

# Gender Differences in Binge Drinking

## Prevalence, Predictors, and Consequences

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*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.<sup>1-3</sup> 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.<sup>4</sup> 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).<sup>5,6</sup> 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).<sup>7-10</sup> Furthermore, many studies use gender-specific measures of binge drinking (e.g., 5+ drinks for men and 4+ drinks for women),<sup>11</sup> but many other studies use the same measure for men and

women (e.g., the Alcohol Use Disorders Identification Test uses 6+ drinks).<sup>12-16</sup> 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.<sup>17</sup>

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.<sup>18,19</sup> 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).<sup>20-33</sup> 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.<sup>34</sup> 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.<sup>3</sup>

## 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.<sup>35</sup> 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.<sup>3</sup>
- Frequency of binge drinking by men and women often shows complicated nonlinear relationships with age.<sup>28,36,37</sup>
- Gender-specific associations of age with binge drinking may vary among regions within countries.<sup>38</sup>

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.<sup>35,39,40</sup> 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 <sup>20</sup>	United States, ages 18 and older	5+ drinks, 1 occasion, past 30 days	33%	17%
China Chronic Disease and Risk Factor Surveillance, 2007 <sup>21</sup>	China, ages 15 to 60	50+ grams (men), 40+ grams (women), ethanol, 1 day, past 12 months	32%	4%
Health Survey for England, 2007 <sup>22</sup>	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 <sup>23</sup>	Kangwha County, Korea, ages 55 and older	6+ drinks, 1 occasion, past year	21%	<1%
Moscow Health Survey 2004 <sup>24</sup>	Moscow, Russia, ages 18 and older	80+ grams (men), 60+ grams (women), ethanol, 1+ occasion per month	30%	6%
National Health Survey 2004, Singapore <sup>25</sup>	Singapore, ages 18 to 69	5+ drinks, 1 occasion, past month	9%	5%
National survey, Denmark, 2003 <sup>26</sup>	Denmark, ages 15 to 99	6+ drinks, 1 occasion, once a month or more	38%	18%
National survey, Mozambique, 2005 <sup>27</sup>	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 <sup>28</sup>	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 <sup>29</sup>	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 <sup>30</sup>	South Africa, ages 15 and older	5+ drinks (men), 4+ drinks (women), 1 occasion, past month	17%	4%
Survey, Hong Kong, 2006 <sup>31</sup>	Hong Kong, ages 18 to 70	5+ drinks, 1 occasion, past 30 days	15%	4%
Survey of Lifestyle, Attitudes and Nutrition in Ireland, 2007 <sup>32</sup>	Ireland, ages 18 to 29	6+ drinks, 1 occasion, past year	92%	79%
Third National Health Examination Survey, Thailand, 2004 <sup>33</sup>	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).<sup>25,36,41-43</sup> 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.<sup>40,44</sup> 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.<sup>40,45</sup> 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.<sup>35,36,44</sup> 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.<sup>46</sup>

## 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).<sup>47-51</sup> Typically, research has found that women more often report childhood sexual abuse than men,<sup>52-54</sup> and men more often report childhood physical abuse than women,<sup>55,56</sup> but not always.<sup>57</sup> Gender differences in experienced neglect are uncertain.<sup>58-60</sup>

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).<sup>51</sup> 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.<sup>61</sup>

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,<sup>62</sup> 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).<sup>63</sup> 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.<sup>64-67</sup> Gender-specific analyses by Merline and colleagues<sup>64</sup> and White and colleagues<sup>67</sup> 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.<sup>68</sup> 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.<sup>69</sup> 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,<sup>70,71</sup> although the strength of this relationship has been challenged.<sup>72</sup> 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.<sup>73-75</sup> 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.<sup>76</sup> 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.<sup>77</sup> 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.<sup>78</sup>

### **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.<sup>79-81</sup> 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.<sup>82-84</sup> These behavior traits are more prevalent in

men than in women,<sup>85-87</sup> 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.<sup>88,89</sup> Other studies concluded that disinhibiting traits were more clearly associated with women's heavy drinking.<sup>90,91</sup> 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.<sup>92-95</sup> 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,<sup>96-99</sup> 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.<sup>100-102</sup> 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.<sup>68,103-107</sup> 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.<sup>108</sup> 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.<sup>103</sup> 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.<sup>108</sup>

