

Tobacco, alcohol, and sugary beverages in low- and middle- income countries: harms, consumption and costs

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I. Introduction

More than forty million people die each year from non-communicable diseases (NCDs). NCDs now account for 70% of deaths in the world. Four groups of diseases account for the vast majority of those 40 million deaths: cardiovascular disease (17.7 million), cancers (8.8 million), respiratory diseases (3.9 million) and diabetes (1.6 million) (WHO 2015a).

More than three-quarters of all NCD deaths occur in low- and middle-income countries (LMICs) and about half of those deaths occur before age 70, impacting working-age adults. By comparison, only 25% of deaths from NCDs in high-income countries occur before age 70 (WHO 2015a).

Rates of death and disability from NCDs are declining in every region of the world (WHO 2015a) due to improved prevention, better treatment or some combination of both. However, while rates are declining, absolute numbers of NCD deaths are increasing, in large part due to demographic changes in population growth and aging occurring in low- and middle-income countries worldwide.

From 2000-2015, the number of deaths from cardiovascular diseases, diabetes, and chronic respiratory diseases rose by 23% globally (Prabhakaran et al., 2017). The rise in deaths was unequally distributed: deaths from these NCDs rose by 14% in low-income countries, 13% in lower-middle income countries, 6% in upper-middle income countries, and by only 0.6% in high-income countries (WHO, 2015a). Global cancer deaths are also rising, especially in developing countries (American Cancer Society, 2015).

A significant portion of the 40 million NCD deaths and 5 million injury deaths are caused by three risk factors: tobacco, alcohol, and obesity. While obesity has many causes, one significant factor is the growth of consumption of highly processed foods and sugary beverages worldwide.

Mortality from tobacco, alcohol, obesity, 2016

Risk Factor	Annual Deaths
Tobacco	7 million
Alcohol	3.3 million
Obesity	4.5 million

Source: Collaborators, G. R. F. 2017; WHO 2014

These health risks are responsible for significant and growing health and economic burdens in the developing world, where greater effort to implement effective policies is urgently needed.

This paper summarizes the health effects, consumption patterns and known economic impacts from consumption of tobacco, alcohol and sugary beverages with an emphasis on LMICs and provides a brief overview of effective strategies to reduce harmful use and improve health.

2. Tobacco

Seven million people die each year from tobacco use, an estimated 13% of all deaths worldwide (Collaborators G.T., 2017). Half of lifetime smokers will die before they reach 70, losing an average of 10 years of life (Jha et al, 2015). Smokers who quit before the age of 40 can avoid 90% of the life years lost due to smoking (Jha et al, 2015).

There is no safe level of tobacco use. Smoking substantially increases the risk of death from lung and other cancers, heart disease, stroke, respiratory disease and tuberculosis. Second-hand smoke and smoking during pregnancy also harm non-smokers. Fifteen to fifty percent of the global population is exposed to second-hand smoke (NCI, 2016), resulting in 890,000 deaths each year (WHO, 2017a).

Top ten causes of deaths attributable to tobacco, 2016†

1. Ischemic heart disease	6. Diabetes mellitus
2. Chronic obstructive pulmonary disease	7. Esophageal cancer
3. Tracheal, bronchus, and lung cancer	8. Liver cancer
4. Cerebrovascular disease	9. Hypertensive heart disease
5. Lower respiratory infection	10. Tuberculosis

† To rank diseases, authors calculated % of total deaths attributable to tobacco as a % of total deaths

Source: IHME, GBD Compare Data Visualization

Tobacco Consumption

More than 1 billion people in the world smoke; 21% of the world's population over 15 years of age (WHO 2017b). Eighty percent of smokers live in LMICs (NCI, 2016) with half of all smokers worldwide live in five large LMICs: China (26.2%), India (9.9%), Indonesia (6.4%), Russia (4.2%), and Bangladesh (2.3%).

