

Gender Differences in Binge Drinking

Prevalence, Predictors, and Consequences

Richard W. Wilsnack, Sharon C. Wilsnack, Gerhard Gmel, and Lori Wolfgang Kantor

Richard W. Wilsnack, Ph.D., is a professor emeritus in the Department of Psychiatry and Behavioral Science, University of North Dakota School of Medicine and Health Sciences, Grand Forks, North Dakota.

Sharon C. Wilsnack, Ph.D., is the Chester Fritz Distinguished Professor in the Department of Psychiatry and Behavioral Science, University of North Dakota School of Medicine and Health Sciences, Grand Forks, North Dakota.

Gerhard Gmel, Ph.D., is a professor, University of Lausanne, and is affiliated with the Alcohol Treatment Center, University of Lausanne Hospital, Lausanne, Switzerland. He is also an invited professor, University of the West of England, Bristol, United Kingdom.

Lori Wolfgang Kantor, M.A., is a science writer at CSR, Incorporated.

Just as binge drinking rates differ for men and women, the predictors and consequences of binge drinking vary by gender as well. This article examines these differences and how binge drinking definitions and research samples and methods may influence findings. It also describes the relationship between age and binge drinking among men and women, and how drinking culture and environment affect this relationship. It examines gender-specific trends in binge drinking, predictors of binge drinking for men and women, and binge drinking in the context of smoking. The article reviews current findings on gender differences in the health consequences of binge drinking, including morbidity and mortality, suicidality, cancer, cardiovascular disorders, liver disorders, and brain and neurocognitive implications. It also discusses gender differences in the behavioral and social consequences of binge drinking, including alcohol-impaired driving, sexual assault, and intimate partner violence, and includes implications for treatment and prevention.

Key words: Alcohol and other drugs (AODs); AOD associated consequences; binge AOD use; gender differences; physical health; predictive factors

Introduction

A large research literature shows that women consistently consume less alcohol than men, and they experience fewer social problems resulting from drinking than men, but these gender differences vary culturally, demographically, and historically.¹⁻³ This literature often has not given close attention to gender differences in binge drinking and its consequences. This lack of attention is unfortunate, because binge drinking is recognized as a major contributor to the social and health burdens of alcohol consumption.⁴ Binge drinking has been linked specifically to a wide variety of adverse consequences, acute (e.g., accidents and injuries) and chronic (e.g., liver disease), that harm not only the drinker but also communities and societies as a whole (e.g., productivity losses, crime, and public

disorder).^{5,6} In this article we review recent research findings on gender differences in the prevalence, predictors, and consequences of binge drinking, and we note how interpretation of these findings has been limited by differences in concepts, measurements, and research methods.

Measurement Issues

There is considerable variation in the research literature as to how binge drinking is measured (4+, 5+, 6+ drinks) and labeled (binge drinking, heavy episodic drinking, or risky single-occasion drinking).⁷⁻¹⁰ Furthermore, many studies use gender-specific measures of binge drinking (e.g., 5+ drinks for men and 4+ drinks for women),¹¹ but many other studies use the same measure for men and

women (e.g., the Alcohol Use Disorders Identification Test uses 6+ drinks).¹²⁻¹⁶ Other studies define binge drinking by estimated blood alcohol concentration (BAC) level (e.g., a BAC of at least .08%), which may be a less sensitive criterion for men than for women.¹⁷

Finally, different studies measure different frequencies of binge drinking over different time periods (e.g., in the past 2 weeks or past 30 days). Measuring the frequency of binge drinking in a given time period (e.g., once in the past 30 days) may produce greater apparent gender differences than measuring binge drinking as any or none. Moreover, using longer time periods for measurement (e.g., a year versus a month) may reduce gender differences when binge drinking is measured as any or none but may magnify gender differences when binge drinking frequency is measured. Because of the inconsistent measurement methods used across the research, we cannot focus our discussion on any one criterion of quantity, frequency, or time period. However, for examination of the consequences of acute and chronic binge drinking, the importance of measurement variation remains uncertain.

Prevalence

There has been widespread alarm in the mass media about the extent of women's binge drinking. A frequent theme is that, traditionally, men have been binge drinkers more than women, but this gender difference is declining rapidly because of a growing epidemic of binge drinking among women.^{18,19} However, research evidence indicates that these media stories oversimplify men's and women's patterns of binge drinking.

Recent survey data consistently illustrate that men in the United States and throughout the world binge drink more than women (see Table 1).²⁰⁻³³ Although studies measure binge drinking in various

ways and over various periods of time, the gender difference persists, whether or not studies use gender-specific criteria for defining binges. Another analysis of data from 15 countries reached a similar conclusion.³⁴ However, binge drinking rates and gender differences vary greatly across populations. One explanation of the difference is that recent changes in binge drinking have not yet erased the sizable gender gap present in many societies. A second explanation is that gender differences in binge drinking cannot be attributed only to biological or cultural differences but may result from a combination of these influences.³

Age

One response to these explanations has been concern that gender differences in binge drinking may be disappearing specifically among younger drinkers. In the United States, binge drinking is most prevalent in late adolescence or early adulthood, with rates declining as drinkers grow older.³⁵ However, a focus on binge drinking in any one age group may be an oversimplification, for several reasons:

- Women's binge drinking has not caught up with men's in any age group in the United States or any other country, judging from large, general-population surveys.
- As drinkers get older, binge drinking (versus none) declines consistently in Europe, North America, Australia, and New Zealand, but these declines do not occur consistently in other areas of the world.³
- Frequency of binge drinking by men and women often shows complicated nonlinear relationships with age.^{28,36,37}
- Gender-specific associations of age with binge drinking may vary among regions within countries.³⁸

Taken together, these findings suggest that how age modifies effects of gender on binge drinking depends on the spe-

cific drinking culture and environment where the binge drinking occurs.

Gender-Specific Trends

Complex age effects are one reason why it is difficult to evaluate trends in women's and men's binge drinking. Much of the research and discussion of those trends focuses on two questions:

1. Is binge drinking changing (in recent years) in ways that differ by gender?
2. Are gender-differentiated changes leading to a convergence of men's and women's rates of binge drinking?

In the mass media, the common answers to these questions are that women's binge drinking is increasing faster than men's, and, as a result, men's and women's binge drinking rates are converging.

Research to answer these questions is hard to interpret for many reasons besides age effects. In addition to the variation in how binge drinking is measured, some analyses of binge drinking rates include abstainers, whereas others do not. Some studies analyze changes in binge drinking frequency, whereas others analyze changes in rates of ever/never binge drinking. Furthermore, many studies that measure trends over extended periods do not separate period effects (historical trends in whole populations) from age effects (changes that occur more in one age group than others) and cohort effects (changes that are greater in groups born in one historical period than others).

Nevertheless, a small set of large longitudinal studies has provided consistent answers to the two questions about trends. From 2000 to 2010, large U.S. studies found that any binge drinking (measured as ever or never) in the preceding month increased in prevalence more among women than among men.^{35,39,40} This trend was consistent with findings from binge drinking studies that used different

Table 1 Prevalence of Binge Drinking

Source	Population	Binge Drinking Measure	Men	Women
2014 National Survey on Drug Use and Health ²⁰	United States, ages 18 and older	5+ drinks, 1 occasion, past 30 days	33%	17%
China Chronic Disease and Risk Factor Surveillance, 2007 ²¹	China, ages 15 to 60	50+ grams (men), 40+ grams (women), ethanol, 1 day, past 12 months	32%	4%
Health Survey for England, 2007 ²²	England, ages 16 and older	>2 times recommended daily maximum (>8 units for men, >6 units for women), past week, among drinkers	35%	27%
Kangwha Cohort Study, Korea, 1988 ²³	Kangwha County, Korea, ages 55 and older	6+ drinks, 1 occasion, past year	21%	<1%
Moscow Health Survey 2004 ²⁴	Moscow, Russia, ages 18 and older	80+ grams (men), 60+ grams (women), ethanol, 1+ occasion per month	30%	6%
National Health Survey 2004, Singapore ²⁵	Singapore, ages 18 to 69	5+ drinks, 1 occasion, past month	9%	5%
National survey, Denmark, 2003 ²⁶	Denmark, ages 15 to 99	6+ drinks, 1 occasion, once a month or more	38%	18%
National survey, Mozambique, 2005 ²⁷	Mozambique, ages 25 to 64	5+ drinks (men), 4+ drinks (women), or equivalent drink container, 1 day, past week	25%	11%
National survey, Spain, 2008 to 2010 ²⁸	Spain, ages 18 to 64	80+ grams (men), 60+ grams (women), ethanol, 1 occasion, past month	10%	4%
Nationwide survey on alcohol consumption patterns, Brazil, 2005 to 2006 ²⁹	Brazil, ages 18 and older	5+ drinks (men), 4+ drinks (women), 1 occasion, past year	40%	18%
South African National HIV Prevalence, Incidence, Behaviour and Communication Survey, 2008 ³⁰	South Africa, ages 15 and older	5+ drinks (men), 4+ drinks (women), 1 occasion, past month	17%	4%
Survey, Hong Kong, 2006 ³¹	Hong Kong, ages 18 to 70	5+ drinks, 1 occasion, past 30 days	15%	4%
Survey of Lifestyle, Attitudes and Nutrition in Ireland, 2007 ³²	Ireland, ages 18 to 29	6+ drinks, 1 occasion, past year	92%	79%
Third National Health Examination Survey, Thailand, 2004 ³³	Thailand, ages 15 and older	Multiple beverage-specific measures	40%	7%

time periods (a week and a year) and with findings from other countries (England, Finland, Russia, and Singapore).^{25,36,41-43} The greater increase in prevalence among women resulted in partial convergence of men's and women's *likelihood* of binge drinking.

In contrast, in the United States, convergence of women's and men's *frequency* of binge drinking more likely occurred because of greater *declines* in frequency among men than among women.^{40,44} Furthermore, evidence of men's and women's convergence in the United States often has been stronger in young adults (20s and 30s) than in

other age groups.^{40,45} Trends in men's and women's binge drinking may be modified by drinking pattern changes in different birth cohorts. In the United States and Finland, evidence has shown that both men and women in more recent birth cohorts have been increasingly likely to become binge drinkers, at least until the 1980s birth cohort.^{35,36,44} These patterns indicate that further convergence of women's and men's binge drinking patterns may be hard to predict and cannot be attributed entirely to women's increased binge drinking.⁴⁶

Predictors of Adult Binge Drinking

Childhood Experiences

Childhood experiences are possible early predictors of binge drinking. However, evaluations of gender differences in childhood influences on binge drinking are scarce, particularly in the United States. Most studies lack data on binge drinking, do not analyze effects of childhood experiences on men and women separately, or provide data for only one gender.

Child maltreatment. Child maltreatment (including childhood sexual abuse, childhood physical abuse, and neglect) has consistently been found to be a robust predictor of many adverse mental health outcomes, including high-risk drinking and alcohol use disorder (AUD).⁴⁷⁻⁵¹ Typically, research has found that women more often report childhood sexual abuse than men,⁵²⁻⁵⁴ and men more often report childhood physical abuse than women,^{55,56} but not always.⁵⁷ Gender differences in experienced neglect are uncertain.⁵⁸⁻⁶⁰

Given these gender differences in types of child maltreatment, one might infer that childhood sexual abuse is more of a risk factor for women's binge drinking, and childhood physical abuse is more of a risk factor for men's binge drinking. Unfortunately, research has infrequently compared how forms of child maltreatment affect women's versus men's binge drinking. The few relevant studies show inconsistent patterns, suggesting that gender differences in maltreatment effects likely depend on the groups of men and women studied and the measures of binge drinking used.

Widom and colleagues studied men and women with childhood histories of abuse or neglect that resulted in court cases and compared them 30 years later with approximately matched controls (from a Midwest U.S. metropolitan area).⁵¹ The researchers found no significant differences in frequency of past-month binge drinking (defined as 8+ drinks) between men with and without histories of child maltreatment. However, women who had been neglected (with or without other abuse) were more frequent binge drinkers in the past month than same-sex controls. In South Africa, on the other hand, a history of childhood physical punishment nearly doubled the prevalence of binge drinking as the usual behavior on a drinking day, although this effect did not differ significantly between men and women.⁶¹

Concerning childhood sexual abuse, a Pennsylvania study of adults ages 31

to 41 found a direct effect on binge drinking in women but not in men,⁶² whereas a much larger study of U.S. naval recruits found that binge drinking was more prevalent among those men and women who had experienced childhood sexual abuse (and was also more prevalent among those men, but not women, who had experienced childhood physical abuse).⁶³ The variation in the findings does not allow simple conclusions about how gender may modify connections between childhood maltreatment and adult binge drinking.

Parental problem drinking. Another childhood experience linked to adult alcohol problems is exposure to problematic parental drinking.⁶⁴⁻⁶⁷ Gender-specific analyses by Merline and colleagues⁶⁴ and White and colleagues⁶⁷ found that heavy drinking by parents adversely affected the drinking behavior of their male and female adult children. Unfortunately, reports on parental drinking generally have not provided data on gender-specific effects or on binge drinking, and often they have focused only on adolescent drinkers or parents with diagnosed alcohol disorders (e.g., studies of adult children of alcoholics). However, a community study in Finland found that heavy parental drinking was significantly associated with binge drinking at age 42 for men but not for women, when controlling for individual drinking history.⁶⁸ In data from the Young in Norway Longitudinal Study, parental binge drinking (not gender specific) was related to adult children's intoxication, or 5+ drink binges at age 28, but there were no significant gender differences for this parental influence.⁶⁹ The lack of other recent data means the question of how gender modifies parental drinking effects on binge drinking by adult children remains unresolved.

Early onset of alcohol use. In the United States, early onset of alcohol use is linked to adult alcohol problems,^{70,71} although the strength of this relationship has been challenged.⁷² Boys in the United States begin

drinking earlier than girls, which could increase male risk of later binge drinking, but recent gender differences in age of onset are not large and are not entirely consistent with data from outside the United States.⁷³⁻⁷⁵ The few studies of gender-specific associations between early onset of alcohol use and later binge drinking suggest that gender effects may be culturally dependent. Caetano and colleagues, who studied Hispanic national groups in the United States, found that drinking onset at age 14 or younger versus 21 or older increased the prevalence of binge drinking among women more than among men for Mexican Americans, Puerto Ricans, and South/Central Americans but not for Cuban-Americans.⁷⁶ In Korea, both men and women who began drinking at age 17 or younger were more likely to binge on drinking days, and later onset of drinking reduced binge drinking (as typical drinking behavior) among women more than among men.⁷⁷ In a Finnish community sample of middle-aged men and women, binge drinking was more frequent among those who began drinking at age 16 or younger, but this effect did not have a clear gender difference.⁷⁸

Psychological Characteristics

The alcohol studies field has a long history of research on associations between personality traits and alcohol use in clinical and nonclinical samples.⁷⁹⁻⁸¹ For this article, we selected two clusters of personality characteristics that have known gender differences in prevalence and that may affect men's and women's binge drinking differently: disinhibiting traits (i.e., impulsivity, sensation-seeking, and risk-taking) and affective characteristics (i.e., anxiety and depression).

