The Harms and Benefits of Moderate Drinking: Summary of Findings of an International Symposium*

R. Curtis Ellison
Institute on Lifestyle & Health
Boston University School of Medicine
Boston, Massachusetts

Marjana Martinic
International Center for Alcohol Policies
Washington, DC

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The Harms and Benefits of Moderate Drinking: Findings of an International Symposium

R. Curtis Ellison,* Marjana Martinic†

In May 2006, the Institute on Lifestyle and Health at Boston University School of Medicine and the International Center for Alcohol Policies jointly sponsored an international symposium to examine harms and benefits associated with moderate drinking. The meeting brought together leading researchers from the fields of medicine, epidemiology, and the biomedical and social sciences. A supplement to Annals of Epidemiology, for which R. Curtis Ellison is the Guest Editor, contains the papers presented, and this review article summarizes the evidence discussed at the symposium.

Alcoholic beverages are an integral part of cultures around the world. In addition to its social effects, “moderate drinking,” when defined as excluding any binge drinking, has been shown to have predominantly beneficial effects on health. Despite questions about methodology in some epidemiologic studies, the consensus of the conference was that the total scientific evidence strongly supports an inverse association between moderate alcohol consumption and the risk of cardiovascular diseases, and possibly diabetes, cognitive decline, and total mortality; numerous mechanisms have been identified to support this association. Liver disease and certain cancers are undoubtedly related to alcohol intake, especially heavy drinking. Culture plays a strong moderating effect and can be a powerful tool in promoting drinking practices that are positive while discouraging those associated with harm. The need for better definitions of patterns of drinking and of social outcomes was stressed. © 2007 Elsevier Inc.

Introduction

Alcoholic beverages are an integral part of cultures around the world. Their consumption is linked with a range of settings and occasions, symbolism and ritual, and social connotations.1 Although most people who drink do so because it gives them pleasure, there are others for whom drinking is associated with a range of harmful outcomes. As a general rule, social and physical harms have been linked to heavy chronic drinking or episodic (“binge”) drinking.2 Moderate drinking, on the other hand, has generally been found to have beneficial effects on various aspects of health, especially for middle-aged and older adults.3

In May 2006, the Institute on Lifestyle and Health† at Boston University School of Medicine and the International Center for Alcohol Policies (ICAP)§ in Washington, DC, jointly sponsored an international symposium to examine the available evidence on moderate drinking and related harms and benefits. The meeting brought together leading researchers from the fields of medicine, epidemiology, and biomedical and social sciences, who were invited to share their findings and views. The full proceedings of the conference are being published in a supplemental issue of the Annals of Epidemiology4; included in that publication are not only the papers presented at the conference but also the summaries of the panel discussions. Speakers at the symposium were offered a modest honorarium to give a presentation and to prepare a manuscript reviewing the evidence from their areas of expertise; organizers covered all travel expenses and related costs. Speakers were asked to present information that was unbiased and scientifically sound. Every effort was made to ensure the integrity of both the content and the conclusions of individual submissions.

This review paper summarizes the evidence presented at
The Importance of Pattern of Drinking

The dual nature of the relationship between alcohol consumption and outcomes has been well described over the past several decades through extensive biomedical and epidemiologic research. The evidence shows that both beneficial and harmful outcomes are a function not only of the amount of alcohol consumed but also of the pattern of drinking. Patterns encompass the various dimensions related to drinking context and the cultural relevance of alcohol. They include who drinks and who abstains; the quantity of alcohol as well as the frequency with which it is consumed; the how, when, where, and with whom it is consumed; and the type of beverage. Each of these facets of drinking patterns influences potential outcomes.

There is now a significant body of evidence supporting the notion that moderate drinking may confer protection for various chronic diseases: coronary heart disease (CHD) and other forms of cardiovascular disease (CVD), particularly in middle-aged and older men and postmenopausal women; type 2 diabetes; metabolic syndrome; cognitive dysfunction in the elderly; osteoporosis; and cholelithiasis. However, what exactly is “moderate drinking”? Generally, the term applies to those levels (and patterns) of consumption at which harm is minimized and benefit maximized. In terms of drinking levels, the upper threshold may thus be defined as the point at which the risk for harm increases over that for nondrinkers. Drinking levels considered “moderate” for men are generally higher than for women, due to physiological differences, and certain groups, often referred to as “special populations,” require quite different recommendations regarding alcohol. For individuals who are alcohol dependent or particularly susceptible to the effects of alcohol, there may be no “safe” level of drinking.

