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# Societal Costs of Alcohol in Sub-Saharan Africa

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**Summary of Key Findings**

Drinking Patterns & Commercial Alcohol Production

- While total alcohol consumption in Africa has been relatively stable over the past twenty years (1990-2010), some countries have experienced increases or decreases in total alcohol consumption in the past ten years. These changes are partially driven by changing income, employment rates, or availability of commercially produced alcohol.
- Abstention is still the most common drinking pattern in SSA. Six of the forty-three African countries (Algeria, Guinea, Senegal, Niger, Mali, and Mauritania) had abstention rates over 90% in the prior twelve months, and abstention rates in most countries (36 out of 43) is between 50% and 89%.
- Recent data suggest that market liberalization has increased the availability of alcohol, particularly for groups of lower socio-economic status (SES), increasing consumption particularly among those who face the greatest social burden.
- Multinational brewing companies in SSA have shifted to local supply chains, and currently all major brewers partially substitute imported barley with sorghum and other locally produced crops.
- While many countries in SSA have signed drug control and prevention conventions including the UN Drug Control Convention, national alcohol policies are a relatively recent development and have been subject to alcohol industry influence.

Health Costs

- In Sub-Saharan Africa, alcohol use contributed to 3.4% of total deaths and 2.2% of total DALYs in 2010.
- Alcohol use was the leading risk factor in *southern* Sub-Saharan Africa (Botswana, Lesotho, Namibia, South Africa, Swaziland, and Zimbabwe).
- Alcohol use is the leading risk factor for early mortality and morbidity for men aged 15-49 in SSA.
- In 2010, there were 285,500 alcohol-attributable deaths in SSA. Among these deaths, nearly 12% were caused by HIV/AIDS associated with alcohol use.
- The most common cause of death associated with alcohol use in SSA was intentional and unintentional injuries (including transport injuries, inter-personal violence, and self-harm).
- Drinkers in SSA are more likely to have HIV than non-drinkers and are less likely to adhere to treatment.
- Parry et al. (2009) established a causal linkage between alcohol use and tuberculosis and HIV/AIDS transmission.

Social Costs – Alcohol, Poverty, & Impacted Populations

- Men consume more alcohol and with greater frequency than women, but women and children face higher health and social costs from alcohol use.
- In most African countries, 40-50% of the population consists of young people below age 15. Results from several substance abuse studies indicate increasing alcohol use and abuse among younger segments of the population.
- Alcohol consumption is positively associated with wealth, but low-income regions such as Africa and the Eastern Mediterranean have higher relative impact of alcohol-related deaths and DALYs when controlling for amount consumed compared to higher-income regions in Europe and the Americas.
- Chronically poor households are more likely to have alcohol expenditures than those not in poverty, and expenditures on alcohol as a proportion of all food and beverage consumption are likely higher than average in households in chronic poverty.

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## Introduction

The commercial alcohol industry in Africa may provide opportunities to increase market access and incomes for smallholder farmers by increasing access to agriculture-alcohol value chains. While increased engagement in these value chains may not increase smallholders' alcohol consumption directly, the increased production and availability of alcohol in these countries could contribute to increased consumption at a societal level. Despite the benefits of increased market opportunities for smallholder farmers and those involved in the agriculture-alcohol value chains, the high costs to human health and social welfare from increased alcohol use and alcoholism could contribute to a net loss for society.

To better understand the tradeoffs between increased market access for smallholders and societal costs associated with harmful alcohol consumption, this paper provides an inventory of the societal costs of alcohol in Sub-Saharan Africa (SSA). We examine direct costs associated with addressing harmful effects of alcohol and treating alcohol-related illnesses, as well as indirect costs associated with the goods and services that are *not* delivered as a consequence of drinking and its impact on personal productivity.

This evidence is intended to enable donors and policy makers to better assess the net social impact that increased investment in alcohol-related agricultural interventions would have in Sub-Saharan Africa, with a particular focus on women and children. **Section I** provides an overview of current consumption trends and drinking patterns driving the health and social costs; **Section II** describes the current alcohol production, commercialization, and policy environment; **Section III** inventories the direct and indirect health costs related to alcohol use drawing from empirical studies and global databases; and **Section IV** inventories the social and welfare costs using the same methods.

## Literature Review Methodology

We conducted searches using Google Scholar and the University of Washington libraries using the following search terms: alcohol costs, social costs of alcohol, health costs of alcohol, patterns of drinking, prevalence of drinking, income effects of alcohol use, and disease burden, with sub-searches for Sub-Saharan Africa. For all statistics and graphics, we utilized the Global Burden of Disease (GBD) database by the Institute for Health Metrics and Evaluation (IHME) and the World Health Organization's Global Information System on Alcohol and Health (GISAH) database. We also utilized FAOSTAT to retrieve raw data on national-level alcohol production and export statistics.

In this paper, we attempt to quantify the economic costs of alcohol consumption on the welfare of society as a whole. However, due to data limitations, we were unable to provide *monetary* values of the social costs related to alcohol use as is consistent with guidelines for estimating the attributable (Single, 2003) and avoidable (Lapsley et al., 2006) costs of alcohol such as health costs and loss of property. Instead we use prevalence of alcohol consumption and indicators such as DALYs as proxies for monetized health and social costs.

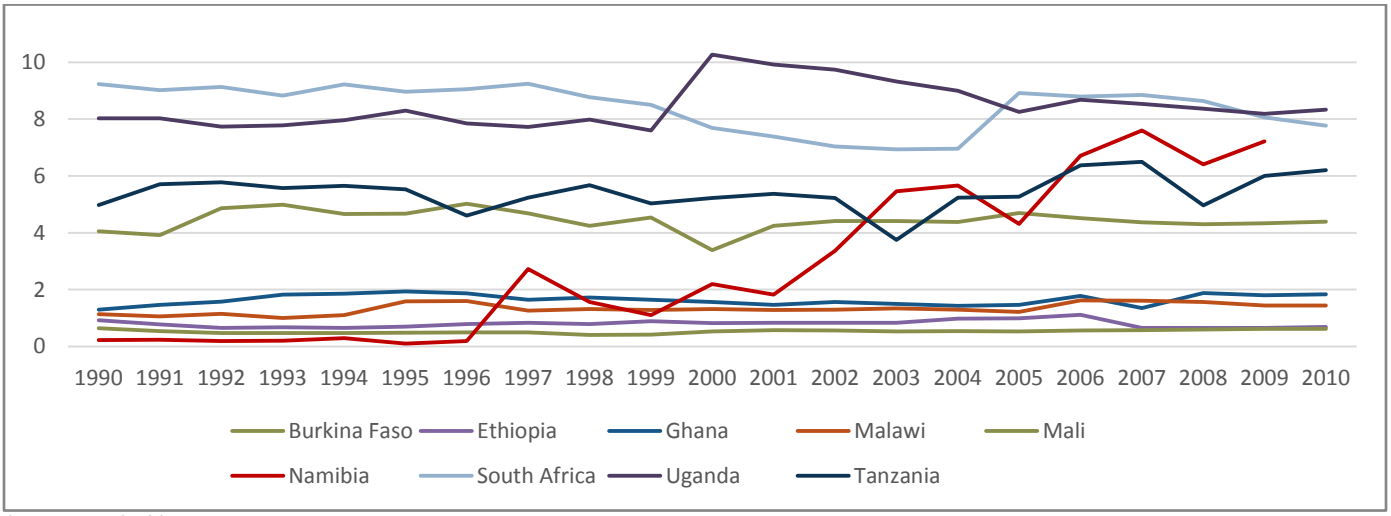
## Section I: Summary of current alcohol consumption and drinking patterns in SSA

### Total Consumption Levels

Alcohol consumption volume and drinking patterns vary widely across Sub-Saharan African countries. Overall abstention rates are high in most countries, especially among women, but heavy episodic drinking is common among male and female drinkers in some countries (Obot, 2006; WHO, 2014). A relatively small minority of drinkers consumes the majority of all alcohol consumed in most SSA countries (WHO, 2014). Total alcohol consumption is conventionally reported in terms of annual adult alcohol consumption per capita (APC), as measured in litres of pure (100%) alcohol.[1] **Appendix I** provides more detailed information about the WHO's alcohol consumption and drinking pattern indicator methodology. *Figure 1* provides an overview of total recorded alcohol consumption levels (APCs) in select countries from 1990 to 2010.

[1] WHO uses adult per capita data to measure alcohol consumption, instead of the widely used "per capita for the whole population" to balance the fact that population distributions in developing countries are quite different from developed countries given larger proportions of children and young people. This helps to avoid underestimating consumption among adults in countries with many young people.

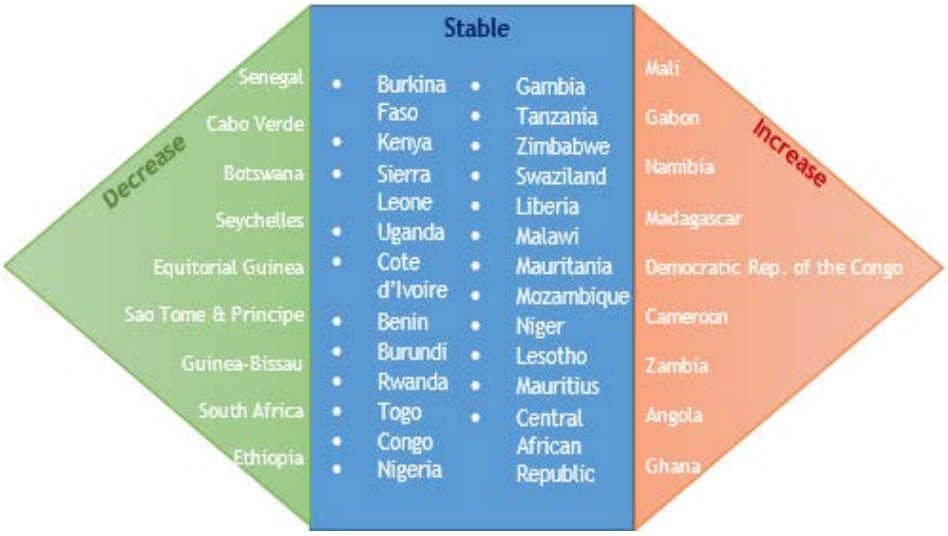
*Figure 1: Recorded adult alcohol consumption per capita (APC) among select countries (litres of pure alcohol), 1990-2010*




*Source: WHO, 2014*

While consumption trends in the region look relatively flat over the twenty-year period, some countries have experienced increases or decreases over the past ten years. These changes are partially driven by changing income, employment rates, or availability of commercially produced alcohol (WHO, 2014). *Figure 2* provides a list of SSA countries by the WHO indicator, *five-year* APC change trend from 2005-2010. While most countries in the region were stable or decreased, Mali, Gabon, Namibia, Madagascar, Democratic Republic of the Congo, Cameroon, Zambia, Angola, and Ghana all saw increases in total APC.

*Figure 2: Estimate of five-year change in recorded alcohol per capita (15+ years), consumption of pure alcohol, 2010*

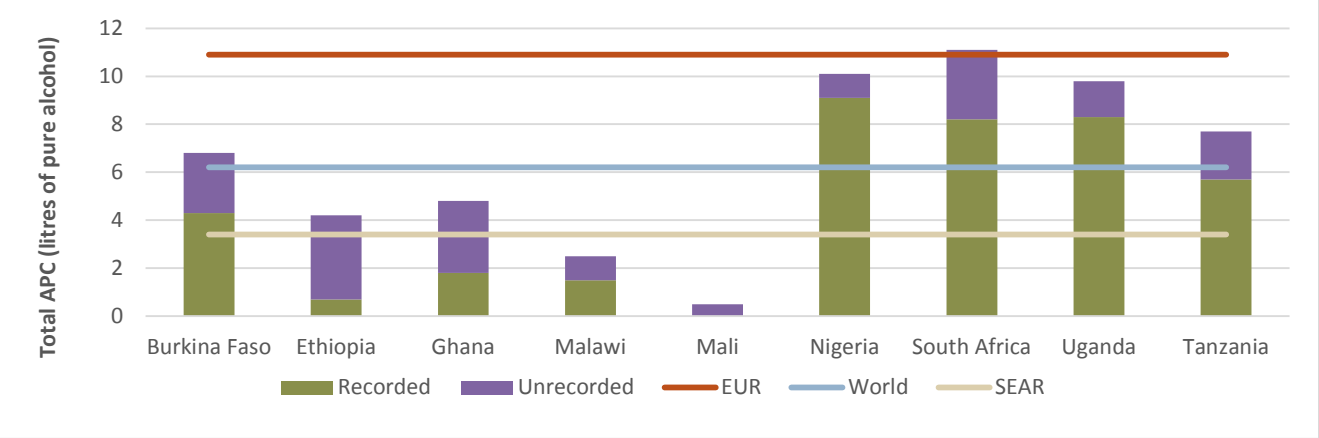



*Source: WHO, 2014. Note: GISAH lists inconclusive data for Chad, Eritrea, Algeria, Comoros, Guinea.*

While adult per capital (APC) alcohol consumption data from official records is useful for looking at population-level trends in alcohol consumption, it may not capture *unrecorded* alcohol consumption, which may be as high as 90% of total consumption in East Africa (WHO, 2014). According to the WHO (2011), unrecorded alcohol, which is typically homemade and illegally produced, may be associated with "an increased risk of harm because of unknown and potentially dangerous impurities or contaminants in these beverages." The 2014 update, however, concludes from reviews of the most recent literature that unrecorded alcohol is, in fact, no more markedly linked to higher rates of morbidity or mortality at a population level than recorded alcohol (pure alcohol, ethanol) (Rehm, Kanteres & Lachenmeier, 2010; Rehm et al., 2014 in WHO 2014). Rather, the mechanism through which unrecorded alcohol may contribute to overall disease burden is through unregulated, lower prices leading to increased consumption and more occasions of heavy drinking (Rehm et al., 2014). *Figure* 3 illustrates the total recorded and unrecorded alcohol consumption among select countries based on three-year averages between 2008 and 2010 with WHO world regional averages for Europe and Southeast Asia. As

illustrated by the graph, four of the select countries (Nigeria, South Africa, and Uganda) consume more alcohol than the global average (6.2), while several countries in the region consume less than the global average. **Appendix II** provides APC rates by contry for all countries in Africa based on three-year averages in 2003-2005 and 2008-2010.

*Figure 3: Recorded and Unrecorded Alcohol Consumption per capita (litres of pure alcohol), select countries, 3-year averages, 2008-2010*




*Source: WHO, 2014*

**Drinking Patterns**

*Drinking patterns drive relationship between volume consumed and risk of harm to populations*

Drinking patterns are classified either by the incidence of an individual's pattern of consumption (e.g. abstention or heavy episodic drinking) or by an index of indicators aggregating the hazards associated with them. Among all adults (15+), average volume of consumption is strongly associated with the prevalence of heavy drinkers (Clausen et al., 2009). In addition, the risk of harm from alcohol-related accidents and disease burden tends to increase with increased rates of alcohol consumption (WHO, 2002). The amount of alcohol consumed per episode and the number of heavy drinking occasions determine the relationship between volume consumed and risk of harm to a population (Clausen et al., 2009). In addition to total population APC, drinking rates among drinkers can illuminate drinking patterns that lead to health outcomes among those who drink.

As shown in *Table 1*, the 2014 WHO Report provides both total per capita consumption rates, and per capita rates among drinkers only. In Mali, where the total population drinks relatively little alcohol per capita (1.1 APC), drinking among drinkers was relatively high (29.4 APC).

