U.S. Department of Health & Human Services
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# ALCOHOL ALERT

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## ALCOHOL— AN IMPORTANT WOMEN'S HEALTH ISSUE

While it's true that men are more likely to drink alcohol and more likely to drink greater amounts, women have a higher risk of developing problems from alcohol consumption. When a woman drinks, the alcohol in her bloodstream typically reaches a higher level than a man's even if both are drinking the same amount. This is because women's bodies generally have less water than men's bodies. Because alcohol mixes with body water, a given amount of alcohol is less diluted in a woman's body than in a man's. Women become more impaired by alcohol's effects and are more susceptible to alcohol-related organ damage. That is, women develop damage at lower levels of consumption over a shorter period of time.

Considering that about one-third of American women report regular alcohol consumption (1) and 2.3 percent, or 2.5 million women, meet the criteria for alcohol dependence (2), it is clear that research to better understand the effects of alcohol in women is critical. This issue of *Alcohol Alert* summarizes some of the most practical implications for women across the lifespan to come from that research.

### ADOLESCENCE— SETTING THE STAGE

Results from national surveys show that alcohol use is prevalent among both adolescents and young adults. And while heavy drinking remains more common among young men, the number of young women who drink heavily is alarmingly high (3).

Adolescence is a critical stage of development. Rapidly changing body systems may be especially vulnerable to alcohol's effects. Drinking during this time of accelerated brain and hormonal maturation may have long-term consequences (4).

*"The younger a woman is when she begins drinking, the more likely she is to develop a problem with alcohol later in life."*

During adolescence, striking physical changes occur in the brain. The prefrontal cortex, the brain region thought to be involved in various goal-directed behaviors, undergoes substantial changes (5). The

amygdala, the brain structure believed to be involved in a person's emotional reactions and coordinating the body's response to stress, also undergoes developmental changes (6). Changes in these systems have a powerful effect on adolescent psychological functioning and behavior. As a result, some adolescents may be more likely to engage in risk-taking behaviors, such as experimenting with alcohol and other drugs.

In adolescents with significant alcohol use problems, the volume of the hippocampus, a brain region important for learning and memory, has been found to be significantly smaller than in control subjects (7). Limited research suggests that women may be more susceptible than men to shrinkage of brain regions (8). Whether this is true in adolescent girls is not yet known.

Adolescence is a time of dramatic changes in hormone levels and patterns. Gender differences in the body's hormonal response to stress also begin to emerge. Some girls may be at particular risk for emotional difficulties, depression, and problems with self-image as well as an increase in risk-taking behaviors. In addition, during early adolescence, girls may be especially vulnerable to stress (9–11). Levels of perceived stress have been found to be the most powerful predictor of alcohol and other drug use, after peer substance use (12).

Finally, evidence from animal studies suggests that alcohol may affect adolescents differently than adults. Adolescents do not become as uncoordinated or sleepy when drinking alcohol as adults do (13). Adolescents do, however, appear to be more sensitive to alcohol-induced disruptions in certain types of memory (14). Clearly, more research is needed to explain how gender differences may influence the way alcohol affects the developing adolescent brain and other body systems. What is known, however, is that the younger a person begins drinking, the more likely he or she is to develop a problem with alcohol later in life (15).

## The Reproductive Years

Alcohol use may have effects on female reproductive function at several stages of life. Some research suggests that the growth spurt and normal timing or progression of puberty may be at risk in human adolescents who consume even moderate amounts of alcohol on a regular basis (16). Heavy drinking has been shown to disrupt normal menstrual cycling and reproductive function. The reproductive consequences associated with alcohol abuse and alcoholism range from infertility and increased risk for spontaneous abortion, to impaired fetal growth and development (17).

### What Is a Drink?

- One 12-ounce bottle of beer or wine cooler
- One 5-ounce glass of wine
- 1.5 ounces of 80-proof distilled spirits.

### Fetal Alcohol Syndrome

Maternal alcohol use during pregnancy contributes to a wide range of effects on exposed offspring, including hyperactivity and attention problems, learning and memory deficits, and problems with social and emotional development. The most serious consequence of maternal drinking during pregnancy is fetal alcohol syndrome (FAS). Children with FAS have a distinctive set of facial anomalies, growth retardation, and significant learning and/or behavioral problems. Even children prenatally exposed to lower levels of alcohol may exhibit learning and behavioral problems. Thus far, a threshold below which no fetal damage will occur has not been established. In the absence of such information, following the Surgeon General's recommendation that women abstain from drinking alcohol during pregnancy remains the safest course (18).

