Background
The harmful use of alcohol is a causal factor in more than 200 disease and injury conditions, as measured by International Statistical Classification of Diseases and Related Health Problems, 11th Revision (ICD-11) codes, and affects the risk of communicable and noncommunicable diseases (Rehm, Gmel et al., 2017). According to the World Health Organization (WHO), alcohol affects the risk of diseases and conditions as a result of (1) the amount of alcohol consumed, (2) the patterns in which alcohol is consumed, (3) the lifetime history of alcohol consumption, and (4) the presence of harmful agents other than ethanol (WHO, 2018b). Alcohol also interacts with societal and political factors (development and macro-economic profiles, cultural and societal values, public health policies, alcohol availability and marketing), as well as with individual vulnerability factors (age and gender, genetic and familial factors, socio-economic status, and smoking, diet and other risk modifying factors) (WHO, 2018b). A significant, pervasive, and persistent alcohol-related public health concern is the potential impact of alcohol use and alcohol use disorders among women of childbearing age and during pregnancy (see also Chapters 11, 12, and 26). Accordingly, this chapter outlines alcohol consumption among women of childbearing age (15–49 years of age) (Manthey et al., 2019; WHO, 2019). Furthermore, this chapter outlines diseases and injuries causally related to alcohol consumption, and consequential deaths and disability-adjusted life years (DALYs) lost, a measure of both premature mortality and disability (WHO, 2018b).

Global alcohol consumption data
Global data on alcohol consumption and alcohol use disorders (AUDs) are based on information obtained from the Global Information System on Alcohol and Health (Poznyak et al., 2014; WHO, 2019). Two different measurement indices are used.
**Alcohol per capita consumption (APC)**

Globally, the most consistently accurate and widely available measurement of alcohol consumption is adult (≥15 years of age) per capita consumption of ethanol (Bloomfield, Stockwell, Gmel, & Rehn, 2003; Gmel & Rehm, 2004; Poznyak et al., 2014). APC is used to monitor alcohol consumption and set health targets by the United Nations (UN) (United Nations, 2015, 2016), the WHO (WHO, 2010), and the Organisation for Economic Co-operation and Development (OECD) (2019). In particular, the UN’s Sustainable Development Goals call for a 10% reduction in the harmful use of alcohol by 2025 (United Nations, 2015, 2016). For information on how this target can be achieved, see information on the WHO’s Best Buy policies (increases in alcohol taxation, availability restrictions and marketing restrictions; see Begun, Clapp, & The Alcohol Misuse Grand Challenges Collective, 2015; Chisholm et al., 2018).

Due to biases in survey design, study participation, and participant’s responses, data on APC consumption from alcohol surveys are thought to underestimate APC consumption by more than 50% (Shield & Rehm, 2012). However, APC consumption statistics are differentiated by age and sex (i.e. stratified) using nationally representative survey data on the prevalence of individuals who currently consume alcohol (i.e. during the past year) and the average amount of alcohol they consumed daily (WHO, 2018b). Unless otherwise noted, the following data are excerpted from the Global Status Report on Alcohol and Health (GSRAH) 2018 (WHO, 2018b) and the Global Information System on Alcohol and Health (WHO, 2018a).

**Prevalence**

Data on the prevalence of current alcohol consumption (one standard drink during the past year), former alcohol consumption (one standard drink but not within the past year), lifetime abstention, heavy episodic drinking (consumption of 60 grams of alcohol or more during the past 30 days on at least one drinking occasion), and the prevalence AUDs, harmful alcohol use, and alcohol dependence (AD) were obtained from systematic reviews and meta-analyses of population surveys which measured alcohol drinking statuses and AUDs at the population level (for information on how alcohol consumption has been modeled, see Kehoe, Gmel, Shield, Gmel, & Rehm, 2012; Rehm et al., 2010).

**APC**

In 2016, global APC consumption was estimated to be 6.4 liters, representing a stable APC from 2010 when APC consumption was also 6.4 liters (WHO, 2018a; see Table 3.1). However, between 2016 and 2025, based on previous trends in data, APC is projected to increase by 9.4% to 7.0 liters. This projection is based on forecasted increases in alcohol consumption in the WHO regions of the Americas (8.0–8.4 liters), the Western Pacific (7.3–8.1 liters), and South–East Asia (4.5–6.2 liters) (global regions based on the WHO regional definitions from: https://www.who.int/healthinfo/global_burden_disease/definition_regions/en/).