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.<sup>109</sup> In the large U.S. National Epidemiologic Survey on Alcohol and Related Conditions (NESARC),<sup>105</sup> 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.<sup>110</sup> 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,<sup>111</sup> college students,<sup>112</sup> adults ages 18 to 25,<sup>113</sup> and adults older than age 50,<sup>114</sup> 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.<sup>115-117</sup> 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.<sup>118-120</sup>

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,<sup>121</sup> and smokers have a higher probability than nonsmokers of heavy drinking behavior at ages 35 and older.<sup>122</sup> In China in 2007, the majority of men and women smokers were also binge drinkers, an association that was much stronger in women.<sup>21</sup> 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.<sup>31</sup> 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.<sup>123</sup> 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.<sup>124</sup> 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.<sup>125</sup> 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.<sup>126</sup> 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.<sup>127</sup>

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.<sup>128</sup> 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.<sup>129</sup> 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.<sup>130</sup> 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.<sup>131</sup>

### 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,<sup>132,133</sup> 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,<sup>134</sup> 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.<sup>134</sup> 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.<sup>135</sup> 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.<sup>136</sup> 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.<sup>137</sup> However, the time order of binge drinking

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

## 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,<sup>138,139</sup> and pancreas.<sup>140-142</sup> 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.<sup>143</sup> 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.<sup>144</sup>

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.<sup>145-148</sup> 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.<sup>149,150</sup> (Alcohol is apparently less relevant in the rarer male breast cancer.<sup>151</sup>) 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).<sup>152,153</sup>

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.<sup>154</sup> 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.<sup>155</sup> 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.<sup>156</sup> 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.<sup>157</sup>

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.<sup>158,159</sup> Some research reported that drinking raised risk only for advanced cancer<sup>160</sup> or only for non-advanced cancer.<sup>161</sup> In other studies, heavier drinking raised prostate

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

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.<sup>168</sup> 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.<sup>158</sup> In contrast to these cohort-based studies, case-control data from the 2000 NHIS survey,<sup>169</sup> the U.K. Prostate Testing for Cancer and Treatment ( ProtecT ) study,<sup>170</sup> and the U.S. Prostate Cancer Prevention Trial<sup>171</sup> 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,<sup>172,173</sup> atrial fibrillation,<sup>174</sup> and stroke.<sup>175,176</sup> 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,<sup>177</sup> whereas other studies failed to find such connections.<sup>178-180</sup>

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

cardiovascular disorders, but reports of such associations often are not gender specific.<sup>181-183</sup> 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,<sup>184</sup> death from cardiovascular disease,<sup>185</sup> and death from ischemic stroke.<sup>186</sup> 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 hypertension<sup>187</sup> and for death after myocardial infarction.<sup>188</sup>

### Liver Disorders

Research has shown conclusively that heavy drinking increases risk of a variety of liver diseases and damage.<sup>189-191</sup> 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.<sup>192,193</sup>
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).<sup>194-196</sup> 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,<sup>190,197</sup> possibly because of differences in how the body distributes and metabolizes alcohol.<sup>189,198</sup> 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.<sup>199</sup>

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.<sup>200-202</sup> 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,<sup>203</sup> 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,<sup>204,205</sup> an effect that at least one study found mainly in males and in areas of the brain related to cognitive function and attentional processes.<sup>206</sup> Studies also have shown that adolescent binge drinkers had reductions in white and gray matter in the cerebellum (for both genders)<sup>207</sup> and changes in frontal cortices (thicker for females, thinner for males).<sup>208</sup> 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.<sup>209</sup>

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.<sup>210</sup> 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.<sup>211,212</sup>
2. In studies of response inhibition and monitoring of one's own behavior, binge drinking generally impaired females more than males,<sup>90,213,214</sup> but at least one study found an increase in performance self-monitoring among females, who were possibly compensating for alcohol effects.<sup>215</sup> 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,<sup>216</sup> another study found males and females were similarly impaired,<sup>217</sup> and a laboratory test of acute impairment reported that males and females performed similarly, although the females had higher BAC levels.<sup>218</sup>