*Table 1: Total APC among total population and drinkers only (recorded three-year average + unrecorded) per capita for adults (15+) in litres of pure alcohol, both sexes, 2008-2010*

| Country | Total Population (APC) | Drinkers Only (APC) |
|---|---|---|
| Burkina Faso | 6.8 | 18.0 |
| Ethiopia | 4.2 | 26.5 |
| Ghana | 4.8 | 20.6 |
| Malawi | 2.5 | 12.8 |
| Mali | 1.1 | 29.4 |
| Namibia | 10.8 | 27.7 |
| Nigeria | 10.1 | 23.1 |
| South Africa | 11.0 | 27.1 |
| Uganda | 9.8 | 23.7 |
| Tanzania | 7.7 | 18.4 |

The WHO's Patterns of Drinking Score captures the hazard per litre of alcohol consumed. It is calculated by the frequency, quantity, and circumstances (e.g. public or private consumption) with which the population drinks and relates these factors to the alcohol-attributable burden of disease. As shown in *Table 2* most SSA countries fall into the Medium Risky category. Only three countries, Namibia, South Africa, and Zimbabwe were considered very risky.

For international comparison, Spain and Switzerland scored a 1 on the Patterns of Drinking scale; the United States scored a 2; and the Russian Federation scored a 5.

*Table 2: Patterns of Drinking Scores, 1 (least risky) to 5 (most risky), 2010*

| 2 (Somewhat Risky) | 3 (Medium Risky) | | | 4 (Very Risky) |
|---|---|---|---|---|
| • Algeria<br>• Benin | • Angola<br>• Botswana<br>• Burkina Faso<br>• Burundi<br>• Cote d'Ivoire<br>• Cabo Verde<br>• Cameroon<br>• Central African Republic<br>• Chad<br>• Congo<br>• Dem. Rep. of the Congo | • Equatorial Guinea<br>• Eritrea<br>• Ethiopia<br>• Gabon<br>• Gambia<br>• Ghana<br>• Guinea-Bissau<br>• Kenya<br>• Lesotho<br>• Liberia<br>• Madagascar<br>• Malawi<br>• Mauritius | • Mozambique<br>• Nigeria<br>• Rwanda<br>• Sao Tome & Principe<br>• Senegal<br>• Seychelles<br>• Sierra Leone<br>• Swaziland<br>• Togo<br>• Uganda<br>• United Republic of Tanzania<br>• Zambia | • Namibia<br>• South Africa<br>• Zimbabwe |

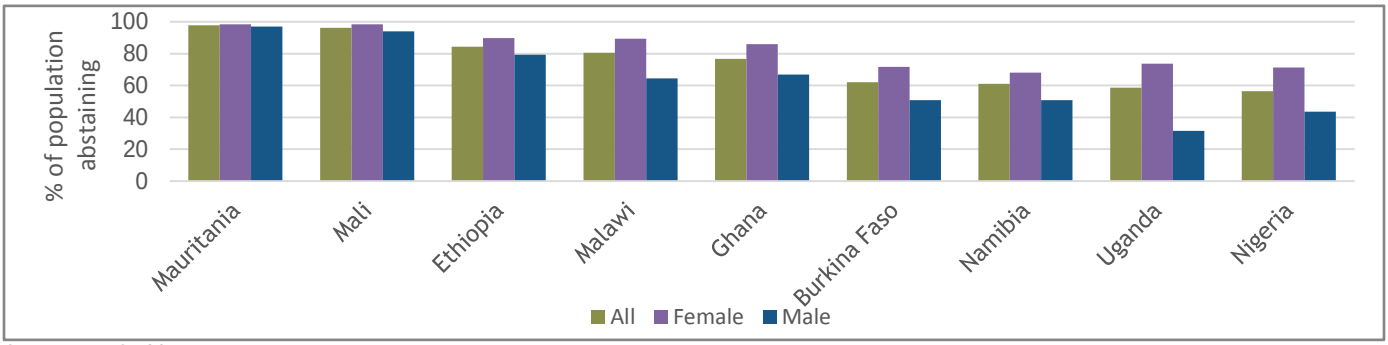
*Source: WHO, 2014*

*Abstention rates in SSA are high, but hazardous drinking patterns are common among drinkers*

Abstention rates in most SSA countries are high. Twenty-nine of the 43 African WHO member countries reported total population abstention rates above 50%; ten reported total population abstention rates between 40 and 50%; and three countries (Gabon, Seychelles, and Togo) reported the lowest total lifetime abstention rates in the region, with 37.9%, 34.1%, and 33.1%, respectively.

Among abstainers, the WHO considers 4 distinct abstention types: lifetime abstainers, former drinkers, and past year abstainers.[2] WHO measures of past 12-month abstention may provide a more recent picture of the current state of the population's current drinking patterns. With regard to this indicator, all but Togo (37.2%) report past 12-month abstention rates over 50%, consistent with previous data. *Figure 4* illustrates abstention rates by gender across select countries in the WHO Africa Region, and **Appendix III** provides a comprehensive list of abstention rates by type, disaggregated by gender among all WHO Africa countries for which data was available. Six of the forty-three African countries (Algeria, Guinea, Senegal, Niger, Mali, and Mauritania) had past 12-month abstention rates over 90%, and rates in the majority of countries (36 out of 43) fell between 50% and 89%. In all countries except for Togo, females are more likely to abstain.

*Figure 4: Proportion of population abstaining from alcohol use in the past twelve months, by gender, 2010*




*Source: WHO, 2014*

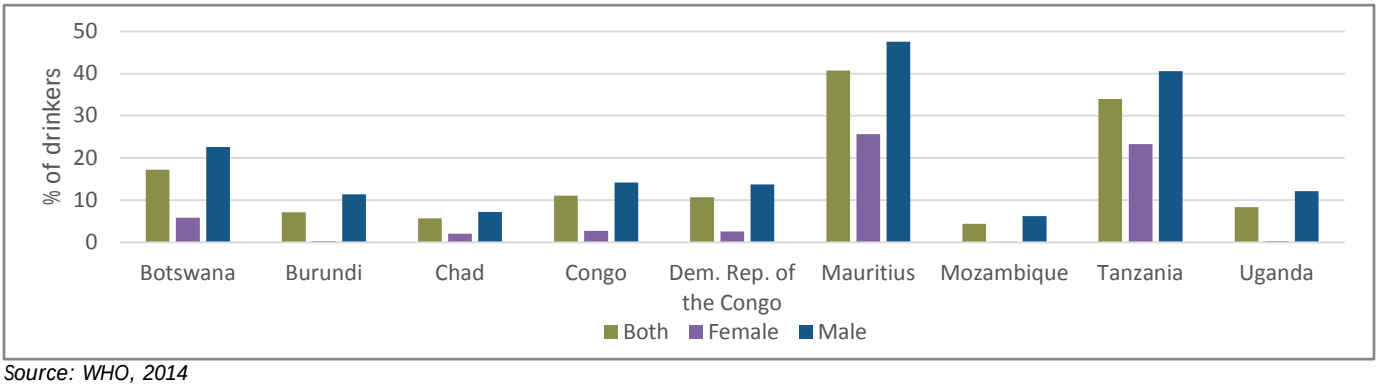
[2] Lifetime abstainers: the percentage of those in the population aged 15 years and older, who have never consumed alcohol; Former drinkers: the percentage of those in the population aged 15 years and older who have previously consumed alcohol but who have not done so in the previous 12-month period; Past year abstainers: the percentage of those in the population aged 15 years and older, who did not drink any alcohol in the past 12 months. These categories are not mutually exclusive.

In general, greater economic wealth of a country and alcohol consumption have a positive correlation. As a rule, high-income countries have the highest alcohol per capita consumption (APC) and the highest prevalence of heavy episodic drinking among drinkers (WHO, 2014). This may also be true in SSA, where relatively industrialized and wealth South Africa has one of the highest APC rates in the region.

Heavy episodic drinking (HED) is defined by WHO as drinking 60 grams or more of pure alcohol on at least one occasion in the past thirty days.[3] Incidence of HED is identified by WHO (2011, 2014) as one of the most important indicators of acute consequences of alcohol use such as injuries (2011). In the 2014 update, WHO used more systematic reviews and meta-analyses to determine the causal mechanisms between volume of alcohol consumed, drinking patterns (particularly incidence of HED), and the impact on different categories of acute and chronic disease. Some countries in SSA with relatively low overall alcohol consumption rates (APC) had relatively high rates of HED in 2010. For example, among the 46 countries in the Africa WHO region, Madagascar ranks 11th lowest in terms of APC among drinkers but highest in terms of HED rates, Seychelles ranks 13th lowest and 2ndhighest, respectively, and Zimbabwe ranks 17th lowest and 6th highest, respectively.

HED is more prevalent among male drinkers than female drinkers in every country where we have data. *Figure 5* depicts the rates of HED among men, women and both sexes in multiple SSA countries. Again, in all countries, women reported lower HED rates than men, but the range of HED rates for both sexes varied from 64.8% in Madagascar to 0.9% in Eritrea, suggesting a range of drinking patterns. In the WHO Africa Region, 6.0% of the total adult population and 16.4% of the drinking population reported HED occasions. The total adult rate was slightly lower than the global rate of 6.2% and the rate among drinkers was slightly higher than the global rate of 16.0%. **Appendix IV** provides HED rates by countrie and gender for all SSA countries.

*Figure 5: Percentage of drinkers in SSA countries reporting heavy episodic drinking in past 30 days, drinkers only, 2010*




*Source: WHO, 2014*

**Commercialization**

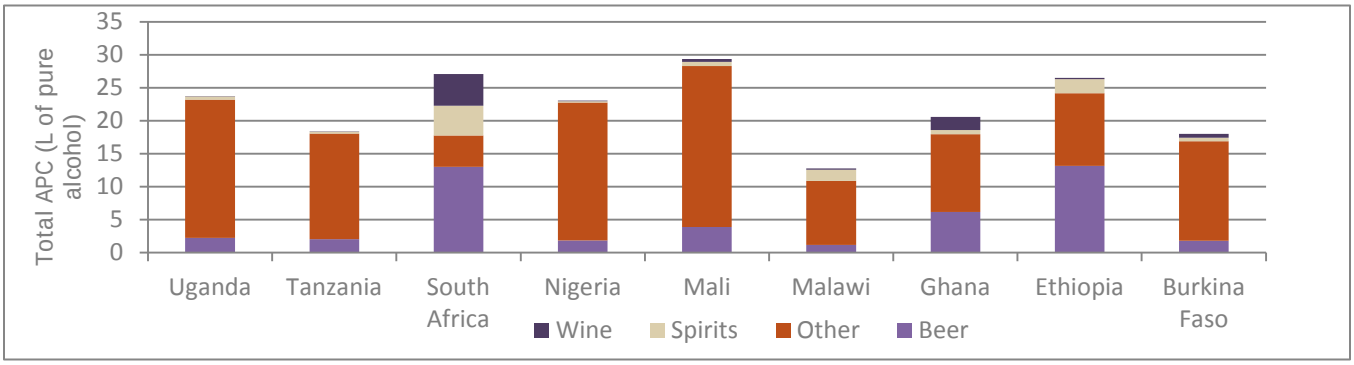
*Increasing commercialization drives changes in drinking patterns among drinkers*

The growth of large-scale commercial alcohol production and the commoditization of "traditional" alcoholic beverages has led to an increase in the consumption of high alcohol content beverages (Willis, 2006). *Figure 6* shows the alcohol consumption by beverage type weighted by total ACP ***among drinkers*** across select African countries. Countries with lower

[3] The most significant change in the methodology of alcohol consumption between the WHO 2011 and 2014 Status Reports is the definition of HED: In 2011, HED was defined as 60g or more of pure alcohol on at least one occasion on a *weekly* basis, while in 2014 it is defined on a *monthly* basis to reflect global differences in patterns of alcohol consumption.

ACP tended to consume a greater proportions of beer, wine, and spirits, while countries with higher total alcohol consumption levels, typically drank more beverages made from sorghum, maize, millet, rice, or fortified wine.[4]

*Figure 6: Proportion (%) of recorded alcohol per drinker (15+ years) consumption consumed in the form of beer, wine, spirits and other types of beverages, select countries, 2010*




*Source: WHO, 2014. adapted from Table 1.2. Note: percentages of beverages consumed were calculated at the population level, while the APCs (litres of pure alcohol) were calculated among drinkers only. Thus, the total APC for drinkers only was the author's calculation weighting the raw drinker only APC data by population beverage proportions.*

According to the World Health Organization (WHO), in many SSA countries "traditional drinking patterns dominated by sporadic episodes of intoxication continue, but involvement in the cash economy and industrialization of alcohol production and distribution have permitted the episodes to become more frequent in the form of weekend binge drinking" (WHO, 2002). Although limited historical data on drinking patterns makes it difficult to interpret current drinking patterns as riskier than in the pre-colonial period (Willis, 2006), recent data suggest that market liberalization has increased the availability of alcohol, particularly for groups of lower socio-economic status (SES), increasing consumption particularly among those who face the greatest social burden (WHO, 2014).

Traditional types and places of drinking have changed recently with increased availability and consumption of mass-produced alcoholic beverages. Given affordability-induced increases in consumption, a rise in alcohol consumption is expected to increase the burden of disease attributable to alcohol in many developing economies (WHO, 2014).

## Section II: Production, commercialization, and alcohol policy environment

While home and craft production is still believed to be a common, albeit unrecorded, source of alcohol production, commercially available alcohol has gradually increased over the last century (Willis, 2006). Despite concerns that illicit, home-brewed alcohol poses significant health and social costs due to its unregulated brewing processes outside the reach of state controls and taxation, commercially available beverages can pose similar health and social costs (WHO, 2002).

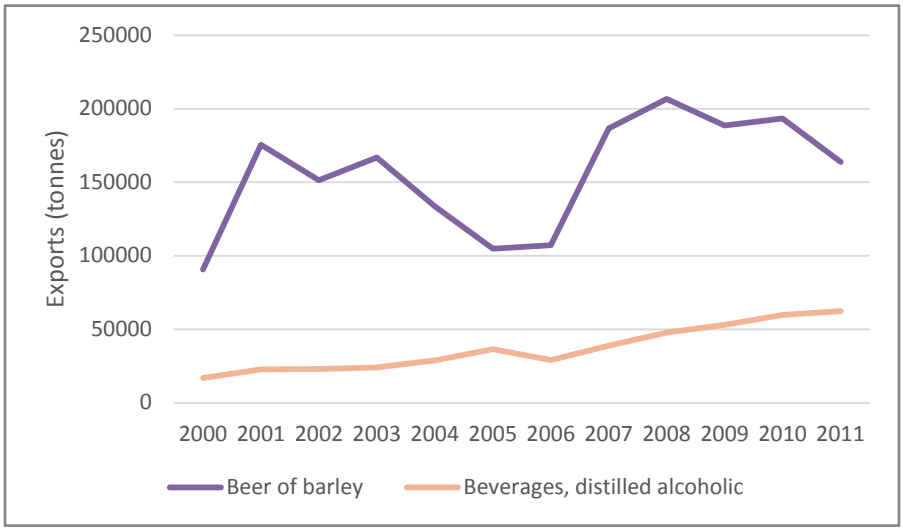
FAOSTAT alcohol data include alcohol commodity production, imports, and exports. FAOSTAT captures production data for "Beer of Barley,"[5] and volume imported and exported for broader commodity categories including "beverages, alcoholic," "beverages, fermented," and "wine" (FAOSTAT). In 2012, the highest producing countries in Africa included South Africa (3,150,000 tonnes), Nigeria (2,400,000 tonnes), Angola (950,000 tonnes), and Ethiopia (815, 743 tonnes).