**APC by women**

Stratified by gender global APC consumption among women was estimated to be 2.3 liters in 2016; APC consumption among men was estimated to be 10.5 liters. Among women, APC consumption ranged from 0.1 liters in the Eastern Mediterranean region, to 4.2 liters in
### Table 3.1 Adult per capita consumption and the prevalence of current drinking, former drinking, lifetime abstention, and heavy episodic drinking in 2016

<table>
<thead>
<tr>
<th>Regions</th>
<th>Adult per capita Consumption (liters)</th>
<th>Per capita Consumption (liters) among Women 15–49 Years of Age</th>
<th>Drinking Prevalence (%: Women 15–49 Years of Age)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Total</td>
</tr>
<tr>
<td>Global</td>
<td>10.5</td>
<td>2.3</td>
<td>6.4</td>
</tr>
<tr>
<td>WHO regions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African</td>
<td>10.7</td>
<td>2.0</td>
<td>6.3</td>
</tr>
<tr>
<td>American</td>
<td>13.3</td>
<td>2.9</td>
<td>8.0</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>1.0</td>
<td>0.1</td>
<td>0.6</td>
</tr>
<tr>
<td>European</td>
<td>16.0</td>
<td>4.2</td>
<td>9.8</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>7.6</td>
<td>1.3</td>
<td>4.5</td>
</tr>
<tr>
<td>Western Pacific</td>
<td>11.9</td>
<td>2.6</td>
<td>7.3</td>
</tr>
<tr>
<td>World Bank regions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-income economies</td>
<td>6.6</td>
<td>1.1</td>
<td>3.8</td>
</tr>
<tr>
<td>Lower-middle-income economies</td>
<td>7.9</td>
<td>1.4</td>
<td>4.7</td>
</tr>
<tr>
<td>Upper-middle-income economies</td>
<td>11.5</td>
<td>2.5</td>
<td>7.0</td>
</tr>
<tr>
<td>High-income economies</td>
<td>15.6</td>
<td>4.0</td>
<td>9.8</td>
</tr>
</tbody>
</table>

Source: Data were obtained from the Global Information System on Alcohol and Health (WHO, 2018a).
the European region. Furthermore, APC consumption among women was highest in countries
with high-income economies (4.0 liters), followed by upper-middle-income economies (2.5 liters),
lower-middle-income economies (1.4 liters), and low-income economies (1.1 liters). The ratio of men’s
to women’s APC in 2016 was estimated to be 4.6 globally; highest in the Eastern
Mediterranean region (10.8) and lowest in the European region (3.8). Assuming a prospective
trend of convergence of gendered alcohol use (Bloomfield, Gmel, Neve, & Mustonen,
2001), consumption by women is expected to continue to increase in regions where currently
there exists a large discrepancy in the amount of alcohol consumed by men and by women.

Among women of childbearing age, 2016 global APC consumption was estimated to be
2.3 liters; this consumption varied widely, ranging from 0.1 liters in the Eastern Mediter-
ranean region to 4.6 liters in the European region. Furthermore, APC consumption among
these women was highest in countries with high-income economies (4.5 liters), followed by
upper-middle-income economies (2.7 liters), lower-middle-income economies (1.5 liters),
and low-income economies (1.2 liters).

Current and heavy episodic drinking

In 2016, 44.0% of adults globally had consumed at least one standard drink of alcohol within
the past year; 53.7% of adult men and 32.4% of adult women consumed alcohol in the past
year. In 2016, 17.0% of the global adult population engaged in heavy episodic drinking
(HED), defined as consuming at least 60 grams or more on at least one occasion in the past
30 days; 27.0% of men and 6.4% of women engaged in HED. A European standard drink
contains approximately 10 grams of alcohol, and a U.S. standard drink contains 14 grams.

Heavy drinking by women of childbearing age

Globally, in 2016, 32.1% of women of childbearing age consumed alcohol in the past year, and
8.7% engaged in HED. The prevalence of current drinking among these women was lowest
in the Eastern Mediterranean region (1.3%) and highest in the European region (53.9%).
Similarly, the prevalence of HED among these women was lowest in the Eastern Mediterra-
nean region (0.1%) and highest in the European region (18.7%). Furthermore, the prevalence
rates of women aged 15–49 years who currently consume alcohol and HED were highest
in countries with high-income economies (60.7% consume alcohol, 17.3% HED), followed
by upper-middle-income economies (37.6% consume alcohol, 10.4% HED), lower-middle-
income economies (20.6% consume alcohol, 5.0% HED), and low-income economies (17.4%
consume alcohol, 5.5% HED).

Alcohol use disorders

Data concerning HED, AUDs, and AD are utilized by policy makers when determining public
health policies and allocating treatment resources (Grant et al., 2015; WHO, 2018b); see Chap-
ter 1 and Appendix A for defining characteristics of AUD. Currently, the majority of individu-
als experiencing these highly prevalent, highly comorbid, and disabling disorders go untreated.
In 2016, the prevalence of AUDs among adults was 5.1%, while the prevalence of AD
was 2.6% (WHO, 2018b). Stratified by sex, the prevalence of AUDs and AD among adult
men was 8.6% and 4.5% respectively, and among adult women was 1.7% and 0.8% respect-
ively. Among adult women, the prevalence of AUDs was lowest in the Eastern Medi terrane-
an region (0.2%) and highest in the European region (3.5%). Similarly, among adult
women, the prevalence of AD was lowest in the Eastern Mediterranean region (0.1%) and highest in the European region (1.5%). Stratified by income, the prevalence rates of AUDs and AD were highest in countries with very high-income economies (5.0% AUDs and 2.4% AD), while the prevalence of AUDs was lowest in lower-middle-income economies (0.6% AUDs), and the prevalence of AD was lowest in low-income economies (0.3%).

