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# Cohabitation, Gender, and Alcohol Consumption in 19 Countries: A Multilevel Analysis

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## Abstract

We used an ecological paradigm and multilevel analytic techniques to analyze gender-specific relationships of cohabitation (versus marriage) to drinking in 19 countries (n = 32,922) and to "heavy episodic drinking" (HED) in 17 countries (n = 24,525) in surveys (1996–2004) from Gender, Alcohol, and Culture: An International Study. Cohabitation was associated with elevated risk of HED among drinkers of both genders, controlling for age, education, and societal characteristics. The association between cohabitation and HED tended to be stronger for female drinkers than for male drinkers. HED was more prevalent among younger drinkers, especially among younger women in countries with higher per capita gross domestic product. Cross-culturally, cohabiters deserve special attention in prevention efforts for hazardous drinking, considering both individual-level and societal factors.

### Keywords

cohabitation; gender; alcohol; multilevel modeling; global health; cross-national comparisons; culture

## Introduction

Hazardous drinking is a major public health concern worldwide. Alcohol contributes to more than 60 medical conditions and accounts for 4% of the global burden of disease (Room, Babor, and Rehm, 2005). The adverse effects on death and disability are comparable to effects of tobacco and hypertension globally, and are particularly burdensome for developing countries, which require attention (Grimm, 2008; Obot and Room, 2005). Alcohol consumption-related problems have been a major challenge to both medicine and public health, in part because most efforts have focused on individuals and treatment programs, and population-based public health approaches and primary prevention have been relatively neglected (Caetano and Cunradi, 2002; Room et al., 2005). With growing awareness that alcohol consumption-related problems are global and multicultural, and require culturally appropriate and population-based primary prevention (Wilsnack, Vogeltanz, Wilsnack, and Harris, 2000; World Health Organization, 2007), it has become



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increasingly important to understand cross-culturally the social contexts in which alcohol consumption-related problems develop.

Gender differences in roles and other behavior patterns are one important context for understanding alcohol problems. While men have long been known to have a greater prevalence of hazardous drinking and alcohol consumption-related problems, research has increasingly identified problems that are specifically associated with women's drinking, including health risks, fetal alcohol spectrum disorders, and risks of intimate partner violence (Greenfield, 2002; Leonard and Eiden, 2007; Plant, 1997; Wilsnack and Wilsnack, 1997). It has therefore become essential to learn to what extent risk factors for hazardous drinking may differently affect men's and women's alcohol consumption cross-culturally (Grimm, 2008; Obot and Room, 2005; Wilsnack et al., 2000).

One other important context for drinking is the kind of living arrangements people form to sustain intimate relationships. Significant cultural, economic, and demographic changes have altered how people become adults and sustain intimate relationships (Di Giulio and Rosina 2007; Furstenberg, 2002; Settersten, Furstenberg, and Rumbaut, 2008). Cohabitation, or living together with one's intimate partner outside of marriage, has become increasingly common in both developed and developing countries (Bumpass and Lu, 2000; Kiernan, 2004). A growing literature demonstrates that cohabitation is associated with increased risk of adverse effects, such as dissatisfaction and negative interaction in relationships, family disruption, violence, drug and alcohol use, "heavy drinking" and alcohol dependence, and alcohol consumption-related death (Joutsenniemi et al., 2007; Koskinen, Joutsenniemi, Martelin, and Martikainen, 2007; Stanley, Whitton, and Markman, 2004). Drinking behavior of cohabiters has become a growing concern for social science researchers and public health professionals.

An association between cohabitation and problem drinking has been well documented in the United States and Europe. In the United States, cross-sectional and longitudinal studies have found consistently that adverse drinking consequences and episodes of extreme drinking are more common among cohabiting than among married men and/or women (Bachman, O'Malley, and Johnston, 1984; Caetano, Ramisetty-Mikler, Floyd, and McGrath, 2006; Duncan, Wilkerson, and England, 2006; Horwitz and White, 1998; Marcussen, 2005; Stets, 1991; Wilsnack, Wilsnack, and Klassen, 1984; Wilsnack, Klassen, Schur, and Wilsnack, 1991). However, gender differences in effects of cohabitation were inconsistent among several studies with varied study designs, comparison groups, and age groups. Gender–cohabitation interaction terms indicated that cohabitation influenced men more than women to report (1) alcohol consumption-related problems in a 7-year follow-up of young adult residents in New Jersey (Horwitz and White, 1998), and (2) "heavy drinking" in a cross-sectional study of the second wave of the National Survey of Families and Households (Marcussen, 2005). In contrast, gender-specific analyses of data from the National Longitudinal Survey of Youth suggest that men's binge drinking is reduced by marriage but not by cohabitation, whereas both marriage and cohabitation reduce comparably women's binge drinking; the cohabitation effect is posited to be a protective factor and larger for women than for men when compared with their own previous union status, including possible marriage, before transitions into cohabitation over an 11-year period (Duncan et al., 2006). Gender-specific analyses in a study of previously married Americans aged 51 years and older who had lost a spouse found that alcohol consumption was higher among cohabiting women but not among cohabiting men, compared with those remarried and unpartnered (Brown, Lee, and Bulanda, 2006). Comparatively, there has been little large-scale quantitative cross-cultural research. In a cross-sectional study of young adults aged 24–32 years in 10 European countries, drinking frequencies of those married and cohabiting were similar, but the cohabiters consumed larger amounts per drinking occasion and

therefore consumed larger annual volumes of alcohol (Plant, Miller, Plant, Kuntsche, Gmel, Ahlstrom, et al., 2008). No gender differences were found in this study. Beyond this comparative study of European countries, there has to our knowledge been no other quantitative cross-cultural research on cohabitation and alcohol use.

Our study was designed to address several limitations of previous research on cohabitation and drinking. First, one concern about the nonsignificant gender difference in the study of Plant et al. (2008) is the lack of technical details about the appropriateness of modeling marital status *x* country and gender *x* country interaction terms in multinational comparisons. Second, despite evidence that societal characteristics influence drinking behavior of general populations (Rahav, Wilsnack, Bloomfield, Gmel, and Kuntsche, 2006; Wilsnack and Wilsnack, 1997), to our knowledge no previous research has used multilevel analytic techniques to model both societal-level and individual-level influences on cohabitation and drinking behaviors simultaneously and cross-culturally. Multilevel analyses of alcohol consumption-related outcomes to date have involved primarily other exposure variables and special populations, including emergency department patients, adolescents in schools, and university students (Bjarnason et al., 2003; Cherpitel, Bond, Ye, Rehm, Poznyak, Macdonald, et al., 2005; Cherpitel, Bond, Ye, Borges, Room, Poznyak, et al., 2006; Cherpitel, Ye, and Bond, 2004; Demers, Kairouz, Adlaf, Gliksman, Newton-Taylor, and Marchand, 2002; Elgar, Roberts, Parry-Langdon, and Boyce, 2005; Kuntsche, Gmel, Wicki, Rehm, and Grichting, 2006; Scribner, Mason, Theall, Simonsen, Schneider, Towvim, et al., 2008; Wells, Mihic, Tremblay, Graham, and Demers, 2008).

Finally, an important strength of this study is the opportunity to investigate both more developed, high-gender-equality countries and less developed, low-gender-equality countries using multilevel analyses. Across societies, economic development is highly correlated with the prevalence of drinking (Rahav et al., 2006), and the greater the gender equality in a nation, the smaller is the gender gap in alcohol consumption (Bloomfield, Gmel, and Wilsnack, 2006). Other evidence on associations between societal gender inequality and couple-level behaviors (Fuwa, 2004) also suggests that differences in societal gender inequality may influence the cohabitation effect on gender-specific behavior. Multilevel analyses of data from countries that vary considerably in levels of economic development and gender equality may indicate how these societal characteristics interact with individual-level characteristics to predict risks of hazardous drinking behavior.

