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## Alcohol-Related Negative Consequences among Drinkers around the World

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### Abstract

**Aims**—This paper examines (1) gender and country differences in negative consequences related to drinking; (2) relative rates of different consequences; (3) country-level predictors of consequences.

**Design, setting and participants**—Multi-level analyses used survey data from the GENACIS collaboration.

**Measurements**—Measures included 17 negative consequences grouped into (a) high endorsement acute, (b) personal and (c) social. Country-level measures included average frequency and quantity of drinking, percent current drinkers, Gross Domestic Product (GDP) and Human Development Index (HDI).

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The contents of this paper are solely the responsibility of the authors and do not necessarily represent the official views of the NIAAA or NIH, the CIHR or those of the Ministry of Health and Long Term Care.

#### Conflict of Interest Declaration

*Connection with tobacco, alcohol, pharmaceutical or gaming industry:* None

*Constraints on publishing:* None

*I testify to the accuracy of the above on behalf of all the authors.* Kathryn Graham

**Findings**—Overall, the three groupings of consequences were reported by 44%, 12% and 7% of men and by 31%, 6% and 3% of women, respectively. More men than women endorsed all consequences but gender differences were greatest for consequences associated with chronic drinking and social consequences related to male roles. The highest prevalence of consequences was in Uganda, lowest in Uruguay. Personal and social consequences were more likely in countries with higher usual quantity, fewer current drinkers, and lower scores on GDP and HDI. However, significant interactions with individual-level quantity indicated a stronger relationship between consequences and usual quantity among drinkers in countries with lower quantity, more current drinkers and higher scores on GDP and HDI.

**Conclusions**—Both gender and country need to be taken into consideration when assessing adverse drinking consequences. Individual measures of alcohol consumption and country-level variables are associated with experiencing such consequences. Additionally, country-level variables affect the strength of the relationship between usual quantity consumed by individuals and adverse consequences.

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## Introduction

Alcohol consumption can result in many negative consequences both physiological and social, ranging from health consequences such as liver cirrhosis to social consequences such as conflict with friends or family and job loss. However, the kinds of negative consequences experienced may depend on both gender and culture (1). Assessing gender differences is important first to identify how alcohol affects the lives of men and women differently, and secondly because screening and diagnostic instruments developed from composite measures of problem consequences may risk gender bias if they include behaviors that are more likely to be engaged in by one gender than the other regardless of their drinking patterns. For example, because men are generally more likely than women to drive a motor vehicle (2–4), inclusion of drinking-driving in a composite measure would result in more men than women identified as meeting the DSM IV alcohol abuse criteria even if men and women had comparable drinking patterns.

Culture may also affect both the experience and reporting of negative consequences from drinking. In particular, although country differences in negative consequences are associated with drinking pattern (e.g., 5), drinkers in some countries report more consequences than do drinkers from other countries, even when overall consumption in the country is similar (6, 7). These country differences may be due to the culture and context of drinking, including factors such as the extent that the culture is “wet” (i.e., most people drink) versus “dry” (i.e., most people abstain) (8–10), the extent of temperance sentiments or social intolerance for drinking in the culture (11), norms regarding drunkenness and deviant behavior when drinking (1), the extent to which drinking takes place more frequently in public versus private settings (12) and cultural norms for perceiving and attributing problems to alcohol consumption (13).

One important context for alcohol use is the level of economic and human development (i.e., education, standard of living, etc.) of the country in which alcohol is consumed. For example, family problems related to drinking may be more likely when the drinker’s expenditure on alcohol affects his/her family’s access to food and shelter. Therefore, relative wealth may explain some variations in problem consequences from drinking among countries that have apparently similar patterns and levels of alcohol consumption. Similarly, the experience of alcohol-related problems may be related to the general well-being of the culture in terms of education, standard of living and life expectancy. That is, the negative consequences of alcohol may be less when alcohol is consumed in a context of general well-being.

Finally, the relationship between gender and negative consequences from drinking may vary by culture (14). For example, women may be especially likely to experience negative consequences from drinking in cultures where there are stronger taboos against alcohol consumption for women than for men. On the other hand, economic well-being may have a stronger moderating effect on the problems experienced by male than female drinkers in cultures where the man is the primary income earner. Therefore, it is important to examine not only overall gender differences in negative consequences from drinking but also cultural differences by gender.

Existing studies examining country differences in experiencing negative consequences from drinking have either focused on aggregate statistics of harm such as mortality and morbidity from different alcohol-related causes (e.g., 15) or compared a small number of countries (16, 17) often within the same region (18–20). This paper examines gender and country-level patterns of negative consequences from drinking using data from a large number of countries representing most regions of the world. The specific objectives are:

1. To describe gender differences in experiencing specific negative consequences related to drinking;
2. To identify most and least frequently experienced consequences across different countries and examine country differences in experiences of different types of consequences;
3. To identify the extent that country-level variables such as drinking pattern and level of economic well-being explain country differences in rates of negative consequences from drinking over and above differences accounted for by individual measures of alcohol consumption.

## Method

### Samples

Samples of current drinkers (i.e., consumed alcohol in the past 12 months) from 27 surveys conducted in 26 countries as part of the GENACIS (Gender, Alcohol, and Culture: An International Study) collaboration are included in the present analyses. (Additional details about the surveys and samples were reported in a previous publication (21).) Because surveys differed in the age range sampled, the current analyses are restricted to respondents in the 18 to 65 age range for greater comparability across countries (respondents were aged 18–65 in all countries except Czech Republic, Peru – 18–64; Hungary – 19–65; Japan – 20–65; USA1 – 21–65). Details regarding the survey year, mode of data collection, and the number and percent of men and women in the sample age range who reported alcohol consumption in the previous 12 months are provided in Table S1 in the supplementary material to this paper. Countries are grouped by regions defined for the 2005 Global Burden of Diseases, Injuries, and Risk Factors Study <http://www.globalburden.org/>.

### Individual-level measures

**Negative consequences from drinking**—Measurement of negative consequences from drinking has typically focused on screening and diagnosis (e.g., 22, 23–25), although several instruments have been developed to measure alcohol dependence in clinical and nonclinical samples (26–30). However, no common set of negative consequences from drinking has been adopted for use in epidemiological surveys to estimate the level of various types of alcohol problems experienced in the general population. Therefore, the GENACIS surveys included multiple measures of negative consequences. The present study includes six consequences items from the Alcohol Use Disorders Identification Test (AUDIT) developed by the World Health Organization (WHO) to screen for people at risk of

developing alcohol problems (22, 31, 32) and 11 other consequences commonly measured in alcohol surveys (33–35). Table S2 in the supplementary material shows the core wording of each problem consequence question and notes minor variations in wording used in specific countries. Consequences were scored as 1 (experienced consequence in past 12 months) or 0 (did not experience consequence during the past 12 months).