Alcohol use during pregnancy

Alcohol use during pregnancy has been established as a risk factor for many adverse pregnancy outcomes, including stillbirth (Kesmodel, Wisborg, Olsen, Henriksen, & Secher, 2002), spontaneous birth (Albertsen, Andersen, Olsen, & Gronbaek, 2004; Kesmodel, Olsen, & Secher, 2000; Patra et al., 2011), intrauterine growth retardation (Patra et al., 2011; Yang et al., 2001), low birthweight (O’Callaghan, O’Callaghan, Najman, Williams, & Bor, 2003; Patra et al., 2011) and fetal alcohol spectrum disorder (FASD; see Chapters 11, 12, and 26). Many countries raise awareness concerning the detrimental consequences of alcohol consumption during pregnancy in the form of clinical guidelines (examples include Danish National Board of Health, 2010; French Ministry of Youth Affairs and Sports, 2015; National Health and Medical Research Council, 2009; Society of Obstetricians and Gynaecologists of Canada [Carson, Leach, & Murphy, 2018]; U.S. Centers for Disease Control and Prevention, 2005; and WHO’s 2014 guidelines for the management of substance use during pregnancy [WHO, 2014]). Despite these public health efforts, about 10% of women worldwide consume alcohol while pregnant (Popova, Lange, Probst, Gmel, & Rehm, 2017a, 2017b).

According to a recent study (Popova et al., 2017a), the highest prevalence of alcohol use during pregnancy occurs in the WHO European Region (25.2%; see Table 3.2). This is

Table 3.2  Global prevalence in 2012 of any amount of alcohol use and of heavy episodic drinking (four or more drinks on a single occasion) during pregnancy, and of FAS and FASD among the general population, by WHO region (Popova et al., 2018)

<table>
<thead>
<tr>
<th>Region</th>
<th>Alcohol Use (Any Amount) during Pregnancy (%)</th>
<th>Heavy Episodic Drinking during Pregnancy (%)</th>
<th>FAS (per 10,000)</th>
<th>FASD (per 10,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>9.8</td>
<td>–</td>
<td>14.6</td>
<td>77.3</td>
</tr>
<tr>
<td>WHO region</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African</td>
<td>10.0</td>
<td>3.1</td>
<td>14.8</td>
<td>78.3</td>
</tr>
<tr>
<td>American</td>
<td>11.2</td>
<td>2.8</td>
<td>16.6</td>
<td>87.9</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>0.2</td>
<td>–</td>
<td>0.2</td>
<td>1.3</td>
</tr>
<tr>
<td>European</td>
<td>25.2</td>
<td>2.7</td>
<td>37.4</td>
<td>198.2</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>1.8</td>
<td>–</td>
<td>2.7</td>
<td>14.1</td>
</tr>
<tr>
<td>Western Pacific</td>
<td>8.6</td>
<td>1.8</td>
<td>12.7</td>
<td>67.4</td>
</tr>
</tbody>
</table>

Source: Popova, Lange, Poznyak et al. (2019).

Notes
a The prevalence of any amount of alcohol use during pregnancy is inclusive of the prevalence of binge drinking during pregnancy.
b It was not possible to estimate the prevalence of binge drinking during pregnancy for the Eastern Mediterranean Region and South-East Asia Region due to a lack of available data for countries in these regions, and, therefore, the global prevalence could not be estimated.
c The prevalence of FASD is inclusive of the prevalence of FAS.
not surprising; according to the latest Global Status Report on Alcohol and Health (WHO, 2018b), almost all major alcohol indicators, including prevalence, level of consumption, rates of alcohol use and HED, and AUDs, are the highest in the European region. Additionally, the five countries with the highest prevalence rates of alcohol use among pregnant women also occur in the European region: Ireland (60.4%), Belarus (46.6%), Denmark (45.8%), United Kingdom (41.3%), and Russia (36.5%). The lowest prevalence of alcohol use during pregnancy was estimated to be among women in the Eastern Mediterranean Region (50 times lower than the global average) and in the South-East Asia Region (five times lower than the global average); in these regions, a large proportion of the population abstains from alcohol use, especially the female population (WHO, 2014).

In addition to alarmingly high rates of alcohol consumption during pregnancy, it has also been established that over 25% of the women who consume any alcohol during pregnancy engage in binge drinking, defined as consuming four or more drinks on a single occasion (Lange, Probst, Rehm, & Popova, 2017; Popova et al., 2017b). The highest prevalence of binge drinking during pregnancy was estimated to be in the African region (3.1%), while the Western Pacific region had the lowest prevalence of binge drinking during pregnancy (1.8%). The proportion of pregnant women who engaged in binge drinking during pregnancy, among women who drank any amount of alcohol, was estimated to range from 10.7% in the European region to 31.0% in the African region. The five countries with the highest estimated prevalence of binge drinking during pregnancy were Paraguay (13.9%), Moldova (10.6%), Ireland (10.5%), Lithuania (10.5%), and the Czech Republic (9.4%).

Estimates presented in this section reflect the general populations of the respective countries. However, prevalence rates of alcohol use during pregnancy have been reported to be much higher among some sub-populations. For example, the prevalence of alcohol use during pregnancy among Inuit women in northern Quebec (Canada) was reported to be 60.5%, which is over ten times higher than the estimate for the general population of Canada (Fraser, Muckle, Abdous, Jacobson, & Jacobson, 2012).