New research has clearly indicated that the frequency of drinking is as important as, or even more important than, the amount of alcohol consumed.

Moderate Drinking and Cardiovascular Disease

Perhaps the most widely known relationship between moderate drinking and positive health outcomes relates to CHD, for which an inverse association has been described in at least 100 different studies from 25 countries over the past 35 years. According to a number of reviews on the subject, regular drinking on most days of the week of up to 30 grams of alcohol per day (the equivalent of approximately 2½ typical “drinks”*) is associated with a large reduction in the risk of CHD; this topic is reviewed by Rimm, Mukamal, and others in the Annals of Epidemiology supplement. The effect of greater amounts of alcohol on CHD risk is controversial, but an increase in the risk of other CVD (eg, hemorrhagic stroke, cardiomyopathy) has repeatedly been demonstrated. There is increasing evidence that for individuals who already have a diagnosis of CHD, moderate drinking may reduce the risk of progression of disease and subsequent cardiovascular events.

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* The amount of alcohol contained in a “drink” varies across countries and often across studies. However, as a point of reference, in the United Kingdom a “unit” of alcohol is defined as 8 grams (g); a pint of beer contains more than 2 units. In Australia, the official measure is 10 g, while in the United States it is 14 g. Many epidemiologists, however, consider 12 g of alcohol to be the rough equivalent of a typical drink.
Methodological concerns about observational data on alcohol and CHD: A number of meta-analyses and reviews appraising alcohol use and CHD morbidity and/or mortality have been performed. Two early studies, have suggested a systematic misclassification error in most studies. The central issue relates to the appropriateness of using current abstainers as a control group for measuring the outcomes of moderate drinking. As people age and their health deteriorates, their alcohol consumption generally decreases, with some abstaining altogether. Furthermore, some people decrease their intake or abstain from drinking following treatment for alcohol dependence. Therefore, if these so-called “sick quitters” are included in the abstainer category, it may not be the absence of alcohol that is elevating their risk for CHD but, rather, their compromised health or previous drinking problems. Some former heavy drinkers may also become “occasional drinkers.”

The recent meta-analysis by Fillmore and colleagues, discussed further in the Annals of Epidemiology supplement, suggests that “light” or “moderate” drinkers are at equal, not lower, risk for all-cause and CHD mortality compared with abstainers. At the same time, considerable evidence shows that healthy behaviors generally tend to cluster among moderate drinkers, raising the possibility of confounding by other lifestyle habits.

Many recent studies, however, have excluded former drinkers from their abstainer group and found that when only lifetime abstainers make up the referent group, the same reduced risk of CHD is seen for moderate drinkers. Further, most studies have found that “occasional” drinkers tend to have a similar risk as abstainers, although almost all studies show higher risk of CHD (as well as most other diseases and total mortality) for recognized “ex-drinkers.” Newer studies have placed greater focus on adjusting for many confounding lifestyle factors, as discussed by Gronbaek. On balance, the general opinion still holds that many confounding lifestyle factors, as discussed by Gronbaek, Newer studies have placed greater focus on adjusting for alcohol and CHD: A number of meta-analyses and reviews appraising alcohol use and CHD morbidity and/or mortality have been performed. Two early studies, have suggested a systematic misclassification error in most studies. The central issue relates to the appropriateness of using current abstainers as a control group for measuring the outcomes of moderate drinking. As people age and their health deteriorates, their alcohol consumption generally decreases, with some abstaining altogether. Furthermore, some people decrease their intake or abstain from drinking following treatment for alcohol dependence. Therefore, if these so-called “sick quitters” are included in the abstainer category, it may not be the absence of alcohol that is elevating their risk for CHD but, rather, their compromised health or previous drinking problems. Some former heavy drinkers may also become “occasional drinkers.”

