0	350.5	18.0	1.0	35.5	55.4	1.4	14.1	34.7	1.7	118.9	4.8	0.5	1298.6	1.1	0.2	149.1
<b>Education</b>																		
Secondary school	8.8	1.0	1859.5	2.6	0.4		8.4	1.1	986.5	4.1	0.6	411.0	9.1	1.2	1363.6	1.1	0.3	
High school	55.0	1.3	574.3	15.5	1.1	502.5	52.3	1.8	476.6	25.8	1.8	16.2	57.8	1.4	413.2	5.2	0.6	89.5
College	35.9	1.3	108.1	12.1	0.8	19.1	39.0	1.8	33.7	20.0	1.3	256.0	32.8	1.2	185.7	4.0	0.5	9.7
<b>Occupation</b>																		
Government	14.8	0.8	967.0	4.2	0.4	320.0	13.9	1.2	419.1	6.8	0.8	236.5	15.7	0.9	823.6	1.6	0.3	106.3
Non-government	8.2	0.7	1175.6	3.4	0.5	331.9	10.8	1.1	457.6	6.3	0.9	74.7	5.5	0.6	1332.2	0.6	0.2	167.2
Self-employed	15.0	1.0	662.2	6.9	0.7	115.8	23.2	1.7	175.3	12.8	1.4	689.2	6.7	0.5	1619.7	0.9	0.2	119.5
Non-paid	0.4	0.2	1836.8	0.1	0.1	899.7	0.5	0.3	702.1	0.2	0.1	336.6	0.3	0.1	2168.2	0.0	0.0	364.9
Student	6.3	0.6	1433.8	1.8	0.3	459.1	5.7	0.8	630.1	2.3	0.5	800.3	6.8	0.7	1116.4	1.4	0.3	96.2
Homemaker	21.2	0.8	856.2	2.2	0.3	694.5	0.2	0.1	1608.2	0.2	0.1	1335.6	42.5	1.3	35.2	4.3	0.5	5.7
Retired	4.1	0.3	4132.9	0.4	0.1	1917.9	2.8	0.4	1643.7	0.5	0.1	16.7	5.3	0.4	2805.9	0.2	0.1	614.2

Unemployed	28.1	1.1	327.1	10.9	0.7	49.6	40.2	1.8	28.9	20.4	1.4	1317.2	15.8	0.9	738.1	1.3	0.2	148.9
Unable to work	1.8	0.3	1659.7	0.3	0.1	1150.5	2.4	0.5	865.2	0.4	0.1	0.3	0.1	0.2	1815.1	0.1	0.1	147.5
<b>Monthly Income (GEL)</b>																		
≤ 200	52.2	1.6	2.04 <sup>a</sup>	15.2	1.1	0.03 <sup>a</sup>	51.0	2.0	0.2713 <sup>a</sup>	24.2	1.7	0.00 <sup>a</sup>	53.4	1.8	3.9	6.2	0.8	5.2
> 200 to ≤ 400	23.6	0.9	579.2	7.3	0.7	143.7	23.7	1.4	249.3	12.9	1.2	105.7	23.5	1.1	460.0	1.7	0.3	123.7
> 400 to ≤ 800	17.3	1.0	564.9	5.5	0.5	221.6	18.1	1.4	306.0	9.4	1.0	172.7	16.5	1.1	510.7	1.5	0.3	84.9
> 800 to ≤ 1600	5.9	0.6	1211.8	1.7	0.3	546.8	6.1	0.8	633.8	2.5	0.5	429.4	5.7	0.6	1110.5	0.8	0.2	115.5
More than 1600	0.9	0.2	1770.7	0.5	0.2	380.7	1.0	0.4	645.1	0.9	0.4	274.9	0.8	0.2	2099.4	0.2	0.1	215.1

Data: WHO's STEPwise Approach to Noncommunicable Disease Risk Factor Surveillance (STEPS)

SD: Standard Deviation; Chi-square: Rao-Scott Chi-Squared statistics.

Software: SAS (Surveyfreq Procedure)

Blank: Not enough observations

a: Indicate that demographic differences did not achieve statistical significance;  $p > .05$ .

**Table 3. Results of Multiple Logistic Regression Analysis for correlates of Binge Drinking, Full Sample and by Gender, Adults Aged 18 – 65 in Georgia**