Fetal alcohol syndrome (FAS) and fetal alcohol spectrum disorder (FASD)

Overall, these estimates are very troubling, as binge drinking is the most detrimental pattern of drinking during pregnancy and is a direct cause of FASD. The prevalence of FASD in the Western Cape Province of South Africa, a region known for wine production and a high prevalence of binge drinking among women, has been reported to be 135–208 per 1,000 (13.5–20.8%) among first-grade students—one of the highest FASD prevalence rates in the world (May et al., 2013).

In line with the prevalence of alcohol use during pregnancy, the prevalence rates of FAS (fetal alcohol syndrome) and FASD (fetal alcohol spectrum disorders) were estimated to be highest in the European region at 37.4 per 10,000 and 198.2 per 10,000 respectively, and lowest in the Eastern Mediterranean region at 0.2 per 10,000 and 1.3 per 10,000 respectively. Global prevalence rates of FAS and FASD among the general population were estimated to be 14.6 per 10,000 and 77.3 per 10,000 respectively. The five countries with the highest FAS prevalence per 10,000 were Belarus (69.1), Italy (82.1), Ireland (89.7), Croatia (115.2), and South Africa (585.3). The five countries with the lowest FAS prevalence (less than 0.05 per 10,000) were Oman, United Arab Emirates, Saudi Arabia, Qatar, and Kuwait (all in the Eastern Mediterranean Region). The five countries with the highest FASD prevalence were South Africa (111.1 per 1,000), Croatia (53.3 per 1,000), Ireland (47.5 per 1,000), Italy (45.0 per 1,000), and Belarus (36.6 per 1,000).
**FASD prevalence in sub-populations**

A recent systematic review and meta-analysis revealed that certain sub-populations, such as children in care, correctional, special education, specialized clinical, and Aboriginal populations, experience a significantly higher prevalence of FASD compared to the general population (see Figure 3.1). This trend poses a great service and cost burden across various systems of care, reflecting a substantial global health problem (Popova, Lange, Shield, Burd, & Rehm, 2019). The pooled prevalence of FASD among children in out-of-home care/foster care in Chile was estimated to be 31.2% and 25.2% in the United States. The pooled prevalence of FAS (the most severe form of FASD) was estimated to be 9.6% among children in care in Russia. The pooled FASD prevalence among Aboriginal populations was estimated to be 4.4% and estimated to be 14.7% among adults in the Canadian correctional system.

FASD prevalence rates among these sub-populations far exceed rates among the general population. Compared to the recently estimated 7.7 per 1,000 global prevalence of FASD in the general population (Lange, Probst, Gmel et al., 2017), prevalence in the selected sub-populations were 10- to 40-times higher. For example, the prevalence among children in care was 32-times higher in the United States and 40-times higher in Chile, the prevalence among adults in the Canadian correctional system was 19-times higher, and the prevalence among special education populations in Chile was over 10-times higher.

Furthermore, prevalence rates reported in individual studies (some not meta-analyzed) are even higher, and more alarming. For instance, the prevalence of FASD among children with intellectual disabilities in care in Chile was 62% (Mena, Navarrete, Avila, Bedregal, & Berrios, 1993), over 52% among adoptees from Eastern Europe (Landgren, Svensson, Strömland, & Grönlund, 2010), and about 40% among children residing in orphanages in Lithuania (Kuzmenkovičienė, Prasauskienė, & Endzinienė, 2012). The highest prevalence estimates of FAS, ranging between 46% and 68%, were reported in Russian orphanages for children with developmental abnormalities (Legonkova, 2011). Additionally, the prevalence

![Figure 3.1 Pooled prevalence of FAS and FASD among selected sub-populations, by country and in the general global population](image)

Source: Based on data from Popova, Lange, Poznyak et al. (2019).
of FASD among youth in correctional services was over 23% in Canada (Fast, Conry, & Loock, 1999), and over 14% among United States populations in psychiatric care (Bell & Chimata, 2015). Children are often placed in foster care, orphanages, or for adoption due to unfavorable circumstances, such as parental alcohol and/or drug use, child maltreatment, abandonment, and young maternal age (see Chapter 23). These circumstances suggest a higher likelihood of prenatal alcohol exposure among children in care (Burd, Cohen, Shah, & Norris, 2011).

Appropriate social work interventions, as well as diagnostic and support services, must be applied at an early age for individuals with FASD to decrease their chances of becoming involved with the legal system, either as victims or as offenders. One estimate suggests that, on any given day in a specific year, children and adolescents with FASD are 19 times more likely to be incarcerated compared to children and adolescents without FASD (Popova, Lange, Bekmuradov, Mihic, & Rehm, 2011). Lastly, high prevalence rates of FASD among special education populations and in specialized clinical populations are not surprising, given that individuals with FASD are at greater risk of having learning difficulties and mental health problems, as well as experiencing developmental delays (Popova, Lange, Poznyak et al., 2019).