**Groupings of negative consequences**—No standardized way of grouping consequences has been developed to date. In fact, scaling or grouping of negative consequences from drinking remains one of the most controversial areas within alcohol research (36–39), partly because the items included on any particular measure can affect scores. For example, one analysis of general population survey data (40) found that the single item of driving after drinking accounted for a substantial proportion of persons meeting DSM-IV criteria for alcohol abuse. The selection of negative consequences for grouping is especially important for cross-national comparisons because culture may influence the extent that it is even possible to experience specific consequences (as an obvious example, drinking and driving is less likely to be a problem in countries where few people have access to cars). In addition, specific consequences may be linked to specific country drinking patterns (41, 42), a relationship that might be obscured if negative consequences were simply summed and treated as unidimensional.

Preliminary analyses found that no factor-analytic solution was applicable across all countries and for both genders. Therefore, for the present purposes, we have constructed item groupings based on construct similarity of the items. In grouping the consequences items, we took into consideration the commonly-made distinction between dependence and other types of negative consequences, as well as the five domains defined for the Drinker Inventory of Consequences (DrInC) developed for Project MATCH in the US (43). Our groupings also take into consideration endorsement rates of items in order to avoid scales being dominated by one or two commonly endorsed items. Based on these considerations, we constructed three groupings.

**High endorsement acute consequences [labeled “high endorsement”]**: This grouping consists of two frequently endorsed acute consequences from drinking that reflect at least one occasion of drinking more than a small amount: *had a headache or felt nauseated as a result of your drinking; drank enough to feel the effects of alcohol.*

**Acute (but not highly endorsed) and chronic consequences experienced primarily by the drinker [labeled “personal”]**: The second grouping includes seven negative consequences that primarily affect the drinker (5 from the AUDIT): *guilt or remorse; unable to remember the night before; failing to do what was normally expected from you; taking a drink to get over any of the bad after-effects of drinking; unable to stop drinking once started; feeling sick or shaky when cut down or stopped drinking; and needing a drink in the morning to get yourself going after a heavy drinking session.*

**Social negative consequences from drinking [labeled “social”]**: This grouping is comprised of eight items that generally reflect social problems related to drinking, similar to items on the interpersonal/social responsibility dimensions of the DrInC. The grouping includes harmful effects of drinking on: *finances; housework or chores around the house; work, studies or employment; marriage/intimate relationship; family relationships including children; and friendships or social life.* It also includes: *getting into a fight while drinking; you or someone else injured as a result of your drinking.*

These groupings provide a conceptual framework for scoring consequences, but it should be noted that some items fit conceptually into more than one grouping. Specifically, *guilt or*

*remorse* and *failing to do what was expected* might also be considered social problems from drinking; however, psychometric analyses suggested that these two items were aligned more closely with personal consequences from drinking than with social consequences. Injury has been included as a social rather than personal consequence because the question included injuries to others as well as self.

Scores for items in each grouping were calculated by summing the scores (0/1) for items and dividing by the number of items in the grouping. Thus, scores for each grouping range from 0 to 1. One missing item was allowed for personal and social groupings. Female drinkers from India and Sri Lanka were excluded from these analyses because there were too few female respondents who reported drinking alcohol in the past 12 months (N = 37 for India and N = 38 for Sri Lanka) to yield meaningful estimates of negative consequences from drinking.

**Frequency and usual quantity of drinking**—Responses to questions on usual frequency of drinking were converted into the number of drinking days per year. Usual quantity was converted into standard drinks measured as 12 grams of absolute alcohol per drink (see 21).

**Country-level measures**—The dominant country-level drinking pattern was estimated using two variables: average frequency of drinking (measured as the average number of drinking days in the past year among current drinkers aged 18–65 by gender) and average usual number of drinks per occasion (available for all countries except Kazakhstan and Sri Lanka). Frequency and usual quantity per occasion were chosen for the analyses because they were available for most countries, while measures of heavy episodic drinking (e.g., 60g. ethanol or more per occasion) and hazardous drinking (44) were available for fewer countries; however, we conducted supplementary analyses using these measures and found similar results. Percent of current drinkers (drank alcohol in the past 12 months) was selected as a measure of the “wetness” of the country. Per capita Gross Domestic Product (GDP) was used to measure economic prosperity and the Human Development Index (HDI) as an indicator of economic and social well-being. The GDP measure is adjusted for purchasing power parity using international dollars, calculated by dividing national GDP by population estimates for 2008 obtained from the World Development Indicators database, World Bank, September 15, 2009, ([http://siteresources.worldbank.org/DATASTATISTICS/Resources/GDP\\_PPP.pdf](http://siteresources.worldbank.org/DATASTATISTICS/Resources/GDP_PPP.pdf) and <http://siteresources.worldbank.org/DATASTATISTICS/Resources/POP.pdf>). The HDI is based on indicators of life expectancy, educational attainment and income and is intended to serve as a frame of reference for both social and economic development (<http://hdr.undp.org/en/humandev/hdi/>). The HDI estimates for 2007 for each country were obtained from Human Development Reports of the United Nations Development Program ([http://hdr.undp.org/en/media/HDR\\_2009\\_EN\\_Table\\_H.pdf](http://hdr.undp.org/en/media/HDR_2009_EN_Table_H.pdf)). An HDI estimate was not available for Isle of Man.

## Analyses

Descriptive data for individual negative consequences from drinking are presented by gender overall and by country and gender (Figures 1 to 3). Logistic regression was used to calculate odds ratios and assess the statistical significance of gender for individual consequences. Analysis of Variance (ANOVA) was used to compare each country score to the mean score on that grouping for all other countries (a Bonferroni correction of  $p < .002$  was used for estimating statistical significance to compensate for the number of comparisons conducted). All descriptive analyses controlled for age.



Hierarchical Linear Modelling (HLM) (45) was used to test the relationship between country-level variables and negative consequences from drinking by regressing consequences scores on country-level drinking pattern and economic/social development variables in models including individual-level frequency and quantity of alcohol consumption and interactions of country-level variables with individual-level consumption measures. Each country-level variable was assessed in a separate analysis because they were highly inter-correlated, except that country-level average frequency and quantity (which were not highly correlated) were included in the same model because, used together, they provide a measure of drinking pattern. These analyses did not control for age of respondents because of the high correlation between age and country measures of economic and social development. We used the over-dispersed Poisson version of HLM because the negative consequences scores were equivalent to count variables (summing of positively endorsed items divided by number of items). All person- and country-level variables were grand mean centered. All analyses included random intercepts to allow for unexplained mean country-level differences. For individual-level variables, the variance in slopes across countries was examined to determine whether it was significantly greater than zero. The chi-square  $p$ -value for the variance component of individual-level scores on frequency of drinking was greater than 0.05 for all models; therefore a random residual component was not included for individual-level frequency (i.e., the variance in slopes for average frequency across countries was modeled as being fixed); however, a random residual component was included for quantity of consumption. These analyses included all countries for which scale scores could be calculated except two countries (Kazakhstan and Sri Lanka) where a score on the usual quantity measure was unavailable.

### Ethical review

The overall GENACIS project was reviewed and approved by the Institutional Review Board of the University of North Dakota. Individual country surveys were reviewed according to procedures created to protect research participants in their countries. Work on the present paper by Graham and Bernards was conducted under ethical approval from the Research Ethics Board of the Centre for Addiction and Mental Health for the GENACIS Canada project.

