

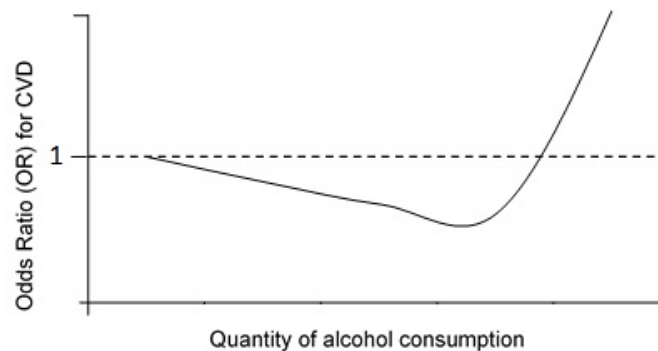
Drinking and Cardiovascular Health

DRINKING AND CARDIOVASCULAR DISEASE RISK

Cardiovascular disease (CVD) is one of the main types of noncommunicable disease (NCD) and is the leading cause of death globally, particularly in low and middle income countries [2].

- Alcohol consumption has been identified as one of the main modifiable risk and protective factors for CVD.
- The effects of alcohol on cardiovascular health were first reported in the *Journal of the American Medical Association* in 1904 [3] and have since been supported by hundreds of observational and experimental studies.

The relationship between alcohol consumption and risk for cardiovascular conditions is generally characterized by a U- or J-shaped curve, which means that lifetime risk is lower for individuals who are light drinkers than for those who drink heavily or do not drink at all [65, 66].



A similar U-shaped curve has also been established between drinking and death from all causes (all-cause mortality) because of the high proportion of CVD deaths [4-6].

Different drinking patterns are associated with varying levels of risk for CVD.

Heavy alcohol consumption increases the risk for some types of CVD[4].

- Chronic heavy drinking may worsen outcomes of existing cardiomyopathy [7].
- Risk of acute myocardial infarction [8] may also be increased with heavy drinking.
- Both chronic heavy drinking and heavy episodic drinking (HED), also referred to as “binge” drinking, are linked with increased risk for hemorrhagic stroke [9], partly due to alcohol’s anticoagulant properties [10], as well as for total stroke risk [11, 12].
- Atrial fibrillation, an abnormal cardiac rhythm, is associated with HED [10, 13]. Some studies also show an increased risk with moderate to heavy drinking [13, 14].
- Heavy drinking is also associated with hypertension; for women, the risk is characterized by a J-shaped risk curve, whereas for men the association appears to be linear [15, 16].

Thirty years of robust biomedical, clinical, and epidemiological evidence support a significant inverse relationship between moderate drinking and CVD.

An inverse relationship between moderate alcohol consumption and risk of disease has been observed for the following cardiovascular and related illnesses:

- Nonfatal myocardial infarction (heart attack) [17, 18];
- Ischemic stroke [9, 10, 19];
- Coronary heart disease (CHD) [6, 11, 20, 21] and ischemic heart disease (IHD) [22, 23];
- Peripheral arterial disease (PAD) [10, 20, 24];
- Heart failure [25-28];
- Hypertension (high blood pressure) [15, 16, 29].

A relationship has also been described between low-to-moderate alcohol consumption and improved CVD outcomes for health conditions independently associated with CVD, such as diabetes and hypertension.

- In a 2014 meta-analysis of prospective cohort studies examining CVD outcomes among patients with hypertension, low-to moderate alcohol consumption (defined as between 10 to 30g per day) was associated with significantly reduced risk of CVD and all-cause mortality [30].
- Similarly, in a 2006 meta-analysis of studies examining patients with Type 2 diabetes, alcohol consumption up to 18g per day was associated with reduced CHD incidence and mortality [6].

The biological mechanisms underlying the effects of moderate drinking on CVD risk have been extensively studied and are well documented.

