PART D. CHAPTER 11: ALCOHOLIC BEVERAGES

INTRODUCTION

Alcohol consumption in the United States has increased during the past 20 years, and 41 states exceed Healthy People 2020 limits for per capita alcohol consumption.[1,2] Fifty-six percent of adults ages 21 years and older report past-month alcohol consumption, and nearly half of current drinkers across most age categories report past-month binge drinking.[3] Binge drinking itself has increased, including among middle- and older-aged adults,[4,5] as has mortality from fully alcohol-attributable causes of death, including alcoholic liver disease.[6] Other than energy (i.e., calorie) intake, alcohol provides little nutritional value. Among U.S. adults, alcohol accounts for approximately 5 percent of energy intake, or approximately 9 percent of energy intake among those who drink (Cat_DS[1]). Among those who consume excessive amounts of alcohol, the percent of energy intake may be considerably higher, and binge drinking is associated with obesity.[7]

Because alcohol is not a component of USDA food pattern guidance, its added energy is discretionary and should be considered in the present context of high and increasing obesity prevalence. In the United States, a standard alcoholic drink is 14 grams of ethanol (0.6 fluid ounces [fl oz]), which is equivalent to 12 fl oz of 5% alcohol by volume (ABV) beer, 5 fl oz of 12% ABV wine, or 1.5 fl oz (a typical shot) of 40% ABV (80 proof) distilled spirits.[8] Because ethanol has 7 calories per gram, the ethanol content of 1 standard drink is approximately 100 calories, and the non-alcoholic components add further calories. In addition, alcohol serving sizes may often exceed the size of a standard drink, which also increases calorie content.[9]

Alcohol consumption accounts for approximately 100,000 deaths annually in the United States.[10] Excessive drinking is defined on the basis of high average amounts consumed, or per-occasion consumption that results in acute impairment (i.e., binge drinking). Although terminology and definitions in this field of study are inconsistent, excessive drinking is typically defined as consuming 5 or more drinks per occasion or 15 or more drinks per week for men, and 4 or more drinks per occasion or 8 or more drinks per week for women.[11,12] Of all alcohol-

[1] For details, see data supplements that provide results of analyses conducted for the Committee, referenced as Food Categories Sources (Cat_DS) and Beverages (Bev_DS). These supplements can be found at https://www.dietaryguidelines.gov/ 2020-advisory-committee-report/data-analysis.

attributable deaths, approximately 88,000 are accounted for by excessive drinking; more than twice the number of deaths from excessive drinking occur among men compared to women.[10] Excessive drinking is responsible for approximately 10 percent of deaths among working age adults.[13] Because a sizable fraction of mortality from excessive drinking occurs among young and middle-aged adults, each alcohol-attributable death from excessive drinking accounts for an average of 30 years of potential life lost.[10] Overall, approximately 20 percent of people who begin drinking will develop an alcohol use disorder (formerly referred to as alcohol use or dependence[14]) at some point in their lives.[15,16] However, only a minority of people who drink excessively or who binge drink have an alcohol use disorder.[17] As such, excessive drinking and alcohol-related problems are prevalent, and are not restricted to those with an alcohol use disorder.

Although the 2020 Dietary Guideline Advisory Committee's systematic review focused on relationships between alcohol and all-cause mortality, other alcohol-related mortality, morbidity, social aspects and economic costs also are important to review,[18] particularly as a high proportion of those who drink in the United States consume alcohol excessively.[19-23] At all levels, and particularly for high per occasion alcohol consumption and resulting blood alcohol concentrations, alcohol is positively associated with intentional injuries (e.g., suicide, homicide) and unintentional injuries (e.g., motor vehicle crash fatalities, drownings).[22,24] Although observational studies find protective effects of low average levels of consumption for some cardiovascular outcomes (e.g., coronary heart disease and ischemic stroke), high average levels of consumption and binge drinking are associated with increased risk of coronary heart disease, stroke, congestive heart failure, atrial fibrillation, and hypertension.[25] Alcohol is recognized as a human carcinogen by the World Health Organization (WHO) and the U.S. government, and is likely causally associated with at least 7 types of cancer.[26-29] For some common cancers (e.g., breast cancer, colorectal cancer), an increased risk is observed starting with any consumption above zero and continues to increase with higher consumption amounts. Overall, alcohol consumption is responsible for approximately 3.5 to 5.5 percent of all cancer deaths in the United States.[30,31] Alcohol also is a risk factor for a range of gastrointestinal health outcomes, including chronic liver disease, pancreatitis, gastritis, gastro-esophageal reflux disease, and peptic ulcer disease.[32]

Alcohol also is an important risk factor for, or contributor to, a variety of social and mental health problems, including depression, child abuse and neglect, fetal alcohol spectrum disorder, motor vehicle crashes, domestic violence, sexual assault, vandalism and other property crimes, and nuisance violations.[33-37] Although the legal drinking age is 21 years in all 50 states and

Washington, DC, alcohol is the most commonly consumed psychoactive substance by underage individuals and contributes to a variety of health, social, and academic problems.[38] Approximately 4,300 alcohol-attributable deaths occur annually among those younger than the legal drinking age, either due to underage drinking or to secondhand effects from another person's drinking.[10]

Excessive alcohol consumption costs $224 billion annually in the United States, or approximately $750 per adult annually, or $2 per drink sold.[39] These costs are based on lost productivity, medically-related costs, and costs to the legal and criminal justice systems, and do not include less quantifiable costs, such as suffering.

The majority of U.S. adults consume alcohol, and alcohol can be a source of enjoyment for many. However, not consuming alcohol also is a preference for many Americans, and not drinking can also be a source of enjoyment and improved quality of life. In the absence of binge drinking, low volume alcohol consumption (sometimes referred to as "moderate" alcohol consumption, and defined variably) has low risk for most adults. Individuals have many personal, cultural, social, and religious reasons for choosing to drink alcohol or to not drink alcohol, apart from health considerations. Evaluating the predisposing factors for drinking is beyond the scope of this chapter. Ultimately, the *Dietary Guidelines for Americans* are oriented to health and well-being.

The *Dietary Guidelines for Americans* recommendations on alcohol pertain to those who currently drink. The 2015-2020 and 2010-2015 editions of the *Dietary Guidelines for Americans* explicitly discouraged anyone from beginning to drink alcohol for "any reason" (2015-2020) or "to begin drinking or drink more frequently on the basis of potential health benefits" (2010-2015).[40,41] Previous editions defined "drinking in moderation" as consuming "up to 1 drink per day for women and up to 2 drinks per day for men" for adults of legal drinking age. This applies to the number of drinks consumed during days when alcohol is consumed rather than average consumption amounts. No consumption is recommended for a number of individuals, including those younger than age 21 years, women who are or may be pregnant, those with health conditions that can be caused or exacerbated by alcohol consumption, those who take medications or other drugs that can interact negatively with alcohol,[11] and those who are performing complex or dangerous tasks.