## Results

### Gender differences

Figure 1 shows the percent of male and female drinkers who reported experiencing each negative consequence from drinking during the past 12 months. As is evident from this graph, a larger proportion of men than women endorsed all consequences (all gender differences were statistically significant at  $p < .001$  for the overall sample); however, the magnitude of the gender difference varied by consequence. Gender differences tended to be lowest (odds ratio for males compared to females  $< 2$ ) for high endorsement consequences (*headache or nausea, felt effects*) and for *guilt or remorse* (from personal group) and *harmful effects on household tasks or chores* (from social). Larger gender differences were found for *drinking to get over bad effects* and *morning drinking* (from personal) and *fighting after drinking* (from social) (odds ratio  $> 3$ ) and for *harmful effects on work, finances and marriage/intimate relationships* and for *injury* (odds ratios close to 3). Within each country, men scored significantly higher ( $p < .05$ ) than did women on all scales (controlling for age) except Australia for the social consequences scale and Nigeria for all scales.

### Most frequently experienced consequences

As shown in Figure 1, aside from the high endorsement items which were the most commonly reported consequences for both men and women overall, the most frequently

reported consequences in other groupings were *guilt or remorse* and *unable to remember the night before* (from personal) and *harmful effect on finances* (from social), the latter especially for men. Figures 2 and 3 show rates of each consequence for men and women by country. As shown in these figures, within country patterns of endorsement rates across items tended to be similar to the overall pattern evident in Figure 1. The lowest endorsement rates among personal (Figure 2) items for most countries were found for *sick or shaking if stopped or cut down* and *morning drinking*. Social items (Figure 3) generally received low rates of endorsement (0% to 10% for men, 0% to 5% for women), except for harmful effects on finances which was frequently endorsed by male respondents in many countries, especially poorer countries. High variability among countries was evident for some consequences, such as fights after drinking, with 26.2% of men from Costa Rica, 20.3% of men from Nicaragua and 17.6% of men from the Czech Republic reporting fights after drinking compared to 3.5% of men from Denmark and 3.7% of men from Spain.

### Country differences in rates of experiencing different types of consequences

Table 1 shows mean scores for the three consequences groupings by gender, country and Global Burden of Disease region. All groupings showed considerable variation by country and gender. For high endorsement acute consequences, men's mean scores varied from a low of .26 for Uruguay to a high of .62 for New Zealand, and women's mean scores from a low of .08 for Hungary to a high of .50 for Uganda. For personal consequences, men's mean scores varied from a low of .05 for Uruguay to a high of .35 for Uganda, and women's mean scores from a low of .02 for Argentina and Uruguay to a high of .22 for Uganda. For social consequences, men's mean scores varied from a low of .02 for Uruguay and Sweden to a high of .27 for Uganda, and women's mean scores from a low of .00 for Argentina and Uruguay to a high of .13 for Uganda.

Countries rank ordered (from highest to lowest) by total consequences scores among male drinkers are shown in Table 2. Superscript <sup>a</sup> beside the ranking indicates that the country scored significantly ( $p < .002$ , the Bonferroni adjusted probability level) *lower* on that consequences scale compared to the average score across all other countries; superscript <sup>b</sup> beside the ranking indicates that the country scored significantly *higher* compared to the average score across all other countries controlling for age. Countries that had consistently higher rankings (i.e., higher mean scores on negative consequences) were Uganda, Nicaragua (except scores on high endorsement acute consequences and not significant for women on personal consequences), Czech Republic, Kazakhstan (men only), and New Zealand (not significant for men on personal consequences). Men from India ranked significantly higher on problems overall and on personal and social consequences but significantly lower on high endorsement acute consequences. Women (but not men) from Australia scored higher than average on all scales. Men from Costa Rica and women from Nigeria scored higher overall and on personal and social consequences.

Countries in which respondents reported the fewest problems overall (Uruguay, Spain, Argentina, Brazil, Sweden, Sri Lanka, Canada) were consistently lower than average on all mean scale scores (except for Canada and Sweden on high endorsement acute consequences), although this difference was not always statistically significant. Men and women from the same country tended to have similar rankings compared to other countries, with the exception of Kazakhstan (women ranked lower than men when compared to other countries), Australia (men lower) and Nigeria (men lower).

Although most countries tended to have similar rankings for all three groupings, some countries had relatively high mean scores on some scales but not on others. Specifically, men and women from Nicaragua, women from Nigeria and men from India were higher than average on personal and social consequences but scored lower than average on high



endorsement acute consequences. Similarly, respondents from Belize scored similar to the average across countries for personal and social consequences but significantly lower than other countries on high endorsement acute consequences. On the other hand, men and women from Denmark and the Isle of Man and men from Australia were among the highest scoring countries on high endorsement acute consequences but scored lower or not significantly different from average on personal and social consequences. Respondents from Japan showed a different pattern from that of all other countries with lower mean scores than other countries on high endorsement acute and personal consequences but significantly higher scores on social consequences.

There were some consistent patterns relating to the Global Burden of Disease regions but also some variations. In terms of consistent findings, countries with lower rates of negative consequences tended to be from South America and Tropical South America (3 of 4 countries from this region were in the low scoring group), Western Europe and North America (for personal and social consequences). No other regional patterns were evident.

### **Associations between rates of negative consequences from drinking and country-level variables**

Table 3 shows the results of the regression of individual-level scores for the three groupings of negative consequences on country-level drinking pattern, percent current drinkers, HDI and GDP. Model I includes only the country-level measures; Model II includes country-level measures plus individual-level measures of frequency of drinking and usual quantity per occasion and interaction terms for each country-level measure by individual-level frequency and quantity of consumption. Probability levels including  $p < .10$  are shown but only those meeting conventional statistical significance ( $p < .05$ ) are discussed. As shown in this table, individual-level measures of quantity and frequency of alcohol consumption were positively associated with negative consequences in all models.

**Country-level drinking pattern**—A significant positive relationship was found between country-level usual quantity and scores on negative personal and social consequences (but not high endorsement consequences) in the country-only and full models, indicating a higher rate of problems in countries where more was consumed per occasion, even when individual-level measures and interaction terms were in the models. There were also significant negative interactions of country-level usual quantity with individual-level usual quantity for all three types of consequences, suggesting a stronger positive relationship between negative consequences and quantity per occasion for individuals in countries where the average usual quantity consumed in the country was lower.

Country-level frequency of drinking was positively related to negative consequences for women ( $p < .05$  for personal consequences,  $p < .10$  for high endorsement and social consequences) in the country-only models but this relationship became nonsignificant when individual-level measures and interactions were included. No significant interactions involving frequency of drinking were found (although several approached significance).

**Percent current drinkers, GDP and HDI**—Percent current drinkers, GDP and HDI were negatively related to experiencing personal and social consequences from drinking, although, for women, this relationship was only significant for HDI. That is, personal and social negative consequences from drinking were *less likely* in countries with a higher proportion of drinkers and higher scores on economic and social development. High endorsement consequences, on the other hand, were positively associated with these country-level measures, significant when other variables were in the model for percent current drinkers for both men and women and GDP for men.