We conceptualize alcohol consumption and harmful use of alcohol as occurring within an ecological framework in which societal-contextual factors and individual factors interact to influence drinking behavior (Gruenewald, 2007; Scribner et al., 2008; Wilsnack et al., 2000). We use gender-specific multilevel analyses to determine whether cohabitation is associated with a higher prevalence of alcohol consumption and with hazardous use of alcohol among drinkers, in multinational general-population samples of married and cohabiting persons, when considering other societal and individual characteristics.

## Methods

### Data and Study Participants

General population surveys in the GENACIS project (Gender, Alcohol, and Culture: An International Study) provided the study variables from 32,922 cohabiting or married individuals aged 18–65 years in 19 countries: Argentina, Brazil, Canada, Costa Rica, Czech Republic, Denmark, Finland, Germany, Great Britain, Hungary, Iceland, Israel, Kazakhstan, Nigeria, Norway, Spain, Uganda, the United States, and Uruguay. Respondents who reported same-gender partners were excluded from the analyses. Characteristics of each survey are listed in Table 1. A large majority of the surveys used multistage representative

sampling, and the remainder used quota sampling or replacement sampling (Bloomfield et al., 2006;Graham, Bernards, Munne, and Wilsnack, 2008;Obot and Room, 2005;Wilsnack, Wilsnack, Kristjanson, Vogeltanz-Holm, and Gmel, 2009). The original survey protocol was reviewed and approved by the Institutional Review Board of the University of North Dakota and by ethics committees in the participating countries.

## Outcome Variables

The analyses reported here focused on two binary outcomes: (1) *current drinking* versus abstaining was indicated by whether a respondent had consumed any alcoholic beverages during the past 12 months, among 32,922 respondents in the 19 countries listed above; and (2) *heavy episodic drinking* (HED) was defined as consuming five or more drinks in a single day, among 24,525 current drinkers in 17 countries (excluding surveys in Spain and Great Britain, which lacked HED data). As part of the Alcohol Use Disorders Identification Test (AUDIT), the 5+ drinks measure has been shown to have good sensitivity and specificity as a brief primary care screening test for identifying potential harmful drinking and alcohol abuse/dependence (Bush, Kivlahan, McDonell, Fihn, and Bradley, 1998).

## Household-Level and Individual-Level Variables

In addition to gender and marital status, the GENACIS surveys collected data about household- and individual-level variables that have been theoretically or empirically linked to drinking patterns, including age, education, employment status, number of children, household income, and informal social control of drinking from family members (Ahlstrom, Bloomfield, and Knibbe, 2001; Bacharach, Bamberger, Sonnenstuhl, and Vashdi, 2008; Serdula, Brewer, Gillespie, Denny, and Mokdad, 2004). However, some variables could not be compared across societies, and some were available for only a small subset of the 19 surveys. For this reason, only age and education are included as additional individual-level measures in the analyses reported here. For the present analyses, age is treated as a continuous variable; female gender is coded 1, male gender is coded 0, and cohabiting is coded 1, being married coded 0. As a socioeconomic indicator, education is the best predictor of health outcomes (Siegrist, 1995). Using the various education measures in the individual country surveys, education level was categorized as high (Bachelor's, Master's, Ph.D., or other professional degree), middle (high school diploma but less than a 4-year college/university degree), and low (less than a high school diploma) and treated as a continuous variable (Kuntsche, Gmel, and Bloomfield, 2008).

## Societal-Level Variables

Two societal-level variables were obtained from data published elsewhere. The log transformation of the *gross domestic product per capita* (GDP) based on purchasing power parity (PPP) was used as a measure of national economic development. GDP-PPP is gross domestic product per capita converted to international dollars using PPP rates developed by the World Bank (2004). The *Gender Gap Index 2006* (GGI), developed by the World Economic Forum (Hausman, Tyson, and Zahidi, 2006), was used as a measure of national gender differences in economic participation and opportunity, educational attainment, health and life expectancy, and political empowerment. Higher GGI scores indicate greater gender equality. Both Log GDP-PPP and GGI were operationalized as continuous variables.

Three additional societal-level variables, also measured as continuous variables, were derived from aggregated data from the GENACIS surveys, as possible indicators of how normative or how deviant drinking and cohabitation are in each society. The *societal prevalence of drinking* was defined as the percentage of respondents aged 18–65 years in each survey who were current (past 12-month) drinkers. The *gender ratio of drinking versus abstaining* was defined as the ratio of the percentage of all men who were current drinkers to

the percentage of all women who were current drinkers (Rahav et al., 2006). Finally, the *societal prevalence of cohabitation* among partnered persons was defined as the percentage of respondents in each survey, aged 18–65 years and living with heterosexual partners, who were cohabiting rather than married.

Potential multicollinearity was assessed by examining Pearson correlation coefficients between each pair of independent variables on the individual level and on the societal level separately. None of the individual-level variables, but seven pairs of the five societal-level variables, had correlations exceeding |0.5| (Bonate, 1999) (data available upon request).

## Analytical Approach

Stratifying the analysis by gender followed the practice in other studies (Brown et al., 2006; Duncan et al., 2006; Yang and Guo, 1999). Multilevel logistic regression models estimated the odds that a given participant living in a given country would report two drinking behaviors, using two-level data from 32,922 individuals (level 1) nested within 19 countries (level 2) and 24,525 current drinkers (level 1) nested within 17 countries (level 2). Multilevel modeling enabled us to differentiate *compositional* effects of cohabitation, gender, and ages of individuals on individual alcohol consumption from the *contextual* effects of societal-level characteristics across the societies (Macintyre and Ellaway, 2000; Subramanian, Jones, and Duncan, 2003).

We defined $y_{ij} = 1$ if participant $i$ living in country $j$ reported the drinking behavior, while $y_{ij} = 0$ if participant did not. To evaluate an individual's likelihood of current drinking, $p_{ij}$, we modeled $\log[p_{ij}/(1 - p_{ij})]$, the natural logarithm of the odds ratio with the form $\log[p_{ij}/(1 - p_{ij})] = \beta x_{ij} + \gamma w_j + r_{ij}$, where $x_{ij}$ is a vector of individual and household characteristics of participant $i$ living in country $j$ and $w_j$ is a vector of societal characteristics. The initial model included only the dependent variable and society identifiers, which was the unconditional model (not shown in tables). The model-building process then followed the steps outlined by other researchers (Hoffmann, 1997; Raudenbush and Bryk, 2002; Rountree and Land, 1996). A level-1 equation for an initial random-coefficient regression model predicting current drinking (versus abstaining) for individual $i$ living in society $j$ was specified as

$$\log[p_{ij}/(1 - p_{ij})] = \beta_{0j} + \beta_{1j}(\text{age}_{ij}) + \beta_{2j}(\text{education}_{ij}) + \beta_{3j}(\text{cohabitation}_{ij}) + r_{ij}$$

with the continuous predictors (age and education) centered on their grand means. Note that $\beta_{0j}$ is the individual-level intercept; $r_{ij}$ is the error term, which is assumed to be normally distributed with mean zero and variance of $\sigma_{\varepsilon}^2$.