Disinhibiting traits. Research has shown that heavy or binge drinking in young adulthood is associated with a set of related disinhibiting personality traits, including impulsivity, sensation-seeking, and risk-taking.⁸²⁻⁸⁴ These behavior traits are more prevalent in

men than in women,⁸⁵⁻⁸⁷ although the size of the gender difference varies across age groups and traits. From these two findings, one could infer that these disinhibiting traits contribute to the excess of binge drinking among men compared with women. However, it is not so clear that disinhibiting traits are associated with men's binge drinking more strongly than with women's. Some studies found stronger associations between disinhibiting traits and frequency of binge drinking or intoxication among men than among women.^{88,89} Other studies concluded that disinhibiting traits were more clearly associated with women's heavy drinking.^{90,91} The most common finding, however, was that disinhibiting traits were associated with binge drinking, intoxication, or problem drinking among both women and men, with more similar than dissimilar gender-specific effects.⁹²⁻⁹⁵ It is important to be cautious about interpreting such associations causally, because the extent to which a history of heavy or binge drinking facilitates men's and women's impulsivity, sensation-seeking, and risk-taking is unknown.

Anxiety and depression. Anxiety and depression are more prevalent among women than men,⁹⁶⁻⁹⁹ and some patterns of anxiety and depression, such as patterns defined in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5), are associated with some patterns of alcohol consumption, such as AUD.¹⁰⁰⁻¹⁰² However, it is not clear that depression and/or anxiety are associated with binge drinking, specifically. Many studies with gender-specific data have failed to find connections among anxiety, depression, and binge drinking for women or men.^{68,103-107} There are some exceptions. A 2006 U.S. Behavioral Risk Factor Surveillance System (BRFSS) survey found that men with current depression were more likely to be binge drinkers than nondepressed men.¹⁰⁸ In a U.S. survey of men and women older than age 56, heavy-drinking or binge drinking men

scored higher than other men on a measure of depressive symptoms.¹⁰³ The 2006 BRFSS survey also reported that women with lifetime diagnoses of anxiety or depressive disorders or with current depression were more likely to binge drink than women without anxiety or depression, and the severity of depression increased women's (but not men's) odds of binge drinking.¹⁰⁸

In a national Canadian survey, for both men and women, depression was associated with drinking larger quantities per drinking occasion, but the association was stronger for women.¹⁰⁹ In the large U.S. National Epidemiologic Survey on Alcohol and Related Conditions (NESARC),¹⁰⁵ women's binge drinking was associated only with post-traumatic stress disorder and panic disorder (without agoraphobia). A survey at a large public university found that students with general anxiety disorder were more likely than other students to engage in frequent binge drinking, and students with major depression were less likely than other students to engage in frequent binge drinking.¹¹⁰ Both of these associations were stronger among men than women. These mixed findings suggest that depression and anxiety do not have simple or gender-determined associations with binge drinking. Studying how drinkers' ages and drinking opportunities differently affect links between binge drinking and anxiety or depression among men versus women may be worthwhile.

Adult Binge Drinking and Smoking

Typically, studies that have examined adult binge drinking and other substance use have focused on tobacco smoking, particularly cigarettes. In the United States, among the whole young adult population,¹¹¹ college students,¹¹² adults ages 18 to 25,¹¹³ and adults older than age 50,¹¹⁴ binge drinkers consistently have higher odds than non-binge drinkers of being smokers.

In the United States and worldwide, smoking is more common among men than among women.¹¹⁵⁻¹¹⁷ To the extent that smoking may be part of a lifestyle that encourages or leads to binge drinking, the general patterns described here might contribute to the gender gap in which men binge drink more than women. However, prolongation of smoking may have unknown effects on women's binge drinking, and evidence indicates that women find it more difficult than men to stop smoking.¹¹⁸⁻¹²⁰

Multiple gender-specific studies worldwide have shown that smoking is strongly related to both men's and women's binge drinking, typically showing stronger connections for women than for men. U.S. surveys have reported that men and women who smoke have three times higher odds than nonsmokers of being binge drinkers,¹²¹ and smokers have a higher probability than nonsmokers of heavy drinking behavior at ages 35 and older.¹²² In China in 2007, the majority of men and women smokers were also binge drinkers, an association that was much stronger in women.²¹ A separate 2006 study in Hong Kong found that smoking multiplied the odds of binge drinking by 3.7 for men and 12.3 for women.³¹ In Brazil, the São Paulo Epidemiologic Catchment Area Study found that men and women who were binge drinkers were more than twice as likely as non-heavy drinkers to be current smokers, and the relationship was stronger for women.¹²³ In a national Canadian survey, the odds of binge drinking were significantly greater than 1.0 for all women smokers, but only for men who smoked more than six cigarettes a day.¹²⁴ The 2004 Moscow Health Survey found that women who were binge drinkers had higher odds of daily smoking than other women, but men who were binge drinkers did not have higher odds of daily smoking than other men.¹²⁵ Most of these studies were cross-sectional and could not distinguish the degree that smoking influenced binge drinking or vice versa. These studies also did not

explore the possibility that both smoking and binge drinking were part of a syndrome with shared antecedents. It would be worth examining the extent to which women who both smoke and binge drink are attempting to show independence from older feminine stereotypes that discouraged both behaviors.

Differences in Health Consequences

Research on how gender affects the health consequences of adult binge drinking is scarce, for several possible reasons. Studies of chronic alcohol-related health problems may neglect binge drinking episodes because researchers may assume binge drinking has acute, not chronic, effects. Gender-specific analyses may be neglected because including enough women who binge drink (e.g., in Asian countries) for reliable statistical analysis is often difficult. Research may focus on adolescent rather than adult binge drinking because of greater concern about acute and long-term health consequences for young drinkers. And, investigators may have difficulty distinguishing between effects of binge drinking and effects of chronic heavy drinking, because the two drinking patterns are correlated. Nevertheless, research does suggest where binge drinking has gender-related health effects, and where it does not.

Morbidity and Mortality

Several recent studies have found that binge drinking adversely affects mortality and morbidity for both men and women. In a sample of U.S. moderate drinkers ages 55 to 65, the odds of dying in the next 20 years were twice as great for moderate drinkers who initially reported binge drinking in the preceding month than for moderate drinkers who did not report such binge drinking. No significant difference between genders was found.¹²⁶ National U.S. surveys (2008

to 2010) found that among binge drinkers, women reported more days of physical and mental ill health than men, and men and women who had recent heavy binge drinking episodes (7+ drinks for women and 8+ drinks for men) were more likely to report poor health-related quality of life than binge drinkers who drank less.¹²⁷

In contrast, a study that analyzed National Health Interview Survey (NHIS) data from 1997 to 2004 found that episodic heavy drinking (5+ drinks in 1 day) added only modestly to the mortality risk of light and moderate drinkers.¹²⁸ And, a population-based study of nearly 27,000 men and women who participated in the Danish National Cohort Study from 1994 to 2005 reported that binge drinking (6+ drinks on an occasion) among male and female moderate drinkers was not associated with increased all-cause mortality when they were compared with moderate drinkers who did not binge drink.¹²⁹ The authors suggested that Danish customs around binge drinking (which usually occurs during a long evening of eating and drinking) may account for the results.

A Russian survey asked respondents about the health of close relatives after age 30 and found that men who had engaged in any binge drinking were more likely to have died than other male drinkers, but for women, increased mortality occurred only among those who binge drank at least once a month.¹³⁰ In Norway, women and men who binge drank on 10 or more occasions in the past year were more likely to report alcohol-related sickness that caused absence from work than those who binge drank no more than 5 times, and the pattern of more frequent binge drinking was associated with sickness-related absence more strongly for women than for men.¹³¹

Suicidality

A special case of mortality risk among binge drinkers is the potential effect of binge drinking on suicid-

al behavior (including thoughts of suicide and suicide attempts). Research has found that suicidal behavior often is associated with chronic heavy drinking,^{132,133} which may be a symptom of psychological problems or a way of coping with such problems. For both men and women, completed suicide has been associated with acute alcohol intoxication,¹³⁴ which may precipitate or enable the behavior.

How episodic binge drinking as a behavior pattern is related to men's or women's suicidality has been studied much less often. Available research suggests that binge drinking has stronger associations with women's suicidality than with men's. According to U.S. National Violent Death Reporting System suicide data from 2003 to 2011, the likelihood of high postmortem blood alcohol concentrations (BACs) of more than .08 g/dL was much greater than the likelihood of high BACs in general population survey data.¹³⁴ Women's postmortem BACs generally were higher than men's, but they were not statistically significantly higher. Data from the 2008 to 2012 U.S. National Survey on Drug Use and Health showed that among women and men who had not experienced major depressive episodes, women's binge drinking was associated with planned and attempted suicide, but men's binge drinking was associated only with suicidal thoughts.¹³⁵ These data showed no association between suicidality and binge drinking in men and women who had past major depressive episodes. In a nationally representative sample in France, binge drinking at least monthly predicted suicidal ideation and suicide attempts better for women than for men.¹³⁶ And, in a survey of U.S. college undergraduates, reported past suicide attempts were significantly associated with reported past binge drinking among young women but not among young men.¹³⁷ However, the time order of binge drinking

and suicidality remains unclear, except as shown in the postmortem data reported by Kaplan and colleagues.¹³⁴

Cancer

A possible life-endangering effect of binge drinking is an increase in women's and men's risks of various forms of cancer. Evidence clearly shows that heavy alcohol consumption is a risk factor for cancers in the oral cavity, pharynx, esophagus, liver, colon and rectum,^{138,139} and pancreas.¹⁴⁰⁻¹⁴² In general, research on these cancers has not provided information about binge drinking and its gender-specific effects. One exception is a San Francisco Bay Area population-based case-control study, which found that the risk of pancreatic cancer was higher specifically among men who had a history of binge drinking, particularly if the binge drinking persisted over years and involved large numbers of drinks.¹⁴³ Another recent exception is a Korean longitudinal study of differentiated thyroid cancer, which found that acute, heavy alcohol consumption (more than 151 grams of ethanol on one or more lifetime occasions), when compared with no alcohol consumption, doubled men's cancer risk and tripled women's cancer risk.¹⁴⁴

In studies of gender-specific (or nearly so) cancers, gender-specific effects of alcohol get closer attention. Research on gynecological cancers (i.e., cervical, ovarian, and endometrial/uterine) has consistently found no association between women's drinking and the risks of these cancers.¹⁴⁵⁻¹⁴⁸ In contrast, a large set of evidence has consistently shown that women's risk of breast cancer increases with increased alcohol consumption, even at moderate levels, resulting in more than 100,000 alcohol-related cases of breast cancer worldwide each year.^{149,150} (Alcohol is apparently less relevant in the rarer male breast cancer.¹⁵¹) Hypothetically, alcohol may increase women's breast cancer risk through multiple processes, including increasing tumor-promoting estrogen

levels (now debated) and acting as a cumulative carcinogen (through increased exposure to acetaldehyde and byproducts of the CYP2E1 enzyme, likely activated by binge drinking).^{152,153}

Research on associations between binge drinking and breast cancer has been scarce. In the Danish Nurse Cohort Study, data from 1993 to 2001 showed that women who binge drank on weekends (Friday through Sunday) or on the latest weekday had greater risk of breast cancer than women who were light drinkers, even after adjusting for total volume of alcohol consumed.¹⁵⁴ In the U.S. Nurses' Health Study, data from 1980 to 2008 showed that monthly binge drinking was associated with a 33% increase in risk of breast cancer, but controlling for cumulative alcohol consumption weakened the association.¹⁵⁵ A New Zealand case-control study found that weekly binge drinking was associated with a 55% increase in risk of breast cancer among Maori women.¹⁵⁶ A case-control study in North Carolina found a positive association between binge drinking and risk of breast cancer among women who drank an average of 91 grams or more of ethanol per week, but the association was not significant after controlling for other variables, possibly because the sample size was small.¹⁵⁷

Evaluating the effects of alcohol consumption and binge drinking on male-specific cancers has been difficult. The effects of drinking on testicular cancer are unknown, because no recent or major research on testicular cancer has evaluated the drinking patterns of the men studied. Also, although research on prostate cancer has examined alcohol consumption, the findings conflict. Some studies found that heavier drinking was associated with a greater risk of prostate cancer.^{158,159} Some research reported that drinking raised risk only for advanced cancer¹⁶⁰ or only for non-advanced cancer.¹⁶¹ In other studies, heavier drinking raised prostate

cancer risk for men only if they had consumed low amounts of dietary fiber,¹⁶² were African American,¹⁶³ or had been lifetime, rather than current, heavy drinkers.¹⁶⁴ And, some large or meta-analytic studies found that drinking had little or no association with prostate cancer.¹⁶⁵⁻¹⁶⁷

The picture is just as confused for the limited research on associations between binge drinking and prostate cancer risk. In the 1986 to 1998 Health Professionals Follow-Up Study of men ages 40 to 75, men who were binge drinkers (compared with abstainers) had the greatest increase in prostate cancer risk.¹⁶⁸ In this study, binge drinking was defined as drinking 105 grams or more of ethanol on 1 to 2 occasions per week. The older part of the Finnish Twin Cohort study, which surveyed twins (mean age of 40) from 1981 to 2012, found that binge drinkers had a greater risk of prostate cancer than non-binge drinkers.¹⁵⁸ In contrast to these cohort-based studies, case-control data from the 2000 NHIS survey,¹⁶⁹ the U.K. Prostate Testing for Cancer and Treatment (ProtecT) study,¹⁷⁰ and the U.S. Prostate Cancer Prevention Trial¹⁷¹ showed no connection between binge drinking and prostate cancer. Our conclusion from the conflicting research is that binge drinking does not have simple or unconditional effects on prostate cancer.

Cardiovascular Disorders

Heavy drinking (variously defined) by both men and women consistently has been associated with higher risks of hypertension,^{172,173} atrial fibrillation,¹⁷⁴ and stroke.^{175,176} Relationships between chronic heavy drinking and coronary heart disease (CHD) have been less consistent. Some studies found that such drinking was a risk factor for both women and men,¹⁷⁷ whereas other studies failed to find such connections.¹⁷⁸⁻¹⁸⁰

Generally, binge drinking has been associated with a higher risk of

cardiovascular disorders, but reports of such associations often are not gender specific.¹⁸¹⁻¹⁸³ Available gender-specific data have shown that men's risks from binge drinking usually are greater than women's risks. For example, men's risk was greater than women's for CHD and hypertension,¹⁸⁴ death from cardiovascular disease,¹⁸⁵ and death from ischemic stroke.¹⁸⁶ However, findings for women were often limited by small sample size, and some studies found that women and men binge drinkers had similar risks for hypertension¹⁸⁷ and for death after myocardial infarction.¹⁸⁸

Liver Disorders

Research has shown conclusively that heavy drinking increases risk of a variety of liver diseases and damage.¹⁸⁹⁻¹⁹¹ From our review of this research, we draw three general conclusions about gender and the effects of binge drinking on the liver:

1. Research on the effects of binge drinking on the liver is scarce and reveals little about gender differences.^{192,193}
2. Research on liver damage specifically from binge drinking may be scarce because research has repeatedly found that harm to the liver results from continuous (frequent) drinking rather than episodic drinking (such as binges).¹⁹⁴⁻¹⁹⁶ Binges may merely increase the cumulative toxic exposure to alcohol.
3. The risk of liver damage from chronic drinking is greater for women than for men,^{190,197} possibly because of differences in how the body distributes and metabolizes alcohol.^{189,198} A European study reported an exception to this gender difference, however. The study found that for men, binge drinking created a higher risk of alcohol-related hepatic steatosis (fatty liver) than it did for women.¹⁹⁹

In general, not enough research has been conducted to draw any firm

conclusions about how gender modifies the adverse effects of binge drinking on the liver.