In addition to describing alcohol's health, social, and economic effects, this chapter summarizes the Committee's review of evidence on the relationship between alcohol consumption and achieving nutrient and food group recommendations and the relationship between alcohol consumption and all-cause mortality. The Committee prioritized the review of

alcohol and all-cause mortality because it is arguably the most important mortality outcome related to alcohol, and because Dietary Guidelines Advisory Committees had not previously reviewed this topic. However, a scientific challenge is that no randomized controlled trials (RCTs) of alcohol and all-cause mortality (nor any cause-specific mortality or morbidity outcome) have been conducted, so the Committee contextualized its findings in considerable detail. This chapter also discusses findings from Mendelian randomization (MR) studies of how genetic factors related to alcohol consumption are related to cardiovascular disease (CVD) and cancer, both of which are leading causes of death in the United States. MR studies are a relatively new type of study and offer some advantages and insights in comparison to studies of these topics using observational study designs. MR studies assess variants of genes that correlate with an exposure of interest (in this case, alcohol consumption).[42,43] These genetic variants are then related to the alcohol-related outcomes of interest in comparison to the other variant of the gene as an instrumental variable in order to circumvent unmeasured confounding, which is a common limitation of epidemiologic alcohol studies.

Because the Committee's purpose was to provide evidence to support advice about alcohol consumption for those who drink, the primary focus of its review on alcohol and all-cause mortality was to assess the relationship between average consumption and patterns of consumption among those who drink. However, the Committee also assessed the relationship between various levels of alcohol consumption and the risk of mortality compared with never drinking alcohol. This evidence base also consisted of observational studies of established drinkers in comparison to those who report never consuming alcohol, and does not directly address popular questions about whether one should purposefully begin drinking, continue drinking, or stop drinking for health reasons.

LIST OF QUESTIONS

1. What is the relationship between alcohol consumption and achieving nutrient and food group recommendations?
2. What is the relationship between alcohol consumption and all-cause mortality?

METHODOLOGY

The Committee developed a data analysis protocol for Question 1 that described how data analyses would be used to answer the question. The protocol included an analytic framework that described the overall scope of the analyses, including the population, types of analyses, and data sources identified to answer each question, and definitions of key terms.

Consideration of this question drew from analyses of data from What We Eat in America (WWEIA), the dietary component of the National Health and Nutrition Examination Survey (NHANES); the Behavioral Risk Factor Surveillance System (BRFSS); the National Survey on Drug Use and Health (NSDUH); Healthy People 2020; and the Alcohol Epidemiologic Data System (AEDS).[1] Existing data tables were used when available. In some cases, upon the Committee's request, the Data Analysis Team (DAT) conducted new analyses to provide additional information. These requests included, for example, analyses by specific population groups, such as adults younger and older than age 65 years, and women who are pregnant or lactating.

A description of the data analysis methodology is provided in ***Part C. Methodology***. Complete documentation of the data analysis protocol and the referenced results are available on the following website: https://www.dietaryguidelines.gov/2020-advisory-committee-report/data-analysis. Below is a summary of the key elements of the protocol developed to answer Question 1.

Data analyses outlined in the analytic plan focused on alcohol use and alcoholic beverage contributions to food group intakes and intakes of nutrients and other food components. The primary life stages considered were adults of legal drinking age (21 years and older), including women who are pregnant or lactating, although some analyses were of adults ages 20 years and older. In the WWEIA, alcohol intake data were collected using 24-hour dietary recalls. In the NSDUH, these data were collected using interviews. For the general population ages 20 years or older, the DAT examined the WWEIA NHANES 2015-2016 cycle of data. For analyses by age group and for women who are pregnant or lactating, WWEIA 2013-2016 data cycles were combined. Analyses of the NSDUH examined data from 2015 and 2016. The following definitions were used:

- **Standard drink in the United States:** 14 grams (0.6 fl oz) of pure alcohol (ethanol), which is equivalent to 12 fl oz of 5% ABV beer, 5 fl oz of 12% ABV wine, or 1.5 fl oz of 40% ABV (i.e., 80 proof) distilled spirits.

- **Binge drinking:** Consuming 5 or more drinks on the same occasion for men, or 4 or more drinks on the same occasion for women.
- **Frequent binge drinking:** Binge drinking on 5 or more days during the past month.

The Committee took into account the strengths and limitations of data quality and analyses when formulating conclusion statements. The grading process used for questions answered by the USDA's Nutrition Evidence Systematic Review (NESR) systematic review methodology does not apply to questions using data analyses and therefore data analyses conclusions were not graded. Because data analysis and systematic review are different approaches to reviewing the evidence, the presentation of the summary of evidence is organized differently, although in each case, the conclusion statements are informed by the evidence reviewed, as outlined in the protocol.

Question 2 in this chapter was answered using a new systematic review conducted with support from USDA's Nutrition Evidence Systematic Review (NESR) team. NESR's systematic review methodology provided a rigorous, consistent, and transparent process for the Committee to search for, evaluate, analyze, and synthesize evidence.

The Committee developed a systematic review protocol, which described how the Committee would apply NESR's methodology to answer the question. The protocol included an analytic framework and inclusion and exclusion criteria to guide identification of the most relevant and appropriate body of evidence to use in answering the systematic review question. The analytic framework outlined core elements of the systematic review question (i.e., population; intervention and/or exposure and comparator (i.e., the alternative being compared to the intervention or exposure; and outcomes), and included definitions for key terms, key confounders, and other factors to be considered when reviewing the evidence. The inclusion and exclusion criteria were selected, a priori, to operationalize the elements of the analytic framework, and specify what makes a study relevant for the systematic review question.

Next, a literature search was conducted to identify all potentially relevant articles, and those articles were screened by 2 NESR analysts independently based on the criteria selected by the Committee. For each included article, data were extracted and risk of bias assessed. The Committee qualitatively synthesized the body of evidence to inform development of conclusion statements, and graded the strength of evidence using pre-established criteria for risk of bias, consistency, directness, precision, and generalizability. Finally, recommendations for future research were identified. A detailed description of NESR's systematic review methodology is provided in ***Part C. Methodology***, including standard inclusion and exclusion criteria applied in

many of the Committee's systematic reviews. Complete documentation of each systematic review is available on the following website: nesr.usda.gov/2020-dietary-guidelines-advisory-committee-systematic-reviews. Following is a summary of the unique elements of the protocol developed to answer the questions addressed in this chapter.

The population of interest for the question on alcohol consumption and all-cause mortality, was adults ages 21 years and older. The interventions or exposures of interest were average consumption of alcoholic beverages and the pattern of consumption of alcoholic beverages (i.e., the number of drinks per drinking day or drinks per drinking occasion). Information on the type of beverage (e.g., beer, wine, distilled spirits) was collected, if available.