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Noncoronary cardiovascular disease: The relationship between alcohol consumption and noncoronary CVD (including stroke, congestive heart failure [CHF], atrial fibrillation [AF], and peripheral arterial disease [PAD]) is complex, in part reflecting their heterogeneity.

STROKE. Most studies suggest a J-shaped relationship between alcohol consumption and ischemic stroke, the most common type of stroke in North America and Europe. The Nurses’ Health Study showed that lower risk is limited to those who consume approximately 1 drink every other day, with possible higher risk among those who consume 3 or more drinks per day. Other studies show an increase in risk only with greater consumption. For hemorrhagic stroke, many studies have suggested a continuous linear increase in risk with any alcohol intake, but based on analyses from their very large cohort, Klatsky and colleagues report that an increased risk is seen only among heavier drinkers (> 5 drinks/day).

CONGESTIVE HEART FAILURE. CHF is an increasingly important public health concern, due especially to improved survival after myocardial infarction and the aging of the population. It has long been recognized that high levels of alcohol intake may lead to one type of underlying cardiomyopathy, attributed primarily to cardiotoxic effects of ethanol and usually malnutrition. In observational studies, moderate intake has been shown to decrease the risk of CHF, especially that associated with CHD, and to increase survival and decrease recurrent CVD events among individuals with CHF.

ATRIAL FIBRILLATION. AF is the most common chronic cardiac arrhythmia. Clinicians have long recognized the temporal association of episodic heavy alcohol use with the onset of AF, dubbed the “holiday heart” syndrome. For chronic alcohol intake, the largest study to date suggests that AF risk does not increase below a usual consumption level of at least 28 to 35 drinks per week. An interesting area for future investigation is the effect of alcohol consumption on individuals with chronic AF, most of whom are likely to be prescribed warfarin or similar anticoagulants. Although guidelines have often explicitly recommended that individuals taking warfarin abstain from drinking entirely, current data suggest that the risk for excessive anticoagulation or bleeding is not higher in moderate drinkers than in abstainers, although it may be elevated in binge drinkers.

PERIPHERAL ARTERIAL DISEASE. Although there are limited data on the association of alcohol and PAD, both prospective and cross-sectional studies have found an inverse association of moderate drinking with PAD (defined as symptoms of intermittent claudication or a low ankle-brachial index). Some studies, but not all, suggest a greater effect among women.

Biological mechanisms for CVD effects: Several distinct biological mechanisms for the CVD effects of moderate alcohol consumption have been described in animal models. Induced changes in plasma lipid profile, including increases in high-density lipoprotein (HDL) cholesterol and its subtypes (HDL2, HDL3), are thought to represent a major mechanism through which the risk for CHD-related mortality is reduced. However, other changes in vascular, myocardial, hemostatic, and endothelial function may be equally important in collectively contributing to reducing overall risk. These include beneficial effects on platelet function, fibrinolysis, inflammation, and a range of other factors, reviewed by Booyse and colleagues.

There are considerable data to support the notion that similar mechanisms may also be involved in humans, substantially reducing the risk for acute CHD-related athero-
It is important that the effects of alcohol consumption, moderate or otherwise, not be viewed in isolation, but as part of broader social, cultural, and lifestyle issues. There are differences among drinkers and the range of outcomes they are likely to experience.

Drinking culture, which shapes drinking patterns, is a strong influence on outcomes, as reviewed by Evans and colleagues. Cross-cultural prospective studies have shown that simply correlating the amount of alcohol consumed with CVD outcomes is inadequate; outcomes relate strongly to the patterns of drinking. While in some cultures daily drinking is the norm, in others alcohol consumption is generally confined to Friday and Saturday nights. Whereas benefits are seen in the former, they are absent in the latter. These differences, along with differences in the type of beverage consumed and whether drinking occurs with meals, may contribute to the outcomes observed.

It is clear that researchers have inadequately considered social and cultural factors as modifying alcohol consumption and its effects in their studies. Further, the social outcomes associated with moderate drinking have been even less well evaluated. Most people consume alcohol not for their health but primarily for pleasure and for beneficial social effects, and such outcomes have rarely been considered in alcohol research. This topic was discussed at the conference by Heath.