[4] "Beer" includes malt beers; "wine" includes wine made from grapes; "spirits" include all distilled beverages, and "other" includes one or several other alcoholic beverages, such as fermented beverages made from sorghum, maize, millet, rice, or cider, fruit wine, fortified wine, etc. (WHO, 2014).

[5] "Beer of Barley" is defined as any beverage that may be alcoholic or non-alcoholic that is made from fermented malted cereals (mainly barley), water and hops. Non-malted cereals may also be used. The FAO definition differs from the main international classifications in that it includes non-alcoholic beer.

Production of commercial beer in Africa has increased steadily over the past ten years, growing from 6.2 million tonnes in 2000, to its peak at 16.4 million tonnes in 2011, then decreasing slightly to 12.5 million tonnes in 2012. As production has gradually increased, beer and distilled alcoholic beverage exports from the region have also increased gradually. *Figure 7* illustrates the gradual increase in exports between 2000 and 2011 for the two types of alcohol traded for which FAOSTAT has data.

*Figure 7: Total recorded alcoholic beverage export quantity in Africa (tonnes), 2000-2011*




Commercial beer production in Sub-Saharan Africa is primarily controlled by three major multinational brewing companies: Heineken (Netherlands), Diageo (UK, owner of Guiness Brand), and SABMiller (UK). These multinational brands operate local African beer lines including Tanzania Breweries Limited (TBL), East African Breweries Limited (EABL), and Zambia Breweries, among others, which collectively represent 75% of the African Beer Market.

*Source: FAOSTAT, 2014*

*Beyond barley: Recent developments in non-barley beer brewing and smallholder value chain participation*

In addition to barley beer, breweries have begun to produce beers using other locally available crops, particularly maize, cassava, sorghum, and millet. In Nigeria, import restrictions on barley malt in the 1980s facilitated the import substitution-driven development of sorghum as a brewing input (Ogun, 1995). The shift to local supply chains has been emulated in other countries as well, and currently all major brewers partially substitute imported barley with sorghum and other locally produced crops (Van Wijk & Kwakkenbos, 2011). For example, Eagle beer launched a clear, sorghum-based beer in 2007, and SABMiller launched a cassava beer initiative in 2013 (SABMiller company website).

Despite local availability of sorghum, millet, and other substitute inputs, the lack of developed and consistent markets for these crops has prevented supply chain development and widespread processing as occurs with more conventional cash crops (Rorhbach & Kiriwaggulu, 2007, in Slakie et al., 2013).

*Smallholder involvement in agriculture-alcohol value chains*

Smallholder farmers are typically involved in brewery value chains through a series of intermediaries including traders, transporters, storage warehouses, and consumers. In the case of sorghum and other non-barley inputs, many multinational breweries have partnered with local subsidiaries and NGOs to form contract farming partnerships with small- and medium-sized farmers.

Development organizations and NGOs also facilitate these partnerships by supporting farmers with loans for start-up costs and provide value chain analysis. Farmers may benefit from these efforts by having a consistent outlet for their marketable surplus. Many development organizations see these partnerships as a "win-win" arrangement. However, according to a recent study in Tanzania, the high expenses incurred by intermediaries to oversee farming operations for farmers under contract with Tanzania Breweries Limited (TBL) led to low prices for farmers (Makindara, J.R., 2012, in Slakie et al., 2013).

Consistent with the findings in Van & Kwakkenbos (2011), farmers and breweries face tradeoffs when engaging in these contract farming arrangements. While breweries gain a robust supply chain and reduced costs and farmers gain market access, both parties must adhere to contract stipulations and both trade flexibility for a guaranteed sale price (Slakie et al., 2013). *Figure 8* lists examples of current brewery-farmer partnerships, adapted from Slakie et al. (2013).

*Figure 8: Select smallholder-brewery partnerships, SSA*

| Partnership | Country | Description |
|---|---|---|
| **Cooperative League of the United States of America (CLUSA)** | Multiple | Partners with USAID and IFAD to support farmers by providing loans. |
| **Guinness-TechnoServe** | Ghana | Provides credit to farmers; contract indicates brewers buy sorghum from farmers for a five year period. |
| **Guinness-ACDEP** | Ghana | Association of Church Development Projects (ACDEP) with the help of Savanna Farmers Marketing Company (SFMC) serves as a commercial intermediary between farmers and Guinness Ghana. |
| **Heineken-Vancil Consultancy Services (VCS)** | Sierra Leone | NGO acts as a grain trading intermediary between farmers and the brewer. |
| **SABMiller-Uganda** | Uganda | Partnership includes Afro Kai (trading company), Ugandan government, Serere Animal and Agricultural Institute (SAARI), and Enterprise Uganda (local NGO). Partnership addresses sorghum supply chain in Uganda. |
| **SABMiller-Zambia** | Zambia | Includes Zambian Breweries and Zambian government contracting CHC Commodities as a grain trader, and CARE to help farmers meet breweries' requests. |

*Multinational alcohol companies see emerging market potential and aim to shape favorable national alcohol policies*

Multinational alcohol producers increasingly view developing countries as growth markets (Bakke & Endal, 2010). In addition to the opportunity presented by low alcohol consumption baselines and, in some cases, growing middle classes, alcohol producers see developing countries in Africa, Asia, and Latin America as particularly attractive emerging markets due to their large potential consumer groups with broadly unestablished brand loyalties (ibid.). In most African countries, 40-50% of the population consists of young people below age 15. This group, a sizeable market opportunity for alcohol industry-produced products, may be most vulnerable to substance use and its effects (Braathen, 2008).

Multinational brewing companies actively seek to increase commercial alcohol consumption (Makindara et al., 2013). They also spend resources aimed at minimizing restrictions to their commercial interests in the form of alcohol policies. While many countries in SSA have signed drug control and prevention conventions including the UN Drug Control Convention, national alcohol policies are a relatively recent development and have been subject to alcohol industry influence (Bisika et al., 2004; Bakke & Endal, 2010).

In a recent systematic review of four draft National Alcohol Policy documents in Lesotho, Malawi, Uganda, and Botswana, Bakke & Endal (2010) conclude that they were identical in nature and largely determined by the multinational brewery company, SABMiller, and the alcohol industry-sponsored group, the International Center on Alcohol Policies (ICAP). According to the authors, firms and ICAP choose selectively from the international evidence of the costs of alcohol and emphasize the economic benefits from the trade in alcohol (ibid.). Countries whose alcohol policies do not fully account for the health and social burden of alcohol consumption may be more likely to sufferfrom the health and social costsoutlined below.

## Section III: Inventory of Health Costs

Research on the Global Burden of Disease (GBD) shows alcohol use as a major risk factor for morbidity and early mortality (Rehm et al., 2009; Rehm et al., 2003; Murray et al., 2012; WHO, 2011). Health costs from alcohol use are determined by culture, national-level alcohol policies, availability, and volume and patterns of consumptions (WHO, 2014).

Alcohol use contributes to early mortality through two pathways: as a cause and as a risk factor. Alcohol use is a direct cause of mortality from alcohol use disorders (dependence), fetal alcohol syndrome, cirrhosis, certain cancers, and hepatitis B and C (Murray et al., 2012; WHO, 2011). In addition, alcohol use has a role in mortality and injury from traffic accidents, interpersonal violence, and unintentional or intentional injury (Rehm, 2011). The second pathway is as a risk factor. Alcohol use is correlated with fatal diseases, though it may not be a direct cause, and increases exposure to infectious diseases such as HIV/AIDS and tuberculosis (Rehm & Kanteres et al., 2009). This section reviews findings from GBD research on the role of alcohol use as a direct and indirect factor in early mortality with special attention to Sub-Saharan Africa.

**A Note on Global Health Data and Methodologies**

The two primary databases for alcohol-related health costs are the World Health Organization's Global Information System on Alcohol and Health (GISAH) and the Institute for Health Metrics and Evaluation's Global Burden of Disease Database (GBD). The primary data source for consumption levels is the WHO Global Survey on Alcohol and Health that was conducted at the national-level in 2012. The WHO calculated health consequences using GBD estimates of risk and survey data.

The Global Burden of Disease Study is a comprehensive analysis of disease, injury, and risk factors led by the Institute of Health Metrics and Evaluation at the University of Washington and supported by the WHO in collaboration with public health research institutions in 1990, 2005, and 2010. Each iteration improved upon the previous study and integrated a more exhaustive list of causes and diseases. The 2010 study identified 291 disease causes, 1,160 sequelae (consequences from disease or injury) and 67 risk factors.

To allow cross-time comparison, the 1990 and 2005 data were re-analyzed and updated using 2010 standards and analytical techniques (Murray et al., 2012b). As a result, current figures for 1990 include imputed data using 2010 methodology. Whiteford et al. (2013) noted that globally-available data on the impacts of alcohol use and substance abuse disorders improved from 1990 to 2010. Studies and papers published before 2010 would include out-of-date data that underestimate the impact of alcohol use on disease outcomes. Gaps in data are particularly problematic in parts of Africa where consumption often is unrecorded and estimates have a high amount of uncertainty (Rehm et al., 2009).

**Alcohol-attributable deaths and DALYs**

*In SSA, 3.3% of deaths and 2.4 % of DALYS are attributed to alcohol.*

Global health researchers use Disability-Adjusted Life Years (DALYs) to approximate the burden that a given disease or health condition has on longevity. WHO defines one DALY as equal to one lost year of healthy life as calculated by summing Years of Life Lost (YLL) measuring premature mortality, and Years Lost due to Disability (YLD) measuring the effect on a population of people living with a health condition (WHO, 2014). Total deaths are another common indicator of disease burden that are estimated using country-level vital registration systems. Deaths are integrated in the calculation for Years of Life Lost (YLL).

Given the variety of direct and indirect effects alcohol use can have on morbidity and mortality, exact figures of its contribution to global early mortality and disease morbidity vary. In estimating disease burden, DALYs have an advantage over number of deaths because a DALY is a time-based measure that includes life lost from premature mortality and disability throughout an individual's life instead of a single point (Murray et al., 2012). Estimates of alcohol disease burden range from 3.8% to 5.9% of global deaths and between 3.9% and 5.1% of global DALYs (WHO, 2014; Lim et al., 2013).[6]

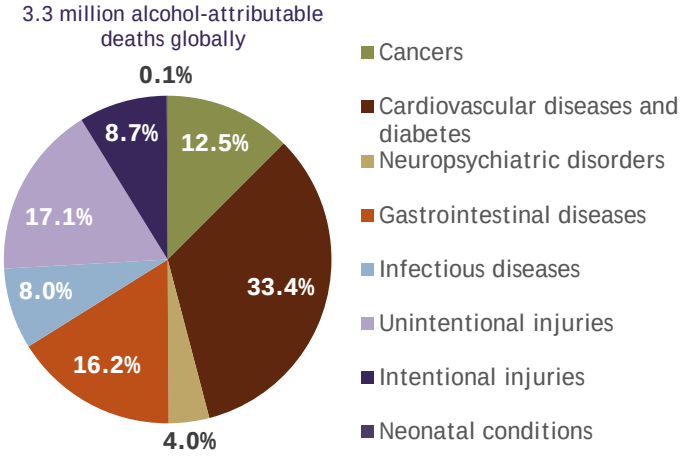
[6] The 2014 WHO Global Status on Alcohol and Health includes alcohol-attributable fractions (AAFs) that quantify the total impact of alcohol on diseases and injuries for which alcohol is a risk factor. Research prior to 2014 tends to use slightly different vocabulary. 'Risk factor' or

In Sub-Saharan Africa, the alcohol-attributable fraction is 3.3% of total deaths and 2.4% of total DALYs (WHO, 2014). The GBD found slightly different numbers for SSA: 3.4% of total deaths and 2.2% of total DALYs in 2010 are attributed to alcohol (GBD Database, 2014).

According to the 2014 WHO Global Status Report, 5.9% of all global deaths are directly attributable to alcohol. [7] This represents a 55% increase from the 2004 figure of 3.8% (WHO, 2011). The 2014 report states that the increase resulted from new evidence on alcohol-attributable mortality in the Russian Federation and new knowledge about the role of alcohol in the incidence of infectious disease, principally tuberculosis and pneumonia (WHO, 2014).

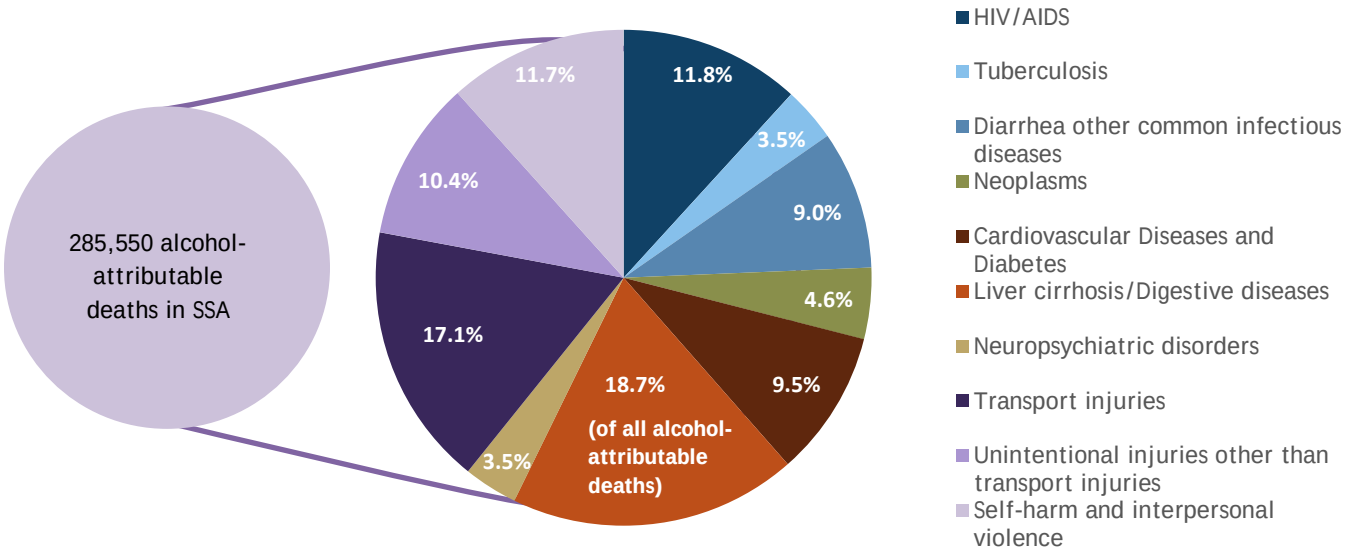
*Figure 9* shows the global distribution of alcohol-attributable deaths by disease or injury in 2012. [8] The WHO estimates 3.3 million total alcohol-attributable deaths in 2012 globally. Within the net total, the leading categories are unintentional (17.1%) and intentional injury (8.7%), gastrointestinal diseases (16.2%), cancer (12.5%), and cardiovascular diseases and diabetes (33.4%).

*Figure 9: Distribution of alcohol-attributable deaths globally (% of all alcohol-attributable deaths by broad disease category), 2012*




*Source: WHO, 2014. Note from data source: Cardiovascular diseases and diabetes estimate including beneficial effects of low risk drinking patterns on some diseases.*

*Figure 10: Distribution of alcohol-attributable deaths in SSA (% of all alcohol-attributable deaths by broad disease category), 2012*




*Source: GBD Database, 2014. Graphs do not add to 100% due to rounding.*

'Alcohol-attributable' deaths and DALYs are other terms used to distinguish between alcohol as a direct *cause* and alcohol use as an indirect *risk factor* that *leads* or *contributes* to harm and injuries from other diseases.