High prevalence rates of alcohol consumption during pregnancy and FASD within Aboriginal populations must especially be examined within the historical context and sociodemographic reality of this marginalized sub-population—colonization, intergenerational trauma, and residential school experiences. These factors contribute to the high prevalence of alcohol use, both in general and during pregnancy (Sotero, 2006; Szlemko, Wood, & Thurman, 2006). For example, the prevalence rates of alcohol use during pregnancy in the Aboriginal populations of the United States and Canada were approximately three and four times higher, respectively, compared to the general population (Popova, Lange, Probst, Parunashvili, & Rehm, 2017). Even more alarmingly, approximately 20% of women in the Aboriginal populations who consumed alcohol during pregnancy engaged in binge drinking as compared to 3% in the general population in both countries (Popova et al., 2017).

### Disease burden attributable to alcohol consumption

Estimates of alcohol-attributable (AA) deaths and disability-adjusted life years (DALYs) lost are used to assess the impact of alcohol on health at the population level and the need for public health policies to reduce the harmful consumption of alcohol and resulting burden of disease.

The diseases, conditions, and injuries causally related to alcohol consumption are outlined in Table 3.3. The number of AA deaths and DALYs lost were estimated based on (1) diseases and injuries where alcohol is a necessary cause, such as AUDs (i.e. diseases and injuries which are 100% attributable to alcohol), and (2) diseases and injuries where alcohol is a component cause, where under a counterfactual scenario of no alcohol consumption a fraction of the disease or injury would not occur. For diseases and injuries where alcohol is a component cause, the fractions of AA deaths and DALYs lost were estimated using a Levin-based methodology by combining data on alcohol consumption with corresponding relative risk (RR) estimates obtained from systematic reviews and meta-analyses (Levin, 1953).

According to the WHO’s GSRAH (WHO, 2018b), 3 million deaths every year result from the harmful use of alcohol, representing 5.3% of all deaths globally. Overall, 5.1% of the global burden of disease and injury is attributable to alcohol, as measured in DALYs lost. Among women
Global alcohol epidemiology

15–49 years of age, alcohol was responsible for 150,466 deaths in 2016, representing 4.6% of all deaths, and 12,711,001 DALYs lost, representing 3.5% of all DALYs lost (see Table 3.4).

Geographically, among women 15–49 years of age, alcohol caused the largest number of age-standardized deaths in the African region (17.2 deaths per 100,000 people) and the European region (14.1 deaths per 100,000), while the Eastern Mediterranean (0.6 deaths per 100,000 people) and Western Pacific (5.0 deaths per 100,000) regions experienced the lowest AA death burdens (see Figure 3.2). Furthermore, the age-standardized AA death burden was highest in countries with low-income economies (10.1 deaths per 100,000), followed by lower-middle-income economies (8.7 deaths per 100,000), upper-middle-income economies (7.4 deaths per 100,000), and high-income economies (5.8 deaths per 100,000; see Figure 3.3). Of note is the age-standardized burden of AA communicable, maternal, perinatal, and nutritional conditions in the African region (5.0 deaths per 100,000), as well as in countries with lower-middle-income economies (1.9 deaths per 100,000), and upper-middle-income economies (1.6 deaths per 100,000 people). The burden of AA deaths in the African region as well as in countries with lower- and lower-middle-income economies is greatly affected by the underlying high risk of tuberculosis, HIV/AIDS, and lower respiratory diseases in this region and these countries (WHO, 2018b).

<table>
<thead>
<tr>
<th>Table 3.3 Causes of death and disability causally related to alcohol consumption a</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diseases and injuries</strong></td>
</tr>
<tr>
<td><strong>Communicable diseases</strong></td>
</tr>
<tr>
<td>Tuberculosis, HIV/AIDS, Lower respiratory infections</td>
</tr>
<tr>
<td><strong>Noncommunicable diseases</strong></td>
</tr>
<tr>
<td>Malignant neoplasms</td>
</tr>
<tr>
<td>Lip and oral cavity, pharyngeal cancers (excluding nasopharyngeal), esophagus cancer, colon and rectum cancers, liver cancer, breast cancer, larynx cancer</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>Alcohol use disorders</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>Epilepsy</td>
</tr>
<tr>
<td>Cardiovascular diseases</td>
</tr>
<tr>
<td>Hypertensive heart disease, Ischemic heart disease, Ischemic stroke, Hemorrhagic stroke, Cardiomyopathy, myocarditis, endocarditis</td>
</tr>
<tr>
<td>Digestive diseases</td>
</tr>
<tr>
<td>Cirrhosis of the liver</td>
</tr>
<tr>
<td>Pancreatitis</td>
</tr>
<tr>
<td><strong>Injuries</strong></td>
</tr>
<tr>
<td><strong>Unintentional injuries</strong></td>
</tr>
<tr>
<td>Road injury, poisonings, falls, fire, heat and hot substances, drowning, exposure to mechanical forces, other unintentional injuries</td>
</tr>
<tr>
<td><strong>Intentional injuries</strong></td>
</tr>
<tr>
<td>Self-harm, interpersonal violence</td>
</tr>
</tbody>
</table>

Source: Based on the conclusions of the review by Rehm, Gmel et al. (2017).