Smoking prevalence and number of smokers by country income group, ages 15+, 2015

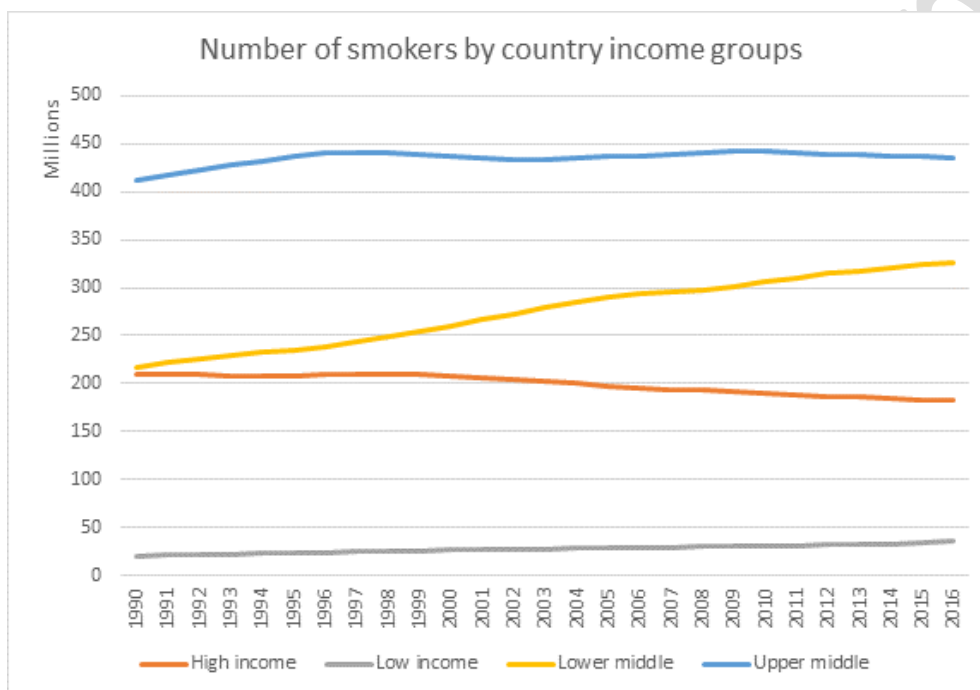
Income group	Smoking prevalence	Numbers of Smokers
Low-income	13.2%	48 million
Middle-income	20.8%	849 million
High-income	23.1%	220 million
World	20.7%	1.1. billion

Source: WHO, 2017b.

Manufactured cigarettes are the most commonly used tobacco product, accounting for 92% of total worldwide tobacco sales. Other smoked tobacco products include cigars, kreteks (clove cigarettes favored in Indonesia), bidis (hand rolled cigarettes favored in South Asia), and waterpipes (smoked tobacco filtered through water favored in middle-east countries).

An estimated 346 million adults use smokeless tobacco products (e.g. chewing tobacco, snuff). Smokeless tobacco use is most common in the WHO South-East Asia region, the region that accounts for 86% of smokeless tobacco consumption (WHO, 2017b).

Globally, smoking prevalence is declining. However, the number of tobacco users is growing in many low- and middle-income countries due to population and income growth, while the number of smokers in high-income countries is declining (NCI, 2016).

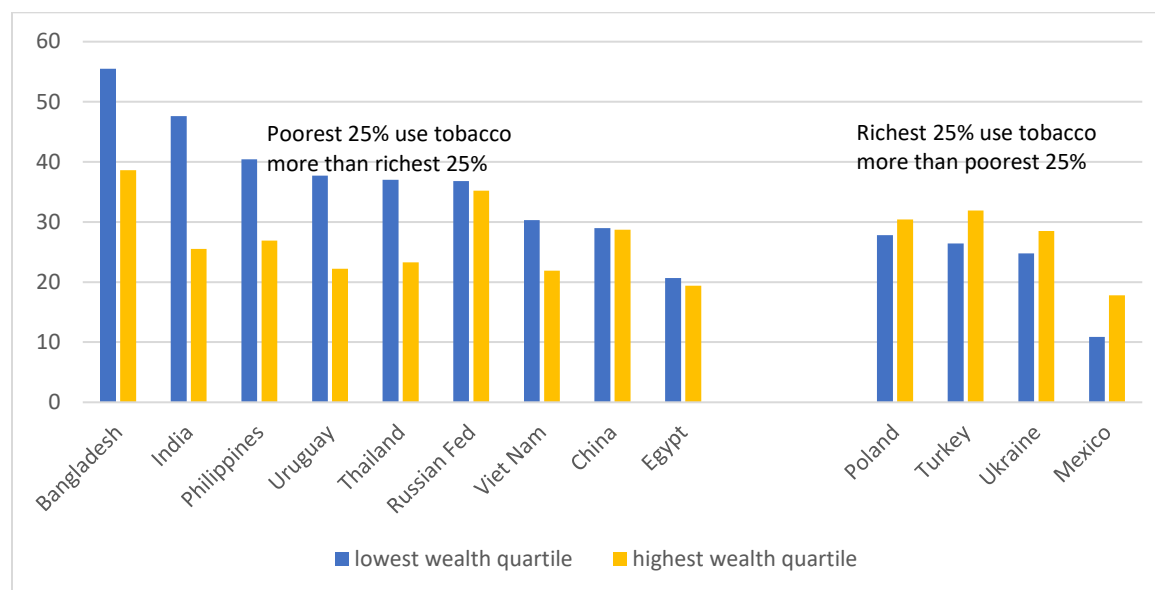


Source: Data from GBD representing 188 countries, sourced 2018; World Bank income groupings, 2016