Following the procedure of Rountree and Land (1996), after initially assuming all coefficients for effects of age, education, and cohabitation varied across societies, each coefficient did vary significantly and was specified as random. Their effects are represented by $\gamma_{10}$, $\gamma_{20}$, and $\gamma_{30}$ below. The resulting level-2 equation, or between-society model, for the initial random-coefficient regression model is as follows:

$$\beta_{0j} = \gamma_{00} + u_{0j}, \quad \beta_{1j} = \gamma_{10} + u_{1j}, \quad \beta_{2j} = \gamma_{20} + u_{2j}, \quad \beta_{3j} = \gamma_{30} + u_{3j} \ .$$

We then substituted the level-2 equation into the level-1 equation, yielding

$$\begin{aligned}\log[p_{ij}/(1-p_{ij})] &= [\gamma_{00}+\gamma_{10}(\text{age}_{ij})+\gamma_{20}(\text{education}_{ij})+\gamma_{30}(\text{cohabitation}_{ij})] \\ &+[u_{0j}+u_{1j}(\text{age}_{ij}) \\ &+u_{20}(\text{education}_{ij}) \\ &+u_{3j}(\text{cohabitation}_{ij})+r_{ij}].\end{aligned}$$

Next we estimated a model with societal characteristics added in order to account for the variability in the adjusted likelihood of drinking across societies and the variability in the effects of cohabitation, education, and age on the likelihood of drinking across societies, which are cross-level interaction effects (Subramanian et al., 2003). The level-2 model is thus extended as follows in order to incorporate the societal characteristics of interest:

$$\begin{aligned}\beta_{0j} = \gamma_{00} &+\gamma_{01}(\text{prevalence of cohabitation}_j) \\ &+\gamma_{02}(\text{prevalence of drinking}_j) \\ &+\gamma_{03}(\text{gender ratio of drinking}_j) \\ &+\gamma_{04}(\text{gender gap index}_j) \\ &+\gamma_{05}(\text{logGDP} \\ &-\text{PPP}_j)+u_{0j}.\end{aligned}$$

We then combined the level-1 and level-2 equations and dropped nonsignificant effects of gender ratio of drinking, prevalence of cohabitation, Gender Gap Index, and nonsignificant cross-level interactions to yield one full model:

$$\begin{aligned}\log[p_{ij}/(1-p_{ij})] &= [\gamma_{00}+\gamma_{02}(\text{prevalence of drinking}_j)+\gamma_{05}(\log \text{GDP}-\text{PPP}_j)+\gamma_{10}(\text{age}_{ij})+\gamma_{20}(\text{education}_{ij})+\gamma_{30}(\text{cohabitation}_{ij})] \\ &+[u_{0j}+u_{1j}(\text{age}_{ij}) \\ &+u_{20}(\text{education}_{ij}) \\ &+u_{3j}(\text{cohabitation}_{ij})+r_{ij}].\end{aligned}$$

Similar procedures were implemented to develop models to predict HED among current drinkers across the GENACIS surveys.

The HLM version 6 program with Laplace estimation was used to estimate the parameters in models containing random effects and binary outcomes, with sampling weights in each survey taken into account (Raudenbush, Yang, and Yosef, 2000). All reported tests of statistical significance were two-tailed, with $\alpha = 0.05$ as the level for statistical significance. To help interpret the relative impact on each dependent variable resulting from a unit of increase in each independent variable, we calculated the change of odds ratio that results from one standard deviation increase in each independent variable (Hwang and Xi, 2008). For example, the coefficient of 7.43 in Table 3 indicates that a one standard deviation (0.19) increase in the societal rate of drinking increased the odds that a woman was a current drinker by 310.29% $[(e^{0.19*7.43}-1)*100]$.

## Results

Table 2 presents individual/household and societal characteristics of married or cohabiting respondents in these surveys. Among the 32,922 respondents from 19 countries with data on current drinking, 80% reported being current drinkers. Fifty-four percent of the respondents were female, 18% were cohabiting, and the mean age was 42.50. About half had a high school diploma but less than a 4-year college/university degree, and 23% had a Bachelor's, Master's, Ph.D., or other professional degree. In the 17 surveys with data on HED, 46% of the 24,525 married or cohabiting current drinkers reported HED. Among the current drinkers, 51% were female, 20% were cohabiting, and the mean age was 42.49. Fifty-three per cent had a high school diploma but less than a 4-year college/university degree, and 26% had a Bachelor's, Master's, Ph.D., or other professional degree. Further analyses indicated that in 30 of 38 gender-specific comparisons among all respondents in the 19 countries surveyed, cohabiting respondents were more likely than married respondents to be current drinkers (data available upon request). In the 17 surveys in which data on HED were available, cohabiting drinkers consistently reported higher rates of HED than married drinkers did (31 of 34 gender-specific comparisons, Figure 1).

Table 3 presents gender-specific results of the multilevel logistic regression analyses predicting current drinking. For *women*, a significant variation in the prevalence of current drinking was found across societies in the unconditional model (not shown). The results indicate that the odds that a woman surveyed was a current drinker were 2.77 to 1 (95% CI = 1.53, 5.01), i.e., women were likely to be current drinkers. Model 1 shows the effects of individual-level variables only. Neither age nor cohabitation, nor the interaction between age and cohabitation, was associated with current drinking ($p \geq 0.05$). Education was positively associated with current drinking ($p < 0.01$). In Model 2 (for women), societal prevalence of drinking was positively associated with the likelihood of drinking among women independent of individual/household and other societal characteristics ($p < 0.01$). The results indicate that a one standard deviation increase in the societal prevalence of drinking increased the odds that a woman was a current drinker by 310.29%. The random effects indicate that the variability of women's drinking and the variability of the associations of cohabitation, education, and age with drinking across countries were not entirely accounted for by the societal-level variables used here. For *men*, the odds of being a current drinker were 6.18 to 1 (95% CI = 3.69, 10.34), i.e., men were very likely to be current drinkers (unconditional model, not shown). Education, but neither age nor cohabitation nor the interaction between age and cohabitation, was positively associated with men's current drinking ($p = 0.02$) (Model 1). These results did not change after adding societal-level variables (Model 2). Societal prevalence of drinking was positively associated with the likelihood of drinking among men independent of individual and other societal characteristics ($p < 0.01$). The results indicate that a one standard deviation increase in the societal prevalence of drinking increased the odds that a man was a current drinker by 236.72%. The random effects indicate that the variability of men's drinking and the variability of the associations of education and age with drinking across countries were not entirely accounted for by the societal-level variables here.

Table 4 presents gender-specific results of multilevel logistic regression analyses predicting HED among current drinkers. Among 12,553 *female* current drinkers, significant variation in the likelihood of HED was found across societies in the unconditional model (not shown). The results indicate that for female drinkers the odds of engaging in HED were 0.53 to 1 (95% CI = 0.32, 0.88), i.e., female drinkers were unlikely to engage in HED. In Model 1, cohabitation was positively associated and age was negatively associated with HED among female drinkers. Education was not associated with HED among female drinkers ($p = 0.57$). These findings persisted after adding the societal-level variables (Model 2). The prevalence

of drinking was not significant ($p > 0.05$). Furthermore, the effect of age on HED among current female drinkers interacted negatively with societal GDP ($p < 0.05$), so the effects of age on HED were greater among female drinkers in economically developed societies (Figure 2). That is, older women appeared to lose more of the protective effects of age in economically less-developed countries, and younger women gained more in risk in economically developed countries. Being a cohabiter increased the odds of HED among current female drinkers by 23.12%; and a one standard deviation increase in age from the mean reduced the odds of HED among current female drinkers by 20.20%, but this protective effect of age on the odds of HED was stronger by a small degree (2.32%) in more economically developed societies. Otherwise, the societal-level variables had no significant effects on the odds that women drinkers would engage in HED. However, the random effects indicate that the variability of HED and the variability of the associations of education and age with HED across countries were not accounted for by the societal-level variables used here. Among 11,972 *male* current drinkers, in contrast, the odds of engaging in HED were 1.97 to 1 (95% CI = 1.36, 2.87) in the unconditional model (not shown), i.e., male drinkers were likely to engage in HED. Cohabitation was positively associated and both education and age were negatively associated with HED among male drinkers ($p < 0.05$) (Model 1). The results indicate that being a cohabiter increased the odds of HED among male drinkers by 12.85%; a one unit increase in education decreased the odds that a male drinker was a heavy episodic drinker by 11.22%; and a one standard deviation increase in age reduced the odds of HED among male drinkers by 28.34%. The effect of age on HED among current male drinkers did not interact with societal GDP ($p = 0.10$) (Model 2). The random effects indicate that the variability of HED and the variability of the association of age with HED across countries were not accounted for by the societal-level variables included here.