**Moderate Drinking and Other Health Outcomes**

The beneficial effects of moderate alcohol consumption extend beyond CVD to other health conditions.

**Diabetes:** The prevalence of type 2 diabetes is on the rise across the world; between 2000 and 2030, a 37% increase in the worldwide prevalence of diabetes is expected. There is evidence that moderate alcohol consumption may modify the risk of developing type 2 diabetes. Meta-analytic reviews of the data have shown a U-shaped relationship between moderate drinking and the risk for type 2 diabetes for both men and women, as reviewed by Hendriks. In addition, patients with type 2 diabetes who consume moderate amounts of alcohol show much lower risks for CVD outcomes than do nondrinkers.

Although the precise mechanism remains unclear, the reduction in risk may be explained by an increase in insulin sensitivity from moderate drinking, an association that has been reported in many cross-sectional studies. Moderate drinking may affect insulin sensitivity through several mechanisms that include modulation of changes in the endocrine functioning of fat tissue, the inflammatory status of
several organs, or metabolism. Results from clinical trials of alcohol administration and insulin sensitivity, however, have not been consistent.96,97

Epidemiologic studies have also shown that moderate alcohol consumption is associated with increased adiponectin concentrations,98,99 which correlate with increased insulin sensitivity. Other adipokines such as leptin, resistin, and acylation-stimulating protein may also be affected. Alcohol is known to decrease inflammation, and inflammation of adipose tissue may cause insulin resistance100,101; further, alcohol may favorably affect glucose and fatty acid metabolism in plasma and muscle. Future studies, particularly those evaluating the involvement of different genotypes, should help elucidate the role of alcohol in modulating insulin sensitivity.

Cognitive function: Dementia is the most common disorder affecting the brain in older people. Epidemiologic studies have reported that light to moderate drinking is associated with a reduced risk of dementia,102-104 as reviewed by Letenneur.105 Similar results have been reported by persons from a number of different cultures.106-108 The relationship may be different for men and women109; whereas the risk for women has been found to be lower regardless of drinking level, the risk for men may follow a J-shaped curve.110 A potential genetic component has been identified involving the Apo E4 allele, which may modulate the effect of alcohol.110

The mechanisms by which a reduction in risk of dementia may occur remain unclear. It has been suggested that alcohol may have a direct effect on cognition through the release of acetylcholine in the hippocampus. Another possible mechanism is through antioxidant activity of alcohol and other components in various beverage types,103 as reviewed by Letenneur.105

It has also been suggested that light-to-moderate alcohol consumption may be a marker for broader psychosocial behaviors that are, in turn, associated with a lower risk of dementia. However, animal studies showing improvement in memory with alcohol consumption through the involvement of the retinoic acid pathway support a biological basis for the effect.111 Other studies suggest that moderate drinking may increase the survival of neurons in the hippocampus,112,113 a primary target of Alzheimer’s disease, further supporting a biological mechanism.

Cancer: According to McPherson,114 moderate drinking has little effect on the incidence of cancer, although there is no doubt that heavy drinking is associated with a dose-dependent increase in risk for cancers of the upper digestive tract. A review by Doll and colleagues115 suggests a strong relationship with cancers of the oral cavity, pharynx, esophagus, and larynx. The evidence on the relationship of moderate drinking with cancer of the stomach or pancreas suggests no link.115 Epidemiologic studies point to an association between alcohol consumption and breast cancer risk for heavier drinking; however, the findings for moderate drinking are not consistent, and evidence of any link remains ambiguous.116,117

McPherson114 states that the strongest relative risk is seen for the rarest cancers. With regard to the more common cancers, namely cancers of the colon, breast, liver, and esophagus, the relationship with moderate alcohol consumption is weaker overall, and hence less likely to be causal.118 The mechanisms underlying the association with colon cancer and breast cancer remain unclear, and the moderate associations seen may not be causal. Risks for both colon and rectal cancers are similar for men and women. It is unresolved whether these associations may be a manifestation of confounding by some dietary factor, smoking, substance misuse, or publication bias; however, all are plausible explanations.