Tobacco use is highly addictive. Patterns of use start early in life and often persist throughout adulthood. Seven percent of youth (25 million) between 13-15 years of age are smokers worldwide. Globally, 35% of males and 6% of females over 15 smoke (WHO, 2017b).

In general, tobacco use is highest among the poorer socio-economic groups across countries in all income categories (NCI, 2016). This contributes to a disproportionate burden of disease and death among the poor. In addition, in both high-income and LMICs, low-income smokers are more often uninsured and have minimal access to health care, placing a heavy economic burden from smoking directly on the household. Reductions in wages and other household activities from illness and death also lower the well-being of smokers and their dependents. In low-income households, tobacco expenditure may also crowd out household spending on education, health, and housing (Paraje & Araya, 2017).

Prevalence of current tobacco in the poorest and richest wealth quartiles within countries, 2008-2010



Data sourced from: Palipudi, K. M., et al (2012)

The Economic Costs of Tobacco Use

The economic impacts of tobacco use globally were estimated to be the equivalent of 1.8% of global GDP -- PPP¹ adjusted \$1852 billion -- in 2012. This total breaks down into PPP \$467 billion in direct costs from smoking-attributable health expenditure and \$1385 billion in indirect costs from the lost productivity of disability and mortality combined. Forty percent of this cost are incurred in developing countries (Goodchild et al., 2017).

3. Alcohol

About 3.3 million people die each year from alcohol use, approximately 5% of all deaths worldwide (Collaborators G.R.F., 2017).

Alcohol-related harm is determined by the volume of alcohol consumed and how that alcohol is consumed (i.e., patterns of drinking.) Heavy episodic drinking (HED)², often referred to as binge drinking³, is causally related to acute outcomes including homicides, suicides, traffic crashes and alcohol poisonings. Long-term excess drinking causes acute and chronic heart and liver disease, including cirrhosis, and cancers. Alcohol use can result in mental health problems, including addiction. For some people, alcohol consumed in moderation may provide small cardio-circulatory benefits (Poli et al., 2013); however, this relationship has recently come under greater question

¹ Purchasing Power Parity (PPP\$) or international dollars have the same purchasing power as the U.S. dollar has in the United States. Prices in local currency units are converted into international dollars using the PPP exchange rate, defined as the number of units of a country's currency required to buy the same amounts of goods and services in the domestic market as U.S. dollar would buy in the United States.

² 60 or more grams (roughly 5 U.S. standard drinks) of pure alcohol on at least one occasion at least monthly (WHO, 2014)

³ In some definitions, binge drinking may have a threshold of 4 drinks for women and 5 for men (SAMHSA 2016).

(Zhao et al. 2017). Alcohol-caused externalities include fetal alcohol spectrum disorders, violence against others, traffic fatalities, injuries, and the spread of infectious disease (WHO, 2014)

Top ten causes of deaths attributable to alcohol use, 2016†

1. Cerebrovascular disease	6. Self-harm
2. Cirrhosis and other chronic liver diseases	7. Hypertensive heart disease
3. Tuberculosis	8. Esophageal cancer
4. Alcohol use disorders	9. Liver cancer
5. Road injuries	10. Colon and rectum cancer

† To rank diseases, authors calculated % of total deaths attributable to alcohol as a % of total deaths

Source: IHME, GBD Compare Data Visualization

There is significant variation in number and percent of deaths attributed to alcohol across regions. Over 10% of deaths in Central and Eastern Europe and Central Asia are attributable to alcohol while less than 1% of deaths from North Africa and the Middle East are alcohol attributable, reflecting in large part differences in consumption.

Twenty-five percent of total deaths in prime working ages, 20-39 years, are alcohol attributable. In 2012, 7.6% of deaths among males and 4.0% of deaths among females were attributable to alcohol. Harmful use of alcohol is the leading risk factor for death in males aged 15-59 years (WHO, 2015b).

Most harms from alcohol are caused by the roughly 20-25% of drinkers that consume between 50-75% of all alcohol (OECD, 2015, Burton et. al., 2017). However, most drinkers can reduce their risk of death if they reduce use (OECD, 2015).