## Discussion

Our study found that cohabitation was associated with a higher prevalence of HED among drinkers of both genders, controlling for age, education, and societal characteristics. These findings are consistent with previous U.S. studies (Bachman et al., 1984; Caetano et al., 2006; Duncan et al., 2006; Horwitz and White, 1998; Marcussen, 2005; Wilsnack et al., 1984, 1991) and one study comparing 10 European countries (Plant et al., 2008). However, we found that the association between cohabitation and HED tended to be stronger for female drinkers (increasing their odds of HED by 23.12%) than that for male drinkers (12.85% increase in odds), inconsistent with the findings of some U.S. studies (Horwitz and White, 1998; Marcussen, 2005). Our findings augment those from 10 European countries (Plant et al., 2008) by suggesting a gender difference in the association between cohabitation and hazardous drinking and by showing this association cross-culturally and in a more diverse sample of countries, including both economically developed and less-developed societies. Our evidence suggests that cohabitation is an important risk factor for hazardous drinking worldwide, not just in affluent areas of Europe and North America, and thus it should receive closer attention in global prevention and public health efforts.

Our findings indicate that both individual-level and societal-level factors are associated with the likelihoods of current drinking and HED among *partnered* drinkers cross-culturally. In addition to the apparent gender difference in the cohabitation-HED link, we found that both women and men with higher education were more likely to drink, but only male drinkers with lower education were more likely to report HED, which is unexpected and deserves further study. Younger male and female drinkers were more likely to report HED, and the association of youth with women's HED was unexpectedly stronger in more economically developed countries. Both women and men were more likely to drink in societies where drinking was more prevalent, but most other societal characteristics, including gender

inequality, were not associated with the likelihood of HED. Young drinkers who cohabit, both male and female, appear to be a high-risk group for HED, and the protective effect of aging against HED in women appears to be weaker in economically less-developed countries. The unexpected finding that societal characteristics modified the association between age and HED among female drinkers needs further investigation.

This study used an ecological paradigm and multilevel analytic techniques to examine individual- and societal-level predictors of drinking and “heavy episodic drinking” in 19 countries. Study participants had a wide age range and were selected from general populations, without reference to their potential drinking status. Compared with previous multilevel analyses using university students, adolescents in schools, and patients in emergency rooms (Bjarnason et al., 2003; Cherpitel et al., 2004, 2005, 2006; Elgar et al., 2005; Kuntsche et al., 2006; Scribner et al., 2008;Wells et al., 2008), our use of representative national or regional samples allows us to gain information about individual- and societal-level predictors of hazardous drinking in general populations. Like college campuses and emergency rooms, societies can be an important setting for environmental and context-based prevention and policies, e.g., policies that limit access to alcohol (Subramanian, Nandy, Irving, Gordon, and Davey Smith, 2005), to reduce hazardous drinking among general populations, including cohabiting persons such as those in this study.

The rising cohabitation rate indicates how family life is being transformed (Smock, 2000). The association between cohabitation and HED observed in this study requires further study in order to understand the mechanisms that underlie this association and their implications across societies for intervention and prevention. Recent research in the United States suggests that the association may *not* be explained by marital status differences in coping resources or relationship quality (Marcussen, 2005). However, several other possible explanations should be investigated further: (1) If cohabitation is a nontraditional or unconventional lifestyle (compared with marriage), it may be positively associated with other nontraditional or unconventional behavior patterns, including drinking among women and hazardous drinking among drinkers of both sexes (Horwitz and White, 1998; Lemke, Schutte, Brennan, and Moos, 2008; Lye and Waldron, 1998). (2) Recent research in the United States found that cohabiters reported lower levels of interpersonal commitment to one’s partner, in the sense of dedication to the joint benefit of each partner and the couple’s future (Stanley and Markman, 1992; Stanley, Whitton, and Markman, 2004), and a greater risk of violent interactions, perhaps because there is less informal social control between partners and the victim is more isolated (Li, Kirby, Sigler, Hwang, LaGory, and Goldenberg, 2010; Stets, 1991). Generally, the formation of commitment helps couples adopt realistic goals and come closer to fulfilling those goals over the life-course (Smithey and Straus, 2004). The lack of commitment may be associated with more adverse social interaction in intimate relationships (Stanley et al., 2004), perhaps including less social control of “heavy drinking” among cohabiters (Joutsenniemi et al., 2007). (3) Cohabiting relationships may be inherently less stable and shorter-lasting on average than married relationships, and the insecurity of cohabiting relationships may be a stressor leading to drinking and heavier drinking as a response (Wilsnack et al., 1991). (4) Men and women who engage in “heavy episodic drinking” may be more likely to form cohabiting rather than married partnerships because their habits of alcohol use discourage more permanent commitments and family formation (Waller, 2001). (5) If men who choose to cohabit tend to be heavier drinkers, they may influence their female partners to drink more than the female partners would otherwise drink (Horwitz and White, 1998; Roberts and Leonard, 1997). The current literature on cohabitation and drinking has not yet provided sufficient data to support or refute these hypotheses, however, calling for further investigation of this association and combining

biological and social–cultural perspectives (Wilsnack et al., 2000) to explore its gender difference.

The findings here suggest the value of health promotion and identification and brief intervention for alcohol and drug misuse among cohabiting individuals. Hazardous drinking among cohabiting partners may be a hidden barrier to programs promoting new marriage initiatives to build healthy relationships among unmarried couples (McLanahan and Garfinkel, 2003). Health care providers in primary care, preconception, and internatal care (Lu et al., 2006) should be alert to possible hazardous drinking among their cohabiting patients and refer persons manifesting hazardous drinking for further evaluation and treatment. For primary prevention and health promotion efforts, cohabiting persons may be an important high-risk group for targeted education/prevention messages. Such prevention messages should be designed for *both women and men* who cohabit, not directed only or primarily to men despite their overall higher rates of drinking.

### Study's Limitations

Our study has several limitations. First, despite the diversity of societies analyzed here, the results may not apply equally everywhere, if the social meanings and correlates of cohabitation vary cross-culturally and if variations in sampling methodology across some of the study countries affect the populations to which the study's findings can be generalized. Second, due to the cross-sectional nature of the study, causal relationships cannot be established. Longitudinal research is needed to assess the degree to which drinking patterns contribute to versus result from cohabitation. Third, current drinking and "heavy episodic drinking" may have been underreported since these variables were measured by respondents' self-report at a single interview. Fourth, many of the societal measures were highly correlated, which may have adversely affected our ability to detect associations of drinking patterns with specific societal variables. Finally, the significant variations of associations between age and HED for both genders and between education and HED for women indicate that there may be important dimensions or complexities of societal and household differences, e.g., partner's education (Monden, van Lenthe, de Graaf, and Kraaykamp, 2003) and parenthood (Kuntsche, Knibbe, and Gmel, 2009), which were not taken into account in the available measurements and current analyses.

Multinational, multilevel analyses such as those presented here are an important step toward evaluating social–environmental influences on drinking behavior. Building community capacity for alcohol control requires the involvement of international communities, national and state institutions, health care systems, voluntary groups, and families in a long-term and collective effort (Holder et al., 1999; Howat, Sleet, Elder, and Maycock, 2004; Pittman, Staudenmeier, and Kaplan, 1991; Room, 1996). Our results from these multinational data, in convergence with scattered evidence from other studies, suggest that cohabitation is associated with elevated risks of hazardous drinking cross-culturally. In societies with relatively high or increasing rates of cohabitation, it may be worthwhile to develop policies and programs that aim to prevent the development of hazardous drinking among cohabiters. It will also be important to design longitudinal research that can better explain the observed associations between cohabitation and drinking behaviors across the lifespan, including effects from societies, neighborhoods, families, and social groups. Our findings also suggest that changes in individual-level factors by themselves may not be enough to achieve desired reductions in "heavy" or hazardous alcohol consumption.

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## Glossary

| | |
|---|---|
| **Cohabitation** | Living together with one’s intimate partner outside marriage. |

| | |
|---|---|
| **Cross-cultural research** | Research methods designed to study cultural similarities and differences across diverse societies. |
| **Heavy episodic drinking** | Consuming five or more drinks in a single day. |

## References


Ahlstrom S, Bloomfield K, Knibbe R. Gender differences in drinking patterns in nine European countries: descriptive findings. Substance Abuse. 2001; 22:69–85. [PubMed: 12466670]

Bacharach S, Bamberger PA, Sonnenstuhl WJ, Vashdi D. Aging and drinking problems among mature adults: the moderating effects of positive alcohol expectancies and workforce disengagement. Journal of Studies on Alcohol Drugs. 2008; 69(1):151–159.