The primary comparator of interest was differing average alcohol consumption or patterns among those who currently drink alcohol. The secondary comparison was between those who currently drink alcohol and those who have never consumed alcohol (i.e., lifetime abstainers). Studies for the secondary comparison were excluded if the non-drinking reference group included a mix of lifetime abstainers and former drinkers.

The outcome of interest in this review was all-cause mortality (i.e., total mortality), which was defined as the total number of deaths from all causes during a specific time period. Although some studies disaggregated causes of death, the outcome for this review did not include cause-specific mortality (i.e., total number of deaths from a specific disease, such as CVD or cancer).

When establishing inclusion and exclusion criteria, the Committee used standard NESR criteria for study design, publication status, language of publication, country, and health status of study participants. Initially, studies were included in the review if they were published from January 2000 to March 2020. However, due to time constraints, the Committee revised their protocol to focus the review on studies published from January 2010 to March 2020. Studies that *exclusively* enrolled participants younger than age 21 years also were excluded to focus on adults of legal drinking age, to whom *Dietary Guidelines for Americans* recommendations apply. In addition, the Committee clarified that MR studies were eligible for inclusion by noting this study design specifically in the inclusion criteria. In addition, observational studies enrolling fewer than 1,000 participants were excluded.

REVIEW OF THE SCIENCE

Question 1. What is the relationship between alcohol consumption and achieving nutrient and food group recommendations?

Approach to Answering Question: Data analysis

Conclusion Statement

Beyond contributing to energy intakes, ethanol has no nutritional value and alcoholic beverages (including their non-ethanol components) contribute little toward average intakes of food groups or nutrients. Alcohol consumption has increased in the United States since 2000, and most states exceed Healthy People 2020 objectives for per capita alcohol consumption. Approximately 60 percent of individuals report alcoholic beverage consumption in the past month, and of those, approximately 40 percent binge drink, often multiple times per month. During days when men or women consume alcohol, their consumption also typically exceeds current *Dietary Guidelines for Americans* recommended daily limits of less than or equal to 1 drink per day for women and 2 for men. Alcohol consumption during pregnancy remains a persistent public health problem.

Summary of the Evidence

The following sections describe the results of data analyses conducted to answer Question 1. Additional details can be found in data supplements, referenced below as Beverages (Bev_DS) and Food Categories Sources (Cat_DS).

Adults

Per capita alcohol consumption has increased in the United States since 2000, and 41 states currently exceed Healthy People 2020 objectives for per capita alcohol consumption.[1] The majority of adults, ages 21 years and older, consume alcoholic beverages. Among those ages 21 years and older, 55.8 percent report alcohol consumption in the past month. Alcohol use is most prevalent (67.6 percent) among adults ages 21 to 26 years, and tends to decrease slightly with increasing age, although use remains prevalent across most age groups. Of adults ages 26 to 44 years, 61.5 percent consume some alcohol, and 55.2 percent of adults ages 45 to 64 years of age consume some alcohol.[3]

Binge drinking is common. Approximately one-quarter of all adults ages 21 years and older report past-month binge drinking, including 47.0 percent of those who drink alcohol. Among those who binge drink, 25.0 percent report frequent binge-drinking. By age, approximately 70 percent of drinkers ages 21 to 26 years report past-month binge drinking. Among age groups 26 and older, 44.3 percent of those who drink report binge drinking, although this proportion is somewhat lower among those ages 65 years and older (22.9 percent). Men are more likely to report binge drinking than women. Thirty-two percent of men ages 21 years and older report past-month binge-drinking compared to 20.9 percent of women; among those who binge-drink, 29.1 percent of men and 19.6 percent of women frequently binge-drink.

Among those who consume alcohol, on any given day men are more likely to drink than are women across all age groups (32 percent and 25 percent for men ages 20 to 64 years and ages 65 and older vs 21 percent and 15 percent for women in these age categories) (Bev_DS). For adults, ages 20 to 64 years, on any given day when alcohol is consumed, the type of alcohol differs by sex. Men more commonly report consuming beer (23 percent beer vs 5 percent for wine), while women are slightly more likely to consume wine (9 percent vs 8 percent for beer). Among those ages 65 years and older, wine is the most commonly reported alcoholic beverage consumed by both men and women. Data on distilled spirits consumption were not available for this analysis.

Among all those ages 20 to 64 years, alcohol contributes more than 20 percent of the total daily energy from beverages (Bev_DS). A greater proportion of total daily beverage energy comes from alcohol for men (31 percent) vs women (21 percent). Based on U.S. standard drink sizes, during days when beer or wine is consumed, men drink an average of 3.5 servings of beer (43 fl oz) or 1.8 servings of wine (9 fl oz). During days when beer or wine is consumed, women drink an average of 2.2 servings of beer (26 fl oz) or 2.0 servings of wine (10 fl oz) (Bev_DS). Data on distilled spirits consumption were again not available for this analysis. Therefore, usual consumption amounts for men and women drinking beer and women drinking wine exceed “drinking in moderation” based on recommended limits in the *2015-2020 Dietary Guidelines for Americans*.

Among the entire adult population (including those who do not drink), alcoholic beverages contribute approximately 5 percent of daily energy intake (3 to 4 percent of total daily energy for women and 5 to 7 percent for men); based on the percentage of those who consume alcohol this translates into approximately 9 percent of energy intake among drinkers (Bev_DS). However, alcoholic beverages contribute relatively little to other food group and nutrient intakes

for all age groups; specifically, they contribute less than 3 percent to added sugars, potassium, calcium, and fruit intakes (Cat_DS).

Women who are Pregnant or Lactating

Overall, 59.0 percent of women ages 18 to 44 years report alcohol consumption in the past month and, of those who drink, 59.0 percent report past-month binge drinking.[44] Because many pregnancies are unintended (either mistimed or unwanted) and because the mean gestational age of pregnancy awareness is 5.5 weeks, this creates potential harm to the unborn fetus, if a woman consumes alcohol before pregnancy is recognized. Binge drinking before pregnancy also is a risk factor for drinking and for binge drinking once pregnancy is recognized. Among women who are pregnant, 11.5 percent and 3.9 percent report current drinking and binge drinking in the past 30 days, respectively. Although alcohol consumption may be underreported generally, it may be more underreported among women who are pregnant because of associated stigma. In women who are pregnant, the reported prevalence of past-month alcohol consumption is 8.9 percent for Hispanics, 10.7 percent for White non-Hispanic women, 14.0 percent for Black non-Hispanic women, and 19 percent for other non-Hispanic women. Differences by marital status also exist, with 8.6 percent of married women who are pregnant reporting past-month alcohol consumption compared to 15.2 percent of women who are pregnant and not married. On a given day when beer or wine consumption is reported, women ages 20 to 44 years and who are pregnant consume an average of 2 drink equivalents (24 fl oz) of beer or 2.2 drink equivalents (13 fl oz) of wine. Data on distilled spirits consumption were not available.