Alcohol Consumption

Worldwide approximately 40% of adults consumed at least some alcohol in the past year. There is large variation in the prevalence of alcohol use across regions and countries (WHO 2014).

Proportion of current drinkers, former drinkers and lifetime abstainers among the total population (15+ years) by WHO region and the world, 2010



Source: WHO (2014)

About 16% of drinkers aged 15 years or older engage in heavy episodic drinking, with similar large variation in HED across countries and regions.

Young men have the highest rates of high risk drinking at 17% prevalence globally. Rates of excess alcohol use are especially high in Europe and the Americas where 40% and almost 30%, respectively, of 15-19 year old males are binge drinkers (WHO, 2014).

Alcohol consumption and high-risk patterns of drinking overall are highest in high-income countries and lowest in low-income countries. However, while there are more drinkers in higher socioeconomic groups and more abstainers in the poorest social groups, people with lower socio-economic status who do consume alcohol are more vulnerable to alcohol consumption problems and consequences (WHO, 2014, Grittner et al., 2012, Hemström, 2002).

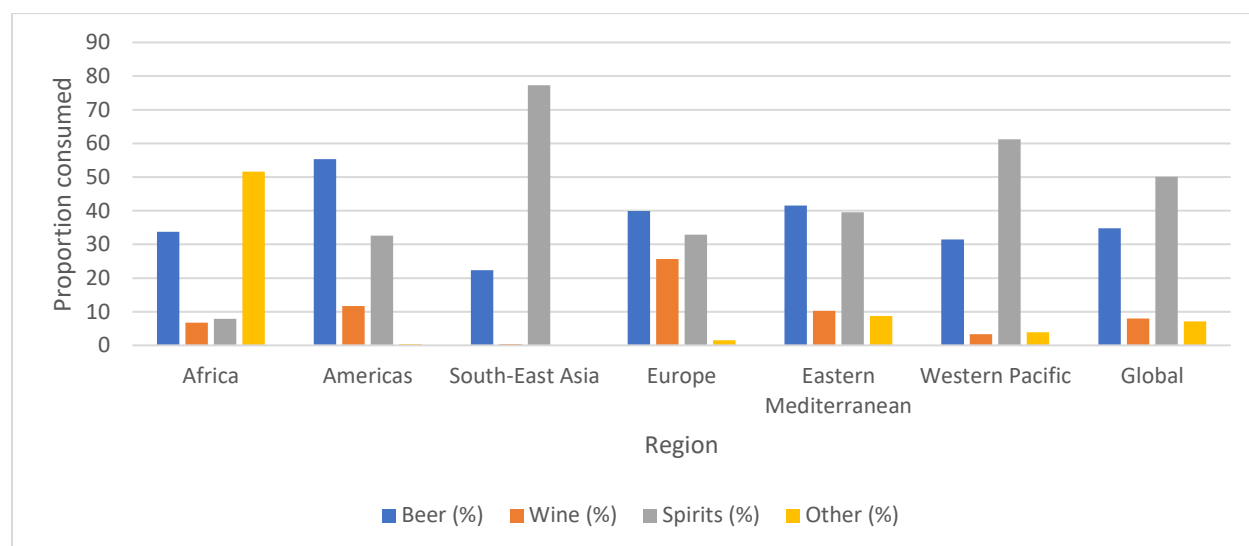
Alcohol use by country income group, 2012

Income group	Alcohol Consumption		
	Total alcohol per capita (litres)	Prevalence of current drinkers	Prevalence of HED among drinkers
Low-income	3.1	18.3%	11.6%
Lower middle-income	4.1	19.6%	12.5%
Upper middle-income	7.3	45.0%	17.2%
High-income	9.6	69.5%	22.3%
World	6.2	38.3%	16.0%

Source: WHO, 2014

Most of the world's alcohol is consumed as beer, wine or spirits, with regional differences in the most commonly consumed form. Globally, and in terms of pure alcohol, approximately half of recorded alcohol consumed is spirits (the most common type of beverage in Asia-Pacific), followed by beer (most common in the Americas). One-quarter of world consumption consists of unrecorded and untaxed products. This type of alcohol is typically cheaper, and less controlled than recorded beer, wine, and spirits and is also often consumed by the poor (WHO, 2014).

Proportion of recorded alcohol consumption per capita, ages 15 years and older, by type of alcoholic beverage by WHO region and World, 2010.



Source: WHO, 2014

With population increases and increases in income, the total amount of alcohol consumed and the total number of people who drink is expected to increase substantially, especially in growing LMICs. The highest increase is expected in the populations of the WHO Western Pacific Region.