Brain and Neurocognitive Consequences

Damage that some patterns of alcohol consumption can do to the brain is both well-known and well-studied, particularly in adolescents and individuals with AUD.²⁰⁰⁻²⁰² Furthermore, many studies have specifically examined the harmful effects of binge drinking on the brain and neurocognition. However, it is difficult to draw general and reliable conclusions from these studies about gender differences in binge drinking effects on the brain,²⁰³ in part because many of these studies (e.g., those that used functional magnetic resonance imaging) examined small, nonrepresentative samples, which does not allow reliable, within-gender evaluations (i.e., comparing binge drinkers with same-sex controls). Nevertheless, certain patterns have emerged that may guide future gender-specific research and interventions.

One pattern is that binge drinking may alter the anatomy of the young brain in ways that could have persistent adverse effects. In adolescents and college students who have binge drinking histories, studies have shown evidence of poorer integrity (as indicated by lower fractional anisotropy) of white matter in multiple areas of the brain,^{204,205} an effect that at least one study found mainly in males and in areas of the brain related to cognitive function and attentional processes.²⁰⁶ Studies also have shown that adolescent binge drinkers had reductions in white and gray matter in the cerebellum (for both genders)²⁰⁷ and changes in frontal cortices (thicker for females, thinner for males).²⁰⁸ In the latter study, the increased cortical thickness was associated with worse performance on visuospatial, inhibition, and attention assessments, possibly reflecting

impairment of the normal neuronal pruning process in binge drinking females.²⁰⁹

A larger set of studies of cognitive functioning has identified at least three general areas in which binge drinking adolescent and young adult males and females may be impaired.

1. In tasks involving working memory, binge drinking females showed less activation of spatial working memory than same-sex controls, and binge drinking males showed greater activation than controls.²¹⁰ In other working memory tasks, the brains of binge drinkers apparently had to work harder to perform at the same level as non-binge drinkers, but no gender differences were reported for those tasks, possibly because of small sample sizes in these studies.^{211,212}
2. In studies of response inhibition and monitoring of one's own behavior, binge drinking generally impaired females more than males,^{90,213,214} but at least one study found an increase in performance self-monitoring among females, who were possibly compensating for alcohol effects.²¹⁵ No such increase was found among male binge drinkers.
3. In evaluations of executive functioning and decision-making, one study found the worst performance in male binge drinkers,²¹⁶ another study found males and females were similarly impaired,²¹⁷ and a laboratory test of acute impairment reported that males and females performed similarly, although the females had higher BAC levels.²¹⁸

All these performance tests are more descriptive than explanatory, saying little about why gender differences sometimes occur and sometimes do not, or about the extent to which these levels of impairment are reversible or might affect adult life.

Differences in Behavioral and Social Consequences

Research has repeatedly documented and decried multiple adverse behavioral and social consequences of binge drinking.²¹⁹⁻²²² This research, however, has not reported much about gender differences for many of these consequences. The research has revealed even less about possible gender-specific links between binge drinking and behavioral or social harm. Our focus here, therefore, is on three major behavioral and social problems for which gender-specific effects of alcohol consumption have been recognized and studied: alcohol-impaired driving (AID), sexual assault, and intimate partner violence (IPV).

Alcohol-Impaired Driving

In recent U.S. research on AID, two gender patterns are clear. Men engage in AID more than women, but the prevalence of both men's and women's AID has been declining since the 1990s, judging from self-reports⁴⁰ and the National Roadside Survey.²²³ However, from 1982 to 2004, women's arrests for driving under the influence increased (while men's decreased),²²⁴ possibly reflecting changes in laws and law enforcement (including lower limits for BACs) and increases in women's driving.^{225,226}

U.S. surveys indicate that more than 80% of AID episodes were self-reported by binge drinkers.^{227,228} It is unclear, however, whether binge drinking immediately preceded the episodes of drunk driving, and U.S. reports have not indicated how many binge drinking drivers were men and how many were women. Cultural differences may affect AID gender patterns. In Sweden, men and women arrested for driving under the influence drank a similar amount beforehand (typically more than five drinks).²²⁹ Among Australian drivers killed in single-vehicle crashes, 50% of the males, compared with 29% of

the females, had BACs of more than .07 g/dL.²³⁰

Although AID episodes are very likely to involve binge drinkers, a majority of binge drinkers do not report driving after drinking. In 2003 to 2004 U.S. survey data from self-reported binge drinkers, 13.2% of the men and 8.1% of the women reported driving after drinking.²³¹ However, tendencies to binge drink and to drive while intoxicated often occur together. The odds of AID are more than 5 times greater for binge drinkers than for other drinkers, and the odds are more than 10 times greater for those who binge drink frequently or who generally drink heavily, and these odds increase may be greater for men than for women.^{227,232,233} A study of daily diaries kept by college students estimated that each 0.1% increase in estimated daily blood alcohol level was associated with a 4% increase in men driving after drinking, and a 1% increase for women.²³⁴

Sexual Assault

Knowledge about how binge drinking is related to sexual assault has three important limitations:

1. Because the great majority of reported sexual assaults involve men assaulting women, research has focused on how alcohol is related to these assaults.^{235,236} Little is known about the circumstances in which men are sexually assaulted.^{237,238}
2. Most research has focused on assaults among college students and young adults, groups most likely to be both heavy drinkers and sexually active.
3. Research may reveal associations between binge drinking and sexual assaults, but understanding the extent that binge drinking causes or results from the assaults is difficult because of uncertainties about the order of events and time lags between drinking and the assaults.^{239,240}

Nevertheless, research findings show several clear patterns in how binge drinking and sexual assaults are likely to be connected.

Perpetration. One repeated finding is that binge drinking among male college students can make them more likely to engage in sexual aggression. In terms of immediate consequences, a study found that men were more likely to engage in sexual aggression if they had BACs of more than .15 g/dL, particularly if they were otherwise light drinkers.²⁴¹ Another study determined that the number of drinks men drank in the 4 hours before a sexual encounter affected their odds of aggressive sex with new partners.²⁴² And, among men who reported perpetrating past sexual violence, having consumed a larger number of drinks at the time led to greater aggression (up to the point where severe intoxication was disabling).²⁴³ One college study found 1-year lagged effects of men's binge drinking on sexual aggression,²⁴⁴ suggesting that binge drinking as a continuing pattern among men might reinforce recurrent sexual aggression, at least in the college years.

Victimization. There is much evidence that women's drinking, in general, is associated with subsequent sexual assault.²⁴⁵ A lingering question is whether women's binge drinking increases this apparent risk. Incapacitated rape, which can occur when women have drunk too much to be able to resist an attack, is a major adverse effect of binge drinking. Among college women, a majority of rapes occur when women have drunk enough to be incapacitated.^{236,240} Apart from incapacitation and rape, women who binge drink are also at greater general risk of sexual victimization²⁴⁶⁻²⁴⁸ for many possible reasons: men's misinterpretation of women's drinking as a sign of sexual availability, miscommunication of women's refusals, and women's underestimation of hazards from male companions.²⁴⁵ One study of college women found evidence that binge drinkers may overestimate their ability to resist rape attempts.²⁴⁹

It is not clear whether experiences of sexual victimization lead women to binge drink, possibly to help cope with the emotional aftereffects of assault. In some studies of women in college²⁵⁰ and in the general U.S. population,²³⁵ experiences of sexual assault did not predict subsequent binge drinking. Other studies, however, did find that experiences of incapacitated rape²⁵¹ or repeated victimization²⁵² were associated with subsequent binge drinking. These apparent contradictions suggest two more complex patterns:

1. Women's experiences of sexual victimization may perpetuate (not just initiate) binge drinking (and controlling for effects of prior drinking might obscure effects of victimization on subsequent drinking).^{247,250}
2. In the short term, such as during college or the young-adult years, women's binge drinking and sexual victimization might become a vicious circle, each making the other more likely, increasing risk of revictimization.²⁴⁵

These more complex patterns should be further evaluated.

Intimate Partner Violence

Research on IPV has focused largely on male violence against female partners and the aftereffects for female partners.^{253,254} Consistent with this focus, 2005 U.S. survey data have shown that women were roughly twice as likely as men to report being victims of IPV over their lifetimes and in the past year.²⁵⁵ However, this focus neglects women's violence against male partners, which may be more prevalent at times in some groups, particularly outside the United States.²⁵⁶⁻²⁵⁹ It also neglects the degree that IPV is an interactive process in which violence can be reactive and defensive as well as proactive, with both partners as victims and attackers.^{260,261} To understand how binge drinking may be related to

IPV, therefore, it is important to study binge drinking among both men and women as perpetrators and as victims of IPV.

A large body of research links alcohol use in general to IPV perpetration and victimization.^{258,262} One might expect binge drinking, in particular, to increase the likelihood of IPV perpetration through disinhibition and increased aggression.²⁶³ Indeed, in bivariate analyses of survey data, binge drinking was associated with IPV perpetration among men and women in Canada and Costa Rica and among women in Brazil.²⁵⁸ In bivariate analyses of U.S. survey data, rates of IPV perpetration were doubled for male binge drinkers and nearly tripled for female binge drinkers.^{264,265} However, in multivariate analyses of U.S. data, the associations between binge drinking and IPV either disappeared^{264,265} or became too small to be meaningful.²⁶⁶

Binge drinking might also increase women's vulnerability to IPV victimization. In surveys in Brazil, Canada, Mexico, and Peru, binge drinking women were more likely to report being victims of IPV.²⁵⁸ A meta-analysis of three longitudinal U.S. studies found that women's binge drinking significantly increased the odds of their subsequent IPV victimization,²⁶⁷ but other U.S. studies either could not confirm such a relationship^{265,268,269} or found only very weak relationships.²⁶⁶ These mixed findings about perpetration and victimization, particularly from multivariate analyses, suggest that binge drinking (as distinct from other drinking patterns) may not be a direct cause of IPV, but it may be an indicator of other personality and behavior patterns that may lead to IPV (e.g., antisocial traits).^{270,271}

Research shows, somewhat more consistently, that a history of IPV victimization increases the likelihood that women will engage in binge drinking after varying time lags.^{267,272,273} However, this relationship is not always evident or strong,^{268,269} possibly because many women who

are victimized cope with the distress in other ways. Indeed, male victims of IPV might be more likely to use binge drinking as a stereotypically male method of coping, but few studies have looked for or found evidence of men's binge drinking behavior after IPV victimization.^{274,275} If binge drinking is becoming more prevalent among women (as noted earlier), there may be a greater need for interventions to reduce the use of alcohol as a coping mechanism.

Alcohol's Harm to Others

To date, alcohol research has focused mostly on how drinking harms the drinker.²⁷⁶ Limited previous research on harm to people other than the drinker has focused mainly on AID,^{277,278} fetal development,^{279,280} and IPV,^{281,282} largely neglecting broader harm to others' mental health, quality of life, living conditions, and resources. An Australian study has suggested that costs of such harm to others may be double those experienced by drinkers themselves.²⁸³

Some studies of alcohol's harm to others (AHTO) have examined gender differences in the types of harm caused and harm received. A common finding has been that women are considerably more likely than men to experience marital and family harm, and men are significantly more likely than women to experience physical assault from strangers and other crime victimization.²⁸⁴⁻²⁸⁶ However, with a few exceptions,^{287,288} AHTO research has focused on harmful effects of others' drinking or heavy drinking without exploring possible associations between specific drinking patterns (e.g., heavy episodic or binge drinking) and specific types of harm. Such associations might include relationships between binge drinking and AID, crashes, and fatalities, or relationships between binge drinking and increased risk of fetal alcohol effects. The harm to others paradigm is a relatively new development in alcohol epidemiology.²⁸⁹ As this perspective matures, we hope

that greater attention will be given to associations between specific drinking patterns, such as binge drinking, and specific types of harm, as well as possible gender differences in those associations.

Possible Implications

Treatment

Our research literature search on gender differences in alcohol treatment outcomes found very little information specifically relevant to binge drinking. Nonetheless, research on gender-specific alcohol treatment is helpful when considering strategies to reduce binge drinking. Before the early 1990s, most alcohol and drug treatment programs were developed for and served primarily men.²⁹⁰ However, more recent research on gender-sensitive treatment has focused on treatment strategies that may be particularly appropriate and effective for women. Much of this evolution of gender-sensitive treatment has been informed by empirical evidence of gender differences in treatment needs. This evidence includes research demonstrating higher prevalence among women of (1) comorbidity of substance use disorders and other psychiatric disorders (e.g., mood, anxiety, and eating disorders), (2) trauma exposure and associated physical and mental health needs, and (3) the central role of relationships (with children, intimate partners, and others) in women's addiction and recovery.²⁹¹⁻²⁹³ A number of studies have reported a general tendency for women to respond somewhat better to a variety of psychosocial interventions²⁹⁴⁻²⁹⁶ and to show a less consistent or harder-to-detect response to some pharmacological treatments.^{297,298} There is general agreement on the need for more well-controlled randomized clinical trials that examine the effects of gender-specific treatment.

Integrated Interventions for Binge Drinking and Smoking

Given the strong associations between binge drinking and smoking described in this article, there may be promise in combined interventions that target both smoking cessation and binge drinking. Indeed, preliminary data presented by Ames and colleagues suggest the potential value of integrated smoking cessation and binge drinking interventions, particularly for young adults.²⁹⁹ Environmental interventions that disengage alcohol use and tobacco use (e.g., smoking bans in bars) may also help to reduce hazardous drinking behavior. Evidence from several countries indicates that female smokers find it more difficult than male smokers to stop smoking,¹¹⁸⁻¹²⁰ so combined interventions to reduce both smoking and binge drinking could prove especially helpful to women who both smoke and binge drink.