Liver disease: It is well established that heavy drinking increases the risk of alcohol-related liver disease (ALD), including fatty liver and cirrhosis119-121; moderate alcohol consumption has no benefit for liver disease and may even cause it in susceptible individuals.118,122 This topic is reviewed by Szabo.123 In the Western world, up to 50% of end-stage liver disease cases are related to alcohol consumption.124 A linear correlation exists between the amount and history of alcohol use and liver disease; the threshold depends on the daily amount and the duration of alcohol intake. Gender is a major factor in ALD125: in males, a daily intake of 40-80 grams of alcohol over a period of 10-12 years can lead to ALD, while in females 10-30 grams daily may be sufficient to lead to disease.125,126 The underlying mechanisms for a possible gender difference are not fully understood, although differences in the alcohol dehydrogenase enzyme and hormonal factors have been suggested. Of importance, after alcohol consumption has ceased, ALD continues to progress in women more frequently than in men.121

The presence of other liver diseases, particularly chronic infection with hepatitis C (HCV) or B viruses (HBV), significantly increases the risk of progressive liver damage in combination with either moderate or excessive alcohol consumption.127,129 Genetic factors, such as hereditary hemochromatosis, are also associated with an increased risk of alcohol-induced liver injury, greatly increasing the risk of cirrhosis with drinking.130 Obesity and exposure to various drugs and other substances present additional risks for ALD.131,132 On the basis of these multiple factors, “safe” levels of alcohol consumption with regard to liver disease may vary significantly among individuals.

For mechanisms by which alcohol consumption causes liver damage, oxidative stress related to alcohol metabolism, resulting in direct damage to hepatocytes and contributing to inflammation, has been proposed.133 The natural history of ALD is characterized by chronic inflammation in the liver.133,134 Whereas light drinking has been shown to acutely reduce inflammation in animals, heavy chronic intake increases inflammation.123 In addition, alcohol con-
sumption is associated with impaired function of the intestinal mucosa, both in rodents after short-term alcohol administration and in patients who are in various stages of alcoholic liver injury.135-140 The continued presence of increased inflammatory mediators induces collagen deposition, fibrosis, and progression to cirrhosis.141,142

**Total mortality**: An important way to judge the net effects of moderate drinking is through its effects on total mortality; this is reviewed by Klatsky and Udaltsova.34 Various meta-analyses of available data have confirmed that the relationship between alcohol consumption and total mortality is J-shaped,12,13,143,144 with lower risk primarily attributable to lower risk of CHD and other atherothrombotic vascular conditions related to moderate drinking.145 There is also evidence demonstrating that once drinking ceases, risk of mortality increases.

The relationship between alcohol consumption and total mortality depends, as one might expect, on the pattern of drinking, which is reviewed by Rehm and colleagues.146 Those who drink infrequently have risk levels similar to those of lifelong abstainers, with beneficial effects being seen more commonly among more frequent drinkers. Other factors include sex and ethnic differences, both of which relate to the magnitude of the risk, although the J-shaped relationship is maintained for both. Some studies conducted in the United States show that the apparent benefit is greatest in whites, but a statistically significant lower risk at light drinking levels has also been reported in blacks.145 Age plays an important role. Risks related to alcohol consumption are highest among younger persons, and benefits from light-to-moderate drinking do not become apparent before middle life.145 However, some have shown that the relationship becomes attenuated as age increases, possibly due to a general reduction of alcohol intake among the elderly resulting in less harm from heavy drinking and less benefit from light-to-moderate drinking.147

**Mental health**: The association between moderate drinking and mental health is less clear, as discussed by el-Guebaly.148 Mental health can be described as “the absence of psychopathology,” but it may be more useful to focus on the relationship between moderate drinking and psychosocial benefits; these include positive subjective health and positive mood effects, both anticipated and experienced.149 Most studies report a J-shaped curve, with positive self-reports of subjective mental health associated with moderate drinking but not with heavier drinking.150 Subjective outcomes of drinking are strongly associated with expectations and with cultural dimensions of drinking.151