The Economic Costs of Alcohol Use

Similar to tobacco, alcohol consumption produces both direct medical costs and indirect costs, representing productivity loss from disease and death. In addition, alcohol imposes economic costs from a range of externalities, including demands on the criminal justice system, social care, property losses from alcohol-related accidents, and lost productivity of the victims of alcohol-related crime and injury (Drummond et al., 2011; WHO 2014).

Economic costs of alcohol use have been estimated for middle- and high-income countries at over 1% of GDP (Rehm, 2009), with much higher estimates in high-income countries. Of that, direct health sector costs account for 9-24% of all alcohol-attributable social costs (OECD 2015). Costs range considerably across countries, for example in South Africa total costs of harmful use of alcohol were estimated at 10-12% of the 2009 GDP (WHO, 2014). In the US, alcohol costs were estimated at \$249 billion in 2010, or \$2.05 per drink (Sacks et al., 2015). In contrast, the average tax per standard drink in the US is less than \$.20 (Naimi, 2011).

4. Sugar-sweetened beverages

Consumption of sugary beverages is directly linked to weight gain and obesity and both directly and indirectly increases the risk of diabetes.

WHO Recommendations on Added Sugar: World Health Organization (WHO) guidelines recommend that individuals should consume no more than 10% of total calories from added sugar, and preferably less than 5% (WHO, 2015c). A single 20-ounce regular soft drink on average provides 12% of total calories from added sugar for an adult on a 2000 kcal/day diet.

Obesity⁴ causes over 4.5 million deaths worldwide each year, a number that has almost doubled since 1990 (Collaborators G.R.F., 2017). Obesity is a risk factor for cardiovascular diseases, diabetes, cancer, osteoarthritis, liver disease, kidney disease, sleep apnea, and depression (Pi-Sunyer, 2009).

Top ten diseases attributable to high body mass index, 2016

1. Ischemic heart disease
2. Cerebrovascular disease
3. Diabetes mellitus
4. Chronic kidney disease
5. Hypertensive heart disease
6. Alzheimer's disease and other dementias
7. Liver cancer
8. Esophageal cancer
9. Colon and rectum cancer
10. Asthma

† Calculated % of total deaths attributable to a high BMI and multiplied into IHME's total deaths in 2016

Source: IHME, GBD Compare Data Visualization

Globally, more than 2.1 billion people, 30% of the global population are overweight or obese (Ng et al., 2014). Obesity has been increasing over the past four decades to the point where overweight prevalence is greater than underweight prevalence. The increases are happening among both children and adults, and in recent years, the acceleration has been greater in low- and middle-income countries than high-income countries (Forouzanfar et. al., 2013). Similar to tobacco, lower-income groups tend to have higher obesity prevalence.

In 2015, diabetes⁵ caused an estimated 1.6 million deaths (GHE, 2015). About 2.2 million deaths were attributable to high blood glucose⁶ in 2012 (WHO, 2017c). The number of people with diabetes has risen from 180 million in 1990 to 383 million prevalent cases in 2016 and is rising most rapidly in LMICs (IHME, GBD Compare Data Visualization). There were almost 250 million diabetics living in LMICs in 2016, 65% of the world's diabetics (IHME Results Tool). Severely obese people have a risk of developing type 2 diabetes that is up to 60 times larger than those of normal weight (OECD, 2010).

Sugary beverages or sugar-sweetened beverages (SSBs) refer to any beverage that is sweetened with sugar or other caloric sweeteners including brown sugar, corn sweeteners, corn syrup, dextrose, fructose, glucose, high fructose corn syrup, honey, lactose, malt syrup, maltose, molasses, raw sugar and sucrose. Examples of sugary beverage include regular soda, fruit punch, sports drinks, energy drinks, sweetened waters, and coffee and tea beverage with added sugar.

⁴ Overweight is defined as having a Body Mass Index (BMI), or weight-to-height ratio, greater than or equal to 25 and lower than 30, while obesity is defined as having a BMI equal to or greater than 30

⁵ Defined as fasting blood glucose equal to or higher than 7 mmol/L, or on medication for raised blood glucose, or with a history of diagnosis of diabetes.

⁶ High blood glucose is defined as a distribution of fasting plasma glucose in a population that is higher than the theoretical distribution that would minimize risks to health.