### Breast Cancer

One of every eight American women will develop breast cancer in her lifetime (19). Some evidence suggests that alcohol consumption may increase the risk of breast cancer. Although the risk is relatively small, the benefits of moderate alcohol use should be weighed against the risk of developing cancer, especially in women with a

*"Research suggests that moderate alcohol use may be linked to breast cancer."*

family history of breast cancer, who appear to be at particular risk, even at low levels of drinking (20). Likewise, postmenopausal women who drink moderate amounts of alcohol have a higher risk of breast cancer if they use hormone replacement therapy (HRT), a known risk factor for breast cancer (21).

*"Light-to-moderate drinking may be associated with increased bone mineral density and decreased risk of fracture in postmenopausal women."*

## Alcohol and Older Women

The cessation of ovarian function at menopause and the accompanying decline in the production of the sex steroid hormones secreted by the ovaries are marked not only by characteristic signs and symptoms but also by a loss of estrogen's protective effects against osteoporosis and coronary heart disease. Alcohol use affects the health of postmenopausal women in two ways—directly, through its impact on organ systems such as the liver, brain, and gastrointestinal tract, and indirectly, by altering the blood levels of sex steroids that affect the risk for disease (22). Both the pattern and amount of alcohol that a woman drinks influence whether alcohol has a beneficial or harmful effect on her body.

### What Is a Safe Level of Drinking?

▶ **The *Dietary Guidelines for Americans* recommend no more than one drink per day for women, and no more than two drinks per day for men. Drinking at these levels usually is not associated with health risks and may prevent certain forms of heart disease.**

### Heart Disease

Coronary heart disease (CHD) is the number one killer of American women. One in every three American women dies of CHD (23). Several studies suggest that in pre- and postmenopausal women, light-to-moderate alcohol consumption may increase blood concentrations of estrogen and its metabolic byproducts—which may serve to protect against CHD (24). In fact, the incidence of CHD remains low until after menopause, apparently because abundant estrogen protects women against CHD. After menopause, however, women's risk of CHD increases, approaching that of men. A large body of epidemiological evidence strongly suggests that light-to-moderate alcohol consumption significantly reduces the risk of CHD in both genders. Although the exact mechanisms remain unclear, alcohol has been found to improve the risk factors and conditions associated with CHD, such as reducing the LDL, or "bad" cholesterol, and increasing the HDL, or "good" cholesterol; and reducing blood clotting and the "stickiness" of platelets, small cells that play an important role in clot formation. It is clear, on the other hand, that heavy drinking can damage the heart.

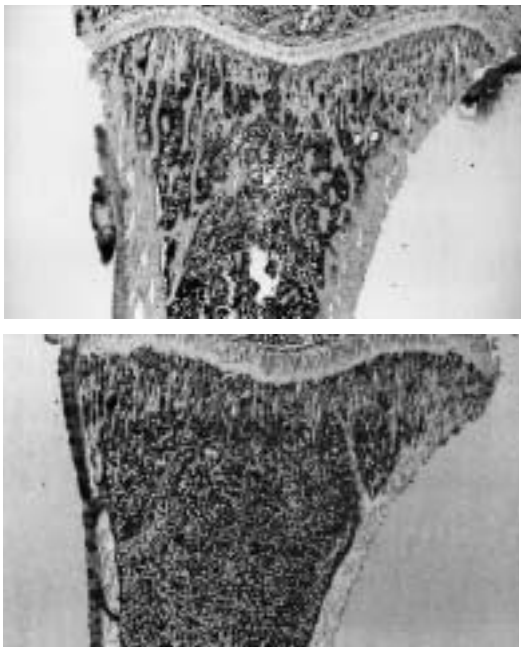
### Bone Disease

Osteoporosis is a skeletal disease characterized by low bone mass, increased bone fragility, and susceptibility to fracture. Nearly half of all women over age 50 will have an osteoporosis-related fracture in their lifetime (25). At about age 35, people reach their "peak bone mass"—the point at which their bones are as strong as they will become (26). After age 35, women lose 0.5 to 1 percent of their bone mass each year. At menopause, when the ovaries stop producing estrogen, the rate of bone loss increases to about 3 to 7 percent per year (27).