Prevention

In our search for prevention programs that specifically target binge drinking, we found an article that described gender-specific prevention strategies focused specifically on binge drinking college women.³⁰⁰ Aimed primarily at nurse practitioners, this article argued that for women college students, several common consequences of binge drinking (e.g., sexually transmitted infections, sexual assault, and other physical injury) bring them into contact with health care providers, offering opportunities for intervention. The author suggested several intervention strategies that may be particularly effective for female binge drinkers, including brief motivational interventions.^{294,301} She speculated that Web-based interventions may be particularly effective for women, perhaps due to women's greater involvement with electronic programs³⁰² and the greater feeling of anonymity online programs may provide for women who feel

stigmatized by their alcohol use or misuse.³⁰³

Considerable anecdotal evidence,³⁰⁴⁻³⁰⁶ supported by qualitative studies in several countries,³⁰⁷⁻³¹⁰ suggests that one motivation for binge drinking among women—*younger women in particular*—may be that “drinking like a man” produces feelings of power, status, and gender equality. To date, in all countries studied, men drank more alcohol than women, and men engaged in extreme forms of drinking, such as high-volume drinking and heavy episodic or binge drinking, more than women. In many traditional societies, heavy alcohol consumption symbolizes and enhances men's greater power relative to women, serving as an emblem of male superiority and a privilege that men have often denied to women.³¹¹ Indeed, in contemporary higher-income countries, numerous studies of young men have reported associations among endorsement of traditional masculine norms, heavy and binge drinking, and adverse drinking consequences.^{312,313} With changing gender roles in many societies, and increasing opportunities for women, increased access to and consumption of alcohol understandably may seem like an expression of liberation and empowerment for many young women.

To our knowledge, prevention scientists have not tried to reduce binge drinking in young women by changing the significance of heavy alcohol consumption as a symbol of gender equality. A critical question is how best to persuade women that alcohol is a poor way to demonstrate gender equality—clearly not through simple educational approaches³¹⁴ or by trying to frighten or shame them, such as with warning labels.³¹⁵ One modest policy step might be to restrict advertising that links drinking to liberation from traditional feminine roles and stereotypes.³¹⁶ It is possible, also, that mass media and marketing methods could be used to sell the positive advantages of abstention or

low-risk alcohol consumption. A powerful message might be that women do not gain status or express liberation by emphasizing their sameness with men or by trying to outdrink them, but by setting their own standards—in their drinking decisions and in other areas of their lives.^{305,317} Such messaging may be most effective if it provides gender-specific information about drinking norms³¹⁸ and is reinforced by multiple community sources.³¹⁹

Parallel prevention strategies could be targeted to men, especially younger men, to weaken associations among traditional constructions of masculinity, heavy episodic drinking, and other risk-taking behavior. Specific strategies might include media literacy training to recognize and resist media images that link masculinity and excessive alcohol use, and interventions designed to change expectancies about alcohol's effects on sexuality, aggression, and other dimensions of traditional masculinity.³¹³

Future Research Needs

When attempting to review gender differences in the prevalence, predictors, and consequences of binge drinking—and gender-sensitive strategies to reduce binge drinking—we became aware of many gaps that future research could fill. Some of the major gaps and challenges in this area are listed and discussed briefly in this section.

First, the use of different *definitions and measures* of binge drinking poses a serious challenge to research on many aspects of binge drinking. For researchers interested in gender similarities and differences, the use of more consistent definitions and measures would permit much firmer conclusions about gender-related patterns in binge drinking prevalence (across types of populations sampled and in various cultural contexts), as well as about gender-linked predictors of binge drinking and the con-

sequences of binge drinking for men's and women's behavior and health.

Second, although a majority of prevalence studies have disaggregated binge drinking rates by gender, many studies of predictors and consequences of binge drinking have not. In some cases, studies have focused only on men or only on women, whereas other studies sampled both males and females but did not conduct or report gender-specific analyses. In the United States in the 1990s, actions by the National Institutes of Health led to increases in female research participants in both human³²⁰ and animal studies.³²¹ Despite these increases, many researchers, from diverse scientific fields, fail to consider the role of (biological) sex and (culturally defined) gender when designing, analyzing, and reporting research. In addition to continued pressure on funding agencies to require sampling of both genders when appropriate for the research question being studied, editors and reviewers for scientific journals can play an important role in requiring adequate analyses and reporting of sex and gender differences in research publications.³²² A greater understanding of gender-differentiated aspects of binge drinking is one of many benefits that could result from development of new, and greater enforcement of existing, guidelines for attention to sex and gender in scientific research.

Third, the majority of studies reviewed in this article were cross-sectional, limiting inferences that can be drawn about time order and causality. Some of the many questions that well-designed longitudinal research could begin to answer are:

- The persistence or nonpersistence into adulthood of effects of adolescent and young-adult binge drinking on brain structure and function
- The extent that psychological characteristics such as impulsivity, anxiety, and depression precede and

predict binge drinking versus being consequences of binge drinking or outcomes of some third factor that also predicts binge drinking

- Temporal and causal linkages (including possible bidirectional relationships) between smoking and binge drinking, binge drinking and suicide attempts, binge drinking and sexual assault, and binge drinking and intimate partner violence

Fourth, we were unable to find recent binge drinking literature, other than studies addressing age differences, that examined interactions of gender with other major demographic variables, such as race/ethnicity, sexual orientation, or socioeconomic status. Future research should give increased attention to such variables' associations with binge drinking prevalence, predictors, and consequences.

Finally, very little research has tested strategies specifically designed to reduce or prevent binge drinking. There are major conceptual and methodological challenges to designing and evaluating intervention strategies that specifically address binge drinking, as compared with more general interventions to reduce or prevent chronic heavy drinking or AUDs. Nonetheless, our review suggests that there may be promise (and possibly gender differences in effectiveness) in intervention strategies that specifically target the combination of binge drinking and smoking, as well as in strategies that attempt to weaken perceptions, expectancies, and norms that link men's binge drinking with ideals of traditional masculinity or women's binge drinking with feelings of status, power, and gender equality. In addition, the emerging perspective of AHTO may eventually suggest approaches for preventing or reducing binge drinking linked to gender-related harm, such as IPV and adverse fetal alcohol effects.

Acknowledgments

Preparation of this article was supported in part by research grant number 1 R01 AA023870 from the National Institute on Alcohol Abuse and Alcoholism (NIAAA), National Institutes of Health (NIH) (multiple principal investigators: T. Greenfield, S. Wilsnack, and K. Bloomfield). The content is solely the responsibility of the authors and does not necessarily represent the official views of NIAAA or NIH.

Financial Disclosure

The authors declare that they have no competing financial interests.

References

- Keyes KM, Li G, Hasin DS. Birth cohort effects and gender differences in alcohol epidemiology: A review and synthesis. *Alcohol Clin Exp Res*. 2011;35(12):2101-2112. PMID: 21919918.
- Nolen-Hoeksema S. Gender differences in risk factors and consequences for alcohol use and problems. *Clin Psychol Rev*. 2004;24(8):981-1010. PMID: 15533281.
- Wilsnack RW, Wilsnack SC, Kristjanson AF, et al. Gender and alcohol consumption: Patterns from the multinational GENACIS project. *Addiction*. 2009;104:1487-1500. PMID: 19686518.
- World Health Organization. *Global Status Report on Alcohol and Health, 2014*. Geneva, Switzerland: World Health Organization; 2014.
- Llerena S, Arias-Loste MT, Puente A, et al. Binge drinking: Burden of liver disease and beyond. *World J Hepatol*. 2015;7(27):2703-2715. PMID: 26644814.
- Plant M, Plant M. *Binge Britain: Alcohol and the National Response*. Oxford, UK: Oxford University Press; 2006.
- Dawson DA, Li TK, Grant BF. A prospective study of risk drinking: At risk for what? *Drug Alcohol Depend*. 2008;95:62-72. PMID: 18243584.
- Gmel G, Rehm J, Kuntsche E. Binge drinking in Europe: Definitions, epidemiology, and consequences. *Sucht*. 2003;49:105-116.
- Gmel G, Kuntsche E, Rehm J. Risky single-occasion drinking: Bingeing is not bingeing. *Addiction*. 2011;106(6):1037-1045. PMID: 21564366.
- Herring R, Berridge V, Thom B. Binge drinking: An exploration of a confused concept. *J Epidemiol Community Health*. 2008;62(6):476-479. PMID: 18477743.
- Wechsler H, Nelson TF. Binge drinking and the American college student: What's five drinks? *Psychol Addict Behav*. 2001;15(4):287-291. PMID: 11767258.
- Babor TF, Delafuente JR, Saunders J. *AUDIT: The Alcohol Use Disorders Identification Test: Guidelines for Use in Primary Health Care*. Geneva, Switzerland: World Health Organization; 1992.
- Saunders JB, Aasland OG, Babor TF, et al. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption—II. *Addiction*. 1993;88:791-804. PMID: 8329970.
- Graham K, Wilsnack R, Dawson D, et al. Should alcohol consumption measures be adjusted for gender differences? *Addiction*. 1998;93(8):1137-1147. PMID: 9813895.
- Standardizing measurement of alcohol related troubles (project SMART): Survey methodology. Institute of Psychiatry and Neurology webpage. http://www.alcsmart.ipin.edu.pl/survey_methodology_main.html. Accessed August 7, 2017.
- World Health Organization. STEPwise approach to surveillance (STEPS). World Health Organization chronic diseases and health promotion webpage. <http://www.who.int/chp/steps/en>. Accessed August 7, 2017.
- Fillmore MT, Jude R. Defining "binge" drinking as five drinks per occasion or drinking to a .08% BAC: Which is more sensitive to risk? *Am J Addict*. 2011;20(5):468-475. PMID: 21838847.
- Counter R. The alarming rise in binge drinking among young women. *Maclean's*. February 21, 2016.
- Hess A. The year of the wasted woman. *Slate*. December 23, 2013.
- Substance Abuse and Mental Health Services Administration (SAMHSA). *2014 National Survey on Drug Use and Health (NSDUH)*. Table 2.46b—Alcohol use, binge alcohol use, and heavy alcohol use in the past month among persons aged 18 or older, by demographic characteristics: Percentages, 2013 and 2014. <http://www.samhsa.gov/data/sites/default/files/NSDUH-DefTabs2014/NSDUH-DefTabs2014.htm#tab2-46b>. Accessed July 26, 2017.
- Li Y, Jiang Y, Zhang M, et al. Drinking behaviour among men and women in China: The 2007 China Chronic Disease and Risk Factor Surveillance. *Addiction*. 2011;106(11):1946-1956. PMID: 21771141.
- Fuller E. Adult alcohol consumption. In: Craig R, Shelton NJ, eds. *Health Survey for England: Volume 1. Healthy Lifestyles: Knowledge, Attitudes, and Behaviour*. Leeds, UK: Health and Social Care Information Centre; 2008:177-218.
- Sull JW, Yi SW, Nam CM, et al. Binge drinking and hypertension on cardiovascular disease mortality in Korean men and women: A Kangwha cohort study. *Stroke*. 2010;41(10):2157-2162. PMID: 20724719.
- Jukkala T, Mäkinen IH, Kisilitsyna O, et al. Economic strain, social relations, gender, and binge drinking in Moscow. *Soc Sci Med*. 2008;66(3):663-674. PMID: 18023952.
- Lim WY, Fong CW, Chan JML, et al. Trends in alcohol consumption in Singapore 1992–2004. *Alcohol Alcohol*. 2007;42(4):354-361. PMID: 17496306.
- Bloomfield K, Grittner U, Rasmussen HB, et al. Socio-demographic correlates of alcohol consumption in the Danish general population. *Scand J Public Health*. 2008;36(6):580-588. PMID: 18775814.
- Padrão P, Damasceno A, Silva-Matos C, et al. Alcohol consumption in Mozambique: Regular consumption, weekly pattern and binge drinking. *Drug Alcohol Depend*. 2011;115(1):87-93. PMID: 21123009.
- Soler-Vila H, Galán I, Valencia-Martin JL, et al. Binge drinking in Spain, 2008–2010. *Alcohol Clin Exp Res*. 2014;38(3):810-819. PMID: 24164355.
- Laranjeira R, Pinsky I, Sanches M, et al. Alcohol use patterns among Brazilian adults. *Rev Bras Psiquiatr*. 2010;32(3):231-241. PMID: 19918673.
- Peltzer K, Davids A, Njuho P. Alcohol use and problem drinking in South Africa: Findings from a national population-based survey. *Afr J Psychiatry (Johannesbg)*. 2011;14(1):30-37. PMID: 21509408.
- Kim JH, Lee S, Chow J, et al. Prevalence and the factors associated with binge drinking, alcohol abuse, and alcohol dependence: A population-based study of Chinese adults in Hong Kong. *Alcohol Alcohol*. 2008;43(3):360-370. PMID: 18230698.
- Mohamed S, Ajmal M. Multivariate analysis of binge drinking in young adult population: Data analysis of the 2007 Survey of Lifestyle, Attitude and Nutrition in Ireland. *Psychiatry Clin Neurosci*. 2015;69(8):483-488. PMID: 25707290.
- Aekplakorn W, Hogan MC, Tiptaradol S, et al. Tobacco and hazardous or harmful alcohol use in Thailand: Joint prevalence and associations with socioeconomic factors. *Addict Behav*. 2008;33(4):503-514. PMID: 18055131.
- Astudillo M, Connor J, Roiblat RE, et al. Influence from friends to drink more or drink less: A cross-national comparison. *Addict Behav*. 2013;38(11):2675-2682. PMID: 23899431.
- Keyes KM, Miech R. Age, period, and cohort effects in heavy episodic drinking in the US from 1985 to 2009. *Drug Alcohol Depend*. 2013;132(1-2):140-148. PMID: 23433898.
- Härkönen JT, Mäkelä P. Age, period and cohort analysis of light and binge drinking in Finland, 1968–2008. *Alcohol Alcohol*. 2011;46(3):349-356. PMID: 21508197.
- Mäkelä P, Gmel G, Grittner U, et al. Drinking patterns and their gender differences in Europe. *Alcohol Alcohol Suppl*. 2006;41(suppl 1):i8-i18. PMID: 17030504.
- Shelton N, Savell E. The geography of binge drinking: The role of alcohol-related knowledge, behaviours and attitudes. Results from the Health Survey for England 2007. *Health Place*. 2011;17(3):784-792. PMID: 21441061.