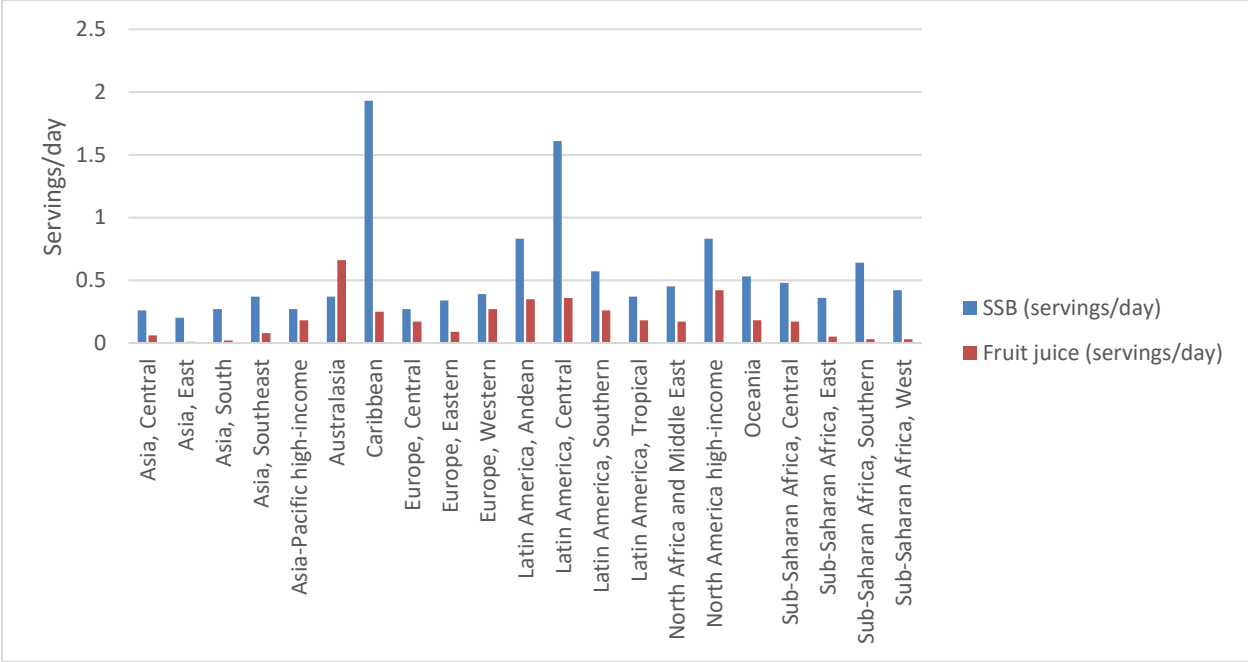
Consuming sugar in liquid form in sugary beverages is a significant contributor to rising rates of obesity and its related diseases. Sugary beverages are energy dense and high in calories. People consuming sugary beverages do not compensate for their high caloric content by eating less food, leading to weight gain and obesity (Pan & Hu, 2011). In children, sugary beverage consumption is associated with lower consumption of healthful foods and greater sedentariness, which can amplify the adverse health impacts of sugary beverage consumption (Gebremariam et al., 2017). Childhood obesity usually persists into adulthood, increasing the likelihood of chronic disease that can start as early as the teen years (Biro & Wien, 2017). In addition, the amount of sugar contained in sugary beverages is not well understood by all consumers, for example, portion sizes are often larger than those of other drink choices, and consumers have difficulty in self-regulation (Leung et al., 2018; Rothman et al., 2006).

Sugary beverage consumption is also linked to *under*-nutrition, especially in some African and Latin American countries where some infants are given sugary beverages as a weaning food, increasing under-nutrition and stunting. Stunted infants in turn have a much greater risk of becoming obese and diabetic (Adair, 2013).

Sugary beverage consumption

Consumption of sugary beverages varies considerably across regions, with highest levels of per capita consumption of sugary beverages in Latin American and the Caribbean (Singh et al., 2015b).

Sugary beverage consumption by region, 2010



Source: Singh et al., 2015b. Note: a serving is 8 oz.

People in upper-middle income countries consume the highest number of daily servings of sugary beverages, followed by lower-middle income.