Significant positive interactions indicate stronger relationships between negative consequences and usual quantity among individuals from countries scoring higher on GDP and HDI and where a larger proportion of respondents were drinkers. There was also a significant negative interaction of percent current drinkers and HDI with individual-level frequency of drinking in predicting high endorsement consequences among men, indicating a stronger relationship between high endorsement consequences and frequency of drinking among men from countries with fewer current drinkers and lower scores on HDI.

## Discussion

These results indicate that across a wide range of cultures and countries, men are generally more likely than women to report negative consequences from drinking; however, this difference varies by type of consequence. Gender differences were least for the two high endorsement consequences (*headache or nausea* and *felt effects*) and for *guilt or remorse* and *household work or chores*. Gender differences were greatest for *drinking to get over bad effects*, *morning drinking*, and *fights after drinking*, followed by negative consequences related to *work, finances, injury* and *marriage/intimate relationships*. Taken together, these results suggest that gender differences are least for minor short-term acute effects and greatest for consequences that result from chronic consumption or dependence and for drinking-related social problems that involve behaviors associated with male roles (e.g., breadwinner -- finances) and male-associated behaviors, such as aggression (46). These results are partly consistent with previous conclusions by Robbins (47) based on U.S. survey data that women are more likely to experience “intrapyschic” problems from drinking and drug use while men are more likely to experience social consequences. The greater gender difference of consequences related to chronic drinking (e.g., morning drinking) may reflect greater access to alcohol and higher levels of consumption by men in most cultures as well as greater controls in some cultures of women’s drinking.

Gender differences were similar across most countries; however, rankings were not similar for men and women in all countries. Specifically, women from Nigeria, Australia and New Zealand tended to have higher scores overall on negative consequences from drinking compared with women in other countries, whereas men from these countries tended to score closer to the average for men from other countries. The opposite was true for respondents from Kazakhstan where male respondents scored higher than men in most other countries but female respondents did not score higher than women in other countries. These findings underscore the need to take into consideration both gender and country when assessing the importance of different negative consequences from drinking. This finding may also reflect relatively small gender differences in alcohol consumption in Nigeria, Australia and New Zealand (21) when compared to many other countries.

This examination of individual negative consequences as well as groupings of consequences across a diverse sample of countries also provides insight generally into the measurement of negative consequences from drinking. First, the most highly endorsed consequences, *headache or nausea from drinking* and *feeling the effects*, likely reflect both occasional experiences of usually light drinkers as well as problems from chronic drinking. That is, even people consuming as little as one or two drinks might report feeling the effects. Thus, it is questionable whether these should be considered indicators of problem drinking in the same way as items in the personal and social groupings. Differential results for high endorsement consequences than for personal and social consequences on the country rankings and country comparisons using HLM also suggest that the high endorsement consequences may not belong with the other negative consequences as indicators of drinking problems.

Personal and social consequences were found to reflect similar rankings among countries with the exception of Japan which ranked significantly lower than other countries on personal consequences but significantly higher on social consequences. Although this difference occurred only for one country, the finding suggests that in order to develop a better understanding of drinking patterns and perceived negative consequences from drinking around the world, it is important not to assume that clustering of negative consequences will be the same in all countries. With regard to the findings for Japan, one possible explanation for the anomalous finding is that alcohol consumption, even heavy consumption, is widely tolerated in Japan but bad behavior while drinking is not (51). Thus, the difference in ranking for personal versus social consequences may be due to Japanese respondents having a lower threshold for perceiving social harms compared with respondents from other countries even though social harms may not be objectively more frequent in Japan (52). This interpretation is supported by the relatively high proportions of Japanese respondents (compared to other countries) reporting *perceived* harmful effects such as harmful effects on marriage and family (shown in Figure 3) but low proportions reporting more *objective* social consequences such as fights and injuries.

There were substantial differences in rates of problem consequences among countries, reflecting not only differences in drinking pattern, but also a range of other cultural and socioeconomic factors that can affect perceptions and reporting of negative consequences (1, 8–12, 48). In the present paper, we examined the extent that four country-level measures contributed to differences among countries in the extent of negative consequences from drinking reported by male and female current drinkers. These included usual quantity and frequency of alcohol consumption of men and women in the country (i.e., gender specific drinking pattern), percent current drinkers (i.e., “wetness” or “dryness” of the culture), GDP (i.e., economic prosperity) and HDI (economic and social well-being). Because the country-level variables were highly correlated, they were examined in separate models.

Although individual measures of alcohol consumption were strong and consistent predictors of negative consequences, country-level variables were also associated with negative consequences over and above individual alcohol consumption. First, controlling for individual level consumption, drinkers generally are at greater risk of negative consequences in countries where the average quantity level is high. For social consequences, this higher rate may be related to exposure to others who have been drinking heavily. Increased risk of personal consequences such as morning drinking may reflect engaging in this behavior because this practice is commonly engaged in by other drinkers in the culture.

However, this country-level main effect was moderated by a significant negative interaction indicating that the increase in experiencing negative consequences with increased amount consumed per occasion is greater in countries where people on average drink *less* per occasion. This interaction may be due to lower tolerance of intoxicated behaviour in countries where people generally drink low quantities per occasion. Conversely, in countries where usual quantity and negative consequences experienced are already high, increased consumption at the individual level may not contribute as much to the level of consequences experienced by the individual as it would in countries where usual consumption and negative consequences are generally low.

Second, although average frequency of drinking in the country was associated with negative consequences, this relationship became nonsignificant when individual alcohol consumption measures were in the models. That is, the association between country-level drinking frequency and negative consequences was accounted for by measures of individual drinking pattern.

Third, *higher rates* of personal and social consequences were reported by drinkers in countries with *lower rates* of current drinking and lower scores on economic and social well-being. These relationships may be partly attributable to higher usual quantity consumed in countries with these characteristics but it may also include an effect of these country characteristics, per se; that is, there may be increased risk of negative consequences in countries where abstinence is normative and economic and social development is lower than in other countries, because of generally lower tolerance for drinking in high abstaining countries and fewer resources to prevent negative consequences (as hypothesized in the introduction).

As with country-level quantity, however, significant positive interactions between usual quantity at the individual level and country-level measures of percent current drinkers, GDP and HDI suggest further interpretation of country-level effects. In particular, the interactions indicate that, although the rate of negative consequences is generally higher in countries with a larger proportion of abstainers and low economic and social well-being, the increase in consequences with increased quantity per occasion is greater in countries with fewer abstainers and better economic and social well-being. This may reflect lower tolerance for intoxicated behavior (although drinking is accepted) and greater perceptions of negative effects of alcohol (e.g., failed expectations and feelings of guilt or remorse) in countries where drinking is done, not by just a few drinkers in one socio-economic group, but by most people (many of whom drink at low levels) and where generally high economic and social development involves behavioral norms for drinking that are less tolerant of “time-out” behavior..