Note
a Alcohol is also causally related to atrial fibrillation and flutter, esophageal varice, and psoriasis, and major depressive disorder.

15–49 years of age, alcohol was responsible for 150,466 deaths in 2016, representing 4.6% of all deaths, and 12,711,001 DALYs lost, representing 3.5% of all DALYs lost (see Table 3.4).

Geographically, among women 15–49 years of age, alcohol caused the largest number of age-standardized deaths in the African region (17.2 deaths per 100,000 people) and the European region (14.1 deaths per 100,000), while the Eastern Mediterranean (0.6 deaths per 100,000 people) and Western Pacific (5.0 deaths per 100,000) regions experienced the lowest AA death burdens (see Figure 3.2). Furthermore, the age-standardized AA death burden was highest in countries with low-income economies (10.1 deaths per 100,000), followed by lower-middle-income economies (8.7 deaths per 100,000), upper-middle-income economies (7.4 deaths per 100,000), and high-income economies (5.8 deaths per 100,000; see Figure 3.3). Of note is the age-standardized burden of AA communicable, maternal, perinatal, and nutritional conditions in the African region (5.0 deaths per 100,000), as well as in countries with lower-middle-income economies (1.9 deaths per 100,000), and upper-middle-income economies (1.6 deaths per 100,000 people). The burden of AA deaths in the African region as well as in countries with lower- and lower-middle-income economies is greatly affected by the underlying high risk of tuberculosis, HIV/AIDS, and lower respiratory diseases in this region and these countries (WHO, 2018b).
Table 3.4 Deaths and disability-adjusted life years lost globally in 2016, by cause, among women 15–49 years of age

<table>
<thead>
<tr>
<th>Cause of Death and/or Disability</th>
<th>Deaths</th>
<th></th>
<th>Disability-Adjusted Life Years Lost</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fraction (%)</td>
<td>Per 100,000 People</td>
<td></td>
</tr>
<tr>
<td>All causes</td>
<td>3,214,365</td>
<td>150,466</td>
<td>4.7</td>
<td>7.9</td>
<td>365,440,152</td>
</tr>
<tr>
<td>Communicable, maternal, perinatal, and nutritional conditions</td>
<td>1,084,733</td>
<td>18,915</td>
<td>1.7</td>
<td>1.0</td>
<td>92,615,606</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>152,436</td>
<td>12,258</td>
<td>8.0</td>
<td>0.6</td>
<td>9,435,283</td>
</tr>
<tr>
<td>HIV AIDS</td>
<td>302,730</td>
<td>3,657</td>
<td>1.2</td>
<td>0.2</td>
<td>18,542,354</td>
</tr>
<tr>
<td>Lower respiratory infections</td>
<td>85,382</td>
<td>3,000</td>
<td>3.5</td>
<td>0.2</td>
<td>5,078,643</td>
</tr>
<tr>
<td>Noncommunicable diseases</td>
<td>1,559,340</td>
<td>67,905</td>
<td>4.4</td>
<td>3.6</td>
<td>227,975,977</td>
</tr>
<tr>
<td>Malignant neoplasms</td>
<td>564,475</td>
<td>10,202</td>
<td>1.8</td>
<td>0.5</td>
<td>29,921,215</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>53,707</td>
<td>3,143</td>
<td>−5.9</td>
<td>−0.2</td>
<td>7,307,617</td>
</tr>
<tr>
<td>Alcohol use disorders</td>
<td>8,440</td>
<td>8,440</td>
<td>100.0</td>
<td>0.4</td>
<td>3,538,984</td>
</tr>
<tr>
<td>Epilepsy</td>
<td>24,456</td>
<td>1,381</td>
<td>5.6</td>
<td>0.1</td>
<td>3,265,894</td>
</tr>
<tr>
<td>Cardiovascular diseases</td>
<td>441,412</td>
<td>13,097</td>
<td>3.0</td>
<td>0.7</td>
<td>26,589,893</td>
</tr>
<tr>
<td>Digestive diseases</td>
<td>167,234</td>
<td>37,929</td>
<td>22.7</td>
<td>2.0</td>
<td>11,491,598</td>
</tr>
<tr>
<td>Injuries</td>
<td>570,293</td>
<td>63,646</td>
<td>11.2</td>
<td>3.4</td>
<td>44,848,570</td>
</tr>
<tr>
<td>Unintentional injuries</td>
<td>315,315</td>
<td>45,064</td>
<td>14.3</td>
<td>2.4</td>
<td>27,567,796</td>
</tr>
<tr>
<td>Intentional injuries</td>
<td>254,978</td>
<td>18,582</td>
<td>7.3</td>
<td>1.0</td>
<td>17,280,774</td>
</tr>
</tbody>
</table>