39. Dwyer-Lindgren L, Flaxman AD, Ng M, et al. Drinking patterns in US counties from 2002 to 2012. *Am J Public Health*. 2015;105(6):1120-1127. PMID: 25905846.
40. White A, Castle LJ, Chen CM, et al. Converging patterns of alcohol use and related outcomes among females and males in the United States, 2002 to 2012. *Alcohol Clin Exp Res*. 2015;39(9):1712-1726. PMID: 26331879.
41. Dawson DA, Goldstein RB, Saha TD, et al. Changes in alcohol consumption: United States, 2001–2002 to 2012–2013. *Drug Alcohol Depend*. 2015;148:56-61. PMID: 25620731.
42. Perlman FJA. Drinking in transition: Trends in alcohol consumption in Russia 1994–2004. *BMC Public Health*. 2010;10:691. PMID: 21070625.
43. Twigg L, Moon G. The spatial and temporal development of binge drinking in England 2001–2009: An observational study. *Soc Sci Med*. 2013;91:162-167. PMID: 23608600.
44. Kerr WC, Greenfield TK, Bond J, et al. Age-period-cohort modelling of alcohol volume and heavy drinking days in the US National Alcohol Surveys: Divergence in younger and older adult trends. *Addiction*. 2009;104(1):27-37. PMID: 19133886.
45. Grucza RA, Norberg KE, Bierut LJ. Binge drinking among youths and young adults in the United States: 1979–2006. *J Am Acad Child Adolesc Psychiatry*. 2009;48(7):692-702. PMID: 19465879.
46. Roberts SC. Whether men or women are responsible for size of gender gap in alcohol consumption depends on alcohol measure: A study across U.S. states. *Contemp Drug Probl*. 2012;39(2):195-212. PMID: 23248388.
47. Dube SR, Miller JW, Brown DW, et al. Adverse childhood experiences and the association with ever using alcohol and initiating alcohol use during adolescence. *J Adolesc Health*. 2006;38(4):444.e1-e10. PMID: 16549308.
48. Hughes T, McCabe SE, Wilsnack SC, et al. Victimization and substance use disorders in a national sample of heterosexual and sexual minority women and men. *Addiction*. 2010;105(12):2130-2140. PMID: 20840174.
49. Kendler KS, Bulik CM, Silberg J, et al. Childhood sexual abuse and adult psychiatric and substance abuse disorders in women: An epidemiological and cotwin control analysis. *Arch Gen Psychiatry*. 2000;57:953-959. PMID: 11015813.
50. Nelson EC, Heath AC, Madden PA, et al. Association between self-reported childhood sexual abuse and adverse psychosocial outcomes: Results from a twin study. *Arch Gen Psychiatry*. 2002;59:139-145. PMID: 11825135.
51. Widom CS, White HR, Czaja SJ, et al. Long-term effects of child abuse and neglect on alcohol use and excessive drinking in middle adulthood. *J Stud Alcohol Drugs*. 2007;68:317-326. PMID: 17446970.
52. Dube SR, Anda RF, Whitfield CL, et al. Long-term consequences of childhood sexual abuse by gender of victim. *Am J Prev Med*. 2005;28(5):430-438. PMID: 15894146.
53. Pereda N, Guilera G, Forns M, et al. The prevalence of child sexual abuse in community and student samples: A meta-analysis. *Clin Psychol Rev*. 2009;29(4):328-338. PMID: 19371992.
54. Stoltenborgh M, van Ijzendoorn MH, Euser EM, et al. A global perspective on child sexual abuse: Meta-analysis of prevalence around the world. *Child Maltreat*. 2011;16(2):79-101. PMID: 21511741.
55. Chartier MJ, Walker JR, Naimark B. Childhood abuse, adult health, and health care utilization: Results from a representative community sample. *Am J Epidemiol*. 2007;165(9):1031-1038. PMID: 17309899.
56. Thompson MP, Kingree JB, Desai S. Gender differences in long-term health consequences of physical abuse of children: Data from a nationally representative survey. *Am J Public Health*. 2004;94(4):599-604. PMID: 15054012.
57. Keyes KM, Eaton NR, Krueger RF, et al. Childhood maltreatment and the structure of common psychiatric disorders. *Br J Psychiatry*. 2012;200(2):107-115. PMID: 22157798.
58. Arnow BA, Blasey CM, Hunkeler EM, et al. Does gender moderate the relationship between childhood maltreatment and adult depression? *Child Maltreat*. 2011;16(3):175-183. PMID: 21727161.
59. Hussey JM, Chang JJ, Kotch JB. Child maltreatment in the United States: Prevalence, risk factors, and adolescent health consequences. *Pediatrics*. 2006;118(3):933-942. PMID: 16950983.
60. May-Chahal C, Cawson P. Measuring child maltreatment in the United Kingdom: A study of the prevalence of child abuse and neglect. *Child Abuse Negl*. 2005;29(9):969-984. PMID: 16165212.
61. Sorsdahl K, Stein DJ, Williams DR, et al. Childhood punishment and risk for alcohol use disorders: Data from South Africa. *Int J Ment Health Addict*. 2015;13(1):103-114.
62. Skinner ML, Kristman-Valente AN, Herrenkohl TI. Adult binge drinking: Childhood sexual abuse, gender and the role of adolescent alcohol-related experiences. *Alcohol Alcohol*. 2016;51(2):136-141. PMID: 26260149.
63. Trent L, Stander V, Thomsen C, et al. Alcohol abuse among US Navy recruits who were maltreated in childhood. *Alcohol Alcohol*. 2007;42(4):370-375. PMID: 17533164.
64. Merline A, Jager J, Schulenberg JE. Adolescent risk factors for adult alcohol use and abuse: Stability and change of predictive value across early and middle adulthood. *Addiction*. 2008;103(suppl 1):84-99. PMID: 18426542.
65. Muthén BO, Muthén LK. The development of heavy drinking and alcohol-related problems from ages 18 to 37 in a US national sample. *J Stud Alcohol*. 2000;61(2):290-300. PMID: 10757140.
66. Thompson RG, Alonzo D, Hasin DS. Parental divorce, maternal-paternal alcohol problems, and adult offspring lifetime alcohol dependence. *J Soc Work Pract Addict*. 2013;13(3):295-308. PMID: 24678271.
67. White HR, Johnson V, Buysse S. Parental modeling and parenting behavior effects on offspring alcohol and cigarette use: A growth curve analysis. *J Subst Abuse*. 2000;12(3):287-310. PMID: 11367605.
68. Pitkänen T, Kokko K, Lyyra AL, et al. A developmental approach to alcohol drinking behaviour in adulthood: A follow-up study from age 8 to age 42. *Addiction*. 2008;103(suppl 1):48-68. PMID: 18426540.
69. Pedersen W, von Soest T. Socialization to binge drinking: A population-based, longitudinal study with emphasis on parental influences. *Drug Alcohol Depend*. 2013;133(2):587-592. PMID: 23993083.
70. Grant BF, Stinson FS, Harford TC. Age at onset of alcohol use and DSM-IV alcohol abuse and dependence: A 12-year follow-up. *J Subst Abuse*. 2001;13(4):493-504. PMID: 11775078.
71. Hingson RW, Heeren T, Winter MR. Age at drinking onset and alcohol dependence: Age at onset, duration, and severity. *Arch Pediatr Adolesc Med*. 2006;160(7):739-746. PMID: 16818840.
72. Maimaris W, McCambridge J. Age of first drinking and adult alcohol problems: Systematic review of prospective cohort studies. *J Epidemiol Community Health*. 2014;68(3):268-274. PMID: 24249000.
73. Fernández-Artamendi S, Secades-Villa R, Fernández Hermida JR, et al. Gender differences in early alcohol and tobacco use as a risk factor in Spanish adolescents. *Subst Use Misuse*. 2013;48(6):429-437. PMID: 23517404.
74. Keyes KM, Martins SS, Blanco C, et al. Telescoping and gender differences in alcohol dependence: New evidence from two national surveys. *Am J Psychiatry*. 2010;167(8):969-976. PMID: 20439391.
75. Simons-Morton B, Pickett W, Boyce W, et al. Cross-national comparison of adolescent drinking and cannabis use in the United States, Canada, and the Netherlands. *Int J Drug Policy*. 2010;21(1):64-69. PMID: 19303761.
76. Caetano R, Mills BA, Vaeth PA, et al. Age at first drink, drinking, binge drinking, and DSM-5 alcohol use disorder among Hispanic national groups in the United States. *Alcohol Clin Exp Res*. 2014;38(5):1381-1389. PMID: 24689445.
77. Kang M, Kim JH, Cho WH, et al. The gender-specific association between age at first drink and later alcohol drinking patterns in Korea. *PLoS One*. 2014;9(3):e90713. PMID: 24595268.
78. Pitkänen T, Lyyra AL, Pulkkinen L. Age of onset of drinking and the use of alcohol in adulthood: A follow-up study from age 8–42 for females and males. *Addiction*. 2005;100(5):652-661. PMID: 15847623.
79. Cloninger CR, Sigvardsson S, Prybeck TR, et al. Personality antecedents of alcoholism in a national area probability sample. *Eur Arch Psychiatry Clin Neurosci*. 1995;245:239-244. PMID: 7578287.

80. Leonard KE, Blane HT, eds. *Psychological Theories of Drinking and Alcoholism*. New York, NY: Guilford; 1999.
81. Sher KJ, Bartholow BD, Wood MD. Personality and substance use disorders: A prospective study. *J Consult Clin Psychol*. 2000;68(5):818-829. PMID: 11068968.
82. Brennan AF, Walfish S, AuBuchon P. Alcohol use and abuse in college students: I. A review of individual and personality correlates. *Int J Addict*. 1986;21(4-5):449-474. PMID: 3533794.
83. Coskunpinar A, Dir AL, Cyders MA. Multidimensionality in impulsivity and alcohol use: A meta-analysis using the UPPS model of impulsivity. *Alcohol Clin Exp Res*. 2013;37(9):1441-1450. PMID: 23578176.
84. Shin SH, Hong HG, Jean SM. Personality and alcohol use: The role of impulsivity. *Addict Behav*. 2012;37(1):102-107. PMID: 21955874.
85. Byrnes JP, Miller DC, Schafer WD. Gender differences in risk taking: A meta-analysis. *Psychol Bull*. 1999;125(3):367-383.
86. Cross CP, Copping LT, Campbell A. Sex differences in impulsivity: A meta-analysis. *Psychol Bull*. 2011;137(1):97-130. PMID: 21219058.
87. Cross CP, Cyrenne DL, Brown GR. Sex differences in sensation-seeking: A meta-analysis. *Sci Rep*. 2013;3:2486. PMID: 23989235.
88. Rutledge PA, Sher KJ. Heavy drinking from the freshman year into early young adulthood: The roles of stress, tension-reduction drinking motives, gender and personality. *J Stud Alcohol*. 2001;62(4):457-466. PMID: 11523533.
89. Tomás MC, Costa JG, Sellés PM, et al. The importance of expectations in the relationship between impulsivity and binge drinking among university students. *Adicciones*. 2014;26(2):134-145. PMID: 25225730.
90. Nederkoorn C, Baits M, Guerrieri R, et al. Heavy drinking is associated with deficient response inhibition in women but not in men. *Pharmacol Biochem Behav*. 2009;93(3):331-336. PMID: 19409923.
91. Weafer J, de Wit H. Sex differences in impulsive action and impulsive choice. *Addict Behav*. 2014;39(11):1573-1579. PMID: 24286704.
92. Balodis IM, Potenza MN, Olmstead MC. Binge drinking in undergraduates: Relationships with sex, drinking behaviors, impulsivity and the perceived effects of alcohol. *Behav Pharmacol*. 2009;20(5-6):518-526. PMID: 19730367.
93. de Haan L, Egberts AC, Heerdink ER. The relation between risk-taking behavior and alcohol use in young adults is different for men and women. *Drug Alcohol Depend*. 2015;155:222-227. PMID: 26235432.
94. Legrand FD, Kaltienbach ML, Joly PM. Association between sensation seeking and alcohol consumption in French college students: Some ecological data collected in "open bar" parties. *Pers Individ Dif*. 2007;43(7):1950-1959.
95. Patock-Peckham JA, King KM, Morgan-Lopez AA, et al. Gender-specific mediational links between parenting styles, parental monitoring, impulsiveness, drinking control, and alcohol-related problems. *J Stud Alcohol Drugs*. 2011;72(2):247-258. PMID: 21388598.
96. Bekker MH, van Mens-Verhulst J. Anxiety disorders: Sex differences in prevalence, degree, and background, but gender-neutral treatment. *Genet Med*. 2007;4:S178-S193. PMID: 18156102.
97. McLean CP, Anderson ER. Brave men and timid women? A review of the gender differences in fear and anxiety. *Clin Psychol Rev*. 2009;29(6):496-505. PMID: 19541399.
98. Piccinelli M, Wilkinson G. Gender differences in depression. *Br J Psychiatry*. 2000;177(6):486-492. PMID: 11102321.
99. Van de Velde S, Bracke P, Levecque K. Gender differences in depression in 23 European countries. Cross-national variation in the gender gap in depression. *Soc Sci Med*. 2010;71(2):305-313. PMID: 20483518.
100. Boden JM, Fergusson DM. Alcohol and depression. *Addiction*. 2011;106(5):906-914. PMID: 21382111.
101. Morris EP, Stewart SH, Ham LS. The relationship between social anxiety disorder and alcohol use disorders: A critical review. *Clin Psychol Rev*. 2005;25(6):734-760. PMID: 16042994.
102. Sullivan LE, Fiellin DA, O'Connor PG. The prevalence and impact of alcohol problems in major depression: A systematic review. *Am J Med*. 2005;118(4):330-341. PMID: 15808128.
103. Choi NG, DiNitto DM. Heavy/binge drinking and depressive symptoms in older adults: Gender differences. *Int J Geriatr Psychiatry*. 2011;26(8):860-868. PMID: 20886659.
104. Haynes JC, Farrell M, Singleton N, et al. Alcohol consumption as a risk factor for anxiety and depression: Results from the longitudinal follow-up of the National Psychiatric Morbidity Survey. *Br J Psychiatry*. 2005;187(6):544-551. PMID: 16319407.
105. Chou KL, Liang K, Mackenzie CS. Binge drinking and Axis I psychiatric disorders in community-dwelling middle-aged and older adults: Results from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). *J Clin Psychiatry*. 2011;72(5):640-647. PMID: 21294995.
106. Bobak M, Pikhart H, Pajak A, et al. Depressive symptoms in urban population samples in Russia, Poland and the Czech Republic. *Br J Psychiatry*. 2006;188(4):359-365. PMID: 16582063.
107. Parikh RB, Junquera P, Canaan Y, et al. Predictors of binge drinking in elderly Americans. *Am J Addict*. 2015;24(7):621-627. PMID: 26300301.
108. Strine TW, Mokdad AH, Dube SR, et al. The association of depression and anxiety with obesity and unhealthy behaviors among community-dwelling US adults. *Gen Hosp Psychiatry*. 2008;30(2):127-137. PMID: 18291294.
109. Graham K, Massak A, Demers A, et al. Does the association between alcohol consumption and depression depend on how they are measured? *Alcohol Clin Exp Res*. 2007;31(1):78-88. PMID: 17207105.
110. Cranford JA, Eisenberg D, Serran AM. Substance use behaviors, mental health problems, and use of mental health services in a probability sample of college students. *Addict Behav*. 2009;34(2):134-145. PMID: 18851897.
111. Harrison EL, Desai RA, McKee SA. Nondaily smoking and alcohol use, hazardous drinking, and alcohol diagnoses among young adults: Findings from the NESARC. *Alcohol Clin Exp Res*. 2008;32(12):2081-2087. PMID: 18828805.
112. Weitzman ER, Chen YY. The co-occurrence of smoking and drinking among young adults in college: National survey results from the United States. *Drug Alcohol Depend*. 2005;80(3):377-386. PMID: 16009507.
113. Ling PM, Neilands TB, Glantz SA. Young adult smoking behavior: A national survey. *Am J Prev Med*. 2009;36(5):389-394. PMID: 19269128.
114. Blazer DG, Wu LT. Patterns of tobacco use and tobacco-related psychiatric morbidity and substance use among middle-aged and older adults in the United States. *Aging Ment Health*. 2012;16(3):296-304. PMID: 22292514.
115. Freedman ND, Leitzmann MF, Hollenbeck AR, et al. Cigarette smoking and subsequent risk of lung cancer in men and women: Analysis of a prospective cohort study. *Lancet Oncol*. 2008;9(7):649-656. PMID: 18556244.
116. Huxley RR, Woodward M. Cigarette smoking as a risk factor for coronary heart disease in women compared with men: A systematic review and meta-analysis of prospective cohort studies. *Lancet*. 2011;378(9799):1297-1305. PMID: 21839503.
117. Ng M, Freeman MK, Fleming TD, et al. Smoking prevalence and cigarette consumption in 187 countries, 1980-2012. *JAMA*. 2014;311(2):183-192. PMID: 24399557.
118. Bock B, Lewis B, Jennings E, et al. Women and smoking cessation: Challenges and opportunities. *Curr Cardiovasc Risk Rep*. 2009;3(3):205-210.
119. Grøtvedt L, Stavem K. Association between age, gender and reasons for smoking cessation. *Scand J Public Health*. 2005;33(1):72-76. PMID: 15764244.
120. Royce JM, Corbett K, Sorensen G, et al. Gender, social pressure, and smoking cessations: The Community Intervention Trial for Smoking Cessation (COMMIT) at baseline. *Soc Sci Med*. 1997;44(3):359-370. PMID: 9004370.
121. Blazer DG, Wu LT. The epidemiology of at-risk and binge drinking among middle-aged and elderly community adults: National Survey on Drug Use and Health. *Am J Psychiatry*. 2009;166(10):1162-1169. PMID: 19687131.
122. Karlamangla A, Zhou K, Reuben D, et al. Longitudinal trajectories of heavy drinking in adults in the United States of America. *Addiction*. 2006;101(1):91-99. PMID: 16393195.