Bachman JG, O'Malley PM, Johnston LD. Drug use among young adults: the impacts of role status and social environment. Journal of Personality and Social Psychology. 1984; 47(3):629–645. [PubMed: 6333504]

Bjarnason T, Andersson B, Choquet M, Elekes Z, Morgan M, Rapinett G. Alcohol culture, family structure and adolescent alcohol use: multilevel modeling of frequency of heavy drinking among 15–16 year old students in 11 European countries. Journal of Studies on Alcohol. 2003; 64(2):200–208. [PubMed: 12713193]

Bloomfield K, Gmel G, Wilsnack S. Introduction to special issue 'gender, culture and alcohol problems: a multi-national study.'. Alcohol and Alcoholism Supplement. 2006; 41(1):i3–i7. [PubMed: 17030501]

Bonate P. The effect of collinearity on parameter estimates in nonlinear mixed effect models. Pharmaceutical Research. 1999; 16:709–717. [PubMed: 10350015]

Brown SL, Lee GR, Bulanda JR. Cohabitation among older adults: a national portrait. The Journals of Gerontology Series B: Psychological Sciences and Social Sciences. 2006; 61:S71–S79.

Bumpass L, Lu H-H. Trends in cohabitation and implications for children's family contexts in the United States: Population Investigation Committee. Population Studies. 2000; 54(1):29–41.

Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Archives of Internal Medicine. 1998; 158(16):1789–1795. [PubMed: 9738608]

Caetano R, Cunradi C. Alcohol dependence: a public health perspective. Addiction. 2002; 97:633–645. [PubMed: 12084125]

Caetano R, Ramisetty-Mikler S, Floyd LR, McGrath C. The epidemiology of drinking among women of child-bearing age. Alcoholism: Clinical and Experimental Research. 2006; 30(6):1023–1030.

Cherpitel CJ, Bond J, Ye Y, Borges G, Room R, Poznyak V, et al. Multi-level analysis of causal attribution of injury to alcohol and modifying effects: data from two international emergency room projects. Drug and Alcohol Dependence. 2006; 82(3):258–268. [PubMed: 16257137]

Cherpitel CJ, Ye Y, Bond J. Alcohol and injury: multi-level analysis from the emergency room collaborative alcohol analysis project (ERCAAP). Alcohol and Alcoholism. 2004; 39(6):552–558. [PubMed: 15351747]

Cherpitel CJ, Ye Y, Bond J, Rehm J, Poznyak V, Macdonald S, et al. Multi-level analysis of alcohol-related injury among emergency department patients: a cross-national study. Addiction. 2005; 100(12):1840–1850. [PubMed: 16367985]

Demers A, Kairouz S, Adlaf EM, Gliksman L, Newton-Taylor B, Marchand A. Multilevel analysis of situational drinking among Canadian undergraduates. Social Science and Medicine. 2002; 55(3): 415–424. [PubMed: 12144149]

Di Giulio P, Rosina A. Intergenerational family ties and the diffusion of cohabitation in Italy. Demographic Research. 2007; 16(14):441–468.

Duncan GJ, Wilkerson B, England P. Cleaning up their act: the effects of marriage and cohabitation on licit and illicit drug use. Demography. 2006; 43(4):691–710. [PubMed: 17236542]

Elgar FJ, Roberts C, Parry-Langdon N, Boyce W. Income inequality and alcohol use: a multilevel analysis of drinking and drunkenness in adolescents in 34 countries. European Journal of Public Health. 2005; 15(3):245–250. [PubMed: 15985459]

Furstenberg, FFJ., editor. Early adulthood in cross-national perspectives. Thousand Oaks, CA: Sage; 2002.

Fuwa M. Macro-level gender inequality and the division of household labor in 22 countries. American Sociological Review. 2004; 69(6):751–767.

Graham, K.; Bernards, S.; Munne, M.; Wilsnack, SC., editors. Unhappy hours: alcohol and partner aggression in the Americas. Washington, DC: Pan American Health Organization; 2008.

Greenfield SF. Women and alcohol use disorders. Harvard Review of Psychiatry. 2002; 10:76–85. [PubMed: 11897748]

Grimm D. Public health: staggering toward a global strategy on alcohol abuse. Science. 2008; 320(5878):862–863. [PubMed: 18487166]

Gruenewald PJ. The spatial ecology of alcohol problems: niche theory and assortative drinking. Addiction. 2007; 102:870–878. [PubMed: 17523980]

Hausman, R.; Tyson, LD.; Zahidi, S. The global gender gap report 2006. Geneva: World Economic Forum; 2006.

Hoffmann DA. An overview of the logic and rationale of hierarchical linear models. Journal of Management. 1997; 23:723–744.

Holder H, Flay B, Howard J, Boyd G, Voas R, Grossman M. Phases of alcohol problem prevention research. Alcoholism: Clinical and Experimental Research. 1999; 23:183–194.

Horwitz AV, White HR. The relationship of cohabitation and mental health: a study of a young adult cohort. Journal of Marriage and the Family. 1998; 60(2):505–514.

Howat P, Sleet D, Elder R, Maycock B. Preventing alcohol-related traffic injury: a health promotion approach. Traffic Injury Prevention. 2004; 5:208–219. [PubMed: 15276921]

Hwang SS, Xi J. Structural and individual covariates of English language proficiency. Social Forces. 2008; 86(3):1–26.

Joutsenniemi K, Martelin T, Kestila L, Martikainen P, Pirkola S, Koskinen S. Living arrangements, heavy drinking and alcohol dependence. Alcohol and Alcoholism. 2007; 42(5):480–491. [PubMed: 17369285]

Kiernan, K. Cohabitation and divorce across nations and generations. In: Chase-Lansdale, PL.; Kiernan, K.; Friedman, R., editors. Human development across lives and generations: the potential for change. New York: Cambridge University Press; 2004. p. 139-170.

Koskinen S, Joutsenniemi K, Martelin T, Martikainen P. Mortality differences according to living arrangement. International Journal of Epidemiology. 2007; 36:1255–1264. [PubMed: 17971389]

Kuntsche, S.; Gmel, G.; Bloomfield, K. Cross-country and within-country assessment of educational status and its link with alcohol use. Paper presented at the 65th Alcohol Problems Research Symposium; Kendal, United Kingdom. 2008.

Kuntsche E, Gmel G, Wicki M, Rehm J, Grichting E. Disentangling gender and age effects on risky single occasion drinking during adolescence. European Journal of Public Health. 2006; 16(6):670–675. [PubMed: 16672252]

Kuntsche S, Knibbe RA, Gmel G. Social roles and alcohol consumption: a study of 10 industrialised countries. Social Science and Medicine. 2009; 68(7):1263–1270. [PubMed: 19232807]

Lemke S, Schutte KK, Brennan PL, Moos RH. Gender differences in social influences and stressors linked to increased drinking. Journal of Studies on Alcohol Drugs. 2008; 69(5):695–702.

Leonard KE, Eiden RD. Marital and family processes in the context of alcohol use and alcohol disorders. Annual Review of Clinical Psychology. 2007; 3:285–310.

Li Q, Kirby RS, Sigler RT, Hwang SS, LaGory ME, Goldenberg RL. A multilevel analysis of individual, household, and neighborhood correlates of intimate partner violence among low-income pregnant women in Jefferson County, Alabama. American Journal of Public Health. 2010; 100(3):531–539. [PubMed: 19696385]

Lu MC, Kotelchuck M, Culhane JF, Hobel CJ, Klerman LV, Thorp JM Jr. Preconception care between pregnancies: the content of internatal care. Maternal and Child Health Journal. 2006; 10 5 Suppl:S107–S122. [PubMed: 16817001]

Lye DN, Waldron I. Relationships of substance use to attitudes toward gender roles, family and cohabitation. Journal of Substance Abuse. 1998; 10(2):185–198. [PubMed: 9854703]

Macintyre, S.; Ellaway, A. Ecological approaches: rediscovering the role of the physical and social environments. In: Berkman, LF.; Kawachi, I., editors. Social epidemiology. New York: Oxford University Press; 2000. p. 332-348.