These findings of country differences are consistent with previous studies of diagnostic criteria for alcohol problems suggesting that the understanding of negative consequences from drinking varies considerably across different cultures (48, 49) and that culture can also play a role in perceptions and reporting of problems, for example, that *guilt* from drinking may be as strongly related to the cultural attitude toward alcohol use as to the amount consumed (11, 50).

High endorsement consequences showed similar interactions of country-level variables and individual usual quantity (significant only for country-level quantity and HDI); however, relationships with country-level variables were found for high endorsement consequences that were not found for personal and social consequences. Specifically, *higher rates* of high endorsement consequences were reported in countries with *higher rates* of current drinking and *higher* GDP (when other variables were in the models). As noted in the methods section, we assigned these consequences to a separate scale because they are reported by a very large proportion of drinkers. Thus, these effects may be associated with consuming even a small amount of alcohol, not necessarily heavy drinking, and may, therefore, be commonly reported by many light drinkers in countries where most people drink.

There were also significant negative interactions of frequency of drinking with percent current drinkers and HDI for men. These interactions suggest that in countries with a higher percent of current drinkers and higher social development, the relationship between frequency of drinking and negative consequences is weaker compared to countries with a lower percent of current drinkers and lower social development. That is, because these consequences can occur even at low levels of consumption, in countries where drinking is already frequent, increased frequency of drinking at the individual level is likely to have less of an impact on experiencing negative consequences than it would in countries where drinking is generally infrequent and an increase in drinking frequency at the individual level would result in an increase in high endorsement consequences.

The present study provides much new information about negative consequences from drinking among drinkers from diverse countries around the world. However, there are also some important limitations. First, not all countries employed national samples; therefore, these results cannot necessarily be considered representative of the countries overall. Second, all survey sampling methods have some bias. In almost all surveys, women were more likely than men to participate. In addition, for some surveys administered face-to-face, dangerous regions or neighborhoods may be under-represented. For telephone surveys, persons who were institutionalized or did not feel comfortable speaking the language(s) of the country were generally not included. It is also possible that some of the country differences may relate to differences in phrasing or formatting of questions (shown in Table S2). Another possible limitation is the lack of inclusion of measures of heavy episodic drinking in the analyses. However, usual measures of heavy episodic drinking (e.g., 5 or more drinks per occasion) may not be suited for cross-cultural research when in some countries nearly all male drinkers engage in heavy episodic drinking, while in other countries only a small proportion of women ever drink this amount [21]. Alternative measures of heavy episodic drinking that are sensitive to cultural differences in drinking pattern are needed to more fully distinguish between usual quantity and occasional heavy episodic drinking in a way that is meaningful across genders and cultures. Finally, the findings regarding country-level variables need to be interpreted with caution because of the relatively small number of countries in the analyses.

Further investigation of the relationship between drinking pattern and negative consequences is needed to explore more fully the possible moderating effect of culture on the experience of negative consequences from drinking. In addition, cross-cultural qualitative and quantitative research is needed to improve understanding of the factors that influence the experience of negative consequences from drinking at the individual level. These experiences, along with the cultural factors that influence these experiences, can contribute to improved understanding of the links between alcohol consumption and harms and how such harms might be prevented.

Despite limitations, the GENACIS data on drinking consequences are (to our knowledge) unprecedented, both in the comparability of questions across countries and in the number and diversity of cultures represented. In addition, the multi-level analyses, incorporating both country-level and individual-level measures for different consequences measures from a highly diverse sample of countries, provide a powerful approach to understanding country differences. Overall, the findings suggest that there are large differences among countries in the negative consequences experienced from alcohol consumption. Most country differences appear to be attributable to the drinking pattern of individuals in those countries; however, there is also some evidence that country and drinking culture play a role in the experience of negative consequences from drinking.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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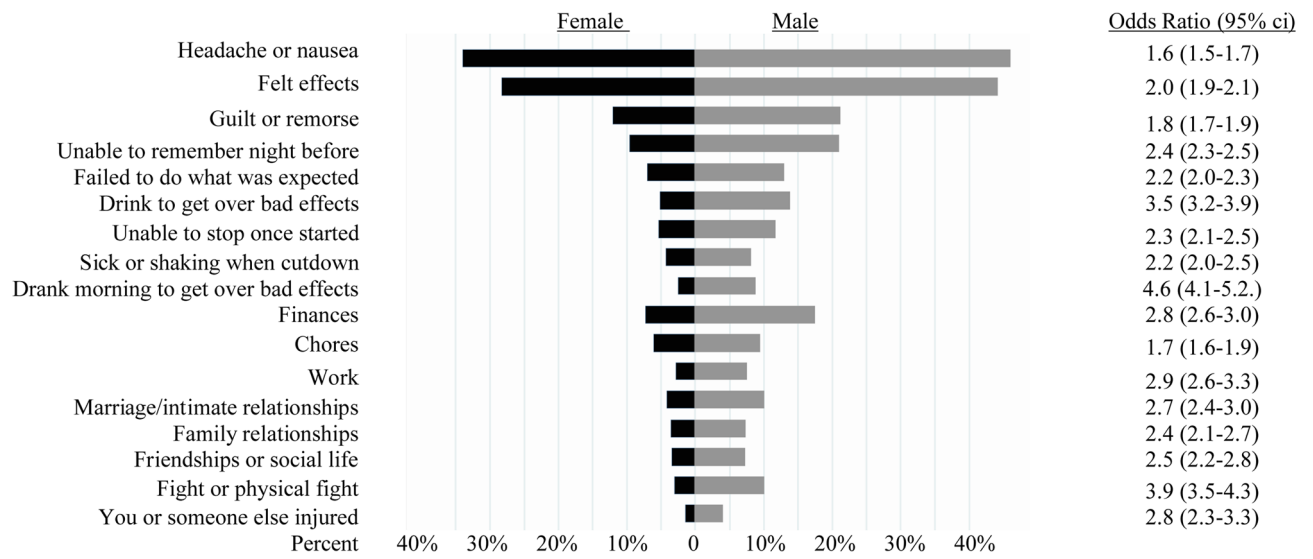
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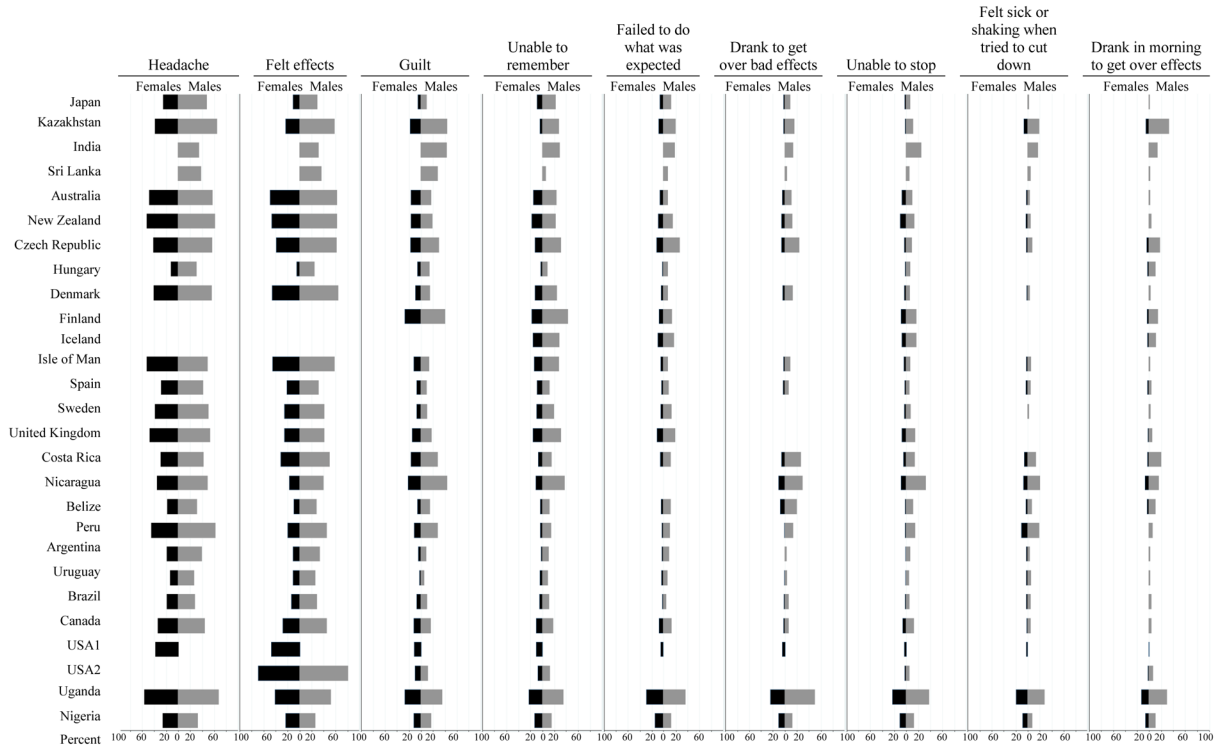
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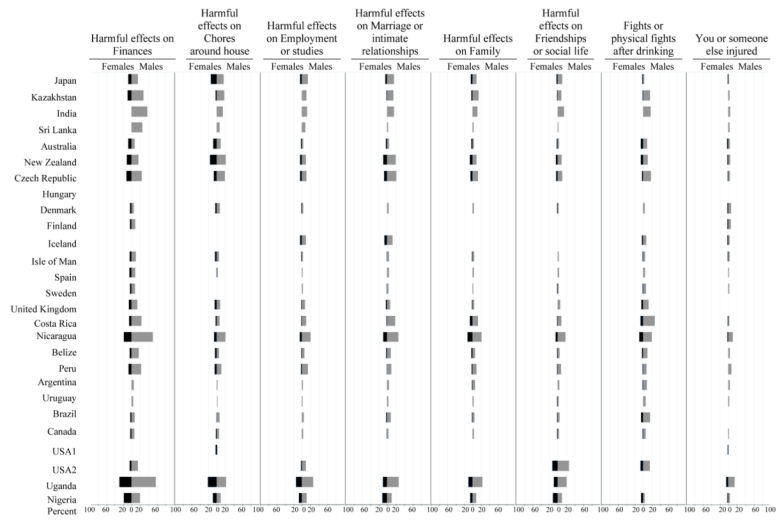
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**Figure 1.** Percent of female (dark bar to the left) and male (lighter bar to the right) current drinkers who experienced each negative consequence from drinking averaged across countries and male-female odds ratios for each consequence (controlling for age)