[7] The WHO defines alcohol-attributable deaths as "the number of deaths attributable to alcohol consumption. They assume a counterfactual scenario of no alcohol consumption. Thus, alcohol-attributable deaths are those deaths that would not have happened without the presence of alcohol" (WHO, 2011b)

[8] Because the WHO re-categorized several of its disease categories between the 2004 and 2012 data, it is not possible to calculate a direct comparison of proportions between years. The differences reported in the text are from disease categories that remained constant.

*Nearly twelve percent of alcohol-attributable deaths in SSA are from HIV/AIDS*

Data from the GBD (2014) shows similar results for SSA with a few distinctions. *Figure 10* graphs the distribution of alcohol-attributable deaths for SSA. Of the estimated 285,550 alcohol-attributable deaths in SSA,[9] 11.8% are from HIV/AIDS, and an additional 12.5% are from other infectious diseases (3.5% for tuberculosis and 9% for diarrhea and other infectious diseases). Other leading causes of death are liver cirrhosis and digestive disorders (18.7%), transport injuries (17.1%), and self-harm and interpersonal violence (11.7%). At the global level, most alcohol attributable deaths are from chronic diseases (45% from cardiovascular diseases and cancer), where the majority of alcohol-attributable deaths in SSA are from infectious diseases and unintentional injury (including transport) – which sum to 52%.

*Global alcohol-attributable factors for deaths*

In addition to measuring the total number of alcohol-attributable deaths, we can also look at the percentage of each cause of death for which alcohol is the leading factor, also known as the Alcohol-Attributable Fraction or AAF. For example, the AAF for global deaths directly caused by alcohol use disorders or fetal alcohol syndrome is 100%, whereas only 9% of deaths from unintentional injuries are attributable to alcohol.

Alcohol use contributes to a high proportion of many other causes of morbidity and mortality. The highest alcohol-attributable fractions for specific causes of deaths include 50% of global deaths from liver cirrhosis, between 20% and 30% of some cancers, 25% of pancreatitis, 22% of interpersonal harm, 18% of poisonings, 17% of unintentional injuries and falls, and 15% of traffic injuries. As mentioned above, the role of alcohol in infectious disease has been examined only recently (WHO, 2014). In SSA, alcohol contributes to 13% of tuberculosis deaths, 20% of road deaths, 50% of liver cirrhosis deaths, and 25% of deaths from self-harm and interpersonal violence (GBD Database, 2014).

*Unintentional and intentional injury account for the greatest proportion of alcohol-attributable deaths and DALYs in SSA*

The WHO divides Africa into the sub-regional classifications based on child and adult mortality (WHO, 2001). Africa D[10] and Africa E[11] have high or very high rates. (WHO, 2001). Rehm et al. (2009b) examined the instance of alcohol-attributable deaths and DALYs from unintentional (road traffic accidents, poisonings, falls, drowning, and other) and intentional injury (self-inflicted injury, violence, and other) in both of these sub-regions. The study found that in the Africa D region 12.3% of alcohol-attributable deaths were from intentional injuries and 11.9% were from unintentional injuries. In the Africa E region, unintentional and intentional injury accounted for 24.6% and 31.3% of alcohol-attributable deaths, respectively.

**Alcohol as risk factor**

*Alcohol the leading risk factor for mortality and morbidity in* southern *SSA and increasing throughout the region*

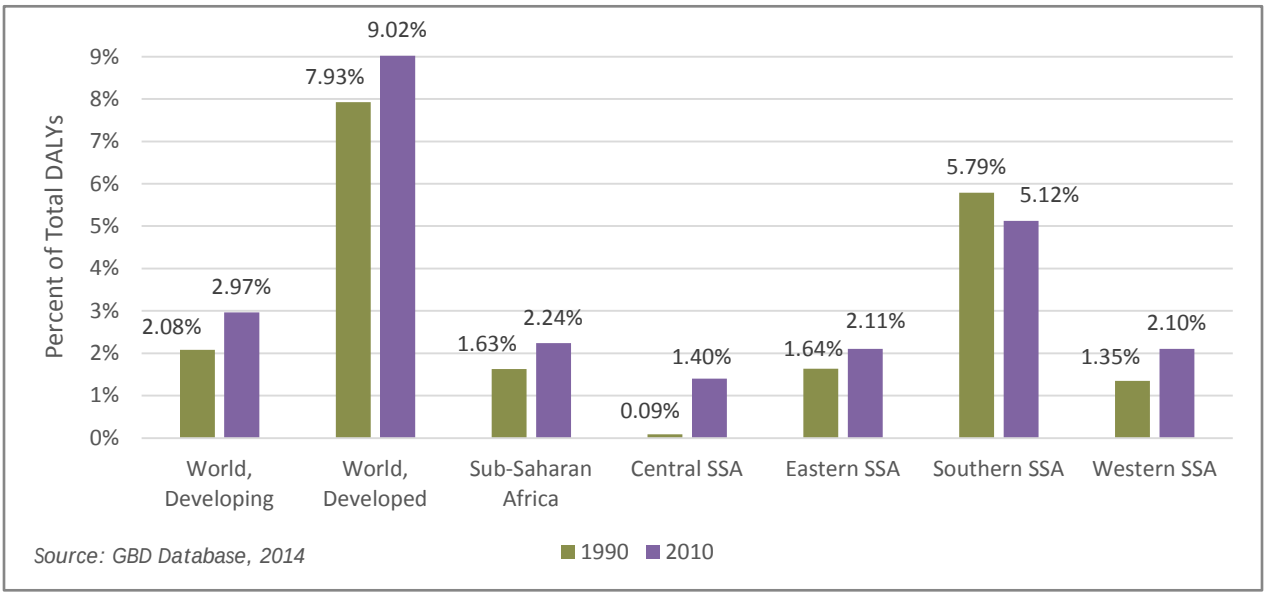
Lim et al. (2013) calculated the global disease burden of 67 risk factors from 1990-2010. Risk factors are potentionally preventable causes of ill health that lead to early mortality or diseases. Alcohol use was the leading risk factor in *southern* Sub-Saharan Africa,[12] followed by high blood pressure and high body-mass index. The authors found that the impact of alcohol use in Sub-Saharan Africa was particularly large due to increased risk of traffic accidents, unintentional and intentional injury, and tuberculosis. The leading risk factors in central,[13] eastern,[14] and western[15] Sub-Saharan Africa are

[9] The 285,000 figure is from GBD Database and is slightly lower than the WHO estimate of 300,000 alcohol-attributable deaths.
[10] WHO classification *D* signifies high child, high adult mortality. Africa D includes: Algeria, Angola, Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Comoros Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Madagascar, Mali, Mauritania, Mauritius, Niger, Nigeria, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Togo
[11] WHO classification *E* signifies high child, very high adult mortality. Africa E includes: Botswana, Burundi, Central African Republic, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Eritrea, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Uganda, United Republic of Tanzania, Zambia, Zimbabwe
[12] GBD regional classifications - southern sub-Saharan Africa: Botswana, Lesotho, Namibia, South Africa, Swaziland, and Zimbabwe.
[13] Central Sub-Saharan Africa: Angola, Central African Republic, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon.
[14] Eastern Sub-Saharan Africa: Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Seychelles, Somalia, Sudan, Tanzania, Uganda, Zambia.

associated with poverty and risks that impact children, including unimproved water and sanitation, underweight, household air pollution, and suboptimal breastfeeding. The authors noted that across Sub-Saharan Africa the share of the disease burden attributable to these factors fell from 1990-2010 and that alcohol use and high blood pressure increasingly account for a greater portion of the disease burden.

*Figure 11* shows the risk from alcohol use as a percent of total DALYs in 1990 and 2000 by sub-region in Sub-Saharan Africa, with world figures for comparison. In both periods, southern SSA has the highest portion of disease burden compared to other regions in SSA, though it decreased slightly from 1990 to 2010 (5.79% to 5.12%). Across all other sub-regions, the burden of disease from alcohol use as a risk factor rose from 1990 to 2010, which is also seen in global trends disaggregated by developing and developed countries.

*Figure 11: Alcohol use as a percentage of risk factors for DALYs by region, 1990-2010*




**Disease burden and wealth**

*Alcohol consumption is positively associated with wealth but the burden of disease is disproportionately greater for low-income countries*

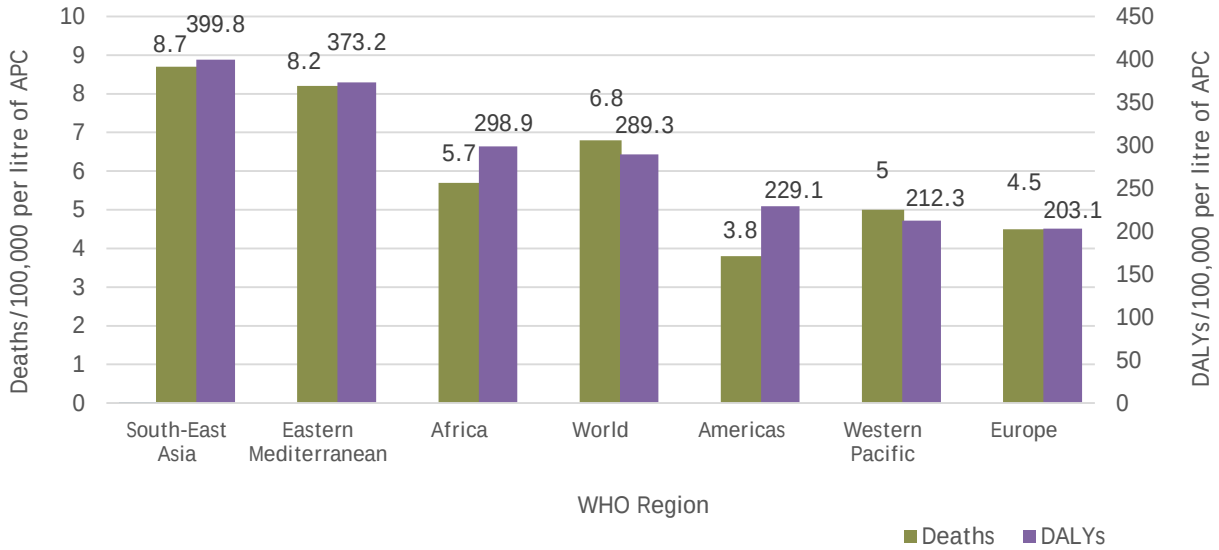
Rehm et al. (2009) used multivariate regression models to explain variation in unintentional and intentional injury deaths. They found that the two main explanatory factors were level of consumption and level of economic development. The model estimated that a one litre increase of pure alcohol consumed per year contributed to a 2.9% increase in alcohol-attributable unintentional injury deaths and a 2.7% increase in alcohol-attributable intentional injury deaths.

Thus, an increase in national-level consumption leads to a statistically significant increase in alcohol-related deaths. While both economic development and consumption are positively associated with increased DALYs from alcohol use, countries with higher levels of economic development actually had lower DALYs once the model controlled for levels of consumption, indicating that *poorer countries with similar consumption as wealthier countries are likely to face a higher disease burden from alcohol.* The authors' regression model indicated that *levels* of consumption explain injury-related deaths from alcohol more than other factors. Since this study only looked at deaths and DALYs from alcohol-attributable unintentional and intentional injury, these findings are not generalizable to other diseases or when using DALYs as the unit of analysis (instead of deaths).

[15] Western Sub-Saharan Africa: Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, Togo.

Other studies suggest a leveling-off effect of income on alcohol-attributable deaths. In a separate study that examined alcohol-related deaths and disease burden, Rehm et al. (2009a) found that alcohol consumption is linked to income up to about $10,000 GDP per capita (as measured using purchasing power parity). After that threshold, the relationship flattens. The paper also states that when controlling for volume of alcohol consumed per capita, alcohol-attributable mortality rates were higher in developing than in developed countries. The studies included SSA but did not provide disaggregated results.

*Figure 12: Alcohol-attributable deaths and DALYs after controlling for consumption levels*




*Source: WHO, 2014. Note: For details on WHO regions, see www.who.int/about/reigons*
*Europe does not include Eastern Europe per data in the publication*

The WHO (2014) study found similar results. Low-income regions had a higher relative impact of alcohol-related deaths and DALYs when controlling for amount consumed. Controlling for levels of consumption allows comparison between countries *regardless of the percent of the population that are drinkers.* *Figure 11* shows the burden of disease when controlling for levels of alcohol consumption. It illustrates that the relative burden in terms of alcohol-attributable deaths and DALYs for the Africa region is higher than the Americas or Western Europe after controlling for consumption levels. On average, levels of consumption in Africa are lower than in the Americas or Europe. Despite this, the average DALYs per 100,000 per litre consumed is higher in Africa than in either Western Europe or the Americas. A complete table of this calculation for SSA countries and WHO regions can be found in **Appendix V**.

In the WHO Africa Region, there are slightly more than 300,000 alcohol-attributable deaths and 16 million alcohol-attributable DALYs per year and the average adult per capita (APC) consumption of alcohol is 6.0 litres per year. That equates to 5.7 deaths per 100,000 per litre of APC and 298.9 DALYs per 100,000 per litre of APC (WHO, 2014). In the Americas region, the equivalent normalized numbers are 3.8 deaths/100,000 and 229.1 DALYs/100,000. In Western Europe, the numbers are lower: 4.5 deaths/100,000 and 203.1 DALYS/100,000. Low-income regions such as Africa and South-East Asia have higher disease burdens from alcohol use compared to higher-income regions in Europe and the Americas.

*Figure 13: Alcohol attributable (AA) DALYs per 100,000 and DALYs per 100,000 per liter of adult per capita consumption (APC) for select SSA countries*

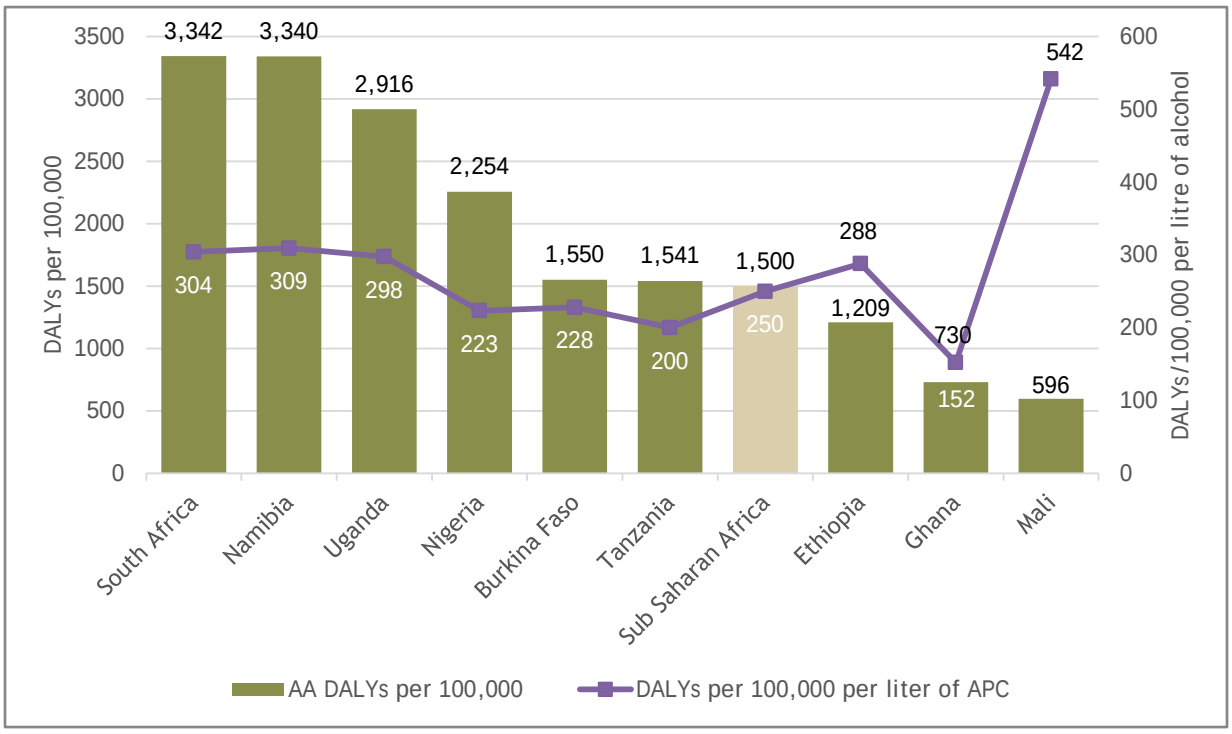



*Figure 13*[16] graphs the rate of DALYs on the left axis and the rate of DALYs per litre on the right axis for select countries in SSA. It shows the relationship between DALYs/100,000 and DALYs/100,000 per litre of alcohol. South Africa and Namibia have the highest DALYs/100,000. Ghana and Mali have lower rates of DALYs/100,000, likely because of higher abstention rates. However, when controlling for levels of alcohol consumed, Mali and Ethiopia have the highest rates. Though relatively few people drink in Mali, the disease burden for those who drink escalates the proportion of DALYs per litre.