Marcussen K. Explaining differences in mental health between married and cohabiting individuals. Social Psychology Quarterly. 2005; 68(3):239–257.

McLanahan, S.; Garfinkel, I. Strengthening fragile families. In: Sawhill, I., editor. One percent for the kids: new policies, brighter futures for American's children. Washington, DC: Brookings Institution; 2003. p. 76-92.

Monden CW, van Lenthe F, de Graaf ND, Kraaykamp G. Partner's and own education: does who you live with matter for self-assessed health, smoking and excessive alcohol consumption? Social Science and Medicine. 2003; 57(10):1901–1912. [PubMed: 14499514]

Obot, IS.; Room, R., editors. Alcohol, gender and drinking problems: perspectives from low and middle income countries. Geneva: World Health Organization; 2005.

Pittman DJ, Staudenmeier WJ Jr, Kaplan A. Alcohol and other drugs: the response of the political and medical institutions. British Journal of Addiction. 1991; 86:967–975. [PubMed: 1912751]

Plant, M. Women and alcohol: contemporary and historical perspectives. London: Free Association Books; 1997.

Plant M, Miller P, Plant M, Kuntsche S, Gmel G, Ahlstrom S, et al. Marriage, cohabitation and alcohol consumption in young adults: an international exploration. Journal of Substance Use. 2008; 13(2): 83–98.

Rahav G, Wilsnack R, Bloomfield K, Gmel G, Kuntsche S. The influence of societal level factors on men's and women's alcohol consumption and alcohol problems. Alcohol and Alcoholism Supplement. 2006; 41(1):i47–i55. [PubMed: 17030503]

Raudenbush, SW.; Bryk, AS. Hierarchical linear models: applications and data analysis methods. 2nd ed.. Thousand Oaks, CA: Sage; 2002.

Raudenbush SW, Yang ML, Yosef M. Maximum likelihood for generalized linear models with nested random effects via high-order, multivariate Laplace approximation. Journal of Computational and Graphical Statistics. 2000; 9(1):141–157.

Roberts, LJ.; Leonard, KE. Gender differences and similarities in the alcohol and marriage relationship. In: Wilsnack, RW.; Wilsnack, SC., editors. Gender and alcohol: individual and social perspectives. New Brunswick, NJ: Rutgers Center of Alcohol Studies; 1997. p. 289-311.

Room R. Gender roles and interactions in drinking and drug use. Journal of Substance Abuse. 1996:227–239. [PubMed: 8880662]

Room R, Babor T, Rehm J. Alcohol and public health. Lancet. 2005; 365(9458):519–530. [PubMed: 15705462]

Rountree PW, Land KC. Perceived risk versus fear of crime: empirical evidence of conceptually distinct reactions in survey data. Social Forces. 1996; 74:1353–1376.

Scribner R, Mason K, Theall K, Simonsen N, Schneider SK, Towvim LG, et al. The contextual role of alcohol outlet density in college drinking. Journal of Studies on Alcohol Drugs. 2008; 69(1):112–120.

Serdula MK, Brewer RD, Gillespie C, Denny CH, Mokdad A. Trends in alcohol use and binge drinking, 1985–1999: results of a multi-state survey. American Journal of Preventive Medicine. 2004; 26(4):294–298. [PubMed: 15110055]

Settersten, RA.; Furstenberg, FF.; Rumbaut, RG. Chicago, IL: University of Chicago Press; 2008. On the frontier of adulthood: theory, research, and public policy (MacArthur Foundation Series).

Siegrist J. Social differentials in chronic disease: what can sociological knowledge offer to explain and possibly reduce them? Social Science and Medicine. 1995; 41(12):1603–1605. [PubMed: 8746860]

Smithey, M.; Straus, M. Primary prevention of intimate partner violence. In: Jury, H.; Obergfell-Fuchs, J., editors. Crime prevention – new approaches. Mainz, Germany: Weisser Ring; 2004. p. 239-276.

Smock PJ. Cohabitation in the United States: an appraisal of research themes, findings, and implications. Annual Review of Sociology. 2000; 26:1–20.

Stanley S, Markman H. Assessing commitment in personal relationships. Journal of Marriage and the Family. 1992; 54:595–608.

Stanley S, Whitton S, Markman H. Maybe I do: interpersonal commitment and premarital or nonmarital cohabitation. Journal of Family Issues. 2004; 25:496–519.

Stets J. Cohabiting and marital aggression: the role of social isolation. Journal of Marriage and the Family. 1991; 53:669–680.

Subramanian, SV.; Jones, K.; Duncan, C. Multilevel methods for public health research. In: Kawachi, I.; Berkman, LF., editors. Neighborhoods and health. New York: Oxford University Press; 2003. p. 65-111.

Subramanian SV, Nandy S, Irving M, Gordon D, Davey Smith G. Role of socioeconomic markers and state prohibition policy in predicting alcohol consumption among men and women in India: a multilevel statistical analysis. Bulletin of the World Health Organization. 2005; 83(11):829–836. [PubMed: 16302039]

Waller MR. High hopes: Unwed parents' expectations about marriage. Children and Youth Services Review. 2001; 23:457–484.

Wells S, Mihic L, Tremblay PF, Graham K, Demers A. Where, with whom, and how much alcohol is consumed on drinking events involving aggression? Event-level associations in a Canadian national survey of university students. Alcoholism, Clinical and Experimental Research. 2008; 32(3):522–533.

Wilsnack RW, Vogeltanz ND, Wilsnack SC, Harris TR. Gender differences in alcohol consumption and adverse drinking consequences: cross-cultural patterns. Addiction. 2000; 95(2):251–265. [PubMed: 10723854]

Wilsnack, RW.; Wilsnack, SC. Gender and alcohol: individual and social perspectives. New Brunswick, NJ: Rutgers Center of Alcohol Studies; 1997.

Wilsnack RW, Wilsnack SC, Klassen AD. Women's drinking and drinking problems: patterns from a 1981 national survey. American Journal of Public Health. 1984; 74(11):1231–1238. [PubMed: 6496815]

Wilsnack RW, Wilsnack SC, Kristjanson AF, Vogeltanz-Holm ND, Gmel G. Gender and alcohol consumption: patterns from the multinational GENACIS project. Addiction. 2009; 104(9):1487–1500. [PubMed: 19686518]

Wilsnack SC, Klassen AD, Schur BE, Wilsnack RW. Predicting onset and chronicity of women's problem drinking: a five-year longitudinal analysis. American Journal of Public Health. 1991; 81(3):305–318. [PubMed: 1994739]

World Bank. World development indicators. 2004. from https://publications.worldbank.org/WDI/

World Health Organization. Sixtieth World Health Assembly: evidence-based strategies and interventions to reduce alcohol-related harm. 2007. from www.who.int/gb/ebwha/pdf_files/WHA60/A60_14-en.pdf

Yang X, Guo F. Gender differences in determinants of temporary labor migration in China: a multilevel analysis. International Migration Review. 1999; 33(4):929–953. [PubMed: 12349706]