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.<sup>219-222</sup> 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-reports<sup>40</sup> and the National Roadside Survey.<sup>223</sup> However, from 1982 to 2004, women's arrests for driving under the influence increased (while men's decreased),<sup>224</sup> possibly reflecting changes in laws and law enforcement (including lower limits for BACs) and increases in women's driving.<sup>225,226</sup>

U.S. surveys indicate that more than 80% of AID episodes were self-reported by binge drinkers.<sup>227,228</sup> 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).<sup>229</sup> 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.<sup>230</sup>

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.<sup>231</sup> 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.<sup>227,232,233</sup> 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.<sup>234</sup>

### 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.<sup>235,236</sup> Little is known about the circumstances in which men are sexually assaulted.<sup>237,238</sup>
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.<sup>239,240</sup>

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.<sup>241</sup> 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.<sup>242</sup> 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).<sup>243</sup> One college study found 1-year lagged effects of men's binge drinking on sexual aggression,<sup>244</sup> 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.<sup>245</sup> 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.<sup>236,240</sup> Apart from incapacitation and rape, women who binge drink are also at greater general risk of sexual victimization<sup>246-248</sup> 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.<sup>245</sup> One study of college women found evidence that binge drinkers may overestimate their ability to resist rape attempts.<sup>249</sup>

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 college<sup>250</sup> and in the general U.S. population,<sup>235</sup> experiences of sexual assault did not predict subsequent binge drinking. Other studies, however, did find that experiences of incapacitated rape<sup>251</sup> or repeated victimization<sup>252</sup> 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).<sup>247,250</sup>
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.<sup>245</sup>

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.<sup>253,254</sup> 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.<sup>255</sup> 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.<sup>256-259</sup> 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.<sup>260,261</sup> 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.<sup>258,262</sup> One might expect binge drinking, in particular, to increase the likelihood of IPV perpetration through disinhibition and increased aggression.<sup>263</sup> 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.<sup>258</sup> 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.<sup>264,265</sup> However, in multivariate analyses of U.S. data, the associations between binge drinking and IPV either disappeared<sup>264,265</sup> or became too small to be meaningful.<sup>266</sup>

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.<sup>258</sup> A meta-analysis of three longitudinal U.S. studies found that women's binge drinking significantly increased the odds of their subsequent IPV victimization,<sup>267</sup> but other U.S. studies either could not confirm such a relationship<sup>265,268,269</sup> or found only very weak relationships.<sup>266</sup> 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).<sup>270,271</sup>

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.<sup>267,272,273</sup> However, this relationship is not always evident or strong,<sup>268,269</sup> 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.<sup>274,275</sup> 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.<sup>276</sup> Limited previous research on harm to people other than the drinker has focused mainly on AID,<sup>277,278</sup> fetal development,<sup>279,280</sup> and IPV,<sup>281,282</sup> 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.<sup>283</sup>

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.<sup>284-286</sup> However, with a few exceptions,<sup>287,288</sup> 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.<sup>289</sup> 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.<sup>290</sup> 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.<sup>291-293</sup> A number of studies have reported a general tendency for women to respond somewhat better to a variety of psychosocial interventions<sup>294-296</sup> and to show a less consistent or harder-to-detect response to some pharmacological treatments.<sup>297,298</sup> 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.<sup>299</sup> 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,<sup>118-120</sup> 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.<sup>300</sup> 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.<sup>294,301</sup> She speculated that Web-based interventions may be particularly effective for women, perhaps due to women's greater involvement with electronic programs<sup>302</sup> and the greater feeling of anonymity online programs may provide for women who feel

stigmatized by their alcohol use or misuse.<sup>303</sup>

Considerable anecdotal evidence,<sup>304-306</sup> supported by qualitative studies in several countries,<sup>307-310</sup> 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.<sup>311</sup> 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.<sup>312,313</sup> 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 approaches<sup>314</sup> or by trying to frighten or shame them, such as with warning labels.<sup>315</sup> One modest policy step might be to restrict advertising that links drinking to liberation from traditional feminine roles and stereotypes.<sup>316</sup> 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.<sup>305,317</sup> Such messaging may be most effective if it provides gender-specific information about drinking norms<sup>318</sup> and is reinforced by multiple community sources.<sup>319</sup>

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.<sup>313</sup>

### **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 human<sup>320</sup> and animal studies.<sup>321</sup> 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.<sup>322</sup> 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.

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