Specifically, alcohol (ethanol) may:

- Reduce the development of atherosclerosis and arterial plaques [31];
- Improve endothelial (vascular lining) function [32];
- Increase levels of high-density lipoprotein (HDL), or “good,” cholesterol [33-35];
- Reduce the risk of arterial blockage through thrombolytic (anti-coagulation and blood clotting) action in conditions such as ischemic stroke and atherosclerosis [34, 36]; and
- Increase insulin sensitivity [37, 38].

However, there are variations in outcomes among individuals. In some instances, the same pathways that confer benefits for some individuals may also lead to negative outcomes for others [39].

The relationship between moderate drinking and beneficial outcomes is complex.

- The protective effects of moderate drinking may be diminished or eliminated when moderate drinkers engage in HED [22, 40].
- Research also shows that moderate drinking that accompanies meals may increase the cardioprotective effects of alcohol compared to drinking that occurs outside of meals. Several explanations have been proposed.
 - They include slower absorption of ethanol with food; increased alcohol elimination rates with meals; a beneficial effect of ethanol on fibrinolysis and lipids; and reductions in the breakdown of lipids [41, 42].
 - It has also been suggested that drinking alcohol with food is a reflection of distinct lifestyle or cultural norms, which themselves may be linked with protective health effects [42, 43].

The effects of moderate drinking are seen across all beverage types [18, 20, 34].

The main beneficial effects of alcohol beverages are linked with ethanol itself, present in wine, beer, and distilled spirits [44, 45].

- While some research suggests that other ingredients, such as resveratrol and other polyphenols (found especially in wine), may confer additional benefits due to antioxidant effects [46], there is insufficient evidence to conclude that one type of alcohol beverage is more beneficial than others.
- However, there is some indication that beverage preference may be associated with other health protective behaviors which may independently influence overall cardiovascular risk [47-49].

The relationship between drinking patterns and CVD outcomes is influenced by additional individual, genetic, and physiological factors, as well as by social and economic considerations.

Age and Gender:

- Protective effects of low-to-moderate alcohol consumption have been demonstrated among both men and women.
- Historically, these effects have been more often demonstrated among middle-aged and older men [20, 50, 51], and among postmenopausal women [53, 54].
- Recent studies are expanding the research into populations of younger adults. Half of the studies included in a recent meta-analysis of alcohol consumption and CVD outcomes among men compared with women included younger adults, replicating the findings from older populations [52].

Genetic factors:

- Genetic factors play a role in alcohol metabolism and influence risk for CVD [33]. These genetic factors can manifest themselves as physiological factors, including lipid metabolism and coagulation pathways [55].
- A recently developed research approach investigating the role of alcohol consumption in CVD suggests that genetic differences associated with lower or no alcohol consumption found in some individuals may explain the observed beneficial impact of moderate drinking on CVD [56].

Race and ethnicity:

- Race and ethnicity may also influence the relationship between drinking and outcomes; a stronger cardioprotective effect has been reported for White men and women in the United States, than for Black men and women with the same patterns of moderate drinking [57].
- The relationships between race, ethnicity, and the effects of moderate drinking are also in part attributable to social and economic differences, as well as in differences in lifestyles among the various groups studied [57].

There is also a strong association (or correlation) between moderate alcohol consumption and a healthy lifestyle that includes not smoking, maintaining a healthy body weight, regular exercise, and a healthy diet [58-60]. Individuals adopting two or more of these healthy behaviors have significantly lower risk of death from all causes including CHD.

METHODOLOGICAL CONSIDERATIONS

There has been extensive discussion about the role of study methodology and additional factors which may affect drink patterns, CVD, or the relationship between the two. In particular, questions have been raised regarding the cardioprotective effects of alcohol consumption.

Concern has been raised that the way in which moderate drinkers and abstainers, in particular, are classified in studies may have an impact on observed outcomes for CVD.