Eight percent of women who are lactating report beer or wine consumption on a given day, consuming approximately 1 standard drink of beer (15 fl oz) or wine (4 fl oz) (Bev_DS). Data on distilled spirits consumption were not available.

To access the data analyses referenced above, visit:
https://www.dietaryguidelines.gov/ 2020-advisory-committee-report/data-analysis

Question 2. What is the relationship between alcohol consumption and all-cause mortality?

Primary Comparisons (Among Those Who Currently Drink Alcohol)

Approach to Answering Question: NESR systematic review

Conclusion Statements and Grades

Moderate evidence indicates that higher average alcohol consumption is associated with an increased risk of all-cause mortality compared with lower average alcohol consumption among those who drink. Grade: Moderate

Moderate evidence indicates that binge drinking (consuming 5 or more drinks for men or 4 or more drinks for women during a drinking occasion) is associated with increased risk of all-cause mortality, and that more frequent binge drinking is associated with increased risk of all-cause mortality compared with less frequent or no binge drinking among those who drink. Grade: Moderate

Summary of the Evidence

- Sixty studies that met the inclusion criteria for this systematic review addressing alcohol consumption and all-cause mortality were identified through the literature search from January 2010 to March 2020.[25,45-103]
  - The body of evidence included 1 MR study, 1 retrospective cohort study, and 58 prospective cohort studies. The evidence included no RCTs.
- Consistent evidence reported increased all-cause mortality among those with higher average volume of alcohol consumption compared to lower average alcohol consumption. Although consumption categories varied, among those who drank alcohol, most studies found lower risk among men consuming within ranges up to 2 drinks per day and women consuming within ranges up to 1 drink per day compared to those consuming higher average amounts. Among studies assessing continuous distributions or based on dose-response relationships among narrower consumption ranges, among men who drink, the lowest levels of risk were generally up to 1 or 1.5 drinks on average (depending on how consumption was categorized). Relatively few studies among women examined risk based on categories within the range of up to 1 drink per day on average.

- Consistent evidence among those who drink alcohol reported higher all-cause mortality with more frequent binge drinking (consuming 5 or more drinks for men or 4 or more drinks for women during a drinking occasion) compared with less frequent or no binge drinking.
- Generally, the evidence was limited by inadequate adjustment for confounders, selection bias, and generalizability (studies often included middle- and older-aged adults), and potential misclassification or bias from an exposure assessment based on one-time measurements of alcohol consumption.
- Because the studies provided no consistent definition or categorization of higher average or lower average consumption, these terms are used in a descriptive sense in the conclusion statement. However, across most studies definitions of binge drinking or levels that corresponded to binge drinking were generally consistent; thus binge drinking is defined based on a set number of drinks in the conclusion statement.

Discussion about Relationships between Alcohol Consumption and All-Cause Mortality among Drinkers

The primary comparisons addressed were relationships between alcohol consumption and all-cause mortality among those who currently drink. These comparisons are relevant to those who already consume alcohol, to whom *Dietary Guidelines for Americans* recommendations on alcohol are meant to apply. For these primary comparisons, the Committee assessed relationships between different levels of average consumption, and different levels consumed per drinking occasion or per drinking day.

The body of evidence was comprised of observational studies, with no randomized trials. A relatively large number of studies informed the primary comparisons, with generally consistent findings for both the United States and other high-income nations. Most studies had large sample sizes (greater than 10,000). In terms of alcohol exposure, most studies were of average consumption, with fewer studies examining binge drinking, and even fewer assessing the number of drinks consumed per drinking day. Most studies examined adults of middle age and older, but some population-based studies of adults (e.g., ages 18 years and older) or more representative age groups (e.g., ages 35 to 75 years) were included. Most studies assessed consumption at one point in time. The MR study did not provide drinking levels.

The risk of confounding bias was high overall, both because of known issues with confounding in observational alcohol studies generally and because of specific weaknesses in the reviewed studies. Specifically, studies typically lacked consideration of multiple key

confounders (e.g., adequate adjustment for socioeconomic factors, diet quality or pattern), and did not typically account for patterns of alcohol consumption (i.e., the number of drinks per drinking day or frequency of consumption) for studies of average consumption, nor average consumption in studies assessing patterns of consumption. The lack of adjustment for patterning is important because cohort or survey participants may be less likely to binge drink or have alcohol-related problems compared to people in the general population, even among those with similar consumption levels.[104,105] This could lead to underestimates of alcohol-related risk in cohort or survey participants compared to the general population, and adversely affect the generalizability of findings. Selection bias, based on the age of the study cohorts, also is a consideration, as approximately 40 percent of alcohol-attributable deaths occur before age 50 years,[106] and those who have been established moderate drinkers for longer periods or until later in life may be advantaged, socially, or in terms of health. In general, therefore, studies of older cohorts could lead to underestimation of alcohol-mortality associations compared with studies that are population-based.

The effects of measuring alcohol at one point in time are unclear. Alcohol consumption typically changes throughout the life course, but may have independent associations with outcomes based on the time at which consumption changes, or among those with relatively stable vs shifting consumption over the life course. At a minimum, changes in consumption over time suggest that measuring consumption at only 1 point in time may result in misclassification of either average consumption or patterns of consumption compared to what was usually consumed, and when, over the life course.

In terms of average consumption, these observational studies found increased mortality among those with higher average volume of consumption compared to lower average volume consumption, with generally consistent dose-response relationships, at least with respect to point estimates. Although the most common ranges defining lower consumption levels were up to an average of 2 drinks per day for men and up to 1 drink per day for women, studies often used different levels of comparison (and terminology) to classify relatively lower vs higher average consumption. Among studies that examined finer gradations of consumption, the lowest levels of risk for men were generally up to 1 or 1.5 drinks per day on average. For women, relatively few studies examined average consumption among gradations within the range of up to 1 drink per day on average.

Summarizing these data presents other challenges. Few studies reported consumption in grams of ethanol, but rather in drinks per day or per week. In many cases, it was not clear how carefully respondents had standard drink sizes defined for them, or how carefully their drink

estimates were translated into grams of ethanol by researchers. Furthermore, while in the United States a standard drink consists of 14 grams (or 0.6 fl oz) of pure ethanol, other countries have different standard drink sizes (typically in the range of 10 to 12 grams per drink). For international studies in which consumption was reported in drinks or units rather than grams of ethanol, the Committee assumed that a drink corresponded to the number of grams of ethanol for that particular country, and translated that into U.S. standard drinks.