**Figure 2.** Percent of male and female current drinkers from each country who experienced each negative consequence for high endorsement and personal consequences



**Figure 3.** Percent of male and female current drinkers from each country who experienced each social consequence



Table 1

Mean scores for groupings of each type of consequence and all consequences combined by country, gender of drinker (M = male, F = female) and Global Burden of Disease region

Region/country	All negative consequences		High endorsement consequences		Personal consequences		Social consequences	
	M	F	M	F	M	F	M	F
<b>Asia Pacific, high income</b>	<b>0.13</b>	<b>0.06</b>	<b>0.39</b>	<b>0.17</b>	<b>0.09</b>	<b>0.03</b>	<b>0.10</b>	<b>0.05</b>
Japan	0.13	0.06	0.39	0.17	0.09	0.03	0.10	0.05
<b>Asia other</b>	<b>0.19</b>	<b>0.07</b>	<b>0.43</b>	<b>0.30</b>	<b>0.19</b>	<b>0.06</b>	<b>0.12</b>	<b>0.03</b>
Kazakhstan	0.23	0.07	0.61	0.30	0.24	0.06	0.13	0.03
India	0.20	--	0.33	--	0.23	--	0.16	--
Sri Lanka <sup>a</sup>	0.11	--	0.37	--	0.08	--	0.06	--
<b>Australasia</b>	<b>0.16</b>	<b>0.12</b>	<b>0.61</b>	<b>0.49</b>	<b>0.12</b>	<b>0.08</b>	<b>0.09</b>	<b>0.06</b>
Australia	0.13	0.11	0.60	0.48	0.10	0.07	0.05	0.05
New Zealand	0.18	0.13	0.62	0.49	0.13	0.09	0.12	0.07
<b>Europe, Central</b>	<b>0.23</b>	<b>0.11</b>	<b>0.45</b>	<b>0.26</b>	<b>0.21</b>	<b>0.08</b>	<b>0.15</b>	<b>0.05</b>
Czech Republic	0.23	0.11	0.59	0.40	0.21	0.08	0.15	0.05
Hungary	--	--	0.27	0.08	--	--	--	--
<b>Europe, Western</b>	<b>0.11</b>	<b>0.07</b>	<b>0.49</b>	<b>0.37</b>	<b>0.09</b>	<b>0.04</b>	<b>0.04</b>	<b>0.02</b>
Denmark	0.13	0.08	0.60	0.43	0.10	0.05	0.04	0.02
Isle of Man	0.12	0.09	0.54	0.48	0.09	0.06	0.04	0.02
Spain	0.08	0.05	0.36	0.24	0.07	0.04	0.03	0.01
Sweden <sup>b</sup>	0.10	0.06	0.45	0.31	0.09	0.04	0.02	0.01
United Kingdom <sup>c</sup>	--	--	0.47	0.36	--	--	0.07	0.03
<b>Central America and Caribbean</b>	<b>0.16</b>	<b>0.07</b>	<b>0.36</b>	<b>0.22</b>	<b>0.16</b>	<b>0.06</b>	<b>0.11</b>	<b>0.04</b>
Costa Rica	0.19	0.08	0.46	0.30	0.18	0.07	0.13	0.03
Nicaragua <sup>d</sup>	0.28	0.11	0.44	0.26	0.30	0.11	0.23	0.09
Belize	0.12	0.04	0.30	0.13	0.12	0.04	0.07	0.03
<b>South America and Tropical</b>	<b>0.10</b>	<b>0.04</b>	<b>0.37</b>	<b>0.20</b>	<b>0.08</b>	<b>0.03</b>	<b>0.06</b>	<b>0.01</b>
Peru	0.17	0.07	0.54	0.31	0.15	0.04	0.10	0.02
Argentina	0.09	0.03	0.36	0.14	0.06	0.02	0.04	0.00
Uruguay	0.06	0.02	0.26	0.12	0.05	0.02	0.02	0.00