	Full Sample (n = 6497)				Male (n = 1887)				Female (n = 4610)			
<i>% Concordant</i>	<i>0.77</i>				<i>0.68</i>				<i>0.66</i>			
<b>Effect</b>	<b>Odds</b>	<b>95% CL</b>		<b>p- values</b>	<b>Odds</b>	<b>95% CL</b>		<b>p- values</b>	<b>Odds</b>	<b>95% CL</b>		<b>p- values</b>
<b>Ethnicity</b>												
Ossetian	1.03	0.35	3.03	0.95	1.49	0.30	7.33	0.62	0.49	0.10	2.50	0.39
Azerbaijani	0.64	0.30	1.37	0.25	0.70	0.32	1.55	0.38	0.08	0.02	0.29	0.00 *
Armenian	0.61	0.32	1.18	0.14	0.60	0.28	1.30	0.19	0.52	0.14	1.91	0.32
Russian	0.24	0.06	0.95	0.04 *	0.16	0.01	2.51	0.19	0.92	0.23	3.70	0.90
<b>Household Size</b>												
Two	0.81	0.57	1.15	0.23	0.93	0.58	1.49	0.77	0.67	0.43	1.03	0.07
Three	1.02	0.72	1.46	0.90	1.39	0.87	2.21	0.17	0.79	0.51	1.24	0.31
Four	1.15	0.78	1.70	0.47	1.27	0.77	2.10	0.35	0.93	0.54	1.60	0.80
Five or more	1.06	0.71	1.60	0.77	1.19	0.70	2.04	0.52	1.00	0.58	1.72	0.99
<b>Age</b>												
26 - 35	1.01	0.71	1.44	0.95	1.13	0.72	1.78	0.59	0.84	0.48	1.48	0.55
36 - 45	0.98	0.69	1.40	0.92	1.22	0.78	1.92	0.38	0.79	0.47	1.35	0.40

46 - 55	0.93	0.66	1.33	0.70		1.16	0.73	1.87	0.53	0.56	0.33	0.96	0.04	*	
56 - 65	1.05	0.70	1.57	0.81		1.19	0.72	1.99	0.50	0.46	0.25	0.86	0.01	*	
<b>Marital Status</b>															
Never married	1.12	0.83	1.52	0.45		1.21	0.82	1.78	0.34	1.09	0.67	1.79	0.73		
Separated	0.52	0.24	1.12	0.10		0.43	0.17	1.14	0.09	0.75	0.25	2.24	0.60		
Divorced	0.55	0.25	1.21	0.14		1.08	0.29	4.00	0.91	0.47	0.21	1.04	0.06		
Widowed	0.35	0.23	0.54	0.00	*	0.88	0.43	1.80	0.73	0.45	0.26	0.78	0.00	*	
<b>Maternal Status</b>															
Pregnant	0.53	0.20	1.39	0.19						0.62	0.23	1.68	0.35		
<b>Smoking</b>															
Smoker	5.30	4.35	6.46	0.00	*	3.09	2.41	3.97	0.00	*	3.00	1.84	4.89	0.00	*
<b>Education</b>															
Secondary School	1.37	0.96	1.97	0.09		1.20	0.76	1.90	0.44	2.00	1.09	3.67	0.02	*	
College or higher	1.08	0.86	1.37	0.50		1.04	0.77	1.39	0.81	1.43	0.99	2.05	0.06		
<b>Occupation</b>															
Government	2.20	1.50	3.22	0.00	*	1.00	0.22	4.47	0.99	1.05	0.64	1.72	0.84		
Non-government	3.06	2.09	4.50	0.00	*	1.34	0.31	5.71	0.69	0.83	0.40	1.70	0.61		
Self-employed	3.59	2.52	5.12	0.00	*	1.19	0.27	5.17	0.82	1.30	0.73	2.30	0.38		
Non-paid	1.29	0.47	3.58	0.62		0.44	0.08	2.39	0.34	1.29	0.12	13.59	0.83		
Student	2.12	1.24	3.61	0.01	*	0.72	0.16	3.36	0.68	1.31	0.66	2.63	0.44		
Retired	0.64	0.37	1.13	0.12		0.26	0.05	1.22	0.09	0.48	0.25	0.92	0.03	*	
Unemployed	2.57	1.85	3.59	0.00	*	1.03	0.25	4.29	0.97	0.61	0.39	0.98	0.04	*	

Unable to work	0.82	0.31	2.14	0.68		0.22	0.04	1.22	0.08		0.72	0.13	3.86	0.70
<b>Monthly Income (GEL)</b>														
> 200 to <=400	0.93	0.73	1.20	0.59		1.19	0.86	1.65	0.29		0.49	0.33	0.72	0.00 *
> 400 to <=800	0.85	0.63	1.13	0.26		1.01	0.68	1.49	0.97		0.52	0.33	0.82	0.01 *
> 800 to <=1600	0.58	0.34	0.99	0.05	*	0.53	0.27	1.02	0.06		0.75	0.39	1.45	0.39
More than 1600	2.07	0.76	5.59	0.15		3.96	0.69	22.86	0.12		1.06	0.29	3.91	0.93

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Data: WHO's STEPwise Approach to Noncommunicable Disease Risk Factor Surveillance (STEPS)

Odds: Odds ratio point estimates

CL: Confidence Limits (Wald Confidence Limits)

*p-values*: probability values from the multiple logistic regression estimates (probability that estimated Wald Chi-square is greater than its critical value)

GEL: Georgian Lari (currency of the Republic of Georgia; 1 Lari = 0.55 US dollar in October 2010).

\* Statistically different from 0 by  $p < 0.05$