**The Burden of Disease by Gender and Age**

*The health burden is significantly greater for men and young people*

The WHO (2014) found that alcohol accounted for 5.9% of total global deaths in 2012. The number is higher for men (7.6%) than for women (4.0%). This represents an increase for both men and women from the 2011 estimate which was 6.2% for men and 1.1% for women. In terms of total DALYs, alcohol use represents 7.4% of the burden of disease for men and 2.3% for women. For men, this number remained consistent with the 2011 estimate (7.4%), but for women total DALYs from alcohol use increased (from 1.4% in 2011). *Figure 14* graphs the change in alcohol as a risk factor for disease from 1990 to 2010 in SSA, disaggregated by men and women (GBD Database, 2012). In SSA, the percent of total DALYs for men increased from 2.16% in 1990 to 3.1% in 2010. Women's disease burden also increased from nearly 1% in 1990 to 1.26% in 2010, consistent with global trends of increasing consumption by women.

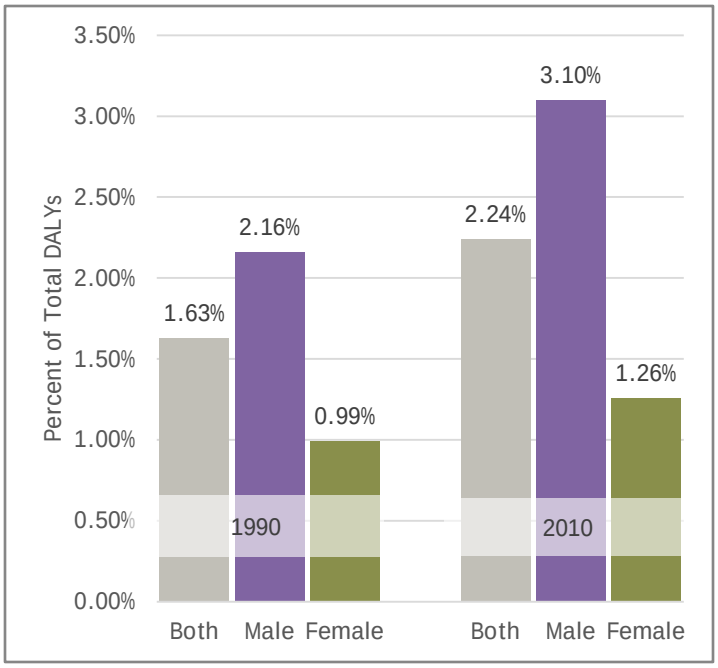
[16] SSA estimate lower than above due to slight variation in data between GBD database and WHO.

**Women and Youth**

*Figure 14: Alcohol use as risk factor for disease burden, by gender*

In all Sub-Saharan countries, current drinking rates are much lower among female respondents, and the majority of current and heavy drinkers are male (WHO, 2014). Men have a far greater rate of total burden of disease attributable to alcohol than women (7.4% vs. 2.3%), in large part because they drink more frequently and in larger quantities. A number of studies, however, chronicle how alcohol consumption among women has been increasing steadily in line with economic development and changing gender roles, which has led to increased public health concerns about female drinking patterns as it relates to personal and neonatal health (Grucza et al., 2008; Wilsnack, 2013; Obot, 2006).

Young drinkers and urban women, in particular, are increasingly likely to consume commercialized alcohol products (Clausen et al., 2009). Country-specific studies provide more nuanced gender-disaggregated data as well. A questionnaire-based study in Uganda showed that, consistent with literature elsewhere, while men drank more frequently and in higher volumes, younger women drank more than older women, which, the authors report, suggests that female drinking patterns in Uganda may be changing (Tumwesigye & Kasirye 2005, in Braathen, 2008).




*Source: GBD Database, 2014*

Consistent with most alcohol use studies in Africa, a 2008 study found that women are less likely to use substances in general than men, but data from Malawi suggest that women in urban sites were more likely to use substances or visit pubs or bars than women in rural sites (Braathen, 2008). Results from several substance abuse studies indicate increased alcohol use and abuse among younger segments of the population (Odejide, 2006; Parry et al., 2004; Bisika et al., 2004 in Braathen 2008). According to the Global School-based Student Health Survey (GSSHS) (2004), alcohol consumption among youth ranged from 2% among women in Senegal to over 62% among young men in Seychelles.

*"Protective Effect" of alcohol for women dissipates when women's drinking patterns become more similar to men's*

The literature reports the net effect of alcohol use by calculating total alcohol-attributable deaths and DALYs and subtracting out lives saved due to the beneficial effect that some drinking patterns confer on health. Rehm et al. (2009a) provides an example that in the year 2000, alcohol was a primary cause of 600,000 cardiovascular deaths. However, the protective effect of some alcohol use on cardiovascular diseases prevented an estimated 300,000 deaths, resulting in a net *loss* of 268,000 deaths. Due to variation in patterns of drinking between genders, women in certain regions (Western Europe) have net positive effects from alcohol use for cardiovascular disease, though it varies substantially by region. Rehm et al. (2009a) indicate that the protective effect for women dissipates in places where women's drinking patterns become similar to men's patterns.

*Alcohol is the leading risk factor for men in SSA aged 15-59*

When disaggregated by age, Lim et al. (2013) found that alcohol use was the leading risk factor for disease burden for people aged 15-49 years globally. Similarly, the WHO (2011) found that in 2004 alcohol use was the leading risk factor for men aged 15-59 years globally. Data from Sub-Saharan Africa reflects this trend. *Figure 7* shows an age distribution for men and women in SSA with the percent of total DALYs attributed to alcohol. Across most age groups, the burden of disease and injury for men is greater than for women, peaking at the 20-24 age group for men at nearly 9% of DALYs and the 60-64 age

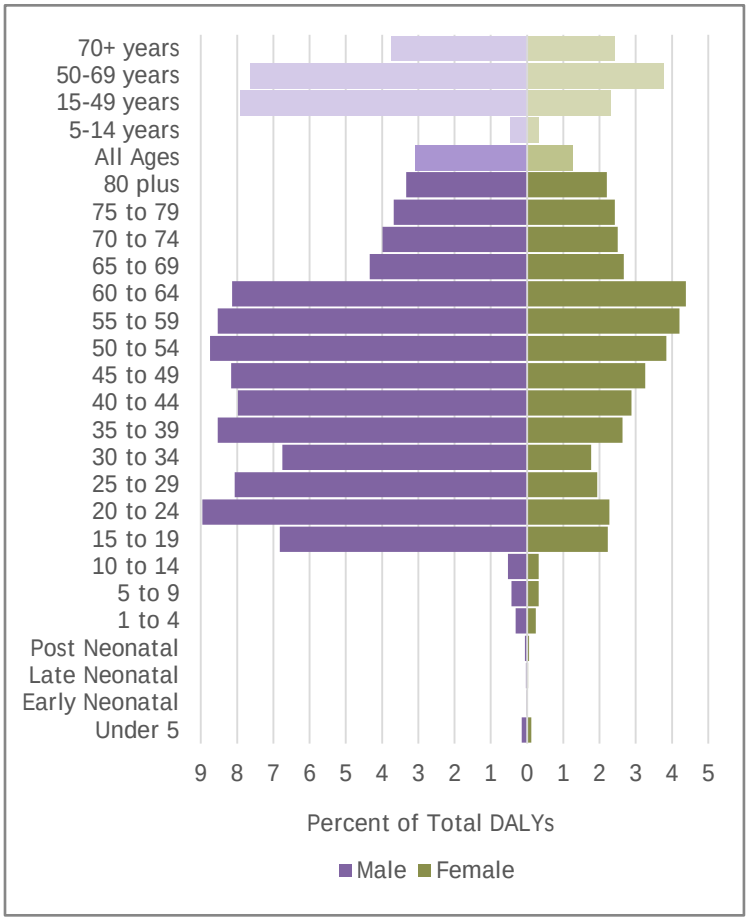
group for women, reaching nearly 4.5% of DALYs. This is likely because women are less likely to drink than men and often the patterns of drinking are less harmful.

**HIV/AIDS and Infectious Disease**

*Drinkers in SSA are more likely to have HIV than non-drinkers and are less likely to adhere to treatment*

As highlighted earlier, interest is growing in the role of alcohol as a risk factor for infectious disease. Parry et al. (2009) established a causal linkage between alcohol use and tuberculosis and HIV/AIDS transmission. Disease transmission increases via two pathways: biological and social. Biologically, heavy alcohol use weakens the immune system and facilitates transmission of tuberculosis and HIV/AIDS. The second pathway, via social mechanisms, is related to consequences of social exclusion and the link between low-income settings and alcohol use disorders. For HIV/AIDS, there is a link between alcohol dependence and failure to adhere to treatment medications.[17]

*Figure 15: Age distribution of alcohol use as a risk factor for disease in SSA*




*Source: GBD, 2014*

In a separate paper, Rehm & Parry (2009) found that in South Africa, alcohol use was attributable to 4.6% of the disease burden for tuberculosis and HIV/AIDS in 2004, corresponding to 2.5% for women and 6.6% for men. Fisher et al. (2007) found that alcohol drinkers in Africa were more likely to have HIV than non-drinkers. They estimated that non-problem drinkers' relative risk of disease burden was 1.57% compared to 2.04% for problem drinkers, which was statistically significant at the 95% confidence level.

[17] A meta-analysis by Hendershot et al. (2009) found that heavy drinkers were 50-60% less likely to adhere to HIV/AIDS treatment than abstainers and non-problem drinkers. Though the analysis was international, it only included developed countries.

## Section IV: Inventory of other individual & social costs

In addition to its impact on human health, alcohol consumption is related to several social costs affecting drinkers and those around them at work, home, or in public. These costs include impacts that are easily monetized such as property destroyed due to vandalism and accidents as well as more intangible costs such as the psychological distress caused by abuse or neglect related to alcohol consumption. While the majority of alcohol-related social cost studies focus on relatively industrialized western countries, limited data from SSA highlights the social costs of alcohol in this region as well.

International guidelines for categorizing and evaluating the social costs of alcohol use are relatively well-established in the public health literature (WHO 2000; Rehm 2009; Lapsley et al., 2006; Perez et al., 2000; Moller & Matic, 2010; Navarro et al., 2011). This section follows these guidelines and presents the social costs of alcohol in SSA at the individual and household levels in the following categories:

- Loss of income & Workplace productivity
- Financial problems
- Income diverted from education or health care
- Increased domestic violence, vandalized property, and correlation to other risky behaviors such as gambling

Studies conducted in Kenya, Zambia, South Africa, Uganda, Ghana, and Nigeria and other countries point to a close association between alcohol and the social costs listed above (Room et al., 2002; WHO, 2004).

Taken together, these costs and the public expenditures required to address them can have a substantial impact on GDP. In a recent study published in the South African Medical Journal, Matzopoulos et al. (2013) estimated that the tangible costs of harmful alcohol use such as healthcare, crime response and damage to motor vehicles accounted for 37,920 million Rand, or 1.6% of South African GDP in 2009. After adding intangible costs, such as mortality and morbidity, absenteeism, and distress this estimate rose to 10-12% (Matzopoulos et al., 2013).

In a paper published in the Drug and Alcohol Review, Baumberg (2006) estimated the global economic burden of disease to be between $210 billion and $650 billion in 2002. This estimate includes $40-105 billion for health, $55-210 billion for premature mortality, $30-65 billion for absenteeism, $0-80 billion for unemployment, $30-85 billion for criminal justice systems, and $15-50 billion for damages to property. This is equivalent to 0.6-2.0% of global GDP. The authors admit that this estimate comes with many caveats, including having limited studies to draw on and differences in health burden faced by individual countries based on their income levels.

**Loss of Income & Workplace Productivity**

*Alcohol reduces workplace productivity and increases risk of work-related injuries and absenteeism*

Alcohol use interferes with most income-generating activities and can lead to reduced productivity and loss of employment. Aside from the effects to the drinkers themselves, productivity at the firm level may be reduced if co-workers have to take time to make up for the drinkers' mistakes, absences, or tardiness due to alcohol (WHO, 2002).

Drunkenness and sickness from drinking at the workplace affect workers' productivity, and if pervasive among employees, it can threaten the economic viability of firms (Room et al., 2002). Alcohol use also increases the risk of work-related injuries, and it can lead to high rates of absenteeism and employee turnover However, many studies providing financial estimates of the costs of lost income and productivity using Cost of Illness methodology are considered by WHO and the EU to be unreliable due to inconsistent methodology (Mollet & Matic 2010) and economic costs due to lost productivity are currently not included in the WHO Global Report due to incomplete data (WHO, 2014).

Recent US studies have provided estimates of the cost of loss productivity from COI frameworks on a smaller scale. Whelan (2008) estimated that lost productivity accounted for $171 million in annual economic losses in the state of Oregon in 2006. A similar study by the Maine office of Substance Abuse (2007) estimated annual costs of lost productivity in their state to be $380 million. A study by Johansson et al. (2006) estimated the cost to the economy from lost productivity from premature death in Sweden to be $242 million Krona in 2002. (Navarro et al., 2011).

**Financial Problems**

*Alcohol consumption contributes to descents into and prevents exits from poverty*

Harm to personal finances is one of the largest non-health impacts to drinkers and their families. Using data from the 2003 GENACIS study, Tumwesigye & Kasirye (2005) found that 44% of Ugandan respondents reported financial problems as a result of drinking. The prevalence was higher among men, 56.4% of whom reported harm to their personal finances.

By examining data from the Ugandan Participatory Poverty Assessment Program (UPPAP), Lawson et al. (2003) found that alcoholism was one of the key factors underlying descents into poverty (2005). Bird and Shinyekwa (2003) came to similar conclusions, finding that poor gender relations and excessive alcohol consumption contributed to movements into poverty, and the study identified excessive drinking as a major shock that prevented exit from poverty.

*Alcohol expenditures as a proportion of total household expenditures diverts resources from education and healthcare*

In addition to financial problems caused by drinking, alcohol purchases divert household resources from education and healthcare. In households with fewer resources, the impact of income diversion can be much larger even at the same level of consumption. Banerjee & Duflo (2007) found that households in Cote d'Ivoire living on less than $1per day spent between 2.2-3.5% of their household budget on alcohol and tobacco.

As evidenced by Table 3, chronically poor Ugandan households were more likely to have alcohol expenditures than those not in poverty (42.6% of all households vs. 39.8%, respectively), and households in chronic poverty were likely to spend more on alcohol as a proportion of all food and beverage consumption than average households (12.6% vs. 10.9%) (Lawson et al., 2003).