Source: Data were obtained from the Global Information System on Alcohol and Health (WHO, 2018a).
AA: Alcohol-Attributable.
Similar to the AA death burden, the age-standardized AA DALYs lost burden among women 15–49 years of age was highest in the European (1,307 DALYs lost per 100,000 people) and African (1,226 DALYs lost per 100,000 people) regions and lowest in the Eastern Mediterranean region (158 DALYs lost per 100,000 people; see Figure 3.4). Furthermore, the age-standardized burden of AA DALYs lost was highest in countries with low-income economies (799 DALYs lost per 100,000 people), followed by lower-middle-income economies (685 DALYs lost per 100,000 people), upper-middle-income economies
(650 DALYs lost per 100,000 people), and high-income economies (617 DALYs lost per 100,000 people; see Figure 3.5). As with the burden of AA deaths, the age-standardized burden of communicable, maternal, perinatal, and nutritional conditions was particularly high in the African region (288 DALYs lost per 100,000 people) as well as in countries with lower- and lower-middle-income economies (112 and 95 DALYs lost per 100,000 people respectively).
Alcohol and risk of communicable diseases

Alcohol consumption affects the risk of communicable diseases through multiple mechanisms. First, alcohol consumption (in particular HED) negatively impacts the immune system (MacGregor, 1986). Second, alcohol increases the risk of HIV infection through a decrease in the probability of using a condom during sexual intercourse (Rehm, Probst, Shield, & Shuper, 2017; Rehm, Shield, Joharchi, & Shuper, 2012) and of HIV deaths through decreased adherence to antiretroviral therapy (Hendershot, Stoner, Pantalone, & Simoni, 2009). As a result, among women of childbearing age, alcohol was responsible in 2016 for 18,915 and 1,144,052 communicable disease deaths and DALYs lost, respectively. Furthermore, alcohol was responsible for 8.0% of all tuberculosis deaths, 1.2% of all HIV/AIDS deaths, and 3.5% of all lower respiratory infection deaths.

Alcohol and risk of noncommunicable diseases

Animal, biological, and epidemiological studies demonstrated sufficient causal evidence that alcohol consumption affects the risk of malignant neoplasms (cancers), diabetes mellitus, AUDs, epilepsy, cardiovascular diseases, and digestive diseases (Rehm, Gmel et al., 2017). For instance, the link between alcohol and esophageal cancer and cardiac carcinoma was first observed in 1910 (Lamy, 1910). Furthermore, the International Agency for Research on Cancer (IARC, 2012) and the World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR, 2018) have attributed the highest level of causal evidence to the association between alcohol consumption and the risk of developing cancer. In particular, alcohol is causally associated with cancers of the oral cavity, oropharynx, hypopharynx, esophagus, colon, rectum, liver and intrahepatic bile duct, larynx, and breast (IARC, 2012; WCRF/AICR, 2018). In 2016, among women 15–49 years of age, alcohol caused 10,202 cancer deaths and 524,761 cancer DALYs lost, representing 1.8% of all cancer deaths and 1.8% of all cancer DALYs lost. Furthermore, although not modeled, alcohol exposure between menarche and the first pregnancy may increase the risk of breast cancer more than alcohol consumption later in life due to undifferentiated nulliparous breast tissue being more susceptible to carcinogens (Liu et al., 2013).

The antioxidative properties of resveratrol (i.e. the red wine chemical) have received media attention for their anti-carcinogenic properties. However, for every cancer case that the resveratrol in wine prevents, 100,000 cancer cases are caused by ethanol (i.e. the margin of exposure of resveratrol is estimated to be 100,000) (Shield, Soerjomataram, & Rehm, 2016).

At lower doses of alcohol consumption, there is a decrease in the risk of diabetes mellitus through increased insulin sensitivity (Hendriks, 2007), and possibly through other pathways such as increase in the levels of alcohol metabolites (Sarkola, Iles, Kohlenberg-Mueller, & Eriksson, 2002). However, at higher doses of alcohol consumption, there has been an observed increase in the risk of diabetes mellitus. As a result, alcohol consumption has a “J” shaped relationship with the risk of diabetes mellitus (Knott, Bell, & Britton, 2015). At the global level, alcohol had a net protective effect on diabetes mortality and morbidity in 2016, preventing 3,143 diabetes deaths and 476,918 diabetes DALYs lost.

The consumption of alcohol increases the predisposition for epileptic seizures; alcohol withdrawal following heavy alcohol consumption has a kindling effect which lowers the threshold for the inducing of an epileptic episode (Ballenger & Post, 1978). Other causal
pathways for epileptic seizures include cerebral atrophy, as well as cerebrovascular infarctions, lesions, and head traumas (Rathlev, Ulrich, Delanty, & D’Onofrio, 2006). As a result, among women 15–49 years of age, alcohol consumption in 2016 caused 1,381 epilepsy deaths and 178,901 epilepsy DALYs lost, representing 5.5% and 5.6% of epilepsy deaths and epilepsy DALYs lost, respectively.

Although not modeled in the GSRAH, heavy alcohol use related causally to major depressive disorders (Rehm, Gmel et al., 2017). Alcohol use is also associated with worsening the depression course, and outcomes such as suicide, as well as impaired social functioning and decreased health-care utilization (Sullivan, Fiellin, & O’Connor, 2005). Additionally, depressive disorders increase alcohol use and can cause AUDs, thus worsening depressive symptoms (Boden & Fergusson, 2011).

