

### ***Are Women More Vulnerable to Alcohol's Effects?***

Women appear to be more vulnerable than men to many adverse consequences of alcohol use. Women achieve higher concentrations of alcohol in the blood and become more impaired than men after drinking equivalent amounts of alcohol. Research also suggests that women are more susceptible than men to alcohol-related organ damage and to trauma resulting from traffic crashes and interpersonal violence. This *Alcohol Alert* examines gender differences in alcohol's effects and considers some factors that may place women at risk for alcohol-related problems.

### ***Prevalence of Women's Drinking***

Household surveys indicate that alcohol use is more prevalent among men than women in the United States (1,2). In one survey, 34 percent of women reported consuming at least 12 standard drinks<sup>1</sup> during the previous year compared with 56 percent of men (1). Among drinkers surveyed, 10 percent of women and 22 percent of men consumed two or more drinks per day on average (1). Men are also more likely than women to become alcohol dependent (3).<sup>2</sup>

Women's drinking is most common between ages 26 and 34 and among women who are divorced or separated (2). Binge drinking (i.e., consumption of five or more drinks per occasion on 5 or more days in the past month) is most common among women ages 18 to 25 (2). Among racial groups, women's drinking is more prevalent among whites, although black women are more likely to drink heavily (1).

## ***Metabolism***

Women absorb and metabolize alcohol differently than men. In general, women have less body water than men of similar body weight, so that women achieve higher concentrations of alcohol in the blood after drinking equivalent amounts of alcohol (5,6). In addition, women appear to eliminate alcohol from the blood faster than men. This finding may be explained by women's higher liver volume per unit lean body mass (7,8), because alcohol is metabolized almost entirely in the liver (9).

## ***Consequences of Alcohol Use***

Research suggests that women are more vulnerable than men to alcohol-related organ damage, trauma, and legal and interpersonal difficulties.

***Liver Damage.*** Compared with men, women develop alcohol-induced liver disease over a shorter period of time and after consuming less alcohol (10,11). In addition, women are more likely than men to develop alcoholic hepatitis and to die from cirrhosis (12). Animal research suggests that women's increased risk for liver damage may be linked to physiological effects of the female reproductive hormone estrogen (13).

***Brain Damage.*** Views of the brain obtained by magnetic resonance imaging (MRI) suggest that women may be more vulnerable than men to alcohol-induced brain damage. Using MRI, researchers found that a brain region involved in coordinating multiple brain functions was significantly smaller among alcoholic women compared with both nonalcoholic women and alcoholic men. These differences remained significant after measurements were adjusted for head size (14). Conversely, a study measuring metabolic energy utilization in selected brain regions found a significant difference between alcoholic and nonalcoholic men but no significant difference between alcoholic and nonalcoholic women (15). These results are not

consistent with a greater vulnerability to alcoholic brain damage in women. However, the female alcoholics reported less severe alcohol use compared with the male alcoholics studied (15).

**Heart Disease.** Men and women who consume one or two alcoholic drinks per day have a lower death rate from coronary heart disease (e.g., heart attacks) than do heavier drinkers and abstainers, as discussed in *Alcohol Alert No. 45, "Alcohol and Coronary Heart Disease"* (16). Among heavier drinkers, research shows similar rates of alcohol-associated heart muscle disease (i.e., cardiomyopathy) for both men and women, despite women's 60 percent lower lifetime alcohol use (17).

**Breast Cancer.** Many studies report that moderate to heavy alcohol consumption increases the risk for breast cancer (18), although one recent study found no increased breast cancer risk associated with consumption of up to one drink per day, the maximum drinking level reported by most women (19).

**Violent Victimization.** A survey of female college students found a significant relationship between the amount of alcohol the women reported drinking each week and their experiences of sexual victimization (20). Another study found that female high school students who used alcohol in the past year were more likely than nondrinking students to be the victims of dating violence (e.g., shoving, kicking, or punching) (21).

A history of heavy premarital drinking by both partners has been found to predict first-year aggression among newlyweds (22). In some studies, problem drinking by wives has been linked to husband-to-wife aggression regardless of the husbands' drinking levels (23).

**Traffic Crashes.** Although women are less likely than men to drive after drinking (1,24) and to be involved in fatal alcohol-related crashes (25), women have a higher relative risk of driver fatality than men at similar blood alcohol concentrations (26). Laboratory studies of the effects of alcohol on responding to visual cues and other tasks suggest that there may be gender differences in how alcohol affects the performance of driving tasks (27).