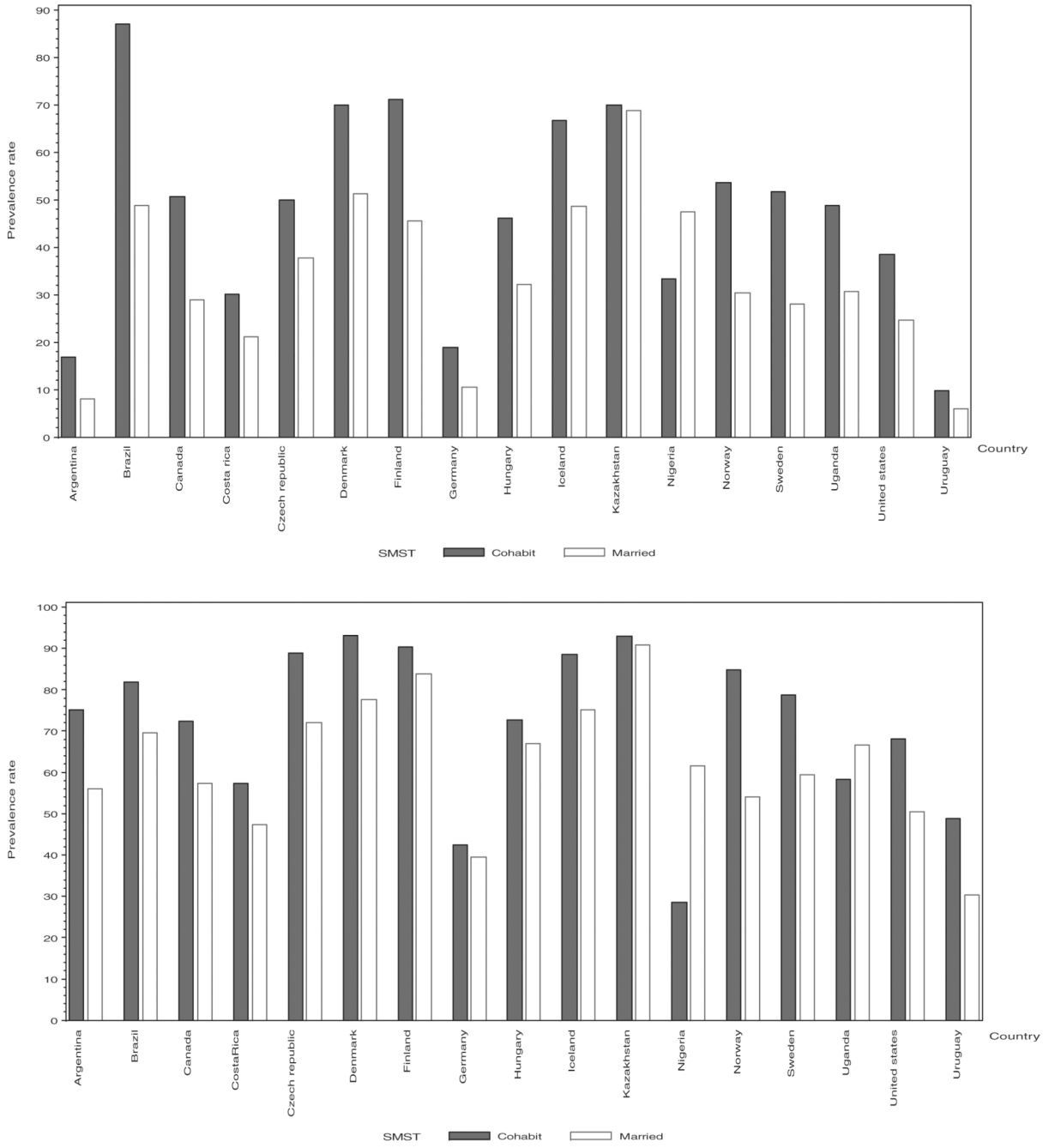


**Figure 1.**
Weighted gender-specific prevalence rates of HED (top:women, and bottom: men) among cohabiting and married respondents in 17 countries, from GENACIS.

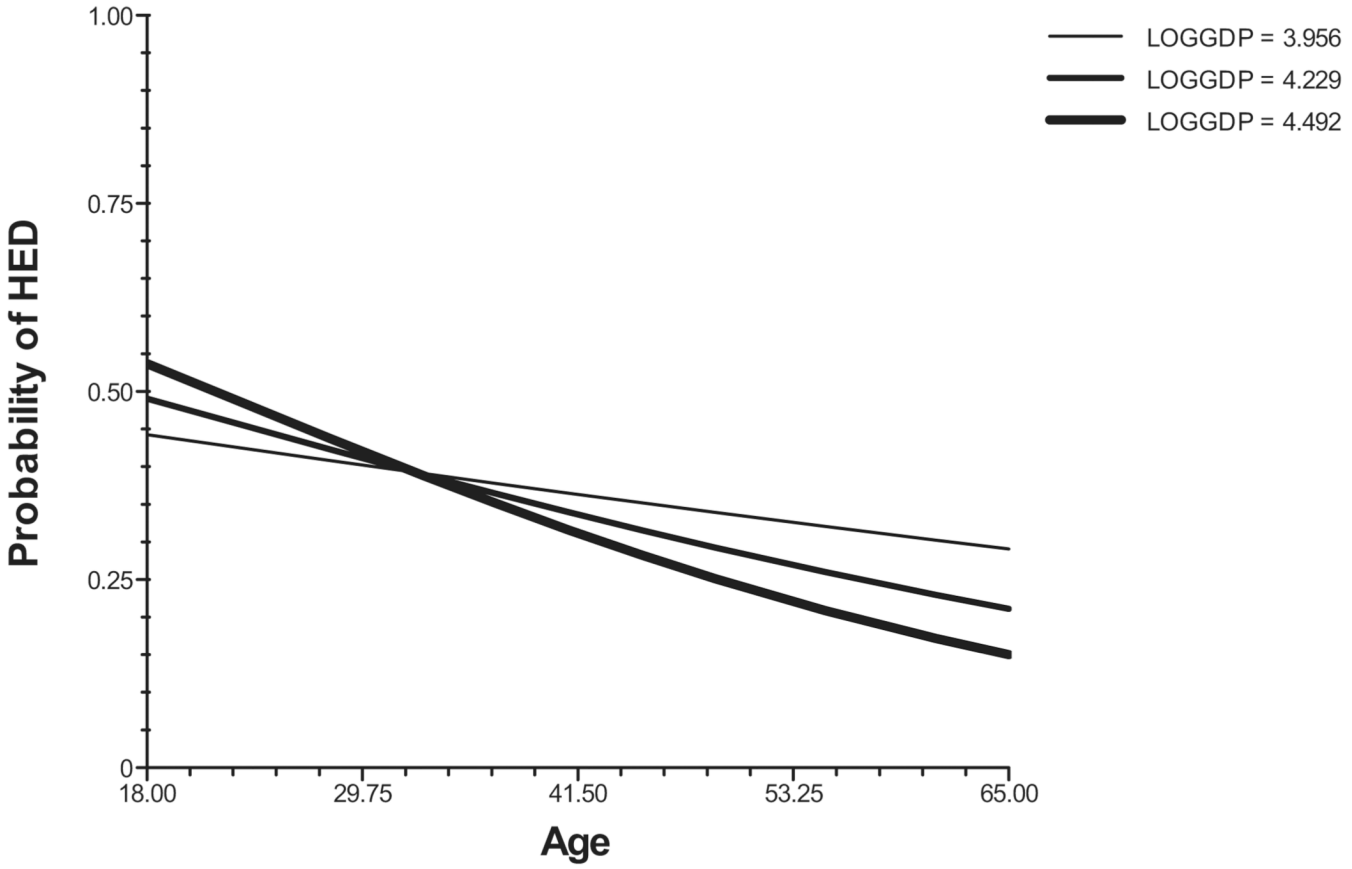


**Figure 2.**
Probability of HED predicted by women's age and national economic development level (25th/50th/75th percentiles of log transformation of the gross domestic product per capita, Log GDP) among cohabiting and married female respondents in 17 countries, from GENACIS.