For many people, drinking plays a role in stress reduction and relaxation, as well as in the reduction of social anxiety, although methodological inconsistencies among studies make interpretation difficult.152,153 In general, non-problem drinkers emphasize expectations of social and physical pleasure, while problem drinkers anticipate tension reduction.154 Those who drink heavily also have higher expectations across all dimensions of the positive effects they anticipate from drinking.155 Among young people, the social impact of drinking appears to be more apparent in men than in women.156 Another indicator of mental health is work performance, closely linked with higher income and the absence of disability and/or stress. Being a moderate drinker has been found to be associated with higher income, a reduction in sickness and absence from work, less disability, and better social networks.157 Heath89 points out that there are marked deficiencies in the evaluation of social outcomes in alcohol research.

Most of the work on the relationship between moderate drinking and mental health has been conducted in developed countries. Data on drinking patterns and their relationship with outcomes in the developing world are still largely lacking, as discussed by Patel.151 However, mental health problems are closely related to alcohol use disorders in developing countries, as they are in the developed world,158 with higher prevalence of both among the poor and marginalized.159,160 It should be noted that a much smaller proportion of the population — in particular, among women — consumes alcohol in developing countries. Future research on the relationship between hazardous drinking and negative outcomes as well as the potential benefits of moderate consumption in developing countries will be an important step.

**Implications for Future Research**

Significant strides have been made in understanding the relationship between moderate drinking and health outcomes. However, challenges remain with implications for future research areas and design. For example, much of the experimental research on drinking rests on animal models, and there is concern that these paradigms may not be fully applicable to humans. Many of the protective effects of moderate drinking in humans accrue as a result of long-term alcohol consumption; however, for practical reasons, experimental designs often rely on short time spans. Conducting small-scale studies that measure specific biological endpoints in humans may therefore at times be a more important approach than performing animal experiments. In addition, much remains to be learned about the biological mechanisms underlying the acute effects of alcohol; much of the impact of drinking, both moderate and heavy, occurs over the course of hours, not years, a relationship that is still poorly understood.

Refining research on moderate drinking also requires a more precise understanding of its relationship with drinking patterns. Current approaches for measuring drinking patterns vary widely; better and more consistent definitions of “moderate drinking” that apply to different populations would be a useful starting point for understanding such relationships.

How outcomes of drinking are quantified is another area
There is a need for greater attention to the positive aspects of alcohol consumption, which are closely related to its psychosocial effects. Current research is largely devoted to assessments of harms, often neglecting the benefits, despite the fact that the vast majority of those who drink do so moderately.

where further refinement of techniques would be useful. Currently, epidemiologic research rarely takes psychosocial outcomes into consideration, and these are altogether missing from measures such as the burden of disease attributable to alcohol.161 Psychosocial outcomes are generally discounted because of the lack of adequate instruments for measuring them. Methodology for quantifying such outcomes with standardized and comparable instruments is an important area for future work; such methodology would also allow reanalysis of available data with these outcomes in mind.

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The Message on Moderate Drinking

Providing messages about moderate drinking is the domain of policy makers, governments, and health experts, who rely on the availability of balanced scientific evidence when conveying information to the general public. Currently, there is a wide disparity across countries in what is provided in recommendations on drinking, with regard both to limits and to moderate drinking,162 as reviewed by Harding and Stockley.163 Drinking guidelines variously define “low-risk,” “safe,” or “moderate” drinking in terms of daily or weekly amounts of alcohol. Providing information on the relationship between drinking patterns and outcomes would be of great importance in helping to formulate recommendations for the public.

In translating scientific evidence into policy, a balance must be achieved between the desire to reduce alcohol misuse and the importance of reflecting accurately any beneficial health effects of drinking, as discussed by Smallwood.166 Achieving the ideal balance whereby the social and health benefits of moderate drinking can be enjoyed by the majority, while the harm that alcohol causes is minimized, is a challenge that has hitherto not been met successfully.

It is recognized that people receive their knowledge and information about drinking through a variety of sources. Communication between patients and their health-care providers is an important mechanism by which individual behaviors and perceptions about health may be changed. Provided with the proper tools, physicians and other practitioners can tailor their messages, depending on the patient’s age, sex, past alcohol use experience, cardiovascular risk, and other factors. However, to be able to do so effectively, health-care professionals themselves require training about alcohol consumption and its potential outcomes.