*Table 3: Alcohol expenditure as a proportion of consumption in Uganda, 2003*

| | Poverty Status | | | | |
|---|---|---|---|---|---|
| **Consumption Purchases of Alcoholic Drinks** | **Chronic Poor** | **Moving out of Poverty** | **Moving into Poverty** | **Never in Poverty** | **All** |
| Avg. Consumption as a proportion of all food and beverages | 4.5 | 3.7 | 4.5 | 3.3 | 3.8 |
| Avg. Purchases as a proportion of all food and beverages | 9.9 | 7.7 | 10.2 | 6.8 | 8 |
| Proportions of hhs with any alcohol consumption expenditures (exp.) | 42.6 | 39.3 | 48.2 | 36.7 | 39.8 |
| Proportions of hhs with any purchase of alcoholic drinks | 40.6 | 33.9 | 41.6 | 34.2 | 36.1 |
| Proportions with alcohol consumption exp. >25% of all food/bev cons. exp. | 4.3 | 2.1 | 2.6 | 2.7 | 2.8 |
| Proportions with alcohol purchase exp. >25% of all food/bev cons. exp. | 12.6 | 10.7 | 13.3 | 9.6 | 10.9 |

*Source: Lawson et al. (2003)*

Household costs from alcohol purchases for weddings, other special occasions, and other symbolic or social values are less studied and understood. However, these expenditures are often status-related and can contribute to lifelong debts among the poor (Samarasinghe , 2009).

**Domestic Violence & Gender**

Women and children are more vulnerable to harm from alcohol-related domestic violence than men (Room et al., 2002). Some of the costs due to domestic violence, such as injuries or disability, are accounted for in health costs and inventoried in the previous section. Another large category of social costs that is more difficult to quantify includes psychological

distress and loss of amenity or peace of mind (WHO, 2014). These harms may be relatively mild, such as loss of sleep from drunken passerbys at night, or they may be more traumatic for the victim.

Studies exploring the negative consequences of drinking on others *besides the drinker* in New Zealand (Connor & Caswell, 2009), Australia (Laslett et al., 2011), the EU (Graham, 2008; Shield et al., 2012) and Sweden (Ramstedt et al., 2013) found that women appear to suffer greater consequences than men. This topic is the subject of an upcoming WHO/Thai Health collaborative research study designed to measure and analyze the harm to others from drinking in low-income and middle-income countries (WHO, 2014).

**Loss of Social Standing and Self Perception**

*Drinkers may face loss of social standing due to stigma attached to alcohol use.*

In a study of stigma attached to undesirable social conditions across 14 countries globally, 46% of respondents replied that "people would think it was wrong" for one to appear visibly drunk in public. In Nigeria, the only SSA country included in the study, 80% responded this way about public drunkenness, whereas only 64% of respondents replied they would think it is wrong for someone to appear visibly under the influence of *drugs*, and 47% answered similarly for people who are dirty or unkempt (Room et al., 2005). Marginalization of drinkers can lead to diminished access to health care and other social services (Schmidt et al., 2010) or lead to social exclusion from families or social networks (WHO 2014; Room et al., 2001).

| Reported Drinking Problems | Uganda | | Nigeria | |
|---|---|---|---|---|
| | M | F | M | F |
| Base Ns | 384 | 297 | 457 | 211 |
| 1. Harmed Marriage/Intimate Relations | 27% | 9 | 9 | 11 |
| 2. Harmed Family Relations | 25 | 9 | 7 | 5 |
| 3. Harmed Friendships | 21 | 10 | 9 | 11 |
| 4. Fight while Drinking | 18 | 6 | 3 | 5 |
| 5. Drink-driving | 9 | 4 | 2 | 2 |
| 6. Harmed Work | 28 | 14 | 10 | 7 |
| 7. Harmed Chores | 23 | 22 | 9 | 9 |
| 8. Harmed Finances | 59 | 28 | 19 | 18 |
| 9. Harmed Physical Health | 34 | 26 | 12 | 12 |
| 0. Guilt/Remorse | 17 | 13 | 8 | 4 |

In addition to public perceptions of drinking and the effects that social stigma or exclusion may have on drinkers, drinkers themselves report problems from their own drinking. *Table 4* reports these self-identified challenges. In both Uganda and Nigeria, higher percentages of males reported problems from drinking in all 10 categories. In Uganda, 59% of male drinkers reported financial problems, and 28% of males and 14% of females reported having experienced harm to their work lives. Financial problems followed by harm to physical health were the most commonly reported across all groups of drinkers in this study (Room & Selin, 2005).

*Table 4: Percentage of current drinkers reporting 10 problems from their own drinking, among those aged 18-65 in Uganda and Nigeria, GENACIS Surveys, 2003 (Room & Selin, 2005)*

*Alcohol consumption and drinking preferences associated with socio-demographic factors*

Alcohol use varies by employment status and other socio-demographic variables. A community-based study in Tanzania in 2009 found that those respondents who were economically inactive (unemployed but not seeking work) had higher rates of hazardous drinking, while the unemployed had the highest prevalence of hazardous drinking (Mbatia et al., 2009). In this same study, heads of household reported the highest rates of hazardous alcohol use, which may be due to greater access to money (ibid.). The GENACIS study found that drinking patterns in Nigeria are driven by gender, age, income, marital status and area of residence (Ibanga et al., 2005 in Braathen, 2008). In Uganda, results from the GENACIS study were broadly similar by age, sex, and marital status, and additional findings included the association between alcohol consumption and physical aggression, smoking, and loss of relationships (Tumwesigye & Kasirye 2005).

**Vandalized Property and Harm to Strangers**

*Property damage and interpersonal violence are tangible costs of harmful alcohol use.*

Tangible alcohol costs include property damage and destruction by someone under the influence of alcohol. This includes loss of property due to theft, traffic accidents, fires, and vandalized property (Navarro et al., 2011). Individuals under the influence of alcohol may be more likely to commit crimes including homicide, robbery, sexual assault and vandalism, or cause harm through verbal threats or nuisance (Room et al., 2002). Globally, one out of five deaths from interpersonal violence is attributable to alcohol (WHO, 2014).

## Conclusion

Hazardous alcohol use contributes to early mortality and morbidity, loss of productivity, property damage, and other social costs and harms for drinkers and those around them. Given the close association between economic development and alcohol use at a global scale, recent evidence of increasing consumption of high alcohol content beverages in Sub-Saharan Africa, and patterns of risky drinking throughout the region, social costs from alcohol may increase with increased, locally available alcohol.

Drinking also affects vulnerable segments of the population disproportionately. Recent data suggest that market liberalization has increased the availability of alcohol, particularly for groups of lower socio-economic status (SES), increasing consumption particularly among those who face the greatest social burden (WHO, 2014). Chronically poor households are more likely to spend a greater proportion of their food and beverage expenses on alcohol, and women, despite consuming less alcohol by volume and frequency than men, face higher health and social costs from alcohol relative to their consumption. In addition, Results from several substance abuse studies indicate increased alcohol use and abuse among younger segments of the population, which in most African countries, is approximately 40-50% of the population. Policymakers, local authorities, and donor agencies can use the information presented in this paper to plan and prepare for the higher consumption levels and subsequent social costs that may follow through agricultural development and economic growth in the region.

*Please direct comments or questions about this research to Leigh Anderson and Mary Kay Gugerty, at eparx@u.washington.edu.*

## References


Bakke, Ø., & Endal, D. (2010). Vested Interests in Addiction Research and Policy Alcohol policies out of context: drinks industry supplanting government role in alcohol policies in sub-Saharan Africa. Addiction, 105(1), 22-28.

Banerjee, A. V., & Duflo, E. (2007). The economic lives of the poor. The journal of economic perspectives: a journal of the American Economic Association, 21(1), 141.

Baumberg, B. (2006). The global economic burden of alcohol: a review and some suggestions. Drug and alcohol review, 25(6), 537-551.

Bird, K., & Shinyekwa, I. (2003). Multiple shocks and downward mobility: Learning from life histories of rural Ugandans. Chronic Poverty Research Centre Working Paper, (36).

Braathen, S.H. (2008) Substance Use and Gender Based Violence in a Malawian Context – Pilot Project 2. SINTEF Health Research. Oslo.

Slakie, E., Cato, G., Goyenechea, R. (2013). Adding Value to Sorghum and Millet: Market Opportunities for Smallholder Farmers in Burkina Faso and Tanzania. MPA Capstone Project for the Bill & Melinda Gates Foundation University of Washington.

Clausen, T., Rossow, I., Naidoo, N., & Kowal, P. (2009). Diverse alcohol drinking patterns in 20 African countries. Addiction, 104(7), 1147-1154.

Connor, J., You, R., & Casswell, S. (2009). Alcohol-related harm to others: a survey of physical and sexual assault in New Zealand. Journal of the New Zealand Medical Association, 122(1303).

Fisher, J. C., Bang, H., & Kapiga, S. H. (2007). The association between HIV infection and alcohol use: a systematic review and meta-analysis of African studies. Sexually transmitted diseases, 34(11), 856-863.

Graham, K. M. (Ed.). (2008). Unhappy hours: alcohol and partner aggression in the Americas (No. 631). Pan American Health Org.

Grucza, R. A., Bucholz, K. K., Rice, J. P., & Bierut, L. J. (2008). Secular Trends in the Lifetime Prevalence of Alcohol Dependence in the United States: A Re-evaluation. Alcoholism: Clinical and Experimental Research, 32(5), 763-770.

Hendershot, C. S., Stoner, S. A., Pantalone, D. W., & Simoni, J. M. (2009). Alcohol use and antiretroviral adherence: review and meta-analysis. Journal of acquired immune deficiency syndromes (1999), 52(2), 180-202.

Ibanga, A. J., Adetula, A. V., Dagona, Z., Karick, H., Ojiji, O., Obot, I. S., & Room, R. (2005). The contexts of alcohol consumption in Nigeria. Alcohol, Gender and Drinking Problems: perspectives from low and middle income countries, 143-166.

Institute for Health Metrics and Evaluation (IHME). (2012). Global Health Data Exchange. University of Washington. Seattle, USA. Accessed at http://ghdx.healthdata.org/ on 05/01/14

Lapsley, H., Brochu, S., Easton, B., Pérez-Gómez, A., Rehm, J., & Single, E. (2006). International guidelines for the estimation of the avoidable costs of substance abuse. Ottowa, Canada: Health Canada.

Laslett, A. M., Room, R., Ferris, J., Wilkinson, C., Livingston, M., & Mugavin, J. (2011). Surveying the range and magnitude of alcohol's harm to others in Australia. Addiction, 106(9), 1603-1611.

Lawson, D., McKay, A., & Okidi, J. (2003). Poverty Persistence and Transitions in Uganda: A Combined Qualitative and Quantitative Analysis,a paper prepared for the Chronic Poverty Research Centre (CPRC) œ University of Manchester.

Lim, S. S., Vos, T., Flaxman, A. D., Danaei, G., Shibuya, K., Adair-Rohani, H., ... & Davis, A. (2013). A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. The lancet, 380(9859), 2224-2260.

Lozano, R., Naghavi, M., Foreman, K., Lim, S., Shibuya, K., Aboyans, V., ... & Cross, M. (2013). Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. The Lancet, 380(9859), 2095-2128.

Makindara, J. R., Hella, J. P., Erbaugh, J. M., & Larson, D. W. (2013). Consumer preferences and market potential for sorghum based clear beer in Tanzania. Journal of Brewing and Distilling, 4(1), 1-10.

Makindara, J.R. (2012). Sorghum value chain analysis in Tanzania: A case study of sorghum based clear beer production and marketability. PhD Thesis Sokoine University.

Matzopoulos, R. G., Truen, S., Bowman, B., & Corrigall, J. (2013). The cost of harmful alcohol use in South Africa. South African Medical Journal, 104(2), 127-132.

Mbatia, J., Jenkins, R., Singleton, N., & White, B. (2009). Prevalence of alcohol consumption and hazardous drinking, tobacco and drug use in urban Tanzania, and their associated risk factors. International journal of environmental research and public health, 6(7), 1991-2006.

Moller, L., & Matic, S. (2010). Best practice in estimating the costs of alcohol.Recommendations for future Studies. Ginebra: WHO Europe.

Mshana, G. (2014). Alcohol, young people and HIV risk in Tanzania. Presentation. National Institute for Medical Research (NIMR) in Tanzania. Retrieved: http://strive.lshtm.ac.uk/resources/alcohol-young-people-and-hiv-risk-tanzania-gerry-mshana

Murray, C. J., & Lopez, A. D. (1996). Evidence-Based Health Policy---Lessons from the Global Burden of Disease Study. Science, 274(5288), 740-743.

Murray, C. J., Ezzati, M., Flaxman, A. D., Lim, S., Lozano, R., Michaud, C., ... & Lopez, A. D. (2012). GBD 2010: design, definitions, and metrics. The Lancet, 380(9859), 2063-2066.

Murray, C. J., Vos, T., Lozano, R., Naghavi, M., Flaxman, A. D., Michaud, C., ... & Bridgett, L. (2013). Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. The Lancet, 380(9859), 2197-2223.

Navarro, H. J., Doran, C. M., & Shakeshaft, A. P. (2011). Measuring costs of alcohol harm to others: A review of the literature. Drug and alcohol dependence, 114(2), 87-99.

Obot, I. S. (2006). Alcohol use and related problems in sub-Saharan Africa. African Journal of Drug and Alcohol Studies, 5(1), 17-26.

Obot, I. S., Room, R., GENACIS (Organization), & World Health Organization. (2005).Alcohol, gender, and drinking problems: Perspectives from low and middle income countries. Geneva: World Health Organization, Department of Mental Health and Substance Abuse.

Odejide, A. O. (2006). Status of drug use/abuse in Africa: A review. International journal of mental health and addiction, 4(2), 87-102.

Pampel, F. C. (2005). Patterns of tobacco use in the early epidemic stages: Malawi and Zambia, 2000–2002. American journal of public health, 95(6), 1009.

Parry, C.D.H., Myers, B., Morojele, N. K., Flisher,A.J., Bhana, A., Donson, H., Plüddemann, A. (2004). Trends in adolescent alcohol and other drug use: findings from three sentinel sites in South Africa (1997–2001), in Journal of Adolescence, 27, 429–440.

Parry, C.D.H. & Bennetts, A.L. (1998) Alcohol Policy and Public Health in South Africa. Cape Town, Oxford University Press.

Parry, C.D.H et al. (1998) Monitoring alcohol and drug abuse trends in South Africa (July 1996 -June 1998). SACENDU Research Brief, I (2): pp. 1-16.

Parry, C., Rehm, J., Poznyak, V., & Room, R. (2009). Alcohol and infectious diseases: an overlooked causal linkage?. Addiction, 104(3), 331-332.

Pérez-Gómez, A., & Wilson-Caicedo, E. (2000). Estimating the economic costs of drug abuse in Colombia. Economic and social costs of substance abuse, 89.

Ramstedt, M., Leifman, H., Müller, D., Sundin, E., & Norström, T. (2013). Reducing youth violence related to student parties: Findings from a community intervention project in Stockholm. Drug and alcohol review, 32(6), 561-565.

Rehm, J., Room, R., Graham, K., Monteiro, M., Gmel, G., & Sempos, C. T. (2003). The relationship of average volume of alcohol consumption and patterns of drinking to burden of disease: an overview. *Addiction*, *98*(9), 1209-1228. Rehm, J., Baliunas, D., Borges, G. L., Graham, K., Irving, H., Kehoe, T., ... & Taylor, B. (2010). The relation between different dimensions of alcohol consumption and burden of disease: an overview. *Addiction*, *105*(5), 817-843.