Among those with lower average volume consumption, some studies assessed a subgroup of "infrequent," "occasional," or "light" drinkers. When assessed, this group was defined variably (sometimes based only on drinking frequency, and/or on the basis of miniscule amounts of alcohol), and had variable risk estimates for all-cause mortality compared to other lower average volume drinkers. Studies using "occasional/light" drinkers as the reference group had less precision because occasional drinkers are not a large proportion of most study populations.

Although they were not included in the Committee's systematic review, precise estimates of effect sizes at finer gradations in consumption are best addressed by meta-analyses and modeling studies. Meta-analyses of average alcohol consumption and all-cause mortality find that, based on continuous risk curves, risk starts to increase above the equivalent of one-half U.S. standard drink per day on average for women, above one-half to 1 drink per day on average for men, and above 1 drink per day on average for both women and men,[107-111] including among those with CVD.[112] Rather than using meta analyses, others have advocated an approach combining multiple, weighted cause-specific mortality risk curves to estimate relationships between consumption and mortality.[113] Based on data from high-income countries, studies using this approach have similarly found that among drinkers all-cause mortality risk curves generally increase above 10 grams of ethanol per day (i.e., at or below approximately two-thirds of a U.S. standard drink per day) for both men and women.[24,107,114-117]

Studies consistently found that among those who drink, binge drinking was associated with increased mortality risk compared to not binge drinking, and that more frequent binge drinking was associated with increased risk compared with less frequent binge drinking. Although not all studies defined binge drinking by the 5 drinks for men and 4 drinks for women per occasion used in the NSDUH (e.g., some used 6 drinks, some used 5 drinks for both sexes, some constrained the time period for the drinking occasion), findings were generally consistent in terms of the direction of association, magnitude of effect, and significance. To date, no randomized studies of binge drinking have been conducted, and performing such studies would likely be deemed unethical and are unlikely to be conducted.

Other than at thresholds defining binge drinking, relatively few studies considered the relationship between the number of drinks consumed per drinking day or per drinking occasion and all-cause mortality. Among men, all 3 studies found that consuming more than 2 drinks per drinking day (i.e., at levels above the *2015-2020 Dietary Guidelines for Americans* recommended limits for men) was associated with higher mortality risk compared with consuming less; only 1 study examined differences among men comparing 1 vs 2 drinks. For women, 2 studies found increased risk for all-cause mortality with consumption greater than 1 drink (i.e., at levels above the *2015-2020 Dietary Guidelines for Americans* recommended limits for women). These findings are generally consistent with studies of other morbidity and mortality outcomes that find increased risk with increased consumption per drinking day or per drinking occasion (and related blood alcohol concentrations), including at levels exceeding *2015-2020 Dietary Guidelines for Americans* recommended daily recommended limits for men and women, respectively.[118-124] In addition, recent modeling studies of alcohol and all-cause mortality found that at all levels of total weekly consumption, risk is typically lowest for both men and women when fewer drinks are consumed per drinking day given a fixed amount of total consumption.[107,125]

Secondary Comparison (Between Those Who Currently Drink Alcohol and Those Who Have Never Consumed Alcohol)

Approach to Answering Question: NESR systematic review

Conclusion Statement and Grade

Limited evidence suggests that low average alcohol consumption, particularly without binge drinking, is associated with a lower risk of all-cause mortality compared with never drinking alcohol. However, in light of the many scientific and public health issues associated with alcoholic beverages, any conclusions about low average consumption compared to never drinking alcohol require careful consideration. Grade: Limited

Summary of the Evidence

- For the secondary comparison between current drinkers and never drinkers, the limited available evidence suggested that low average consumption was associated with lower risk of mortality compared with never drinking status. Included studies were a subset of the 60 studies above that were used to assess the primary comparisons of interest.

- Twenty-five studies compared those who consumed alcohol with never drinkers. Approximately half of the studies reported significant findings that low average alcohol consumption (particularly without binge drinking) was associated with reduced risk of all-cause mortality compared with never drinking alcohol, approximately half of the studies indicated no significant relationship, and 2 studies reported that low alcohol consumption was significantly associated with greater all-cause mortality compared to never drinking alcohol.
- Generally, the evidence was limited by inadequate adjustment for confounders, selection bias, and limited generalizability (studies often included only middle- and older-aged adults), and potential misclassification or bias from an exposure assessment based on single-time measurements of alcohol consumption. As with the primary comparison, low average volume was classified variably.

Discussion about Comparisons between Drinking Alcohol and Never Drinking Alcohol for All-Cause Mortality

A pre-designated secondary comparison was developed to assess relationships with all-cause mortality for self-reported consumers of alcohol compared with those who self-reported never consuming alcohol. Although not drinking is a level of alcohol consumption (i.e., zero consumption), this was designated as a secondary comparison because the *2015-2020 Dietary Guidelines for Americans* recommendations on alcohol provided advice for those who currently drink and, for a variety of health-related reasons, recommend against beginning to drink.[40,41] This body of research is based exclusively on non-randomized studies of established alcohol drinkers and lifelong never drinkers of alcohol. Because established drinkers are different from those who might initiate alcohol consumption, this comparison does not address the question of whether non-drinkers or lifelong never drinkers might initiate alcohol consumption to improve health.

The evidence grade of “Limited” was weaker than for the within-drinker comparisons for several reasons. First, those who have never consumed alcohol have more adverse confounding factors,[126-129] and all studies lacked inclusion of key pre-specified confounders. Second, approximately half of self-described never drinkers may actually have previously consumed alcohol, and are therefore misclassified.[130] Third, fewer studies of never drinkers were reviewed than those of within-drinker comparisons because some studies were restricted to drinkers, while others assessed non-drinkers as a group and could not or did not

disaggregate former drinkers (arguably a type of drinker) from those who had never drunk alcohol. Fourth, the definition of never drinkers varied among studies, and sometimes included those who had consumed at least some alcohol at some point in time. Fifth, a smaller proportion of studies using never drinker comparisons with low average drinkers had significant findings compared with those comparing lower and higher average consumption of alcohol. And last, generalizability was limited because many study populations were not representative of the age distribution of all adults who typically begin to consume alcohol.

For studies comparing never drinking and non-drinking to the consumption of low average amounts of alcohol, confounding is more than a theoretical risk, as moderate drinking is strongly associated with many favorable health, social and economic factors[131] that are independently associated with longevity.[132] Conversely, non-drinking and never drinking tend to be associated with adverse confounding factors (e.g., poorer baseline health status, lower incomes).[126-129,131] Therefore, unmeasured or residual confounding tends to bias studies in favor of low average alcohol consumption relative to non-drinking and never drinking. Selection bias favoring low average consumption of alcohol also is a concern, as established moderate drinkers are a select group who are not representative of all those who might start drinking (including those who become heavy drinkers or who quit drinking).[133] Furthermore, older study populations cannot include persons who have died prematurely from alcohol-related causes, some of which affect younger adults disproportionately (e.g., deaths from unintentional injury or violence).