Region/country	All negative consequences		High endorsement consequences		Personal consequences		Social consequences	
	M	F	M	F	M	F	M	F
Brazil <sup>c</sup>	0.09	0.04	0.28	0.16	0.06	0.03	0.06	0.02
North America, high income	<b>0.11</b>	<b>0.06</b>	<b>0.44</b>	<b>0.32</b>	<b>0.10</b>	<b>0.05</b>	<b>0.03</b>	<b>0.01</b>
Canada	0.11	0.06	0.44	0.31	0.10	0.05	0.03	0.01
USA 1 (females only)	--	--	--	0.42	--	0.05	--	--
Sub-Saharan Africa	<b>0.22</b>	<b>0.17</b>	<b>0.43</b>	<b>0.39</b>	<b>0.23</b>	<b>0.17</b>	<b>0.17</b>	<b>0.11</b>
Uganda <sup>a</sup>	0.35	0.22	0.60	0.50	0.35	0.22	0.27	0.13
Nigeria	0.12	0.11	0.29	0.23	0.12	0.11	0.09	0.09
All countries <sup>a</sup>	<b>0.14</b>	<b>0.07</b>	<b>0.44</b>	<b>0.31</b>	<b>0.12</b>	<b>0.06</b>	<b>0.07</b>	<b>0.03</b>

<sup>a</sup> excludes fights after drinking;

<sup>b</sup> excludes had drink to fix bad effects and harmful effects on chores;

<sup>c</sup> excludes you or someone else injured;

<sup>d</sup> excludes failed to do what was expected

**Table 2**

Countries rank-ordered by total score for all negative consequences for male drinkers, showing ranks for total scores and scores for different types of consequences for male (M) and female (F) drinkers

Country	GBD region	All negative consequences		High endorsement consequences		Personal consequences		Social consequences	
		M	F	M	F	M	F	M	F
Uganda	SSA	1 <sup>b</sup>	1 <sup>b</sup>	3 <sup>b</sup>	1 <sup>b</sup>	1 <sup>b</sup>	1 <sup>b</sup>	1 <sup>b</sup>	1 <sup>b</sup>
Nicaragua	CAC	2 <sup>b</sup>	3 <sup>b</sup>	8	8 <sup>a</sup>	2 <sup>b</sup>	2	2 <sup>b</sup>	2 <sup>b</sup>
Czech Republic	EC	3 <sup>b</sup>	3 <sup>b</sup>	4 <sup>b</sup>	5 <sup>b</sup>	5 <sup>b</sup>	4 <sup>b</sup>	4 <sup>b</sup>	4 <sup>b</sup>
Kazakhstan	AO	3 <sup>b</sup>	6	2 <sup>b</sup>	7	3 <sup>b</sup>	6	5 <sup>b</sup>	5
India	AO	4 <sup>b</sup>	--	12 <sup>a</sup>	--	4 <sup>b</sup>	--	3 <sup>b</sup>	--
Costa Rica	CAC	5 <sup>b</sup>	5	6	7 <sup>a</sup>	6 <sup>b</sup>	5	5 <sup>b</sup>	5
New Zealand	AA	6 <sup>b</sup>	2 <sup>b</sup>	1 <sup>b</sup>	2 <sup>b</sup>	8	3 <sup>b</sup>	6 <sup>b</sup>	3 <sup>b</sup>
Peru	SAT	7	6 <sup>a</sup>	5	6	7	8 <sup>a</sup>	7	6
<b>All countries</b>		<b>8</b>	<b>6</b>	<b>8</b>	<b>6</b>	<b>9</b>	<b>6</b>	<b>9</b>	<b>5</b>
Australia	AA	9	3 <sup>b</sup>	3 <sup>b</sup>	3 <sup>b</sup>	10	5 <sup>b</sup>	11	4 <sup>b</sup>
Denmark	EW	9	5	3 <sup>b</sup>	4 <sup>b</sup>	10	7	12 <sup>a</sup>	6
Japan	AP	9	7	9	11 <sup>a</sup>	11 <sup>a</sup>	9 <sup>a</sup>	7 <sup>b</sup>	4 <sup>b</sup>
Nigeria	SSA	10	3 <sup>b</sup>	14 <sup>a</sup>	10 <sup>a</sup>	9	2 <sup>b</sup>	8	2 <sup>b</sup>
Isle of Man	EW	10	4 <sup>b</sup>	5 <sup>b</sup>	3 <sup>b</sup>	11	6	12	6
Belize	CAC	10 <sup>a</sup>	9 <sup>a</sup>	13 <sup>a</sup>	14 <sup>a</sup>	9	8 <sup>a</sup>	9	5
Canada	NA	11 <sup>a</sup>	7 <sup>a</sup>	8	6	10 <sup>a</sup>	7	13 <sup>a</sup>	7 <sup>a</sup>
Sri Lanka	AO	11 <sup>a</sup>	--	10 <sup>a</sup>	--	12 <sup>a</sup>	--	10	--
Sweden	EW	12 <sup>a</sup>	7 <sup>a</sup>	7	6	11 <sup>a</sup>	8 <sup>a</sup>	14 <sup>a</sup>	7 <sup>a</sup>
Brazil	SAT	13 <sup>a</sup>	9 <sup>a</sup>	15 <sup>a</sup>	12 <sup>a</sup>	14 <sup>a</sup>	9 <sup>a</sup>	10	6
Argentina	SAT	13 <sup>a</sup>	10 <sup>a</sup>	11 <sup>a</sup>	13 <sup>a</sup>	14 <sup>a</sup>	10 <sup>a</sup>	12 <sup>a</sup>	8 <sup>a</sup>
Spain	EW	14 <sup>a</sup>	8 <sup>a</sup>	11 <sup>a</sup>	9 <sup>a</sup>	13 <sup>a</sup>	8 <sup>a</sup>	13 <sup>a</sup>	7 <sup>a</sup>
Uruguay	SAT	15 <sup>a</sup>	11 <sup>a</sup>	16 <sup>a</sup>	15 <sup>a</sup>	15 <sup>a</sup>	10 <sup>a</sup>	14 <sup>a</sup>	8 <sup>a</sup>

AP (Asia Pacific high income), AO (Asia other), AA (Australasia), EC (Europe Central), EW (Europe Western), CAC (Central America and Caribbean), SAT (South America and Tropical South America), NA (North America high income), SSA (Sub-Saharan Africa)

<sup>a</sup>Significantly (p = .002) lower mean score compared to mean for all other countries combined controlling for age.

<sup>b</sup>Significantly (p = .002) higher mean score compared to mean for all other countries combined controlling for age.