123. Silveira CM, Wang YP, Andrade AG, et al. Heavy episodic drinking in the São Paulo Epidemiologic Catchment Area Study in Brazil: Gender and sociodemographic correlates. *J Stud Alcohol Drugs*. 2007;68(1):18-27. PMID: 17149514.
124. Massak A, Graham K. Is the smoking-depression relationship confounded by alcohol consumption? An analysis by gender. *Nicotine Tob Res*. 2008;10(7):1231-1243. PMID: 18629734.
125. Stickley A, Carlson P. The social and economic determinants of smoking in Moscow, Russia. *Scand J Public Health*. 2009;37(6):632-639. PMID: 19451199.
126. Holahan CJ, Schutte KK, Brennan PL, et al. Episodic heavy drinking and 20-year total mortality among late-life moderate drinkers. *Alcohol Clin Exp Res*. 2014;38(5):1423-1438. PMID: 24588326.
127. Wen XJ, Kanny D, Thompson WW, et al. Binge drinking intensity and health-related quality of life among US adult binge drinkers. *Prev Chronic Dis*. 2012;9:E86. PMID: 22498037.
128. Schoenborn CA, Stommel V, Ward B. Mortality risks associated with average drinking level and episodic heavy drinking. *Subst Use Misuse*. 2014;49(10):1250-1258. PMID: 24621084.
129. Skov-Ettrup LS, Eliassen M, Ekholm O, et al. Binge drinking, drinking frequency, and risk of ischaemic heart disease: A population-based cohort study. *Scand J Public Health*. 2011;39(8):880-887. PMID: 22013157.
130. Nicholson A, Bobak M, Murphy M, et al. Alcohol consumption and increased mortality in Russian men and women: A cohort study based on the mortality of relatives. *Bull World Health Organ*. 2005;83(11):812-819. PMID: 16302037.
131. Schou LA, Storvoll EE, Moan IS. Alcohol-related sickness absence among young employees: Gender differences and the prevention paradox. *Eur J Public Health*. 2014;24(3):480-485. PMID: 24675063.
132. Borges G, Loera CR. Alcohol and drug use in suicidal behaviour. *Curr Opin Psychiatry*. 2010;23(3):195-204. PMID: 20308904.
133. Brady J. The association between alcohol misuse and suicidal behaviour. *Alcohol Alcohol*. 2006;41(5):473-478. PMID: 16891335.
134. Kaplan MS, Huguet N, McFarland BH, et al. Use of alcohol before suicide in the United States. *Ann Epidemiol*. 2014;24(8):588-592. PMID: 24953567.
135. Glasheen C, Pemberton MR, Lipari R, et al. Binge drinking and the risk of suicidal thoughts, plans, and attempts. *Addict Behav*. 2015;43:42-49. PMID: 25553510.
136. Husky MM, Guignard R, Beck F, et al. Risk behaviors, suicidal ideation and suicide attempts in a nationally representative French sample. *J Affect Disord*. 2013;151(3):1059-1065. PMID: 24070905.
137. Schaffer M, Jeglic EL, Stanley B. The relationship between suicidal behavior, ideation, and binge drinking among college students. *Arch Suicide Res*. 2008;12(2):124-132. PMID: 18340594.
138. Boffetta P, Hashibe M. Alcohol and cancer. *Lancet Oncol*. 2006;7(2):149-156. PMID: 16455479.
139. Scoccianti C, Straif K, Romieu I. Recent evidence on alcohol and cancer epidemiology. *Future Oncol*. 2013;9(9):1315-1322. PMID: 23980679.
140. Heinen MM, Verhage BA, Ambergen TA, et al. Alcohol consumption and risk of pancreatic cancer in the Netherlands cohort study. *Am J Epidemiol*. 2009;169(10):1233-1242. PMID: 19318612.
141. Jiao L, Silverman DT, Schaefer C, et al. Alcohol use and risk of pancreatic cancer: The NIH-AARP Diet and Health Study. *Am J Epidemiol*. 2009;169(9):1043-1051. PMID: 19299403.
142. Yadav D, Lowenfels AB. The epidemiology of pancreatitis and pancreatic cancer. *Gastroenterology*. 2013;144(6):1252-1261. PMID: 23622135.
143. Gupta S, Wang F, Holly EA, et al. Risk of pancreatic cancer by alcohol dose, duration, and pattern of consumption, including binge drinking: A population-based study. *Cancer Causes Control*. 2010;21(7):1047-1059. PMID: 20349126.
144. Hwang Y, Lee KE, Weiderpass E, et al. Acute high-dose and chronic lifetime exposure to alcohol consumption and differentiated thyroid cancer: T-CALOS Korea. *PLoS One*. 2016;11(3):e0151562. PMID: 26985827.
145. Allen NE, Beral V, Casabonne D, et al. Moderate alcohol intake and cancer incidence in women. *J Natl Cancer Inst*. 2009;101(5):296-305. PMID: 19244173.
146. Kelemen LE, Bandera EV, Terry KL, et al. Recent alcohol consumption and risk of ovarian carcinoma: A pooled analysis of 5,342 cases and 10,358 controls from the Ovarian Cancer Association Consortium. *BMC Cancer*. January 2013;13:28. PMID: 23339562.
147. Loerbroks A, Schouten LJ, Goldbohm RA, et al. Alcohol consumption, cigarette smoking, and endometrial cancer risk: Results from the Netherlands Cohort Study. *Cancer Causes Control*. 2007;18(5):551-560. PMID: 17437180.
148. Rota M, Pasquali E, Scotti L, et al. Alcohol drinking and epithelial ovarian cancer risk: A systematic review and meta-analysis. *Gynecol Oncol*. 2012;125(3):758-763. PMID: 22449732.
149. Park SY, Kolonel LN, Lim U, et al. Alcohol consumption and breast cancer risk among women from five ethnic groups with light to moderate intakes: The Multiethnic Cohort Study. *Int J Cancer*. 2014;134(6):1504-1510. PMID: 24037751.
150. Shield KD, Soerjomataram I, Rehm J. Alcohol use and breast cancer: A critical review. *Alcohol Clin Exp Res*. 2016;40(6):1166-1181. PMID: 27130687.
151. Ruddy KJ, Winer EP. Male breast cancer: Risk factors, biology, diagnosis, treatment, and survivorship. *Ann Oncol*. 2013;24(6):1434-1443. PMID: 23425944.
152. Brooks PJ, Zakhari S. Moderate alcohol consumption and breast cancer in women: From epidemiology to mechanisms and interventions. *Alcohol Clin Exp Res*. 2013;37(1):23-30. PMID: 23072454.
153. Seitz HK, Pelucchi C, Bagnardi V, et al. Epidemiology and pathophysiology of alcohol and breast cancer. *Alcohol Alcohol*. 2012;47(3):204-212. PMID: 22459019.
154. Mørch LS, Johansen D, Thygesen LC, et al. Alcohol drinking, consumption patterns and breast cancer among Danish nurses: A cohort study. *Eur J Public Health*. 2007;17(6):624-629. PMID: 17442702.
155. Chen WY, Rosner B, Hankinson SE, et al. Moderate alcohol consumption during adult life, drinking patterns, and breast cancer risk. *JAMA*. 2011;306(17):1884-1890. PMID: 22045766.
156. Jeffreys M, McKenzie F, Firestone R, et al. A multi-ethnic breast cancer case-control study in New Zealand: Evidence of differential risk patterns. *Cancer Causes Control*. 2013;24(1):135-152. PMID: 23179663.
157. Kinney AV, Millikan RC, Lin YH, et al. Alcohol consumption and breast cancer among black and white women in North Carolina (United States). *Cancer Causes Control*. 2000;11(4):345-357. PMID: 10843445.
158. Dickerman BA, Markt SC, Koskenvuo M, et al. Alcohol intake, drinking patterns, and prostate cancer risk and mortality: A 30-year prospective cohort study of Finnish twins. *Cancer Causes Control*. 2016;27(9):1049-1058. PMID: 27351919.
159. Middleton Fillmore K, Chikritzts T, Stockwell T, et al. Alcohol use and prostate cancer: A meta-analysis. *Mol Nutr Food Res*. 2009;53(2):240-255. PMID: 19156715.
160. Sawada N, Inoue M, Iwasaki M, et al. Alcohol and smoking and subsequent risk of prostate cancer in Japanese men: The Japan Public Health Center-based prospective study. *Int J Cancer*. 2014;134(4):971-978. PMID: 23929133.
161. Watters JL, Park Y, Hollenbeck A, et al. Alcoholic beverages and prostate cancer in a prospective U.S. cohort study. *Am J Epidemiol*. 2010;172(7):773-780. PMID: 20813803.
162. Chhim AS, Fassier P, Latino-Martel P, et al. Prospective association between alcohol intake and hormone-dependent cancer risk: Modulation by dietary fiber intake. *Am J Clin Nutr*. 2015;102(1):182-189. PMID: 25994566.
163. Layne TM, Graubard BI, Ma X, et al. Prostate cancer risk factor profiles in black and white men in the NIH-AARP Diet and Health Study. *Cancer Res*. 2016;76(14 suppl):1777.
164. McGregor SE, Courneya KS, Kopciuk KA, et al. Case-control study of lifetime alcohol intake and prostate cancer risk. *Cancer Causes Control*. 2013;24(3):451-461. PMID: 23271409.
165. Dennis LK. Meta-analysis for combining relative risks of alcohol consumption and prostate cancer. *Prostate*. 2000;42(1):56-66. PMID: 10579799.
166. Fowke JH, McLerran DF, Gupta PC, et al. Associations of body mass index, smoking, and alcohol consumption with prostate cancer mortality in the Asia Cohort Consortium. *Am J Epidemiol*. 2015;182(5):381-389. PMID: 26243736.