Although it is possible that alcohol consumption at low levels may have some benefits, the likely direction of confounding and selection bias in observational studies means that associations with better health among low average drinkers compared with never drinkers may be a statistical artifact. A recent meta-analysis that weighted studies on quality measures to address sources of bias found no significant protection for low average drinkers compared with never drinkers of alcohol.[110]

Associations of reduced mortality for those who consume low amounts of alcohol in comparison to non-drinkers, including never drinkers, are driven by reduced associations with CVD mortality. The 2010 Dietary Guidelines Advisory Committee conducted a review on the topic of alcohol intake and coronary heart disease, and concluded that “strong evidence consistently demonstrates that compared to non-drinkers, individuals who drink moderately have lower risk of coronary heart disease.”[134] Since that time, observational studies and meta-analyses of observational studies have affirmed that the “J-shaped curve” for coronary heart disease and ischemic stroke demonstrates higher risk among those who do not consume alcohol compared with those who consume low volumes of alcohol, followed by higher risk

among those consuming progressively higher amounts of alcohol.[135,136] However, a relatively new type of study design, referred to as MR or genetic randomization studies, has resulted in evidence that challenges previous conclusions about the protective association between low average consumption and CVD.[137-140]

For additional details on this body of evidence, visit: nesr.usda.gov/2020-dietary-guidelines-advisory-committee-systematic-reviews/beverages-and-added-sugars-subcommittee/alcohol-all-cause-mortality

Additional Topics Considered: Mendelian Randomization Studies on Alcohol and Cardiovascular Disease and Cancer

Due to time constraints and the desire to prioritize the review of alcohol and all-cause mortality, the Committee did not conduct systematic reviews with the support of NESR to examine the relationship between alcohol consumption and risk of CVD or cancers. However, the Committee wanted to address MR studies on these topics because CVD and cancer are leading contributors to all-cause mortality, and because MR studies are relatively new. Furthermore, large bodies of observational evidence already exist about these topics, which are also discussed and referenced in this chapter. The Committee searched the literature to identify any MR study published on these topics from January 2000 through March 2020. This resulted in consideration of MR studies from China when data were collected while China's Human Development Index categorization was medium. The MR studies identified are described and discussed below.

MR studies assess variants of genes that correlate with an exposure of interest (e.g., alcohol consumption). Genetic variants are then related to the outcomes of interest. Overall, genetic variants are analogous to instrumental variables used in epidemiological studies (the idea being that genes assort randomly and thus reduce confounding). To do this type of study, it is necessary to have available genetic variants that are reliably related to the exposure of interest. For alcohol, some variants of the alcohol dehydrogenase gene and the aldehyde dehydrogenase gene associate with reduced consumption among drinkers of alcohol, and higher rates of non-drinking, among those with the variant genotype.

Strengths of these studies, compared to observational studies, are that they reduce confounding and selection bias[42]; these studies are sometimes referred to as nature's RCTs. No possibility of reverse causation (i.e., poor health causing non-drinking status) exists because genotypes are present from birth and therefore precede outcomes, nor does exposure

misclassification occur because genotypes are time-invariant. Genotypes are a better proxy of lifetime alcohol consumption, as opposed to measuring alcohol consumption at one or even several points in time as is done in traditional epidemiological studies. Despite their advantages, MR studies have limitations. Genetic instruments may lack robust associations between the genotype and the exposure of interest. Genotypes may have "pleiotropy," meaning that the genotype could affect other physiological pathways that are independent of the exposure variable (alcohol) and that affect the outcome of interest. They also may have "linkage disequilibrium," meaning that the genotype might be independently associated with other genes that may affect the outcome of interest (i.e., genes do not always assort randomly relative to one another).

Five articles were identified that examined the relationship between alcohol consumption and CVD; 4 could be related to actual or modelled levels of consumption or compared epidemiological approaches to MR approaches. The overview of the findings is that MR studies do not find reduced associations for coronary heart disease and ischemic stroke among low average consumers compared with non-drinkers of alcohol, which is inconsistent with findings from observational studies. In terms of coronary heart disease, a large study of individuals of European descent found that a genetic variant that is associated with less alcohol consumption was associated with reduced risk of coronary heart disease overall. Although this relationship held among those within low, medium, and high categories of self-reported alcohol consumption, importantly, among non-drinkers of alcohol, the genetic variant had no association with coronary heart disease. Thus, the genetic variant was conditional on exposure to alcohol, rather than having an independent effect on coronary heart disease mortality, in the absence of alcohol. A small study from China compared a MR vs a conventional epidemiological approach; neither approach found a protective association for low average consumption compared with nondrinking status. In terms of stroke, a medium-sized study from Denmark reported reduced risk among those consuming 1 to 20 alcoholic drinks per week compared to those consuming fewer than 1 drink per week using a conventional epidemiological approach. However, the MR approach found only non-significant, but positive, associations with increasing genotype-predicted alcohol consumption.[138] Finally, a large study of Chinese men assessed both stroke and coronary heart disease. For stroke, U-shaped associations were observed for alcohol and stroke risk using a conventional epidemiological approach (i.e., increased risk at no consumption, reduced associations at low volumes, followed by increasing risk thereafter), but only a positive association with increasing genotype-predicted consumption using the MR approach. The MR analysis also revealed no evidence of reduced associations for myocardial

infarction or total coronary heart disease at low levels of alcohol consumption, with little overall effect of alcohol consumption on those outcomes.

Findings about MR studies and CVD mortality in this report are supported by MR studies and RCTs about CVD risk factors. These studies find positive associations between alcohol consumption and blood pressure without protective associations among low volume consumers, no protective associations for blood glucose, diabetes or body mass, and no associations with low-density lipoprotein cholesterol.[141-146] Although experimental studies and most MR studies find alcohol consumption is positively associated with high-density lipoprotein cholesterol (HDL-C),[147] MR studies do not suggest a causal relationship between HDL-C and coronary heart disease.[148] Furthermore, a causal role for the association between HDL-C and coronary heart disease has been challenged because medications that raise HDL-C have not shown benefit in clinical trials,[149] and because trials of statin medications (which lower LDL-C, but also raise HDL-C to a lesser extent) find no independent effect of raising HDL-C, after controlling for statin's effects on LDL-C.[150]

The Committee identified and reviewed 3 articles on 3 cancer types, and found positive associations between alcohol consumption and head and neck,[151] esophageal,[152] and colorectal cancers.[153] Although the direction of these findings is consistent with existing observational studies and meta-analyses, the MR results were based on genetic variants associated with more or less consumption, but amounts of consumption by genotype were not available except in a subset of participants in the study of colorectal cancer. Overall, the few MR studies about alcohol consumption and cancer indicate that alcohol consumption is positively associated with certain types of cancer, and are consistent with evidence from prospective cohort studies.[26-29]

