

# DRINKING ALCOHOL AND COGNITIVE DECLINE

## WHAT IS ALREADY KNOWN

Excessive alcohol consumption is a major contributor to lost lives and lost health in the United States. The United States federal guidelines define the limits of low-risk drinking as up to 2 standard drinks per day for a male and 1 standard drink per day for non-pregnant females. A standard drink is typically defined as containing about 14 grams (0.6 ounces) of pure alcohol, which is roughly equivalent to 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of distilled spirits. Drinking above these limits can increase one's long-term risk for cancer, injuries and violence, certain forms of heart disease, liver damage, and death. Drinking heavily can also lead to alcohol use disorder, a form of addiction in which the individual cannot control their drinking even when it has adverse social or medical consequences.

Excessive alcohol consumption can damage the brain in several ways. Alcohol itself can damage nerve cells at high doses, and prolonged heavy drinking leads to a specific form of cognitive decline and dementia (termed alcoholic dementia). Even occasional binge drinking, defined as 5 or more drinks in a day for a man or 4 or more for a woman, can raise blood pressure and risk for atrial fibrillation, the most common heart rhythm disorder, both of which can lead to stroke. Individuals who consume excessive alcohol may also neglect other parts of a healthy diet, leading to nutritional deficiencies that can damage the brain.

Whether there is damage to the brain when a person engages in alcohol consumption below or at the recommended limits is uncertain. Some studies suggest that it is safe for the brain, while others do not. In particular, individuals at higher risk for dementia, such as those with mild cognitive impairment or with a genetic tendency toward dementia, may face increased risk even from limited drinking. These findings are based on correlational studies, which identify associations but cannot establish a direct causal relationship between alcohol use and cognitive decline due to potential confounding factors.

## BACKGROUND AND EVIDENCE BASE

Heavy alcohol consumption has long been known to produce distinctive chronic brain syndromes. In severe cases, this can lead to alcoholic dementia, characterized by widespread and lasting brain damage. However, even before reaching that level of severity, excessive alcohol use

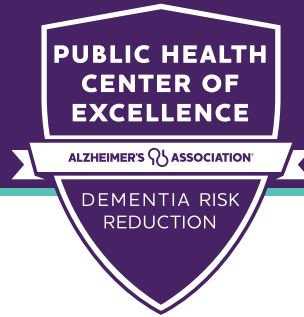
may impair cognitive functions such as memory, attention, and decision-making. These subtler effects can accumulate over time and may not be immediately recognized as part of a broader pattern of cognitive decline.

In addition to direct neurotoxicity, excessive drinking can lead to injury to the brain through several other pathways. For example, individuals with alcohol use disorder, who may consume alcohol at the expense of healthy food, can develop vitamin B1 (thiamine) deficiency, which in turn can injure brain cells and cause a distinctive form of dementia called Korsakoff syndrome. Falls that occur during episodes of heavy drinking can produce concussions and, with repeated injury, chronic traumatic encephalopathy, a progressive degenerative brain disease.

In addition, heavy alcohol consumption can lead to strokes, which cumulatively can also cause dementia through multiple pathways. First, heavy drinking causes high blood pressure, which is the major risk factor for all types of stroke. Second, even occasional episodes of heavy drinking can trigger atrial fibrillation, which is the most common abnormal heart rhythm. This combination of drinking and atrial fibrillation is so common that it has been termed the "holiday heart syndrome." Atrial fibrillation can then lead to blood clots in the heart that may travel to the brain, leading to strokes.

In contrast with excessive drinking, consumption within recommended limits remains a controversial area for research, and the effect of limited alcohol consumption on risk for dementia is not yet settled. For example, an expert panel convened by the National Academies of Sciences, Engineering, and Medicine concluded in January 2025 that too little evidence existed to confidently understand how limited drinking affects risk of dementia, Alzheimer's disease, or cognitive decline.

Important reasons exist to be cautious about even limited alcohol consumption and its effect on the brain. For example, nerve cells are more sensitive to damage from alcohol consumption than are cells in other organs. Even 1-2 drinks can raise blood alcohol concentrations enough to affect individuals' ability to complete complex tasks like driving. In large studies, people who consume higher amounts of alcohol are more likely to have more overall brain shrinkage and more shrinkage of the hippocampus, a particular hallmark of Alzheimer's disease, with no evidence for a threshold. Finally, alcohol acts as a mild blood thinner, reducing the clotting ability of the blood.