Table 3

Coefficients from Hierarchical Linear Modeling (HLM) regression of individual-level negative drinking consequences scores on country level variables only (Model I) and including individual-level alcohol consumption measures and interactions (Model II)

	High endorsement consequences						Personal consequences						Social consequences					
	Men		Women		Men		Women		Men		Women		Men		Women			
	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II		
<i>Country drinking pattern</i>																		
Intercept	-0.859***	-0.895***	-1.301***	-1.355***	-2.149***	-2.330***	-2.908***	-3.092***	-2.664***	-2.856***	-3.623***	-3.801***						
Average quantity <sup>C</sup>	0.023	-0.001	0.101	0.034	0.189**	0.159**	0.269**	0.218*	0.239**	0.218*	0.389*	0.387*						
Average frequency <sup>C</sup>	0.001	-0.001	0.007 <sup>‡</sup>	0.005	0.004	0.000	0.008*	0.004	0.006	0.002	0.010 <sup>‡</sup>	0.007						
Usual quantity		0.058***		0.133***		0.093***		0.171***		0.099***		0.158***						
Intercept <sup>I</sup>																		
Frequency Intercept <sup>I</sup>		0.002***		0.002***		0.003***		0.004***		0.004***		0.005***						
Average quantity <sup>C</sup> X usual quantity <sup>I</sup>		-0.009**		-0.039***		-0.016**		-0.047**		-0.017**		-0.047**						
Average quantity <sup>C</sup> X frequency <sup>I/100</sup>		0.013 <sup>‡</sup>		0.011		0.004		-0.002		0.000		-0.022						
Average frequency <sup>C/100</sup> X usual quantity <sup>I</sup>		-0.024		-0.055		-0.039 <sup>‡</sup>		-0.041		-0.038		-0.031						
Average frequency <sup>C</sup> X frequency <sup>I/100</sup>		-0.001		-0.001		0.001		-0.002 <sup>‡</sup>		-0.001		-0.004 <sup>‡</sup>						
<i>% current drinkers</i>																		
Intercept	-0.860***	-0.914***	-1.305***	-1.372***	-2.145***	-2.321***	-2.890***	-3.106***	-2.648***	-2.861***	-3.556***	-3.771***						
% current drinkers <sup>C</sup>	0.600 <sup>‡</sup>	0.914**	0.714	0.865*	-1.340*	-1.132 <sup>‡</sup>	-0.484	-0.462	-1.905*	-1.760*	-0.970	-1.115						
Usual quantity <sup>I</sup>		0.056***		0.133***		0.092***		0.164***		0.096***		0.145***						
Frequency <sup>I</sup>		0.002***		0.002***		0.003***		0.004***		0.004***		0.004***						
% current drinkers <sup>C</sup> X usual quantity <sup>I</sup>		0.039		0.083		0.117*		0.143*		0.131*		0.155*						
% current drinkers <sup>C</sup> X frequency <sup>I/100</sup>		-0.211**		0.020		-0.017		0.160		-0.022		0.237						

	High endorsement consequences				Personal consequences				Social consequences				
	Men		Women		Men		Women		Men		Women		
	I	II	I	II	I	II	I	II	I	II	I	II	
<b>Gross Domestic Product (GDP)</b>													
Intercept	-0.872 <sup>***</sup>	-0.923 <sup>***</sup>	-1.338 <sup>***</sup>	-1.400 <sup>***</sup>	-2.122 <sup>***</sup>	-2.288 <sup>***</sup>	-2.894 <sup>***</sup>	-3.099 <sup>***</sup>	-2.596 <sup>***</sup>	-2.797 <sup>***</sup>	-3.558 <sup>***</sup>	-3.765 <sup>***</sup>	
GDP <sub>C</sub>	0.008	0.011 <sup>*</sup>	0.014	0.015 <sup>‡</sup>	-0.018 <sup>*</sup>	-0.016 <sup>‡</sup>	-0.008	-0.008	-0.030	-0.030	-0.022	-0.026 <sup>‡</sup>	
Usual quantity <sup>I</sup>		0.057 <sup>***</sup>		0.132 <sup>***</sup>		0.091 <sup>***</sup>		0.162 <sup>***</sup>		0.094 <sup>***</sup>		0.146 <sup>***</sup>	
Frequency <sup>I</sup>		0.002 <sup>***</sup>		0.002 <sup>***</sup>		0.003 <sup>***</sup>		0.004 <sup>***</sup>		0.004 <sup>***</sup>		0.004 <sup>***</sup>	
GDP <sub>C</sub> X usual quantity <sup>I</sup>		0.001 <sup>‡</sup>		0.002		0.002 <sup>**</sup>		0.003 <sup>*</sup>		0.002 <sup>**</sup>		0.003 <sup>**</sup>	
GDP <sub>C</sub> X frequency <sup>I/100</sup>		-0.002 <sup>‡</sup>		-0.000		-0.001		0.003		-0.000		0.005	
<b>Human Development Index (HDI)</b>													
Intercept	-0.871 <sup>***</sup>	-0.926 <sup>***</sup>	-1.336 <sup>***</sup>	-1.399 <sup>***</sup>	-2.124 <sup>***</sup>	-2.294 <sup>***</sup>	-2.892 <sup>***</sup>	-3.092 <sup>***</sup>	-2.607 <sup>***</sup>	-2.813 <sup>***</sup>	-3.549 <sup>***</sup>	-3.752 <sup>***</sup>	
HDI <sub>C</sub>	0.483	0.949 <sup>‡</sup>	0.339	0.728	-2.037 <sup>*</sup>	-1.559 <sup>‡</sup>	-2.122 <sup>*</sup>	-1.842 <sup>*</sup>	-2.889 <sup>**</sup>	-2.546 <sup>*</sup>	-3.202 <sup>*</sup>	-3.263 <sup>*</sup>	
Usual quantity <sup>I</sup>		0.057 <sup>***</sup>		0.133 <sup>***</sup>		0.092 <sup>***</sup>		0.165 <sup>***</sup>		0.096 <sup>***</sup>		0.141 <sup>***</sup>	
Frequency <sup>I</sup>		0.002 <sup>***</sup>		0.002 <sup>***</sup>		0.003 <sup>***</sup>		0.004 <sup>***</sup>		0.004 <sup>***</sup>		0.004 <sup>***</sup>	
HDI <sub>C</sub> X usual quantity <sup>I</sup>		0.091 <sup>*</sup>		0.252 <sup>*</sup>		0.210 <sup>**</sup>		0.364 <sup>**</sup>		0.217 <sup>**</sup>		0.342 <sup>***</sup>	
HDI <sub>C</sub> X frequency <sup>I/100</sup>		-0.233 <sup>*</sup>		0.003		-0.089		0.227		0.022		0.467	

<sup>‡</sup> p < .10,

\* p < .05,

\*\* p < .01,

\*\*\* p < .001.

<sub>C</sub> Country-level variable,

<sub>I</sub> Individual-level variable,

<sup>I/100</sup> Coefficient multiplied by 100 to make the effect evident because the scale of variable was extremely large (measured in drinking days per year).