Research Needs Related to Alcohol and Mortality

More studies are needed with stronger research designs, including RCTs, MR studies, and non-randomized intervention studies with mortality outcomes. Because RCTs of alcohol and all-cause mortality would require large sample sizes for adequate power and/or long follow-up periods, evidence of this type is unlikely to be available any time soon. However, MR studies of alcohol are an emerging area of the literature that will likely expand during the next 5 to 10 years. In addition, more research is needed to disentangle effects of average (i.e., total) consumption vs daily consumption (e.g., usual number of drinks consumed on days or occasions when alcohol is consumed, including the maximum number of drinks consumed during a particular recall period). These studies also need to evaluate effects of drinking

frequency, as higher per occasion consumption is inversely related to drinking frequency among participants bounded by specific levels of total or average consumption of alcohol. Although increasing attention is being paid in the research literature to the effects of alcohol consumption patterns (i.e., how much is consumed, and how often), more evidence is needed on this topic with respect to mortality outcomes, and all-cause mortality in particular. Finally, more research is needed on the relationship between alcohol consumption and alcohol consumption patterns and broader dietary and beverage consumption patterns.

SUMMARY

In this chapter the Committee considered a wide array of evidence about alcohol consumption, which in turn is related to a variety of diseases and social issues.[23] Although the Committee evaluated the relationship between alcohol consumption and all-cause mortality in a new systematic review, these findings also are discussed in context with existing evidence about alcohol's relationship with other diseases and health outcomes,[23] and in context with other types of evidence about alcohol and all-cause mortality and leading alcohol-related diseases. This additional evidence is drawn from traditional meta-analyses, studies of mortality based on composite condition-specific risk curves for alcohol-associated outcomes, MR studies about leading causes of mortality, and relevant literature published before 2010. The Committee's review also considers alcohol-related social and economic costs, harms to others than those who consume alcohol, and alcohol's contribution to meeting nutrient and hydration requirements.

Many U.S. adults consume alcohol excessively, and an even higher proportion consume alcohol at a level exceeding *2015-2020 Dietary Guidelines for Americans* recommended limits for "drinking in moderation" during days when alcohol is consumed. Aside from energy, ethanol has no nutritional value and can also impair the absorption of other nutrients. Alcohol consumption and binge drinking are increasing in the United States, and excessive alcohol consumption is a leading behavioral risk factor for a variety of morbidity and mortality outcomes, social harms, and economic costs. Binge drinking is consistently associated with increased risk of all-cause mortality and other diseases (e.g., injury, CVD) compared to not binge drinking, and more frequent binge drinking is associated with increased risk compared to less binge drinking. Similarly, based on the Committee's review of alcohol and all-cause mortality, higher average consumption is consistently associated with increased mortality risk compared to lower

consumption. Based on meta-analyses and studies with continuous risk curves, the preponderance of evidence indicates that risks are increased at levels above 1 drink per day on average for both men and women.[107-110,116]

Despite limitations of the observational evidence base, the conclusion that higher consumption is associated with increased risk compared to lower consumption is affirmed by outcomes that are fully alcohol-attributable (alcoholic cirrhosis), or outcomes for which alcohol is a predominant risk factor with short and relatively easily studied exposure-outcome relationships (e.g., motor vehicle crashes, falls, drownings). The findings from the Committee's review of current intakes of alcoholic beverages, and their relationships with all-cause mortality and other outcomes raise important questions that have implications for future guidance for Americans.

Should the Dietary Guidelines for Americans continue to recommend against initiating alcohol consumption for health reasons? People drink alcohol for many reasons, and for those who already do so at low levels, risks appear to be low. However, there are several compelling reasons to continue the advice that non-drinkers or never drinkers should not begin to drink on the basis of the notion that alcohol would improve their health. The observational evidence base with respect to alcohol consumption is insufficient to recommend drinking at any level, particularly for a substance that is intoxicating, potentially addictive, and a leading preventable cause of death and other harms. Established low volume drinkers in observational studies are a select group who did not become heavy drinkers or die prematurely from an alcohol-related condition, and differ from non-drinkers who might purposefully begin to drink in middle or older age, some of whom might have adverse effects even at relatively low levels of consumption. As stated by the WHO, "there is no merit in promoting alcohol consumption as a preventive strategy."[154]

Are current recommended limits of no more than 2 drinks per day for men and no more than 1 drink per day for women (i.e., 2/1 consumption limits) reasonable? Although the 2/1 levels (that have been in previous *Dietary Guidelines for Americans* since 1990) constitute reasonably low risk, evidence justifies tightening guidelines for men (discussed below). These 2/1 limits were initially based on theoretical considerations including relative differences in body mass between men and women,[155] but also aligned with increased mortality for men and women above those consumption levels based on an early and influential meta-analysis of alcohol and all-cause mortality.[156]

Continuing to base *Dietary Guidelines for Americans* recommendations on consumption during drinking days (i.e., daily consumption limits) rather than average amounts is justified on

scientific and public health grounds. First, although less scientific literature has been published on daily consumption limits, mortality risk is typically lowest among those who drink less on days when alcohol is consumed, and increasing consumption per drinking day or occasion, and associated blood alcohol concentrations, is typically positively associated with risk for injuries, violence, and a number of other outcomes.[157] Furthermore, the risks of several outcomes were higher modeling 2/1 *average* limits compared with the current 2/1 daily limits[158] because even in the absence of binge drinking, basing guidelines on 2/1 average limits allows for drinking up to 4 drinks per drinking day for men and up to 3 drinks per drinking day for women, so long as implied weekly limits are not exceeded. Consumption at these levels typically leads to some degree of alcohol impairment, including legal intoxication for some people. Drinking levels based solely on the amount consumed in any drinking day has the added advantage of being easier to communicate and interpret compared to having recommendations based on average consumption or some combination of daily and average consumption limits. The guidance should be more explicit that recommended limits are based on consumption per drinking day.

For women, evidence exists that consumption of more than 1 drink per drinking day or of more than 1 drink per day on average (i.e., assuming that a woman drinks 1 drink every day) is associated with increased all-cause mortality risk, with meta-analyses and modeling studies finding that the risk of mortality among women is lowest at approximately one-half drink per day on average. However, it does not seem practical to base recommendations on fractions of a drink, and risk differences for women within ranges of up to 1 drink per day are modest. Therefore, maintaining the current recommendation for women is reasonable.