Alcohol has both detrimental and protective effects on cardiovascular diseases. In particular, low-dose alcohol consumption decreased the risks of both ischemic heart disease and ischemic stroke (Patra et al., 2010; Roerecke & Rehm, 2012). This protective effect is hypothesized to be mediated through increases in blood concentrations of high-density lipoprotein, as the result of cellular signaling effects, decreases in the ability of platelets to form blood clots, and blood clot dissolution (Zakhari, 1997). However, this protective effect is not observed for HED (Roerecke & Rehm, 2012). Alcohol has a detrimental effect on cardiovascular diseases by causing abnormalities and disruptions in the electro-chemical signals that coordinate the heartbeat and heart rate. As a result, alcohol has been associated with an increased risk of hypertensive heart disease, hemorrhagic stroke, and cardiomyopathy (Rehm, Gmel et al., 2017). At the global level, alcohol had a net negative effect in 2016 on cardiovascular diseases, causing 13,097 cardiovascular disease deaths and 663,026 cardiovascular disease DALYs lost among women 15–49 years of age, representing 0.7% of all cardiovascular disease deaths and 2.5% of all cardiovascular disease DALYs lost.

Alcohol consumption has been observed to increase the risk of both liver cirrhosis and pancreatitis. In particular, the breakdown of ethanol in the liver through oxidative and non-oxidative pathways, and the resulting production of acetaldehyde, increased risk of fatty liver, alcoholic hepatitis, and cirrhosis (Tuma & Casey, 2003). Alcohol consumption increases the risk of pancreatitis through the same pathways as for liver cirrhosis; in particular, alcohol metabolism results in damage to pancreatic acinar cells (Vonlaufen, Wilson, Pirola, & Apte, 2007). Based on these risk relationships, among women of childbearing age, alcohol was estimated to have caused 37,929 digestive disease deaths and 2,165,863 DALYs lost during 2016, representing 22.7% of all digestive disease deaths and 18.8% of DALYs lost.

Alcohol and risk of injury

Alcohol increases the risk of injury as a result of psychomotor (Dawson & Reid, 1997) and executive functioning impairment (Giancola, 2000), with the risk of injury being dependent on the person(s) who contribute to the injury, the vehicle/agent which causes the injury, and the environment where the injury takes place (Haddon Jr., 1980; Rivara, Koepsell, Jurkovich, Gurney, & Soderberg, 1993). In particular, alcohol consumption has been linked to an increase in the risk of road and other unintentional injuries, as well as risk of self-harm and interpersonal violence (Rehm, Gmel et al., 2017). Overall, among women 15–49 years of age, AA injuries caused a total of 63,646 injury deaths and 4,972,331 injury DALYs lost, representing 11.2% and 11.1% of all injury deaths and DALYs lost, respectively.
**Alcohol harms by socio-economic status**

Although not accounted for in the 2018 GSRAH estimations, when standardized based on the grams consumed, alcohol has been shown to impact individuals of lower socio-economic statuses to a greater extent (Probst, Roerecke, Behrendt, & Rehm, 2014). This is due to multiple factors, including the interaction with other risk factors, such as tobacco, obesity, and hepatitis infection, and by access to and utilization of health-care resources (WHO, 2018c).

**Public health guidelines for low-risk alcohol consumption**

As alcohol consumption has both protective and detrimental effects on health, the question remains as to what constitutes low-risk drinking; the information on which to make such a determination is inconsistent. Low-risk drinking guidelines are often determined by a group of independent experts, and/or community stakeholders, such as blue-ribbon committees, and are based on average alcohol consumption R.R. curves for all-cause or selected disease mortality (Shield et al., 2017). This is problematic as it does not consider non-fatal outcomes caused by alcohol, such as AUDs (Rehm, Gmel et al., 2017), and all-cause mortality R.R.s are estimated based on large, non-representative cohort studies constructed based on the ease of following up participants. As a result, these estimates are based on data which over-represent deaths occurring in the middle-class population compared to other segments of the general population (Shield et al., 2017).

Recent data from the 2016 Global Burden of Disease study suggest that there is no safe level of drinking (i.e., even at low levels of alcohol consumption there is a net detrimental effect on health) (GBD 2016 Alcohol Collaborators, 2018). However, there may be a net protective effect at lower alcohol consumption amounts (not engaging in HED) (Shield & Rehm, 2019) due to the protective effects of alcohol on the risks of diabetes mellitus, ischemic heart disease, and ischemic stroke (Rehm, Gmel et al., 2017).

**Conclusions**

Alcohol has a net negative impact on health at the population level, impacting the risk of over 230 diseases and injuries. Accordingly, the harmful effects of alcohol should be recognized globally as a large public health problem warranting attention from social workers and health-care professionals. Evidence-supported efforts should be made to educate the general population (women and men, children and teenagers) about the risks of alcohol use, especially binge and frequent drinking, and especially during pregnancy. Moreover, prevention initiatives, aimed at reducing alcohol misuse and alcohol use during and before pregnancy, should be implemented around the world. Social workers and health-care providers are well positioned to fulfill a crucial role in reducing the harms associated with alcohol misuse, and in primary prevention of prenatal alcohol exposure.

**References**


Global alcohol epidemiology