The media also play an important role in influencing individuals in areas of health, as discussed by Stuttaford.167 They are instrumental both in imparting knowledge and in shaping attitudes. More attention to providing scientific accuracy and a balanced presentation of the evidence in media reports on drinking is needed. In addition, it is important to bear in mind that a single message cannot apply to all groups, populations, or countries, and media presentations should be more effectively targeted to those for whom particular information may be relevant.

Some have expressed concern that attention to the health benefits of moderate drinking may encourage those who currently abstain to begin to consume alcohol and that this could lead to alcohol abuse. There is no evidence suggesting currently abstain to begin to consume alcohol and that this could lead to alcohol abuse. There is no evidence suggesting that public awareness of the potentially beneficial aspects of moderate drinking results in greater alcohol abuse. The findings of a public information program in Chile on the potential benefits of moderate drinking showed no resulting increase in per capita total alcohol consumption or in greater alcohol abuse.69 Instead, following the completion of the program, people reported fewer drinks per occasion but more frequent consumption of alcohol, especially with meals.

Summary

The goal of the symposium summarized here was to provide a balanced view of the currently available scientific evidence on moderate drinking and its impact on health. Despite the various caveats and confounders, the overall consensus persists that alcohol consumed in moderation is indeed associated with a number of potentially beneficial health outcomes among middle-aged and older adults. The participants did not lose sight of the problem of alcohol abuse, which remains a significant concern in countries around the world. The belief was expressed, however, that a better understanding of the relationship between drinking and outcomes could only help in efforts to decrease adverse effects and increase beneficial effects. Culture plays a strong moderating role and can be a powerful tool in promoting drinking practices that have net beneficial health effects.

Finally, despite the sometimes highly technical or even esoteric debates about confounders, methodological issues, and mechanisms, the real-life impact of drinking and its outcomes is considerable. For those who drink (and those
who abstain), the implications of moderate drinking on health are clearly of personal interest. For physicians and others within the health-care system, the relationship between moderate drinking and health outcomes has a bearing on the advice and care they are able to offer their patients. Researchers are faced with inconsistencies in findings and the challenge of perfecting methodologies to overcome them. For those involved in developing and implementing policy, available information on the outcomes of moderate drinking needs to be distilled into simple and clear messages that can be shared with the population and that can ultimately help guide drinking behavior.

Statement on Potential Conflict of Interest

The symposium upon which the present publication is based was sponsored by the Institute on Lifestyle and Health, Section of Preventive Medicine and Epidemiology, Boston University School of Medicine, Boston, Massachusetts, and by the International Center for Alcohol Policies (ICAP) in Washington, DC. ICAP provided funds for the conference, including travel expenses and a modest honorarium for scientists to facilitate their participation and submission of manuscripts based on their presentations.

Although ICAP is an independent not-for-profit organization, it does receive its major funding from companies that produce beverage alcohol, whose representatives also comprise its Board of Directors. Because of this, we were careful to abide fully by the Dublin Principles, a set of guidelines for research principles relating to beverage alcohol.168 The Dublin Principles state that while “the beverage alcohol industry should support independent scientific research which contributes to a better understanding of the use, misuse, effects and properties of alcohol and the relationships among alcohol, health, and society,” the “academic and scientific communities should adhere to the highest professional, scientific, and ethical standards in conduction and reporting on alcohol research, whatever the source of funding for such research.” Further, the Principles state specifically that while “scientific researchers should acknowledge the sources(s) of funding, (they) should be free to disseminate and publish the results of their work.”

In the supplement based on these proceedings (www.annalsofepidemiology.org/issues), the opinions expressed in each paper and discussion summary are those of the author(s) and are not necessarily those of the Guest Editor of the supplement, the Annals of Epidemiology, the Institute on Lifestyle and Health, or ICAP. Final decisions regarding the editing of each manuscript rested with the Guest Editor of this supplement and the Editor-in-Chief of the Annals of Epidemiology, and were uninfluenced by the source of funding.

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