Some epidemiological studies suggest that light-to-moderate alcohol consumption may be associated with increased bone mineral density and decreased fracture risk in postmenopausal women (28,29). This effect has not been found in animal studies in which the amount of alcohol consumed as well as other lifestyle factors could be controlled (30). On the other hand, heavy alcohol use clearly has been shown to compromise bone health and to increase the risk of osteoporosis by decreasing bone density and weakening the bone's mechanical properties. These effects are especially striking in young

women, whose bones are still developing, but chronic alcohol use in adulthood also can harm bone health (31). In addition, animal studies suggest that bones do not overcome the damaging effects of early chronic alcohol exposure even when alcohol use is discontinued (32). Other lifestyle factors, such as tobacco use, also may increase the risk of osteoporosis and fractures. People who drink are 75 percent more likely to smoke, and smokers are 86 percent more likely to drink (33). This combination of habits significantly compounds osteoporosis risk (34).

## Alcohol's Effect on Bone



**Normal bone (top) and bone after heavy alcohol consumption (bottom). Note that lighter-colored areas of bone are missing in the bottom image.**

The greatest risk factor for the development of osteoporosis in women is menopause. Previous research found that postmenopausal HRT protected against the loss of bone density and greatly reduced the risk of osteoporosis-related fractures. However, findings from the Women's Health Initiative—a large study on the risks and benefits of strategies that may reduce the incidence of heart disease, breast and colon cancer, and fractures in postmenopausal women—found that when weighed against the risk of other types of disease, such as cancer, there was no net benefit for using HRT, even in women who have a high risk of fracture (35). Other factors, such as weight-bearing exercise and increased body mass, do have beneficial effects on bone health (31,35).

### Memory and Brain Function

Alzheimer's disease (AD) is the most common form of dementia among older people. It is characterized by progressive changes in cognitive ability, memory, and mood. Women appear to be at greater risk than men for AD, although women's longer life spans may contribute to this higher risk (36). Heavy alcohol consumption is known to result in memory deficits. Heavy alcohol consumption also may increase the risk for AD in both genders and in women in particular, as they appear to be more vulnerable than men to alcohol-induced brain damage (36). At present there is no evidence to suggest that brain function is negatively affected by moderate alcohol consumption. In fact, some researchers believe that moderate drinking may even protect the blood vessels in the brain, in a way that is similar to how it protects the vessels in the heart against CHD.

### Mixing Alcohol With Medications

More than 150 prescription and over-the-counter (OTC) medications interact negatively with alcohol (37). Older women may be more sensitive to the effects of OTC and prescription medications (38,39). Although people over 65 make up 12 percent of the population, they consume 25 to 30 percent of all prescription medications (40). Careful attention to the occurrence of alcohol/medication interactions is especially important in this population.

## Putting Research Into Practice

Research is providing information on many aspects of women's use of alcohol, including ethnic patterns of drinking, differences between the sexes in how genes affect the risk of alcohol-related problems, and the greater vulnerability of women to the health effects of heavy drinking.

The bottom line is that health care professionals, especially those involved in prevention and treatment of alcohol use disorders, but also those providing general

*"More than 150 prescription and over-the-counter medications interact negatively with alcohol."*

health care, need to be aware of how alcohol use may affect women's health. The ability to effectively deliver care to women may be significantly influenced by patients' use of alcohol or their knowledge of the impact that alcohol may have on their well-being. Helping each woman to balance the risks and benefits of alcohol use, and to understand the tradeoffs involved with drinking, is critical.

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## Resources

- **Source material for this *Alcohol Alert* originally appeared in *Alcohol Research & Health,* Volume 26, Number 4, 2002. See NIAAA's Web site for subscription information.**

- **The *Dietary Guidelines for Americans* are issued jointly by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services. The Guidelines can be viewed online at the Web site www.nutrition.gov.**


- ***Alcohol: A Women's Health Issue* is a patient education booklet describing the health effects of both moderate and heavy drinking on women. It is available in English and Spanish, and health care providers may order multiple copies to share with patients. An educational video also is available. For more information, and for additional resources, visit NIAAA's Web site, www.niaaa.nih.gov.**

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