Why is tightening recommendations for men justified? The rationale to tighten current recommendations for men is based on 2 principal considerations. The first is that based on existing observational data (i.e., in the absence of RCTs, and ignoring MR studies), the preponderance of evidence indicates that consuming 2 drinks per day among men is associated with a modest but meaningful increase in risk compared to consumption of lower amounts, including 1 drink per day. For those who consume alcohol on most or all days of the week, current United States guidelines sanction consumption of up to an average of 2 drinks per day in men, which is associated with higher mortality risk than drinking up to an average of 1 drink per day. This is consistent with findings of the Committee's review in which studies examining smaller consumption strata generally find that the lowest risk of all-cause mortality among men is consumption of up to 1 or 1.5 drinks per day (depending on how consumption was categorized) compared to higher amounts. Evidence that drinking 2 drinks per day has

increased all-cause mortality risk compared to 1 drink per day among men is more specifically supported by studies with designs that better identify narrower consumption strata or continuous risk functions including traditional meta-analyses,[107-111] survival analyses,[25] and modeling studies using weighted composite risk curves based on multiple alcohol-related causes of death.[24,107,115,116,125] For example, a recent Australian modeling study that incorporated protective effects for CVD found that men drinking approximately 2 drinks per day on average had an approximately 2.5 to 5 percent increase in alcohol-related mortality compared with drinking 1 drink per day (depending on the pattern of consumption); this absolute risk difference was similar in a sensitivity analysis in which no cardio-protective effects were modeled. A 2.5 percent increase in absolute risk translates into 1 additional death for every 40 men drinking 2 instead of 1 alcoholic drinks. In studies examining relative risk (rather than absolute risk), drinking 2 drinks compared to 1 alcoholic drink corresponds to similar or larger increases in mortality risk.[107]

In addition, among those who do not necessarily consume alcohol on most days, available evidence indicates that for any given amount of total consumption, consuming fewer alcoholic drinks per drinking day is generally associated with lower mortality risk than consuming more drinks per drinking day.[107,125] Conversely, the Committee is not aware of studies demonstrating that drinking 2 drinks per drinking day is as safe or safer than drinking 1 drink per drinking day for men. Furthermore, for a variety of “acute” conditions (e.g., injuries from motor vehicle crashes, falls drownings, violence), the number of drinks consumed per drinking day or per drinking occasion is the primary determinant of risk as mediated through blood alcohol concentration; although these risks increase exponentially at higher levels of consumption, risk increases above zero drinks.[124,157,159,160] These acute outcomes, which are more common among men than women, comprise a substantial proportion of all alcohol-attributable deaths,[10] and are of particular concern because they disproportionately affect younger and middle aged adults, result in disproportionate harms to vulnerable populations, and may involve harms to persons other than the drinker him or herself.[161]

The second consideration is that emerging evidence suggests the magnitude of risk associated with low volume alcohol consumption may have been underestimated. This warrants consideration of a more conservative approach to recommendations, particularly because alcohol is a potentially harmful substance with minimal nutritional value. As discussed previously, more recent observational studies and meta-analyses that focus on mitigating confounding and selection bias find reduced protection or no risk reduction for all-cause mortality compared with previous studies. Importantly, MR studies suggest no cardio-protective

effects from low volume consumption for CVD (coronary heart disease and ischemic stroke drive the J-shaped curve for all-cause mortality at low levels of consumption), suggesting that increased all-cause mortality risk (albeit limited) may begin even at very low levels of consumption. Were this the case, the lowest level of risk would be no consumption.

Finally, recognition is growing that alcohol is a causal factor for at least 7 types of cancers, many of them common, with increased risk beginning at levels of consumption starting above zero. For example, in the United States the consumption of less than 1.5 drinks (20 gms) per day on average accounts for approximately 30 percent of all alcohol-attributable cancer deaths.[31] Although effects on alcohol and cancer are reflected in findings in studies of alcohol and all-cause mortality in earlier studies, the possibility of increased risk of certain cancers (e.g., colorectal cancers) needs to be carefully considered when endorsing the consumption of even low amounts of alcohol, particularly because cancer now accounts for a similar number of deaths as heart disease in the United States.[162] The *2020 American Cancer Society Guideline on Diet and Physical Activity for Cancer Prevention* concludes that "it is best not to drink alcohol."[163] Although this precautionary approach regarding cancer applies to both men and women, current guidelines for women are already at 1 drink per day and are written such that consumption of less than 1 drink per day, or 1 drink but not every day, is by no means discouraged and may be associated with better health outcomes for women.

Why should the limit for men be the same as that for women? Although a woman has a higher risk than a man of most harms (including all-cause mortality) at all levels of alcohol consumption, at lower levels of consumption the risk differences between men and women are considerably less than those observed at higher levels of consumption such that different sex-based recommendations are not supported. Furthermore, because men are more likely to drink and accrue alcohol-related outcomes compared to women, reducing consumption in men would have a relatively large health impact at the population level. Over the past decade, other high-income countries (Australia, the Netherlands, the United Kingdom, and France) have tightened alcohol drinking guidelines for men, and harmonized them with women.[164-167]

Final Thoughts

Orienting guidelines around increasing levels of risk is the general approach used to develop recommendations for other risk factors such as blood pressure, cholesterol, blood glucose, and body mass. That alcohol is a popular product should not change this approach, at least in the context of guidance to promote health. Given a public health orientation and

limitations of current evidence, the fact that most existing evidence indicates increased risk of all-cause mortality among men drinking 2 drinks per day compared to 1 drink per day, and the possibility that no protection exists for low volume drinking on CVD, changing recommended limits to 1 drink daily for men is justified and should be strongly considered. It is important to acknowledge that many men consume alcohol in excess of this recommendation (and the current recommendation, for that matter), and may not find revised recommendations achievable or desirable, at least on a consistent basis. Nonetheless, although guidelines may be aspirational they are important for communicating evidence around health, stimulating thought around behavior change, and prioritizing policies that may lead to changes in consumption.[168]

Finally, these guidelines are intended to improve public health, and should not be interpreted to mean that consumption above these amounts is necessarily indicative of Federal definitions of excessive drinking,[10-12,18] which are based on higher consumption amounts with higher levels of risk that have been identified as targets for further screening, counseling, and possibly treatment in a clinical context.

Overall, alcohol is an unhealthy substance, and the United States population is far from achieving alcohol consumption levels that would meaningfully reduce alcohol-related harms. Alcohol can be consumed at low levels with relatively low risk, and is consumed by U.S. adults for a variety of reasons. However in terms of health, among those who consume alcohol, drinking less is better for health than drinking more. Currently, no evidence exists to relax current *Dietary Guideline for Americans* recommendations, and there is evidence to tighten them, for men in particular, such that recommended limits for both men and women should be 1 drink per day on days when alcohol is consumed. The Committee's suggestions regarding advice to the general public about drinking in moderation for the next *Dietary Guidelines for Americans* can be summarized as follows:

- Do not begin to drink alcohol or purposefully continue to drink because you think it will make you healthier.
- If you drink alcohol, at all levels of consumption, drinking less is generally better for health than drinking more.
- For those who drink alcohol, recommended limits are up to 1 drink per day for both women and men.

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