- It has been suggested that some studies failed to differentiate between lifetime abstainers, former drinkers, and occasional drinkers, biasing the observed improved outcomes for moderate drinkers compared with abstainers [61, 62].
- The “sick quitter” hypothesis has also been suggested, which points to the fact that many former drinkers may have stopped drinking for health reasons [63]. As a result, their worse health status may be the reason for the apparent better health outcomes among moderate drinkers.
- However, more recent studies have accounted for these issues and support the balance of the evidence that moderate drinking confers cardiovascular benefits for many adults [4, 51, 64].
- There is also concern that individuals generally underreport their alcohol consumption, which also has implications for the crafting of guidelines and for recommendations.

Many different factors play a role in the relationship between drinking and CVD outcomes and need to be controlled for in a study’s design or in the analysis of data.

- These include individual factors, such as gender, race and ethnicity, genetic and physiological factors; behavioral factors, such as smoking, diet, and physical activity; as well as social and economic considerations, also known as social determinants.

- Because epidemiological studies are unable to control for all potential confounders, results of observational studies should be interpreted with some caution. However, this must apply equally to both harms and benefits, and to evidence on different consumption patterns.

Inconsistencies in how moderate and heavy drinking are defined may play a role in whether study outcomes can be compared.

- There is little consistency in the definitions used across research studies regarding the use of “moderate” and “heavy” alcohol consumption. In some instances, definitions may include average daily or weekly volume, average frequency of alcohol consumption, or a combination. This lack of consensus on what constitutes moderate or heavy drinking can diminish comparability across different studies.
- And, as recent research differentiating drinking patterns suggests, it is important to distinguish consistent moderate drinking patterns from low-to-moderate drinking combined with occasional heavy episodic drinking [22, 40].

TERMS AND CONCEPTS

Cardiovascular disease (CVD) encompasses a number of distinct conditions involving the circulatory system (heart and blood vessels). Some of the main types of CVD or CVD-related conditions include:

- **Ischemic heart disease**, also known as **coronary artery disease** or **coronary heart disease (CHD)**, involves reduced blood supply to the heart, most often due to atherosclerosis, or thickening of arterial walls. Ischemic heart disease, coronary heart disease, and coronary artery disease are used interchangeably in the research literature;
- **Hypertension** refers to chronic elevated blood pressure defined as systolic blood pressure above 140 mm/Hg or diastolic pressure above 90 mm/Hg. Uncontrolled hypertension may lead to cardiovascular complications including heart failure, ischemic/coronary artery disease, atrial fibrillations and stroke;
- **Atrial fibrillation** refers to cardiac arrhythmia, or irregular heartbeat, and is a risk factor for stroke and heart failure;
- **Stroke** is the result of poor blood flow to the brain, and includes two types, **ischemic** stroke (resulting from lack of blood flow) and **hemorrhagic** stroke (resulting from bleeding in the brain);
- **Heart failure**, which can be chronic or acute, results from the heart’s inability to pump and circulate sufficient blood to the body;
- **Cardiomyopathy** refers to an abnormally enlarged, thickened, or stiffened heart muscle, or myocardium, resulting in a weakened heart muscle and diminished blood circulation, a chronic condition that can lead to cardiac arrhythmia or heart failure;
- **Myocardial infarction**, more commonly referred to as a heart attack, is the result of an obstruction of the blood supply, and oxygen, to the cells of the heart muscle, or myocardium; and
- **Peripheral arterial disease** is a more pervasive form of atherosclerosis, restricting blood flow to the limbs, and in some cases, to the cardiac, renal, and cerebral systems.

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Reviews

IARD Health & Policy Reviews cover the effects of alcohol consumption on health. They offer an overview of the relationship between drinking patterns and health outcomes, compile the key literature, and provide the reader with an extensive bibliography that refers to original research on each topic. The *Reviews* attempt to present the balance of the available evidence. They do not necessarily reflect the views of IARD or its sponsoring companies.

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The International Alliance for
Responsible Drinking (IARD)
The Jefferson Building
1225 19th Street NW, Suite 500
Washington, DC 20036

IARD
INTERNATIONAL ALLIANCE FOR
RESPONSIBLE DRINKING
action on alcohol and global health

Phone: 1.202.986.1159
Fax: 1.202.986.2080
Email: info@iard.org
Web: www.iard.org