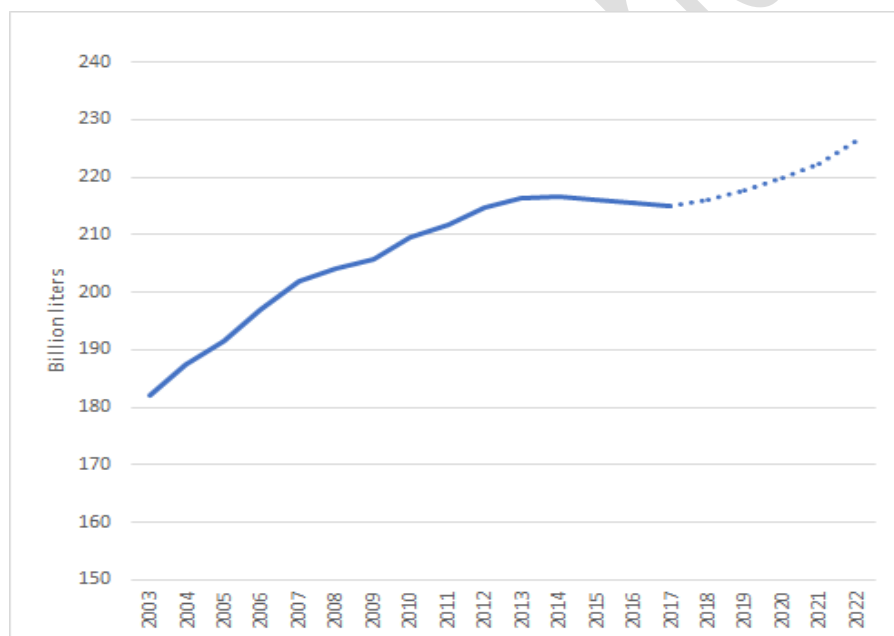
Sugary Beverage Consumption by Country Income groupings, 2010

Income group	Mean SSB intake (servings/day), 2010
Low-income	0.3
Lower middle-income	0.6
Upper middle- income	0.7
High-income	0.5

Source: Singh, 2015a

Consumption of sugary beverages is increasing globally. This has fueled concerns of obesity-related disease epidemics, especially in the same large middle-income countries that have the highest per capita sugary drink consumption.

Historical and forecast volumes sold of carbonate⁷ soft drinks, 2003-2022



Source: Euromonitor, 2018

⁷ Carbonates: Sweetened, non-alcoholic drinks containing carbon dioxide, carbonated products containing fruit juice (“sparkling juices”) unless tea-based or carbonated Energy drinks. Carbonates are an aggregation of cola carbonates and non-cola carbonates, whether regular or low calorie. Includes both naturally and artificially-sweetened carbonates.

The Economic Costs of Sugary Beverages

Much of what we know about the economic costs from obesity come from studies in the United States and other developed countries. Authors of a global policy review conducted for the UK government estimated the global costs of obesity to be \$2.0 trillion a year (Dobbs et.al, 2014). Cross-country studies suggest that obesity-related problems cause between 0.7-3.0% of total health expenditure in OECD countries (OECD, 2010; Withrow & Alter, 2011). The International Diabetes Federation estimated the global health care costs of diabetes at \$727 annually; approximately half of these costs are incurred in the United States (International Diabetes Federation, 2017).

5. Population-wide strategies to combat NCD Risks

A range of policies is available to governments to reduce harmful consumption of tobacco, alcohol and sugary beverages. The most effective policies to prevent harmful use impact whole populations; these population-based policies are generally highly cost effective. The impact of population-wide strategies tends to be cumulative. Higher taxes on tobacco, for instance, reduce tobacco use. Coupling such tax increases with mass media campaigns on the harms of tobacco can increase the impact of both policies on demand.

In May 2013 the World Health Assembly endorsed a set of 'best buys' and recommendations to provide guidance to countries to reduce and control non-communicable diseases based on a review of effectiveness and cost effectiveness, as well as the feasibility and non-financial considerations of potential interventions (WHO, 2017d). These recommendations were updated in 2017 (WHO, 2017e).

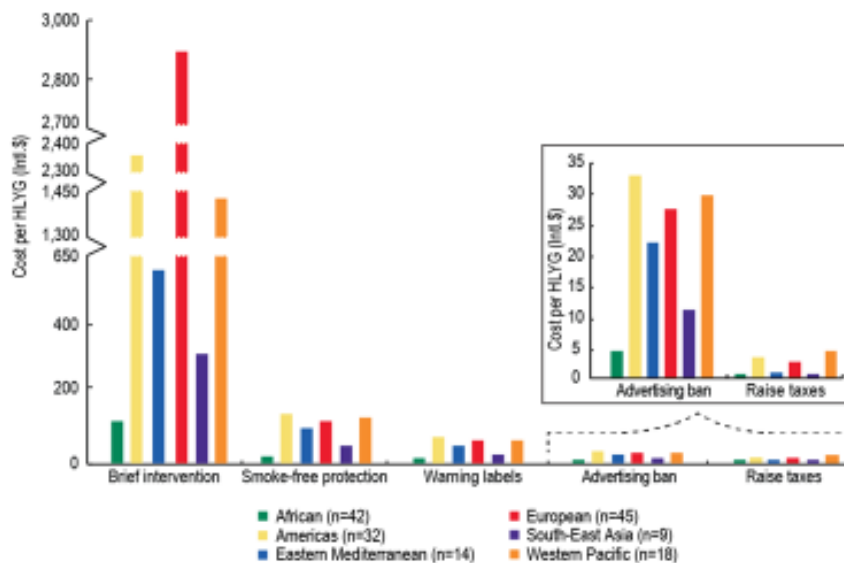
World Health Organization: Categories of interventions:

- "Best buys" – considered the most cost-effective and feasible for implementation - interventions with a cost-effectiveness ratio of $\leq 1\$ 100$ per DALY averted in LMICs.
- Effective interventions – interventions with a cost effectiveness of $> 1\$ 100$ per DALY averted in LMICs
- Other recommended interventions include those shown to be effective but for which no cost-effective analysis was conducted.

'Best buys' in tobacco include increases in excise taxes and prices, comprehensive bans on tobacco industry marketing activities, plain packaging and/or large pictorial health warning labels, smoke-free policies, and effective mass media campaigns to inform the public about the harms of tobacco use. The provision of population wide support for tobacco cessation is also rated as effective, although with a higher associated costs for every year of life gained.

Among these interventions, significant tobacco tax and price increases are the most cost-effective.

Tobacco Control Policies and Cost Per Healthy Life-Year Gained, by WHO Region



Note: HLYG= healthy life-year gained

Source: Based on calculations from WHO CHOICE model, 2016; NCI (2016)

“Best buys” for alcohol also included increasing taxes, comprehensive bans on alcohol advertising, and restricting the availability of alcohol through sales restrictions. Effective interventions included drinking and driving laws and brief interventions for person with harmful alcohol use. Additional recommended interventions included minimum pricing where applicable, minimum purchase age policies, restrictions on outlet density, bans on marketing specific to youth, and the provision of information on alcohol harms. Again, among interventions significant alcohol tax increases are the most cost-effective.

The WHO review focused on policies to reduce unhealthy diets, and effective taxation of sugar-sweetened beverages is ranked as an effective intervention for use in LMICs. “Best buys” included policies to reduce salt intake; policies to ban the use of trans- fats were rated as effective. Recommended interventions included the limiting portion and packaging size, nutritional labeling, promotion of breastfeeding, subsidies to increase the intake of fruits and vegetables, and mass media campaigns on health diets. Bans on advertising of sugary beverages or other ultra processed foods, especially to youth are considered important in reducing consumption of unhealthy foods.

6. Conclusion

Over 10 million of the 40 million NCD deaths and 5 million injury deaths worldwide are caused by harmful consumption of three products: tobacco, alcohol, and sugary beverages -- a significant contributor to rising rates of obesity and diabetes.

Health harms from harmful use of tobacco, alcohol and sugary beverages manifest differently but each contributes to many avoidable deaths. Persistent consumption of almost any amount of tobacco incurs severe health effects, many manifesting after a long time lag. Excess consumption of alcohol imposes both immediate (from e.g., injury) and long-term (from e.g., liver cirrhosis) harms. Sugary beverage consumption increases the

risk of obesity and diabetes and may replace more nutritious food choices. All three products produce significant negative externalities and impose large health care and productivity costs.

The dramatic growth in populations and increases in incomes in many LMICs is resulting in rapid increases in the number of people consuming tobacco, alcohol and sugary beverages. For tobacco and sugar beverages, the consumption gap between high and lower-income countries is diminishing as global brands spread and incomes rise in the developing world. For alcohol, the trends in consumption and the gap between high and lower-income country consumption are mixed. In general however, demand for tobacco, alcohol and sugary beverages grows as incomes rise, while the harms related to use fall disproportionately on the poor.

If no action is taken, the number of people consuming tobacco, alcohol and sugary beverages in LMICs will continue to dramatically climb, significantly contributing to growing numbers of premature deaths from NCDs.

A range of highly effective policies is available to governments to reduce harmful consumption of tobacco, alcohol and sugary beverages. The Sustainable Development Goals call for a one-third reduction in premature mortality from NCDs by 2030. Policies to discourage consumption of these three key risk factors – tobacco, alcohol and sugar-sweetened beverages - are central to achieving that goal.

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Background Paper