167. Rota M, Scotti L, Turati F, et al. Alcohol consumption and prostate cancer risk: A meta-analysis of the dose-risk relation. *Eur J Cancer Prev*. 2012;21(4):350-359. PMID: 22095143.
168. Platz EA, Leitzmann MF, Rimm EB, et al. Alcohol intake, drinking patterns, and risk of prostate cancer in a large prospective cohort study. *Am J Epidemiol*. 2004;159(5):444-453. PMID: 14977640.
169. Coups EJ, Ostroff JS. A population-based estimate of the prevalence of behavioral risk factors among adult cancer survivors and noncancer controls. *Prev Med*. 2005;40(6):702-711. PMID: 15850868.
170. Zuccolo L, Lewis SJ, Donovan JL, et al. Alcohol consumption and PSA-detected prostate cancer risk—A case-control nested in the ProtecT study. *Int J Cancer*. 2013;132(9):2176-2185. PMID: 23024014.
171. Gong Z, Kristal AR, Schenk JM, et al. Alcohol consumption, finasteride, and prostate cancer risk: Results from the Prostate Cancer Prevention Trial. *Cancer*. 2009;115(16):3661-3669. PMID: 19598210.
172. Briasoulis A, Agarwal V, Messerli FH. Alcohol consumption and the risk of hypertension in men and women: A systematic review and meta-analysis. *J Clin Hypertens (Greenwich)*. 2012;14(11):792-798. PMID: 23126352.
173. Taylor B, Irving HM, Baliunas D, et al. Alcohol and hypertension: Gender differences in dose-response relationships determined through systematic review and meta-analysis. *Addiction*. 2009;104(12):1981-1990. PMID: 19804464.
174. Samokhvalov AV, Irving HM, Rehm J. Alcohol consumption as a risk factor for atrial fibrillation: A systematic review and meta-analysis. *Eur J Cardiovasc Prev Rehabil*. 2010;17(6):706-712. PMID: 21461366.
175. Patra J, Taylor B, Irving H, et al. Alcohol consumption and risk of morbidity and mortality for different stroke types: A systematic review and meta-analysis. *BMC Public Health*. 2010;10:258. PMID: 20482788.
176. Reynolds K, Lewis L, Nolen JD, et al. Alcohol consumption and risk of stroke: A meta-analysis. *JAMA*. 2003;289(5):579-588. PMID: 12578491.
177. Corrao G, Rubbiati L, Bagnardi V, et al. Alcohol and coronary heart disease: A meta-analysis. *Addiction*. 2000;95(10):1505-1523. PMID: 11070527.
178. Hvidtfeltl UA, Tolstrup JS, Jakobsen MU, et al. Alcohol intake and risk of coronary heart disease in younger, middle-aged, and older adults. *Circulation*. 2010;121:1589-1597. PMID: 20351238.
179. Roerecke M, Rehm J. Alcohol consumption, drinking patterns, and ischemic heart disease: A narrative review of meta-analyses and a systematic review and meta-analysis of the impact of heavy drinking occasions on risk for moderate drinkers. *BMC Medicine*. 2014;12(1):1.
180. Roerecke M, Rehm J. Chronic heavy drinking and ischaemic heart disease: A systematic review and meta-analysis. *Open Heart*. 2014;1:e000135.
181. Bagnardi V, Zatonski W, Scotti L, et al. Does drinking pattern modify the effect of alcohol on the risk of coronary heart disease? Evidence from a meta-analysis. *J Epidemiol Community Health*. 2008;62(7):615-619. PMID: 18559444.
182. Pletcher MJ, Varosy P, Kiefe CI, et al. Alcohol consumption, binge drinking, and early coronary calcification: Findings from the Coronary Artery Risk Development in Young Adults (CARDIA) Study. *Am J Epidemiol*. 2005;161(5):423-433. PMID: 15718478.
183. Rehm J, Sempos CT, Trevisan M. Alcohol and cardiovascular disease—more than one paradox to consider. Average volume of alcohol consumption, patterns of drinking and risk of coronary heart disease: A review. *J Cardiovasc Risk*. 2003;10(1):15-20. PMID: 12569232.
184. Murray RP, Connett JE, Tyas SL, et al. Alcohol volume, drinking pattern, and cardiovascular disease morbidity and mortality: Is there a U-shaped function? *Am J Epidemiol*. 2002;155(3):242-248. PMID: 11821249.
185. Graff-Iverson S, Jansen MD, Hoff DA, et al. Divergent associations of drinking frequency and binge consumption of alcohol with mortality within the same cohort. *J Epidemiol Community Health*. 2013;67(4):350-357. PMID: 23235547.
186. Hansagi H, Romelsjö A, Gerhardsson de Verdier M, et al. Alcohol consumption and stroke mortality: 20-year follow-up of 15,077 men and women. *Stroke*. 1995;26(10):1768-1773. PMID: 7570723.
187. Pajak A, Szafraniec K, Kubinova R, et al. Binge drinking and blood pressure: Cross-sectional results of the HAPIEE study. *PLoS One*. 2013;8(6):e65856. PMID: 23762441.
188. Mukamal KJ, Maclure M, Muller JE, et al. Binge drinking and mortality after acute myocardial infarction. *Circulation*. 2005;112(25):3839-3845. PMID: 16365208.
189. Gramenzi A, Caputo F, Biselli M, et al. Review article: Alcoholic liver disease—pathophysiological aspects and risk factors. *Aliment Pharmacol Ther*. 2006;24(8):1151-1161. PMID: 17014574.
190. Rehm J, Taylor B, Mohapatra S, et al. Alcohol as a risk factor for liver cirrhosis: A systematic review and meta-analysis. *Drug Alcohol Rev*. 2010;29(4):437-445. PMID: 20636661.
191. Zakhari S, Li TK. Determinants of alcohol use and abuse: Impact of quantity and frequency patterns on liver disease. *Hepatology*. 2007;46(6):2032-2039. PMID: 18046720.
192. Mathurin P, Deltenre P. Effect of binge drinking on the liver: An alarming public health issue? *Gut*. 2009;58(5):613-617. PMID: 19174416.
193. Waszkiewicz N, Szajda SD, Zalewska A, et al. Binge drinking-induced liver injury. *Hepatology*. 2009;50(5):1676. PMID: 19739266.
194. Askgaard G, Grønbaek M, Kjær MS, et al. Alcohol drinking pattern and risk of alcoholic liver cirrhosis: A prospective cohort study. *J Hepatol*. 2015;62(5):1061-1067. PMID: 25634330.
195. Brandish E, Sheron N. Drinking patterns and the risk of serious liver disease. *Expert Rev Gastroenterol Hepatol*. 2010;4(3):249-252. PMID: 20528110.
196. Hatton J, Burton A, Nash H, et al. Drinking patterns, dependency and life-time drinking history in alcohol-related liver disease. *Addiction*. 2009;104(4):587-592. PMID: 19215600.
197. Becker U, Deis A, Sorensen TI, et al. Prediction of risk of liver disease by alcohol intake, sex, and age: A prospective population study. *Hepatology*. 1996;23(5):1025-1029. PMID: 8621128.
198. Müller C. Liver, alcohol and gender. *Wien Med Wochenschr*. 2006;156(19-20):523-526. PMID: 17103288.
199. Lau K, Baumeister SE, Lieb W, et al. The combined effects of alcohol consumption and body mass index on hepatic steatosis in a general population sample of European men and women. *Aliment Pharmacol Ther*. 2015;41(5):467-476. PMID: 25588768.
200. de la Monte SM, Kriegl JJ. Human alcohol-related neuropathology. *Acta Neuropathol*. 2014;127(1):71-90. PMID: 24370929.
201. Foundational studies. National Consortium on Alcohol and Neurodevelopment in Adolescence webpage. <http://ncanda.org/foundational-studies.php>. Accessed August 7, 2017.
202. Svanberg J, Withall A, Bowden S, eds. *Alcohol and the Adult Brain*. New York, NY: Psychology Press; 2015.
203. Hommer DW. Male and female sensitivity to alcohol-induced brain damage. *Alcohol Res Health*. 2003;27(2):181-185. PMID: 15303629.
204. Jacobus J, McQueeny T, Bava S, et al. White matter integrity in adolescents with histories of marijuana use and binge drinking. *Neurotoxicol Teratol*. 2009;31(6):349-355. PMID: 19631736.
205. McQueeny T, Schweinsburg BC, Schweinsburg AD, et al. Altered white matter integrity in adolescent binge drinkers. *Alcohol Clin Exp Res*. 2009;33(7):1278-1285. PMID: 19389185.
206. Smith KW, Gierski F, Andre J, et al. Altered white matter integrity in whole brain and segments of corpus callosum, in young social drinkers with binge drinking pattern. *Addict Biol*. 2017;22(2):490-501. PMID: 26687067.
207. Lisdahl KM, Thayer RE, Squeglia LM, et al. Recent binge drinking predicts smaller cerebellar volumes in adolescents. *Psychiatry Res*. 2013;211(1):17-23. PMID: 23154095.
208. Squeglia LM, Sorg SF, Schweinsburg AD, et al. Binge drinking differentially affects adolescent male and female brain morphometry. *Psychopharmacology (Berl)*. 2012;220(3):529-539. PMID: 21952669.
209. Kvamme TL, Schmidt C, Strelchuk D, et al. Sexually dimorphic brain volume interaction in college-aged binge drinkers. *Neuroimage Clin*. 2015;10:310-317. PMID: 26900571.
210. Squeglia LM, Schweinsburg AD, Pulido C, et al. Adolescent binge drinking linked to abnormal spatial working memory activation: Differential gender

- effects. *Alcohol Clin Exp Res*. 2011;35(10):1831-1841. PMID: 21762178.
211. Campanella S, Peigneux P, Petit G, et al. Increased cortical activity in binge drinkers during working memory task: A preliminary assessment through a functional magnetic resonance imaging study. *PLoS One*. 2013;8(4):e62260. PMID: 23638017.
212. Schweinsburg AD, McQueeney T, Nagel BJ, et al. A preliminary study of functional magnetic resonance imaging response during verbal encoding among adolescent binge drinkers. *Alcohol*. 2010;44(1):111-117. PMID: 20113879.
213. Smith JL, Iredale JM, Mattick RP. Sex differences in the relationship between heavy alcohol use, inhibition and performance monitoring: Disconnect between behavioural and brain functional measures. *Psychiatry Res*. 2016;254:103-111. PMID: 27399307.
214. Townshend JM, Duka T. Binge drinking, cognitive performance and mood in a population of young social drinkers. *Alcohol Clin Exp Res*. 2005;29(3):317-325. PMID: 15770105.
215. Smith JL, Mattick RP, Sufani C. Female but not male young heavy drinkers display altered performance monitoring. *Psychiatry Res*. 2015;233(3):424-435. PMID: 26208747.
216. Parada M, Corral M, Mota N, et al. Executive functioning and alcohol binge drinking in university students. *Addict Behav*. 2012;37(2):167-172. PMID: 21996093.
217. Goudriaan AE, Grekin ER, Sher KJ. Decision making and binge drinking: A longitudinal study. *Alcohol Clin Exp Res*. 2007;31(6):928-938. PMID: 17403069.
218. Weissenborn R, Duka T. Acute alcohol effects on cognitive function in social drinkers: Their relationship to drinking habits. *Psychopharmacology (Berl)*. 2003;165(3):306-312. PMID: 12439627.
219. Danielsson AK, Wennberg P, Hibell B, et al. Alcohol use, heavy episodic drinking and subsequent problems among adolescents in 23 European countries: Does the prevention paradox apply? *Addiction*. 2012;107(1):71-80. PMID: 21672071.
220. Jennison KM. The short-term effects and unintended long-term consequences of binge drinking in college: A 10-year follow-up study. *Am J Drug Alcohol Abuse*. 2004;30(3):659-684. PMID: 15540499.
221. Plant MA, Plant ML, Miller P, et al. The social consequences of binge drinking: A comparison of young adults in six European countries. *J Addict Dis*. 2009;28(4):294-308. PMID: 20155600.
222. Sacks JJ, Gonzales KR, Bouchery EE, et al. 2010 national and state costs of excessive alcohol consumption. *Am J Prev Med*. 2015;49(5):e73-e79. PMID: 26477807.
223. Kelley-Baker T, Lacey JH, Voas RB, et al. Drinking and driving in the United States: Comparing results from the 2007 and 1996 National Roadside Surveys. *Traffic Inj Prev*. 2013;14(2):117-126. PMID: 23343019.
224. Schwartz J. Gender differences in drunk driving prevalence rates and trends: A 20-year assessment using multiple sources of evidence. *Addict Behav*. 2008;33(9):1217-1222. PMID: 18499352.
225. Schwartz J, Rookley BD. The narrowing gender gap in arrests: Assessing competing explanations using self-report, traffic fatality, and official data on drunk driving, 1980–2004. *Criminology*. 2008;46(3):637-671.
226. Robertson AA, Liew H, Gardner S. An evaluation of the narrowing gender gap in DUI arrests. *Accid Anal Prev*. 2011;43(4):1414-1420. PMID: 21545874.
227. Flowers NT, Naimi TS, Brewer RD, et al. Patterns of alcohol consumption and alcohol-impaired driving in the United States. *Alcohol Clin Exp Res*. 2008;32(4):639-644. PMID: 18341648.
228. Quinlan KP, Brewer RD, Siegel P, et al. Alcohol-impaired driving among U.S. adults, 1993–2002. *Am J Prev Med*. 2005;28(4):346-350. PMID: 15831339.
229. Jones AW, Holmgren A. Age and gender differences in blood-alcohol concentration in apprehended drivers in relation to the amounts of alcohol consumed. *Forensic Sci Int*. 2009;188(1):40-45. PMID: 19394172.
230. Devlin A, Fitzharris, M. An analysis of single-vehicle fatality crashes in Australia at various blood alcohol concentrations. Proceedings of the 2013 Australasian Road Safety Research, Policing and Education Conference; August 28-30, 2013; Brisbane, Australia.
231. Naimi TS, Nelson DE, Brewer RD. Driving after binge drinking. *Am J Prev Med*. 2009;37(4):314-320. PMID: 19765503.
232. Bergen G, Shults RA, Beck LF, et al. Self-reported alcohol-impaired driving in the U.S., 2006 and 2008. *Am J Prev Med*. 2012;42(2):142-149. PMID: 22261210.
233. Valencia-Martín JL, Galán I, Rodríguez-Artalejo F. The joint association of average volume of alcohol and binge drinking with hazardous driving behaviour and traffic crashes. *Addiction*. 2008;103(5):749-757. PMID: 18412753.
234. Quinn PD, Fromme K. Event-level associations between objective and subjective alcohol intoxication and driving after drinking across the college years. *Psychol Addict Behav*. 2012;26(3):384-392. PMID: 21688876.
235. Demaris A, Kaukinen C. Violent victimization and women's mental and physical health: Evidence from a national sample. *J Res Crime Delinq*. 2005;42(4):384-411.
236. Mohler-Kuo M, Dowdall GW, Koss MP, et al. Correlates of rape while intoxicated in a national sample of college women. *J Stud Alcohol*. 2004;65:37-45. PMID: 15000502.
237. Bellis MA, Quigg Z, Hughes K, et al. Harms from other people's drinking: An international survey of their occurrence, impacts on feeling safe, and legislation relating to their control. *BMJ Open*. 2015;5:e010112. PMID: 26700293.
238. Stemple L, Meyer IH. The sexual victimization of men in America: New data challenge old assumptions. *Am J Public Health*. 2014;104(6):e19-e26. PMID: 24825225.
239. Abbey A, Wegner R, Woerner J, et al. Review of survey and experimental research that examines the relationship between alcohol consumption and men's sexual aggression perpetration. *Trauma Violence Abuse*. 2014;15(4):265-282. PMID: 24776459.
240. Testa MT, Livingston JA. Alcohol consumption and women's vulnerability to sexual victimization: Can reducing women's drinking prevent rape? *Subst Use Misuse*. 2009;44(9-10):1349-1376. PMID: 19938922.
241. Neal DJ, Fromme K. Event-level covariation of alcohol intoxication and behavioral risks during the first year of college. *J Consult Clin Psychol*. 2007;75(2):294-306. PMID: 17469887.
242. Testa MT, Parks KA, Hoffman JH, et al. Do drinking episodes contribute to sexual aggression perpetration in college men? *J Stud Alcohol Drugs*. 2015;76(4):507-515. PMID: 26098025.
243. Abbey A, Clinton-Sherrod AM, McAuslan P, et al. The relationship between the quantity of alcohol consumed and the severity of sexual assaults committed by college men. *J Interpers Violence*. 2003;18:813-833. PMID: 14675511.
244. Kingree JB, Thompson M, Ruetz E. Heavy episodic drinking and sexual aggression among male college students: The protective influence of church attendance. *J Interpers Violence*. 2017;32(4):604-620. PMID: 26002879.
245. Lorenz K, Ullman SE. Alcohol and sexual assault victimization: Research findings and future directions. *Aggress Violent Behav*. 2016;31:82-94.
246. Howard DE, Griffin MA, Boekeloo BO. Prevalence and psychosocial correlates of alcohol-related sexual assault among university students. *Adolescence*. 2008;43(172):733-750. PMID: 19149143.
247. Mouilso ER, Fischer S, Calhoun KS. A prospective study of sexual assault and alcohol use among first-year college women. *Violence Vict*. 2012;27(1):78-94. PMID: 22455186.
248. Parks KA, Fals-Stewart W. The temporal relationship between college women's alcohol consumption and sexual victimization experiences. *Alcohol Clin Exp Res*. 2004;28:625-629. PMID: 15100614.
249. McCauley JL, Calhoun KS. Faulty perceptions? The impact of binge drinking on college women's perceived rape resistance efficacy. *Addict Behav*. 2008;33:1540-1545. PMID: 18760879.
250. McCauley JL, Calhoun KS, Gidycz CA. Binge drinking and rape: A prospective examination of college women with a history of previous sexual victimization. *J Interpers Violence*. 2010;25(9):1655-1668. PMID: 20068115.
251. McCauley JL, Ruggiero KJ, Resnick HS, et al. Incapacitated, forcible, and drug/alcohol-facilitated rape in relation to binge drinking, marijuana use, and