This could increase the risk of hemorrhagic strokes, where bleeding occurs into the brain.

Other evidence suggests that limited alcohol consumption is unlikely to worsen cognition markedly for most adults in the same way that heavy drinking does. For example, while heavy drinking increases blood pressure, drinking within recommended limits appears not to. Consistent with that finding, the risk of ischemic stroke also does not increase with limited drinking. When consumed in limited amounts with meals, alcohol also tends to reduce average blood sugar, which may slow the development of diabetes, a major risk factor for cognitive decline. A combined analysis of 15 individual studies in 2023 concluded that dementia risk did not differ meaningfully among older adults based on their alcohol intake if they remained within recommended limits.

## IMPLICATIONS FOR PUBLIC HEALTH

Excessive alcohol consumption is a major public health concern, in part because of its damaging effects to the brain. Excessive alcohol consumption is most common among individuals in their 20s and 30s where its major health consequences are increases in injury and violence, but older adults are particularly susceptible to harm from alcohol because their metabolism of alcohol and baseline health can worsen with age. Similarly, women tend to consume less alcohol than men, but harms from alcohol occur at lower levels of consumption among women. Thus, strong efforts to eliminate excessive drinking are needed for individuals of all ages and regardless of sex, beginning with better education about the definition of excessive drinking. Unfortunately, many adults in the United States and globally remain unaware of the specific risks alcohol poses to brain health. These risks include impaired memory, reduced attention and executive function, increased likelihood of mood and anxiety disorders, and at higher levels of consumption, structural brain changes and increased risk for cognitive decline and dementia.

At present, more limited amounts of alcohol consumption have not consistently been found to increase risk for cognitive decline or dementia, although it appears to increase risk for other diseases, such as female breast cancer and atrial fibrillation. Moreover, some individuals, such as those with early cognitive impairment, may be at particular risk with even limited drinking. Therefore, middle-aged and older adults who consume alcohol

within recommended limits should review their alcohol consumption with a health professional regularly and be prepared to modify it as their health changes or as new evidence emerges about this highly complex substance.

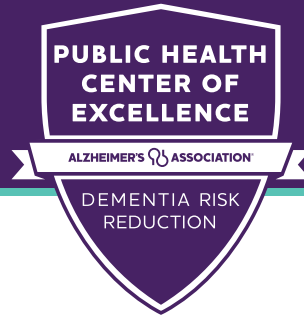
## *The role of social determinants of health*

Alcohol consumption varies markedly across different cultures. Many religious groups abstain completely from alcohol, for example, while others may use wine in specific religious ceremonies. Similarly, some cultures (e.g., Mediterranean countries such as Italy and Spain) tend to encourage limited amounts of alcohol consumption in social settings with meals, which blunts the spikes in blood alcohol concentration that can damage brain cells. In general, alcohol consumption is most harmful in cultural settings where binge drinking occurs.

In addition to the ways that social factors can affect alcohol consumption and its consequences, alcohol can also affect social factors in turn. Alcohol use disorder and problem drinking are powerful social factors, leading to alienation from friends and family, poor self-care, and loss of employment and insurance. Social isolation and lack of self-care can contribute to cognitive decline, exacerbating the harm caused by excessive alcohol consumption itself.

## DISCUSSION

Alcohol consumption remains one of the most complicated medical topics to study, in part because it may not have the same types of effects if consumed within recommended limits that it does at higher doses. This unusual relationship, sometimes called a “J-shaped curve,” does not occur for substances that are either always harmful (e.g., cigarette smoking) or always beneficial (e.g., eating a balanced diet). In addition, investigators have not yet conducted long-term randomized trials of alcohol consumption (similar to what normally occurs for new medications), leaving doctors and patients with evidence that is not definitive, can be difficult to interpret, and seems to change frequently. Nonetheless, the key federal guidelines about alcohol consumption – do not drink more than 1 drink in a day for women or 2 drinks in a day for men – have not changed in decades and remain the basis for maintaining a healthy lifestyle that may reduce risk for dementia.



## Selected References

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