**Table 1**

Characteristics of general population surveys, from GENACIS

| Country | Survey year | Age range | Women *n* | Men *n* | Sampling frame | Survey mode |
|---|---|---|---|---|---|---|
| Argentina | 2003 | 18–65 | 598 | 402 | Regional | Face-to-face |
| Brazil | 2001/2002 | 18+/17+ | 331/365 | 194/368 | Regional | Face-to-face |
| Canada | 2004 | 18–76 | 8054 | 6009 | National | Telephone |
| Costa Rica | 2003 | 18+ | 857 | 416 | Regional | Face-to-face |
| Czech Republic | 2002 | 18–64 | 1282 | 1244 | National | Face-to-face |
| Denmark | 2003 | 15–99 | 1133 | 897 | National | Telephone |
| Finland | 2000 | 16–70 | 987 | 945 | National | Face-to-face |
| Germany | 2000 | 18–60 | 4459 | 3688 | National | Postal |
| Great Britain | 2000 | 18+ | 1038 | 963 | National | Face-to-face |
| Hungary | 2001 | 19–65 | 1198 | 1094 | National | Face-to-face |
| Iceland | 2001 | 18–75 | 1271 | 1168 | National | Postal/phone |
| Kazakhstan | 2002 | 18+ | 631 | 539 | Regional | Face-to-face |
| Nigeria | 2003 | 18+ | 956 | 1114 | Regional | Face-to-face |
| Norway | 1999 | 15+ | 1136 | 1034 | National | Face-to-face |
| Spain | 2002 | 18+ | 956 | 894 | Regional | Face-to-face |
| Sweden | 2002 | 17+ | 2816 | 2656 | National | Telephone |
| Uganda | 2003 | 18+ | 758 | 721 | Regional | Face-to-face |
| United States | 1996 | 18+ | 2701 | 2219 | National | Telephone |
| Uruguay | 2004 | 18–65 | 624 | 376 | National | Face-to-face |

## Table 2

Coding, ranges, and mean levels of individual/household and societal characteristics for two dependent variables, from GENACIS

| | | Descriptive statistics | |
|---|---|---|---|
| **Variables** | **Metrics** | **Mean (SD)/%** | **Range** |
| **Dependent variable 1** | | | |
| Current drinking among 32,922 study participants in 19 countries | 0 = no, 1 = yes | 80% | 0–1 |
| Explanatory variables | | | |
| Household/individual characteristics | | | |
| Age | Years | 42.50 (11.52) | 18–65 |
| Female | 0 = no, 1 = yes | 54% | 0–1 |
| Cohabitation | 0 = no, 1 = yes | 18% | 0–1 |
| Education | Low | 26% | 1 |
| | Middle | 51% | 2 |
| | High | 23% | 3 |
| Societal characteristics | | | |
| Aggregated rate of cohabitation among partnered respondents | Proportion | 0.18 (0.11) | 0.02–0.34 |
| Aggregated drinking vs. abstaining | Proportion | 0.75 (0.19) | 0.33–0.95 |
| Gender ratio of drinking vs. abstaining | Ratio | 1.22 (0.23) | 1.00–1.88 |
| Gender gap index | Scale | 0.71 (0.06) | 0.61–0.81 |
| GDP-PPP | Dollars | 19,566 (11,579) | 966–34,975 |
| Log GDP-PPP | Log Dollars | 4.15 (0.46) | 2.98–4.54 |
| **Dependent variable 2** | | | |
| “heavy episodic drinking” among 24,525 current drinkers in 17 countries | 0 = no, 1 = yes | 46% | 0–1 |
| Explanatory variables | | | |
| Household/Individual characteristics | | | |
| Age | Years | 42.49 (11.31) | 18–65 |
| Female | 0 = no, 1 = yes | 51% | 0–1 |
| Cohabitation | 0 = no, 1 = yes | 20% | 0–1 |
| Education | Low | 21% | 1 |
| | Middle | 53% | 2 |
| | High | 26% | 3 |
| Societal characteristics | | | |
| Aggregated rate of cohabitation among partnered respondents | Proportion | 0.19 (0.11) | 0.02–0.34 |
| Aggregated drinking vs. abstaining | Proportion | 0.75 (0.19) | 0.33–0.95 |
| Gender ratio of drinking vs. abstaining | Ratio | 1.22 (0.24) | 1.00–1.88 |
| Gender gap index | Scale | 0.71 (0.06) | 0.61–0.81 |
| GDP-PPP | Dollars | 18,766 (11,979) | 966–34,975 |
| Log GDP-PPP | Log Dollars | 4.12 (0.47) | 2.98–4.54 |

*Note*. GDP-PPP = Gross domestic product per capita based on purchasing power parity.

**Table 3**

Results of multilevel logistic regression analysis of current drinking among 17,725 women and 15,197 men in 19 countries, from GENACIS

| | Women | | | | Men | | | |
|---|---|---|---|---|---|---|---|---|
| | Model 1 | | Model 2 | | Model 1 | | Model 2 | |
| **Variable** | **β** | **$(e^{SD*\beta}-1)*100$** | **β** | **$(e^{SD*\beta}-1)*100$** | **β** | **$(e^{SD*\beta}-1)*100$** | **β** | **$(e^{SD*\beta}-1)*100$** |
| Fixed effects | | | | | | | | |
| Mean drinking | | | | | | | | |
| Intercept | 1.05** | – | 1.04* | – | 1.81** | – | 1.77** | – |
| Prevalence of drinking | | | 7.43** | 310.29 | | | 6.39** | 236.72 |
| Log GDP-PPP | | | −0.56 | −22.71 | | | −0.53 | −21.64 |
| Age | −0.01 | −6.12 | −0.01 | −5.64 | −0.01 | −10.00 | −0.01 | −6.90 |
| Education | 0.47** | 38.11 | 0.47** | 38.96 | 0.32* | 25.43 | 0.31* | 24.64 |
| Cohabitation | 0.35 | 14.41 | 0.34 | 14.18 | 0.36 | 14.66 | 0.36 | 14.66 |
| Random effects | | | | Variance | | | | |
| Level-2 variance | 1.2152** | | 0.1207** | | 1.0721** | | 0.0477** | |
| Age slope | 0.0003** | | 0.0002** | | 0.0001** | | 0.0001** | |
| Education slope | 0.0785** | | 0.0865** | | 0.0693** | | 0.0570** | |
| Cohabitation slope | 0.0528* | | 0.0477* | | 0.0420* | | 0.0252 | |

* $p < 0.05$,

** $p < 0.01$.

GDP-PPP = Gross domestic product per capita based on purchasing power parity; SD = standard deviation.

**Table 4**

Results of multilevel logistic regression of HED among 12,553 females and 11,972 male current drinkers in 17 countries, from GENACIS

| | Women | | | | Men | | | |
|---|---|---|---|---|---|---|---|---|
| | Model 1 | | Model 2 | | Model 1 | | Model 2 | |
| Variable | β | $(e^{SD*\beta} - 1)*100$ | β | $(e^{SD*\beta} - 1)*100$ | β | $(e^{SD*\beta} - 1)*100$ | β | $(e^{SD*\beta} - 1)*100$ |
| Fixed effects | | | | | | | | |
| Mean drinking | | | | | | | | |
| Intercept | −0.80 | — | −0.76 | | 0.63* | — | 0.63* | — |
| Log | | | −0.26 | −11.50 | | | 0.12 | 6.80 |
| GDP-PPP | | | | | | | | |
| Age | −0.03** | −26.57 | −0.02* | −20.20 | −0.03* | −28.34 | −0.03** | −28.34 |
| Log | | | −0.05* | −2.32 | | | −0.05 | −2.38 |
| GDP-PPP | | | | | | | | |
| Education | −0.08 | −5.53 | −0.07 | −4.58 | −0.17** | −11.22 | −0.17** | −11.22 |
| Cohabitation | 0.52** | 23.20 | 0.52** | 23.12 | 0.31** | 12.85 | 0.31** | 12.85 |
| Random effects | | | | Variance | | | | |
| Level-2 variance | 0.8973** | | 0.8035** | | 0.5854** | | 0.5794** | |
| Age slope | 0.0004** | | 0.0001* | | 0.0008** | | 0.0003** | |
| Education slope | 0.0207** | | 0.0162** | | – | | – | |

*$p < 0.05$,

**$p < 0.01$.

GDP-PPP = Gross domestic product per capita based on purchasing power parity; SD = standard deviation.