- illicit drug use: A national survey. *J Trauma Stress*. 2010;23(1):132-140. PMID: 20135676.
252. Walsh K, Resnick HS, Danielson CK, et al. Patterns of drug and alcohol use associated with lifetime sexual revictimization and current posttraumatic stress disorder among three national samples of adolescent, college, and household-residing women. *Addict Behav*. 2014;39:684-689. PMID: 24370205.
253. Alhabib S, Nur U, Jones R. Domestic violence against women: Systematic review of prevalence studies. *J Fam Violence*. 2010;25(4):369-382.
254. Dillon G, Hussain R, Loxton D, et al. Mental and physical health and intimate partner violence against women: A review of the literature. *Int J Family Med*. 2013;2013:313909. PMID: 23431441.
255. Breiding MJ, Black MC, Ryan GW. Chronic disease and health risk behaviors associated with intimate partner violence—18 U.S. states/territories, 2005. *Ann Epidemiol*. 2008;18(7):538-544. PMID: 18495490.
256. Desmarais SL, Reeves KA, Nicholls TL, et al. Prevalence of physical violence in intimate relationships, Part 1: Rates of male and female victimization. *Partner Abuse*. 2012;3(2):140-169.
257. Desmarais SL, Reeves KA, Nicholls TL, et al. Prevalence of physical violence in intimate relationships, Part 2: Rates of male and female perpetration. *Partner Abuse*. 2012;3(2):170-198.
258. Graham K, Bernards S, Munné M, et al., eds. *Unhappy Hours: Alcohol and Partner Aggression in the Americas*. Washington, DC: Pan American Health Organization; 2008.
259. Lysova AV, Hines DA. Binge drinking and violence against intimate partners in Russia. *Aggress Behav*. 2008;34(4):416-427. PMID: 18384157.
260. Caetano R, Ramisetty-Mikler S, Field CA. Unidirectional and bidirectional intimate partner violence among white, black, and Hispanic couples in the United States. *Violence Vict*. 2005;20(4):393-406. PMID: 16250407.
261. Cunradi CB. Drinking level, neighborhood social disorder, and mutual intimate partner violence. *Alcohol Clin Exp Res*. 2007;31(6):1012-1019. PMID: 17403065.
262. Gerber MR. Alcohol and intimate partner violence. In: Boyle P, Boffetta P, Lowenfels AB, et al., eds. *Alcohol: Science, Policy, and Public Health*. Oxford, UK: Oxford University Press; 2013:194-201.
263. Giancola PR, Levinson CA, Corman MD, et al. Men and women, alcohol and aggression. *Exp Clin Psychopharmacol*. 2009;17(3):154-164. PMID: 19586230.
264. Caetano R, McGrath C, Ramisetty-Mikler S, et al. Drinking, alcohol problems and the five-year recurrence and incidence of male to female and female to male partner violence. *Alcohol Clin Exp Res*. 2005;29(1):98-106. PMID: 15654298.
265. Cunradi CB. Intimate partner violence among Hispanic men and women: The role of drinking, neighborhood disorder, and acculturation-related factors. *Violence Vict*. 2009;24(1):83-97. PMID: 19297887.
266. Smith PH, Homish GG, Leonard KE, et al. Intimate partner violence and specific substance use disorders: Findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Psychol Addict Behav*. 2012;26(2):236-245. PMID: 21823768.
267. Devries KM, Child JC, Bacchus LJ, et al. Intimate partner violence victimization and alcohol consumption in women: A systematic review and meta-analysis. *Addiction*. 2014;109(3):379-391. PMID: 24329907.
268. Nowotny KM, Graves JL. Substance use and intimate partner violence victimization among white, African American, and Latina women. *J Interpers Violence*. 2013;28(17):3301-3318. PMID: 23946141.
269. Testa M, Livingston JA, Leonard KE. Women's substance use and experiences of intimate partner violence: A longitudinal investigation among a community sample. *Addict Behav*. 2003;28(9):1649-1664. PMID: 14656551.
270. Capaldi DM, Knoble NB, Shortt JW, et al. A systematic review of risk factors for intimate partner violence. *Partner Abuse*. 2012;3(2):231-280. PMID: 22754606.
271. Hines DA, Straus MA. Binge drinking and violence against dating partners: The mediating effect of antisocial traits and behaviors in a multinational perspective. *Aggress Behav*. 2007;33(5):441-457. PMID: 17683106.
272. Bosch J, Weaver TL, Arnold LD, et al. The impact of intimate partner violence on women's physical health: Findings from the Missouri Behavioral Risk Factor Surveillance System. *J Interpers Violence*. August 12, 2015. PMID: 26268271.
273. Timko C, Sutkowi A, Pavao J, et al. Women's childhood and adult adverse experiences, mental health, and binge drinking: The California Women's Health Survey. *Subst Abuse Treat Prev Policy*. 2008;3:15. PMID: 18538028.
274. Ally EZ, Laranjeira R, Viana MC, et al. Intimate partner violence trends in Brazil: Data from two waves of the Brazilian National Alcohol and Drugs Survey. *Rev Bras Psiquiatr*. 2016;38(2):98-105. PMID: 27304756.
275. Cerulli C, Bossarte RM, Dichter ME. Exploring intimate partner violence status among male veterans and associated health outcomes. *Am J Mens Health*. 2014;8(1):66-73. PMID: 23832953.
276. Rehm J, Mathers C, Popova S, et al. Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *Lancet*. 2009;373(9682):2223-2233. PMID: 19560604.
277. Berning A, Compton R, Wochinger K. Results of the 2013-2014 National Roadside Survey of Alcohol and Drug Use by Drivers. Traffic safety facts research note. Washington, DC: National Highway Traffic Safety Administration; February 2015.
278. Hingson R, Winter M. Epidemiology and consequences of drinking and driving. *Alcohol Res Health*. 2003;27(1):63-78. PMID: 15301401.
279. Popova S, Chambers C, eds. Special issue: Fetal alcohol spectrum disorders. *Int J Alcohol Drug Res*. 2013;2(3):1-92.
280. Popova S, Chambers C, eds. Second special issue: Fetal alcohol spectrum disorders. *Int J Alcohol Drug Res*. 2014;3(1):1-125.
281. Cunradi CB. Neighborhoods, alcohol outlets and intimate partner violence: Addressing research gaps in explanatory mechanisms. *Int J Environ Res Public Health*. 2010;7(3):799-813. PMID: 20617004.
282. Flynn A, Graham K. "Why did it happen?" A review and conceptual framework for research on perpetrators' and victims' explanations for intimate partner violence. *Aggress Violent Behav*. 2010;15(3):239-251. PMID: 20436933.
283. Laslett AM, Catalano P, Chikritzhs T, et al. *The Range and Magnitude of Alcohol's Harm to Others*. Fitzroy, Victoria: AER Centre for Alcohol Policy Research, Turning Point Alcohol and Drug Centre, Eastern Health; 2010.
284. Greenfield TK, Ye Y, Kerr W, et al. Externalities from alcohol consumption in the 2005 US National Alcohol Survey: Implications for policy. *Int J Environ Res Public Health*. 2009;6(12):3205-3224. PMID: 20049257.
285. Karriker-Jaffe KJ, Greenfield TK. Gender differences in associations of neighbourhood disadvantage with alcohol's harms to others: A cross-sectional study from the USA. *Drug Alcohol Res*. 2014;33(3):296-303. PMID: 24612367.
286. Laslett AM, Room R, Ferris J, et al. Surveying the range and magnitude of alcohol's harm to others in Australia. *Addiction*. 2011;106(9):1603-1611. PMID: 21438943.
287. Bernards S, Graham K. Common survey methods and analyses conducted for each country. In: Graham K, Bernards S, Munné M, et al., eds. *Unhappy Hours: Alcohol and Partner Aggression in the Americas*. Washington, DC: Pan American Health Organization; 2008:25-33.
288. Seid AK, Grittner U, Greenfield TK, et al. To cause harm and to be harmed by others: New perspectives on alcohol's harms to others. *Subst Abuse*. 2015;9(S2):13-22. PMID: 26512203.
289. Lund IO, Sundin E, Konijnenberg C, et al. Harm to others from substance use and abuse. *Subst Abuse*. 2015;9(S2):119-124. PMID: 27199564.
290. Vannicelli M. Treatment outcome of alcoholic women: The state of the art in relation to sex bias and expectancy effects. In: Wilsnack SC, Beckman LJ, eds. *Alcohol Problems in Women: Antecedents, Consequences, and Intervention*. New York, NY: Guilford; 1984:369-412.
291. Fals-Stewart W, Lam WKK, Kelley ML. Behavioral couple therapy: Partner-involved treatment for substance-abusing women. In: Brady KT, Back SE, Greenfield SF, eds. *Women and Addiction: A Comprehensive Handbook*. New York, NY: Guilford; 2009:323-338.

292. Greenfield SF, Grella CE. What is "women-focused" treatment for substance use disorders? *Psychiatr Serv*. 2009;60(7):880-882. PMID: 19564216.
293. Greenfield SF, Pirard S. Gender-specific treatment for women with substance use disorders. In: Brady KT, Back SE, Greenfield SF, eds. *Women and Addiction: A Comprehensive Handbook*. New York, NY: Guilford; 2009:289-306.
294. Gebara CF, Bhona FM, Ronzani TM, et al. Brief intervention and decrease of alcohol consumption among women: A systematic review. *Subst Abuse Treat Prev Policy*. 2013;8:31. PMID: 24016074.
295. McCrady BS, Raytek H. Women and substance abuse: Treatment modalities and outcomes. In: Gomberg ESL, Nirenberg TD, eds. *Women and Substance Abuse*. Norwood, NJ: Ablex; 1993:314-338.
296. Schneider KM, Kviz FJ, Isola ML, et al. Evaluating multiple outcomes and gender differences in alcoholism treatment. *Addict Behav*. 1995;20:1-21. PMID: 7785474.
297. Garbutt JC, Kranzler HR, O'Malley SS, et al. Efficacy and tolerability of long-acting injectable naltrexone for alcohol dependence: A randomized controlled trial. *JAMA*. 2005;293(13):1617-1625. PMID: 15811981.
298. Baros AM, Latham PK, Anton RF. Naltrexone and cognitive behavioral therapy for the treatment of alcohol dependence: Do sex differences exist? *Alcohol Clin Exp Res*. 2008;32(5):771-776. PMID: 18336635.
299. Ames SC, Werch CE, Ames GE, et al. Integrated smoking cessation and binge drinking intervention for young adults: A pilot investigation. *Ann Behav Med*. 2010;40:343-349. PMID: 20730517.
300. Kelly-Weeder S. Binge drinking in college-aged women: Framing a gender-specific prevention strategy. *J Am Acad Nurse Pract*. 2008;20:577-584. PMID: 19120588.
301. Saitz R, Palfai TP, Freedner N, et al. Screening and brief intervention online for college students: The iHealth Study. *Alcohol Alcohol*. 2007;42:28-36. PMID: 17130139.
302. Postel MG, de Jong CAJ, de Haan HA. Does e-therapy for problem drinking reach hidden populations? *Am J Psychiatry*. 2005;162:2393. PMID: 16330613.
303. Finfgeld-Connett D. Web-based treatment for problem drinking. *J Psychosoc Nurs Ment Health Serv*. 2006;44(9):20-27. PMID: 16989328.
304. Morris A. Gender bender: Should gender equality extend to drinking? *New York*. December 7, 2008.
305. Morse J. Women on a binge. *Time*. April 1, 2002.
306. Vesely R. Ladies' night: Equal rights, equal pay, equally drunk. *Mother Jones*. September/October 1998.
307. Jacobs L, Jacobs J. The feminization of alcohol use disorder and policy implications for women: "Sweet, pretty and pink." *Gender Behav*. 2016;14(1):6900-6910.
308. Lyons A, Willott S. Alcohol consumption, gender identities and women's changing social positions. *Sex Roles*. 2008;59:694-712.
309. Watts R, Linke S, Murray E, et al. Calling the shots: Young professional women's relationship with alcohol. *Fem Psychol*. 2015;25(2):219-234.
310. Young AM, Morales M, McCabe SE, et al. Drinking like a guy: Frequent binge drinking among undergraduate women. *Subst Use Misuse*. 2005;40:241-267. PMID: 15770887.
311. Wilsnack RW, Wilsnack SC, Obot IS. Why study gender, alcohol and culture? In: Obot IS, Room R, eds. *Alcohol, Gender and Drinking Problems: Perspectives from Low and Middle Income Countries*. Geneva, Switzerland: World Health Organization; 2005:1-23.
312. Iwamoto DK, Cheng A, Lee CS, et al. "Man-ing" up and getting drunk: The role of masculine norms, alcohol intoxication and alcohol-related problems among college men. *Addict Behav*. 2011;36(9):906-911. PMID: 21620570.
313. Wells S, Flynn A, Tremblay PF, et al. Linking masculinity to negative drinking consequences: The mediating roles of heavy episodic drinking and alcohol expectancies. *J Stud Alcohol Drugs*. 2014;75:510-519. PMID: 24766763.
314. Babor T, Caetano R, Casswell S, et al. *Alcohol: No Ordinary Commodity*. 2nd ed. New York, NY: Oxford University Press; 2010.
315. Wilkinson C, Room R. Warnings on alcohol containers and advertisements: International experience and evidence on effects. *Drug Alcohol Rev*. 2009;28:426-435. PMID: 19594797.
316. Kilbourne J. *Deadly Persuasion: Why Women and Girls Must Fight the Addictive Power of Advertising*. New York, NY: Free Press; 1999.
317. Wilsnack SC. The GENACIS Project: A review of findings and some implications for global needs in women-focused substance abuse prevention and intervention. *Subst Abuse Rehabil*. 2012;3(suppl 1):5-15. PMID: 24474872.
318. Lewis MA, Neighbors C. Optimizing personalized normative feedback: The use of gender-specific referents. *J Stud Alcohol Drugs*. 2007;68(2):228-237. PMID: 17286341.
319. Holder HD, Gruenewald PJ, Ponicki WR, et al. Effect of community-based interventions on high-risk drinking and alcohol-related injuries. *JAMA*. 2000;284(18):2341-2347. PMID: 11066184.
320. National Institutes of Health, Office of Extramural Research. Inclusion of women and minorities as participants in research involving human subjects—policy implementation page. http://grants.nih.gov/grants/funding/women_min/women_min.htm. Accessed August 7, 2017.
321. Clayton JA, Collins FS. Policy: NIH to balance sex in cell and animal studies. *Nature*. 2014;509(7437):282-283. PMID: 24834516.
322. Heidari S, Babor TF, De Castro P, et al. Sex and gender equity in research: Rationale for the SAGER guidelines and recommended use. *Res Integrity Peer Rev*. 2016;1:2.