Women's lower rates of drinking and driving may be attributed to their lower tendency toward risk taking compared with men (28,29).

Women are also less likely to view drinking and driving as acceptable behavior. In a 1990 national household survey, 17 percent of women, compared with 27 percent of men, agreed that it was acceptable for a person to drink one or two drinks before driving (30). Nevertheless, the proportion of female drivers involved in fatal crashes is increasing. In 1996, 16 percent of all drivers involved in alcohol-related fatal crashes were women, compared with 13 percent in 1986 and 12 percent in 1980 (25).

### ***Risk Factors for Women's Alcohol Use***

Factors that may increase women's risk for alcohol abuse or dependence include genetic influences, early initiation of drinking, and victimization.

***Genetic Factors.*** The relative contribution of genetic factors to women's risk for alcoholism has been debated. A survey of 2,163 female twins revealed greater similarity between identical twins compared with fraternal twins on measures of alcohol consumption (31). Similar studies including more than 12,000 twin pairs from the general population have confirmed that among both male and female twin pairs, identical twins are more likely than fraternal twins to have similar rates of alcohol dependence, alcohol abuse, and heavy alcohol consumption (32,33).

Studies of women who had been adopted at birth have shown a significant association between alcoholism in adoptees and their biological parents (34). In addition, antisocial personality (e.g., aggressiveness) in biological parents may predict alcoholism in both male and female adoptees (35). However, potential interactions between genetic and environmental influences require further study.

Using laboratory animals, researchers are currently attempting to identify gender-specific genetic factors whose interactions might contribute to differential sensitivity to alcohol's effects (36).

**Age of Initiating Drinking.** Results of a large nationwide survey show that more than 40 percent of persons who initiated drinking before age 15 were diagnosed as alcohol dependent at some point in their lives (37). Rates of lifetime dependence declined to approximately 10 percent among those who began drinking at age 20 or older. The annual rate of this decline was similar for both genders (37). Although in the past women generally started drinking at later ages than men, more recent survey data show that this difference has nearly disappeared (2).

**Victimization.** Using data collected in a large general population survey, Wilsnack and colleagues (38) found that women who reported being sexually abused in childhood were more likely than other women to have experienced alcohol-related problems (e.g., family discord or household accidents) and to have one or more symptoms of alcohol dependence. Another study found that women in alcoholism treatment were significantly more likely to report childhood sexual abuse and father-to-daughter verbal aggression or physical violence compared with women in the general population (39).

Widom and colleagues (40) reached a different conclusion from that of Miller and colleagues. Instead of relying on women's recall of their pasts, Widom and colleagues consulted court records to identify cases of childhood physical or sexual abuse. These researchers found that for women, a history of childhood neglect, but not abuse, significantly predicted the number of alcohol-related symptoms experienced, independent of parental alcohol or other drug (AOD) problems, childhood poverty, race, and age.

Physical abuse during adulthood has also been associated with women's alcohol use and related problems. One study found that significantly more women undergoing alcoholism treatment experienced severe partner violence (e.g., kicking, punching, or threatening with a weapon) compared with other women in the community. In addition, among women in the community group, those with AOD-related problems reported significantly higher rates of severe partner violence than women without such problems. Although the findings indicate that partner violence and AOD problems co-occur among women, the data do not indicate whether the

association is causal (41).

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***Are Women More Vulnerable to Alcohol's Effects? A  
Commentary by NIAAA Director Enoch Gordis, M.D.***

As can be seen by the varied types of information reported on in this *Alcohol Alert*, the alcohol research field has begun to recognize the importance of understanding gender differences in how alcohol is used, in the consequences of alcohol use, and in the development of alcohol dependence. For example, where women and men drink at the same rate, women continue to be at higher risk than are men for certain serious medical consequences of alcohol use, including liver, brain, and heart damage. We know that some of this risk is due to gender differences in metabolism; it also could quite possibly be due to gender-related differences in brain chemistry, in genetic risk factors, or to entirely different factors that are currently unknown. The more science can tell us about gender-related aspects of alcohol-related problems—not only what they are but why—the better job we will be able to do to prevent and treat those problems in all populations.

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1A standard drink is 12 grams of pure alcohol, which is equivalent to 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of distilled spirits.

2Alcohol dependence was defined according to the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (4)*.

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