Rehm, J. U. R., Rehn, N., Room, R., Monteiro, M., Gmel, G., Jernigan, D., & Frick, U. (2003). The global distribution of average volume of alcohol consumption and patterns of drinking. European addiction research, 9(4), 147-156.

Rehm, J. U. R., Room, R., Monteiro, M., Gmel, G., Graham, K., Rehn, N., ... & Jernigan, D. (2003). Alcohol as a risk factor for global burden of disease. European addiction research, 9(4), 157-164.

Rehm, J., & Parry, C. D. (2010). Alcohol consumption and infectious diseases in South Africa. The Lancet, 374(9707), 2053.

Rehm, J., & Shield, K. D. (2014). Alcohol and Mortality: Global Alcohol-Attributable Deaths From Cancer, Liver Cirrhosis, and Injury in 2010. Alcohol research: current reviews, 35(2), 174.

Rehm, J., Anderson, P., Kanteres, F., Parry, C. D., Samokhvalov, A. V., & Patra, J. (2009). Alcohol, social development and infectious disease. Toronto, ON: Centre for Addiction and Mental Health.

Rehm, J., Kailasapillai, S., Larsen, E., Rehm, M. X., Samokhvalov, A. V., Shield, K. D., Roerecke, M. and Lachenmeier, D. W. (2014), A systematic review of the epidemiology of unrecorded alcohol consumption and the chemical composition of unrecorded alcohol. Addiction, 109: 880–893.

Rehm, J., Kanteres, F., & Lachenmeier, D. W. (2010). Unrecorded consumption, quality of alcohol and health consequences. Drug and alcohol review, 29(4), 426-436.

Rehm, J., Klotsche, J., & Patra, J. (2007). Comparative quantification of alcohol exposure as risk factor for global burden of disease. International journal of methods in psychiatric research, 16(2), 66-76.

Rehm, J., Mathers, C., Popova, S., Thavorncharoensap, M., Teerawattananon, Y., & Patra, J. (2009a). Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. The Lancet, 373(9682), 2223-2233.

Rehm, J., Popova, S., Patra, J., Cherpitel, C. J., Borges, G., Giesbrecht, N., ... & Tockwell, T. (2009b). Alcohol-attributable injury in a global perspective. Alcohol and injuries: Emergency department studies in an international perspective, 41-51.

Rehm, J., Shield, K. D., Rehm, M. X., Gmel, G., & Frick, U. (2012). Alcohol consumption, alcohol dependence and attributable burden of disease in Europe. Potential gains from effective interventions for alcohol dependence.

Rohrbach, D. D., & Kiriwaggulu, J. A. B. (2007). Commercialization prospects for sorghum and pearl millet in Tanzania. *ICRISAT, 3*(1), 1-24. Retrieved from: http://www.icrisat.org/journal/mpii/v3i1/impi3.pdf.

Room, R. (2005). Stigma, social inequality and alcohol and drug use. Drug and alcohol review, 24(2), 143-155.

Room, R., & Rossow, I. (2001). The share of violence attributable to drinking. Journal of substance Use, 6(4), 218-228.

Room, R., & Selin, K. H. (2005). Problems from women's and men's drinking in eight developing countries. Alcohol, gender and drinking problems, 209.

Room, R., Cotrim, B. C., Gureje, O., Jernigan, D., Mäkelä, K., Marshall, M., ... & Room, R. (2000). Alcohol policies in developing societies: perspectives from a project. Journal of Substance Use, 5(1), 2-5.

Room, R., Jernigan, D., Carlini-Marlatt, B., Gureje, O., Mäkelä, K., Marshall, M., ... & Saxena, S. (2002). Alcohol in developing societies: a public health approach. Finnish Foundation for Alcohol Studies.

Room, R., Rehm, J., Trotter, R. T., Paglia, A., & Üstün, T. B. (2001). Cross-cultural views on stigma, valuation, parity and societal values towards disability. Disability and culture: universalism and diversity. Seattle, WA, Hogrefe & Huber, 247-291.

Samarasinghe, D. (2009). Alcohol and poverty: some connections. FORUT. Retrieved from: http://www.add-resources.org/alcohol-and-poverty-some-connections.4610335-137825.html.

Schmidt, L. A., Mäkelä, P., Rehm, J., & Room, R. (2010). Alcohol: equity and social determinants. Equity, social determinants and public health programmes, 11.

Shield, K. D., Kehoe, T., Gmel, G. J., Rehm, M. X., & Rehm, J. (2012). Societal burden of alcohol. Alcohol in the European Union. Consumption, harm and policy approaches. Copenhagen, WHO Regional Office for Europe.

Shuper, P. A., Neuman, M., Kanteres, F., Baliunas, D., Joharchi, N., & Rehm, J. (2010). Causal considerations on alcohol and HIV/AIDS—a systematic review. *Alcohol and alcoholism*, *45*(2), 159-166. Single, E. (2003). Estimating the costs of substance abuse: implications to the estimation of the costs and benefits of gambling. Journal of Gambling Studies, 19(2), 215-233.

Tumwesigye, N. M., & Kasirye, R. O. G. E. R. S. (2005). Gender and the major consequences of alcohol consumption in Uganda. Alcohol, gender and drinking problems, 189.

Wang, H., Dwyer-Lindgren, L., Lofgren, K. T., Rajaratnam, J. K., Marcus, J. R., Levin-Rector, A., ... & Murray, C. J. (2013). Age-specific and sex-specific mortality in 187 countries, 1970–2010: a systematic analysis for the Global Burden of Disease Study 2010. The Lancet, 380(9859), 2071-2094.

Whiteford, H. A., Degenhardt, L., Rehm, J., Baxter, A. J., Ferrari, A. J., Erskine, H. E., ... & Vos, T. (2013). Global burden of disease attributable to mental and substance use disorders: findings from the Global Burden of Disease Study 2010. The Lancet, 382(9904), 1575-1586.

Willis, J. (2006). African Journal of Drug & Alcohol Studies, 5 (1), 2006 Copyright© 2006, CRISA Publications. African Journal of Drug and Alcohol Studies, 5, 1.

Wilsnack, R. W., & Wilsnack, S. C. (2013). Gender and alcohol: consumption and consequences. Alcohol: Science, Policy and Public Health, 153.

World Health Organization. (2002). Alcohol in developing societies : a public health approach. Summary. Retrieved from: http://www.who.int/substance_abuse/publications/en/APDSSummary.pdf

World Health Organization. (2005). Global information system on alcohol and health: Patterns of consumption. Retrieved from: http://apps.who.int/gho/data/node.main.A1038?lang=en&showonly=GISAH

World Health Organization (Ed.). (2009). Global health risks: mortality and burden of disease attributable to selected major risks. World Health Organization.

World Health Organization (2010). Global Information System on Alcohol and Health (GISAH) [online database]. Geneva (http://www.who.int/globalatlas/alcohol).

World Health Organization (2011) Global status report on alcohol and health 2011 ed. Geneva.

World Health Organization (2014) Global status report on alcohol and health 2014 ed. Geneva.

World Health Organization. (2014b) Metrics: Disability-Adjusted Life Year (DALY). (n.d.). Retrieved May 1, 2014, from http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/.

# APPENDIX

### Appendix I: Methodology Notes

WHO alcohol consumption data are based on data from official records or representative population surveys on consumption, while sales or trade data are typically only based on recorded figures (WHO, 2004). Survey-based alcohol consumption data may also underreport alcohol consumption. According to Beaglehole & Bonita (2009), these numbers are "almost certainly conservative, particularly for developing countries where illicit manufacture is poorly controlled and disease registers are limited."

While the 2004 Global Status Report on Alcohol and Health does not include unreported alcohol estimates in its total alcohol consumption, the 2011 Report attempts to quantify and include unrecorded alcohol consumption using an algorithm based on "empirical investigations and expert judgments" (WHO, 2011). The 2014 Report further attempts to account for unrecorded alcohol, and includes both recorded and unrecorded alcohol in its APC estimates for every country.[18]

Inter-country consumption level comparisons may be limited by differing data sources. WHO (2004) reports that the reason many African countries are listed in the top 30 by adult per capita consumption (APC) is that calculations were based on FAO data including non-alcoholic fermented beverages and estimates of locally produced beer from sorghum, millet, and other agricultural products, thus potentially inflating the total volume of alcohol consumed (WHO, 2004). In subsequent editions, the WHO updates its consumption measurement methodology to include unrecorded alcohol consumption in the total alcohol consumption measurement (WHO, 2014).

### APPENDIX II: Total (recorded three-year average + unrecorded) per capita (15+) consumption (in litres of pure alcohol), 2003-2005 and 2008-2010

| Country | Total APC (2003-2005) | Total APC (2008-2010) |
|---|---|---|
| Algeria | 1 | 1 |
| Angola | 7.5 | 5.4 |
| Benin | 2.1 | 2.2 |
| Botswana | 8.4 | 8.6 |
| Burkina Faso | 6.8 | 7 |
| Burundi | 9.3 | 9.5 |
| C?te d'Ivoire | 6 | 6.5 |
| Cabo Verde | 6.9 | 6.5 |
| Cameroon | 8.4 | 7.6 |
| Central African Republic | 3.8 | 3.3 |

[18] For the 2014 Report, **an** additional survey on unrecorded consumption was used to improve unrecorded consumption estimations in some countries. This survey was sent to 42 countries with at least 10% unrecorded consumption as part of the total consumption, and the nominal group technique was used to solicit five expert judgments per country. In addition, the systematic review of all published literature on the topic (Rehm et. al., 2014) fed back to the experts who used this analysis to arrive at a final estimate of unrecorded consumption.

| | | |
|---|---|---|
| Chad | 4.4 | 4.4 |
| Comoros | 0.2 | 0.4 |
| Congo | 3.9 | 4.2 |
| Democratic Republic of the Congo | 3.6 | 3 |
| Equatorial Guinea | 6.6 | 9.1 |
| Eritrea | 1.1 | 1.4 |
| Ethiopia | 4.2 | 4.4 |
| Gabon | 10.9 | 8.8 |
| Gambia | 3.4 | 3.4 |
| Ghana | 4.8 | 3 |
| Guinea | 0.7 | 0.8 |
| Guinea-Bissau | 4 | 3.8 |
| Kenya | 4.3 | 4.1 |
| Lesotho | 6.5 | 5.8 |
| Liberia | 4.7 | 5.1 |
| Madagascar | 1.8 | 1.2 |
| Malawi | 2.5 | 1.8 |
| Mali | 1.1 | 1 |
| Mauritania | 0.1 | 0.1 |
| Mauritius | 3.6 | 3.8 |
| Mozambique | 2.3 | 2.3 |
| Namibia | 10.8 | 8.8 |
| Niger | 0.3 | 0.3 |
| Nigeria | 10.1 | 12.3 |
| Rwanda | 9.8 | 9.8 |
| Sao Tome and Principe | 7.1 | 8.7 |
| Senegal | 0.6 | 0.6 |
| Seychelles | 5.6 | 7.2 |
| Sierra Leone | 8.7 | 9.7 |

| | | |
|---|---|---|
| South Africa | 11 | 12.5 |
| Swaziland | 5.7 | 5.4 |
| Togo | 2.3 | 2 |
| Uganda | 9.8 | 9.9 |
| United Republic of Tanzania | 7.7 | 6.8 |
| Zambia | 4 | 3.9 |
| Zimbabwe | 5.7 | 5.1 |

**Appendix III: Alcohol abstention rates by abstention type and gender, 2010. Source: WHO (2014)**

| Country | Sex | Lifetime Abstainers (%) | Abstainers, past 12 months (%) | % Alcohol Consumers (current drinkers) |
|---|---|---|---|---|
| Algeria | Both sexes | 81.3 | 90.7 | 9.3 |
| Algeria | Female | 87.6 | 95 | 5 |
| Algeria | Male | 75 | 86.5 | 13.5 |
| Angola | Both sexes | 52 | 64.4 | 35.6 |
| Angola | Female | 65.6 | 76.4 | 23.6 |
| Angola | Male | 37.8 | 52 | 48 |
| Benin | Both sexes | 51.1 | 60.6 | 39.4 |
| Benin | Female | 60 | 70 | 30 |
| Benin | Male | 42 | 51 | 49 |
| Botswana | Both sexes | 41.3 | 58.5 | 41.5 |
| Botswana | Female | 54.7 | 73.5 | 26.5 |
| Botswana | Male | 27.8 | 43.6 | 56.4 |
| Burkina Faso | Both sexes | 50.8 | 62 | 38 |
| Burkina Faso | Female | 64.2 | 72.6 | 27.4 |
| Burkina Faso | Male | 36.6 | 50.8 | 49.2 |
| Burundi | Both sexes | 44.9 | 57.9 | 42.1 |
| Burundi | Female | 58.5 | 67.9 | 32.1 |

| | | | | |
|---|---|---|---|---|
| Burundi | Male | 30.9 | 47.5 | 52.5 |
| Cote d'Ivoire | Both sexes | 67.9 | 76.7 | 23.3 |
| Cote d'Ivoire | Female | 83 | 89.8 | 10.2 |
| Cote d'Ivoire | Male | 53.8 | 64.4 | 35.6 |
| Central African Republic | Both sexes | 65.9 | 78.6 | 21.4 |
| Central African Republic | Female | 78.1 | 87.6 | 12.4 |
| Central African Republic | Male | 53.2 | 69.1 | 30.9 |
| Chad | Both sexes | 73.7 | 86.9 | 13.1 |
| Chad | Female | 83.2 | 92.6 | 7.4 |
| Chad | Male | 64 | 81.1 | 18.9 |
| Comoros | Both sexes | 76.1 | 88.1 | 11.9 |
| Comoros | Female | 86 | 93.4 | 6.6 |
| Comoros | Male | 66.2 | 82.7 | 17.3 |
| Congo | Both sexes | 62 | 71.3 | 28.7 |
| Congo | Female | 75 | 84.6 | 15.4 |
| Congo | Male | 48.9 | 57.9 | 42.1 |
| Democratic Republic of the Congo | Both sexes | 62.8 | 72.1 | 27.9 |
| Democratic Republic of the Congo | Female | 75.6 | 85.1 | 14.9 |
| Democratic Republic of the Congo | Male | 49.7 | 58.7 | 41.3 |
| Equatorial Guinea | Both sexes | 48.7 | 60 | 40 |
| Equatorial Guinea | Female | 63.2 | 71.7 | 28.3 |
| Equatorial Guinea | Male | 35.1 | 49.3 | 50.7 |
| | | | | |
| Eritrea | Both sexes | 51.1 | 56.7 | 43.3 |
| Eritrea | Female | 56.3 | 60.6 | 39.4 |
| Eritrea | Male | 45.7 | 52.7 | 47.3 |
| Ethiopia | Both sexes | 71.2 | 84.3 | 15.7 |
| Ethiopia | Female | 79.9 | 89 | 11 |
| Ethiopia | Male | 62.3 | 79.4 | 20.6 |

| | | | | |
|---|---|---|---|---|
| Gabon | Both sexes | 37.9 | 58.9 | 41.1 |
| Gabon | Female | 50.9 | 69.7 | 30.3 |
| Gabon | Male | 24.8 | 48 | 52 |
| Gambia | Both sexes | 87.9 | 89 | 11 |
| Gambia | Female | 93.2 | 93.9 | 6.1 |
| Gambia | Male | 82.4 | 83.9 | 16.1 |
| Ghana | Both sexes | 64.1 | 76.7 | 23.3 |
| Ghana | Female | 76.5 | 86 | 14 |
| Ghana | Male | 51 | 66.9 | 33.1 |
| Guinea | Both sexes | 82.5 | 91.3 | 8.7 |
| Guinea | Female | 90 | 95 | 5 |
| Guinea | Male | 75 | 87.5 | 12.5 |
| Guinea-Bissau | Both sexes | 60.5 | 70 | 30 |
| Guinea-Bissau | Female | 73.6 | 83.7 | 16.3 |
| Guinea-Bissau | Male | 47.1 | 56.1 | 43.9 |
| Kenya | Both sexes | 64.6 | 77.3 | 22.7 |
| Kenya | Female | 77.1 | 86.7 | 13.3 |
| Kenya | Male | 51.8 | 67.7 | 32.3 |
| Lesotho | Both sexes | 58.2 | 70 | 30 |
| Lesotho | Female | 71.2 | 81.3 | 18.7 |
| Lesotho | Male | 44.4 | 58 | 42 |
| Liberia | Both sexes | 63.1 | 70 | 30 |
| Liberia | Female | 75.2 | 81.5 | 18.5 |
| Liberia | Male | 50.8 | 58.4 | 41.6 |
| Madagascar | Both sexes | 72.6 | 85.9 | 14.1 |
| Madagascar | Female | 83.4 | 92.9 | 7.1 |
| Madagascar | Male | 61.5 | 78.7 | 21.3 |
| Malawi | Both sexes | 67.9 | 80.6 | 19.4 |
| Malawi | Female | 79.8 | 89.4 | 10.6 |

| | | | | |
|---|---|---|---|---|
| Malawi | Male | 55.8 | 71.7 | 28.3 |
| Mali | Both sexes | 93.6 | 96.2 | 3.8 |
| Mali | Female | 96 | 98.4 | 1.6 |
| Mali | Male | 91.1 | 94 | 6 |
| Mauritania | Both sexes | 95 | 97.7 | 2.3 |
| Mauritania | Female | 96 | 98.4 | 1.6 |
| Mauritania | Male | 94 | 97 | 3 |
| Mauritius | Both sexes | 55.8 | 68 | 32 |
| Mauritius | Female | 69.4 | 80.2 | 19.8 |
| Mauritius | Male | 41.8 | 55.4 | 44.6 |
| Mozambique | Both sexes | 69.6 | 82.1 | 17.9 |
| Mozambique | Female | 80.7 | 90.3 | 9.7 |
| Mozambique | Male | 57.3 | 73.2 | 26.8 |
| Namibia | Both sexes | 48.7 | 61 | 39 |
| Namibia | Female | 61.8 | 70.2 | 29.8 |
| Namibia | Male | 34.2 | 50.8 | 49.2 |
| Niger | Both sexes | 92.4 | 94.7 | 5.3 |
| Niger | Female | 94.8 | 97.8 | 2.2 |
| Niger | Male | 90 | 91.5 | 8.5 |
| Nigeria | Both sexes | 39.2 | 56.4 | 43.6 |
| Nigeria | Female | 52.5 | 71.3 | 28.7 |
| Nigeria | Male | 26.1 | 41.9 | 58.1 |
| Rwanda | Both sexes | 42.8 | 55.3 | 44.7 |
| Rwanda | Female | 55.8 | 65.2 | 34.8 |
| Rwanda | Male | 28.7 | 44.5 | 55.5 |
| Sao Tome and Principe | Both sexes | 50.7 | 61.9 | 38.1 |
| Sao Tome and Principe | Female | 64.2 | 72.6 | 27.4 |
| Sao Tome and Principe | Male | 36.4 | 50.6 | 49.4 |
| Senegal | Both sexes | 90.2 | 94.5 | 5.5 |

| | | | | |
|---|---|---|---|---|
| Senegal | Female | 95 | 98.5 | 1.5 |
| Senegal | Male | 85 | 90.2 | 9.8 |
| Seychelles | Both sexes | 34.1 | 55.8 | 44.2 |
| Seychelles | Female | 46.9 | 67.2 | 32.8 |
| Seychelles | Male | 21.6 | 44.8 | 55.2 |
| Sierra Leone | Both sexes | 42.7 | 55.3 | 44.7 |
| Sierra Leone | Female | 56.1 | 65.5 | 34.5 |
| Sierra Leone | Male | 29 | 44.7 | 55.3 |
| Swaziland | Both sexes | 43.7 | 56.1 | 43.9 |
| Swaziland | Female | 56.8 | 66.2 | 33.8 |
| Swaziland | Male | 29.7 | 45.4 | 54.6 |
| Togo | Both sexes | 33.1 | 37.2 | 62.8 |
| Togo | Female | 37.9 | 42.7 | 57.3 |
| Togo | Male | 28.1 | 31.4 | 68.6 |
| Uganda | Both sexes | 41.4 | 58.7 | 41.3 |
| Uganda | Female | 54.9 | 73.7 | 26.3 |
| Uganda | Male | 27.9 | 43.7 | 56.3 |
| United Republic of Tanzania | Both sexes | 45.1 | 58.1 | 41.9 |
| United Republic of Tanzania | Female | 58.7 | 68.1 | 31.9 |
| United Republic of Tanzania | Male | 31.2 | 47.8 | 52.2 |
| Zambia | Both sexes | 59.8 | 69.4 | 30.6 |
| Zambia | Female | 73.1 | 83.2 | 16.8 |
| Zambia | Male | 46.4 | 55.4 | 44.6 |
| Zimbabwe | Both sexes | 49.8 | 61 | 39 |
| Zimbabwe | Female | 63.3 | 71.7 | 28.3 |
| Zimbabwe | Male | 35.6 | 49.7 | 50.3 |

Note: data for Cameroon, Cabo Verde, Somalia, and South Africa were incomplete in these three categories and are not included in this Appendix.

**Appendix IV: Heavy Episodic Drinking (HED) rates among men, % of total drinkers, women, and both sexes in Africa region, 2010**

| Country | Both | Female | Male |
|---|---|---|---|
| Algeria | 4.7 | 2.2 | 5.5 |
| Angola | 11.8 | 4.1 | 15.8 |
| Benin | 56.6 | 33.6 | 71.1 |
| Botswana | 17.2 | 5.8 | 22.6 |
| Burkina Faso | 46.7 | 32.4 | 55.1 |
| Burundi | 7.1 | 0.3 | 11.4 |
| Cabo Verde | 12.8 | 6.9 | 16.4 |
| Cameroon | 27.9 | 20.7 | 32.5 |
| Central African Republic | 7.9 | 2.2 | 10.3 |
| Chad | 5.7 | 2 | 7.2 |
| Comoros | 7.2 | 1.5 | 9.4 |
| Congo | 11.1 | 2.7 | 14.2 |
| Cote d'Ivoire | 10.4 | 2.6 | 12.5 |
| Dem. Rep. of the Congo | 10.7 | 2.6 | 13.7 |
| Equatorial Guinea | 12.8 | 4.9 | 16.9 |
| Eritrea | 0.9 | | 1.7 |
| Ethiopia | 3.2 | 0.1 | 4.8 |
| Gabon | 12.9 | 5.3 | 17.3 |
| Gambia | 5 | 1.7 | 6.4 |
| Ghana | 9.2 | 3.6 | 11.7 |
| Guinea | 19.2 | 12.7 | 21.8 |
| Guinea-Bissau | 12.3 | 4.2 | 15.4 |
| Kenya | 5.2 | 0.1 | 7.4 |
| Lesotho | 12.8 | 4.1 | 16.9 |
| Liberia | 38.4 | 26.3 | 43.9 |
| Madagascar | 64.8 | 43 | 72.2 |
| Malawi | 40.8 | 13.1 | 51.4 |
| Mali | 2 | 0.4 | 2.5 |

| | | | |
|---|---|---|---|
| Mauritania | 1 | 0.4 | 1.3 |
| Mauritius | 40.7 | 25.6 | 47.6 |
| Mozambique | 4.4 | 0.1 | 6.2 |
| Namibia | 37.2 | 23.6 | 46.4 |
| Niger | 2.9 | 0.6 | 3.6 |
| Nigeria | 15.3 | 6.8 | 19.4 |
| Rwanda | 45 | 31.2 | 54.3 |
| Sao Tome & Principe | 12.8 | 6.5 | 16.5 |
| Senegal | 3.4 | 0.4 | 3.9 |
| Seychelles | 53.8 | 24.1 | 70.9 |
| Sierra Leone | 19.2 | 13.6 | 22.7 |
| South Africa | 25.6 | 13.9 | 31.7 |
| Swaziland | 16.1 | 7.4 | 21.9 |
| Tanzania | 34 | 23.3 | 40.6 |
| Togo | 38.6 | 24.6 | 51 |
| Uganda | 8.3 | 0.3 | 12.1 |
| Zambia | 7.2 | 0.2 | 9.8 |
| Zimbabwe | 35.1 | 22.2 | 42.8 |

Note: Female HED rates are missing for Eritrea

**Appendix V: Alcohol-attributable deaths and DALYs by SSA country and WHO region**

| | Adult per Capita Consumption | Alcohol-attributable rates of disease burden | | | Disease burden divided by adult per capita consumption | |
|---|---|---|---|---|---|---|
| **Country** | **2010 Recorded and Unrecorded** | **DALYs per 100,000** | **Deaths per 100,000** | **Fraction of total deaths** | **DALYs per 100,000 per litre consumed** | **Deaths per 100,000 per litre consumed** |
| Angola | 7.5 | 1197.5 | 24.2 | 3.2 | 159.7 | 3.2 |
| Benin | 2.1 | 486.7 | 10.1 | 1.8 | 231.7 | 4.8 |
| Botswana | 8.4 | 2184.2 | 36.3 | 3.9 | 260.0 | 4.3 |
| Burkina Faso | 6.8 | 1550.1 | 34.5 | 3.4 | 228.0 | 5.1 |
| Burundi | 9.3 | 3263.7 | 80.7 | 4.4 | 350.9 | 8.7 |
| Cameroon | 8.4 | 1451.9 | 33.4 | 4.3 | 172.8 | 4.0 |
| Cape Verde | 6.9 | 648.4 | 15.2 | 3.6 | 94.0 | 2.2 |
| Central African Republic | 3.8 | 1549.4 | 35.4 | 1.8 | 407.7 | 9.3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Chad | 4.4 | 883.0 | 21.2 | 2.3 | 200.7 | 4.8 |
| Comoros | 0.2 | 343.6 | 6.3 | 0.7 | 1718.1 | 31.4 |
| Congo | 3.9 | 1075.8 | 23.5 | 2.2 | 275.8 | 6.0 |
| Cote d'Ivoire | 6 | 1825.2 | 45.7 | 3.6 | 304.2 | 7.6 |
| Democratic Republic of the Congo | 3.6 | 1018.2 | 20.9 | 2.0 | 282.8 | 5.8 |
| Djibouti | na | 664.9 | 15.4 | na | na | na |
| Equatorial Guinea | 6.6 | 1379.2 | 27.7 | 2.4 | 209.0 | 4.2 |
| Eritrea | 1.1 | 354.1 | 4.8 | 0.6 | 321.9 | 4.4 |
| Ethiopia | 4.2 | 1208.8 | 30.7 | 3.2 | 287.8 | 7.3 |
| Gabon | 10.9 | 3439.3 | 75.1 | 5.5 | 315.5 | 6.9 |
| Ghana | 4.8 | 729.8 | 17.7 | 3.4 | 152.0 | 3.7 |
| Guinea | 0.7 | 388.8 | 9.1 | 1.0 | 555.4 | 13.1 |
| Guinea-Bissau | 4 | 1003.0 | 24.4 | 1.8 | 250.8 | 6.1 |
| Kenya | 4.3 | 804.1 | 19.1 | 2.6 | 187.0 | 4.4 |
| Lesotho | 6.5 | 3591.7 | 67.3 | 3.0 | 552.6 | 10.3 |
| Liberia | 4.7 | 1063.4 | 24.7 | 3.0 | 226.3 | 5.3 |
| Madagascar | 1.8 | 382.7 | 8.6 | 2.4 | 212.6 | 4.8 |
| Malawi | 2.5 | 668.6 | 17.3 | 1.7 | 267.4 | 6.9 |
| Mali | 1.1 | 595.8 | 11.0 | 0.9 | 541.6 | 10.0 |
| Mauritania | 0.1 | 135.6 | 2.4 | 0.6 | 1356.1 | 24.2 |
| Mauritius | 3.6 | 1190.8 | 32.5 | 3.9 | 330.8 | 9.0 |
| Mozambique | 2.3 | 706.9 | 16.2 | 1.3 | 307.3 | 7.0 |
| Namibia | 10.8 | 3340.0 | 66.3 | 6.9 | 309.3 | 6.1 |
| Niger | 0.3 | 300.3 | 6.2 | 0.3 | 1001.1 | 20.8 |
| Nigeria | 10.1 | 2254.5 | 49.5 | 4.2 | 223.2 | 4.9 |
| Rwanda | 9.8 | 2108.5 | 50.4 | 5.6 | 215.2 | 5.1 |
| Sao Tome and Principe | 7.1 | 641.2 | 14.1 | 3.5 | 90.3 | 2.0 |
| Senegal | 0.6 | 207.6 | 4.1 | 1.0 | 346.1 | 6.9 |
| Seychelles | 5.6 | 2596.7 | 62.3 | 4.7 | 463.7 | 11.1 |
| Sierra Leone | 8.7 | 1838.2 | 41.4 | 4.5 | 211.3 | 4.8 |
| Somalia | na | 483.8 | 12.2 | na | na | na |
| South Africa | 11 | 3342.3 | 63.5 | 6.4 | 303.8 | 5.8 |
| Sudan | na | 511.8 | 12.6 | na | na | na |
| Swaziland | 5.7 | 3183.1 | 59.7 | 3.3 | 558.4 | 10.5 |
| Tanzania | 7.7 | 1541.0 | 36.0 | 4.1 | 200.1 | 4.7 |
| The Gambia | 3.4 | 692.2 | 15.3 | 2.5 | 203.6 | 4.5 |
| Togo | 2.3 | 569.2 | 13.0 | 1.5 | 247.5 | 5.7 |
| Uganda | 9.8 | 2915.9 | 67.5 | 5.0 | 297.5 | 6.9 |
| Zambia | 4 | 1066.6 | 27.5 | 4.1 | 266.7 | 6.9 |
| Zimbabwe | 5.7 | 2712.9 | 50.8 | 2.9 | 476.0 | 8.9 |

| Regions | 2012 (Predicted) | | | | | |
|---|---|---|---|---|---|---|
| Sub-Saharan Africa - GBD | 6 | 1499.7 | 33.3 | na | 249.9 | 5.5 |
| Sub-Saharan Africa - WHO | 6 | 1799.0 | 34.2 | 3.3 | 298.9 | 5.7 |
| Americas - WHO | 8.4 | 1924.0 | 31.7 | 4.7 | 229.0 | 3.8 |
| Eastern Mediterranean - WHO | 0.7 | 262.0 | 5.7 | 0.9 | 373.2 | 8.2 |
| Western Europe - WHO | 9.3 | 1889.0 | 41.6 | 13.3** | 203.1 | 4.5 |
| Eastern Europe* - WHO | 14.8 | 13377.0 | 463.0 | | 903.9 | 31.3 |
| South-East Asia - WHO | 4 | 1599.0 | 34.6 | 4.6 | 399.8 | 8.7 |
| Western Pacific - WHO | 8.4 | 1783.0 | 41.6 | 5.9 | 212.3 | 5.0 |
| World - WHO | 6.8 | 1967.0 | 46.5 | 5.9 | 289.3 | 6.8 |

*The Russian Federation, Belarus, Moldova, and the Ukraine
**Eastern and Western Europe not available disaggregated
Source: WHO, 2014; GBD Database, 2014