Chapter **7**

Alcohol Use and Alcohol Use Disorders

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INTRODUCTION

Alcohol is one of the most important risk factors for premature mortality and disability. Premature mortality disproportionately affects low- and middle-income countries (LMICs) (WHO 2011a); more than 85 percent of all deaths attributable to alcohol occur in these nations (Room and others 2013; WHO 2011a). This chapter updates the chapter on alcohol in *Disease Control Priorities in Developing Countries*, 2nd ed. (DCP2) (Rehm and others 2006), with new scientific evidence for interventions based on population, community, and individuals, with an emphasis on evidence from LMICs.

Alcoholic beverages vary with respect to their raw material, method of production, alcohol content, and presentation. Beverages are usually classified as *fermented* or *distilled*. In addition to the alcohol that appears in official statistics, many countries have a substantial amount of *unrecorded alcohol,* which may include illegally produced or smuggled alcohol products, but also surrogate alcohol (nonbeverage alcohol not officially intended for human consumption) and legal but unrecorded alcohol products (Lachenmeier, Sarash, and Rehm 2009).

Role of Industry

The alcohol industry is diverse and includes beer, wine, and spirits producers and importers, as well as bars, restaurants, and often stores that sell alcohol. Alcohol is an important contributor to business opportunities and jobs in the hospitality and retail sectors and a source of revenues for governments. It also plays an important role in commercial activity linked to the hospitality industry, such as hotels and airlines, and the advertising industry.

In recent years, a few large corporations have dominated the international alcohol market, particularly the beer and spirits sectors. In 2009, global companies produced 67 percent of the world's commercially brewed beer; "the big four" corporations produced 50 percent—AB InBev, SABMiller, Heineken, and Carlsberg (Impact Databank 2011). A similar trend has been observed in the spirits sector, with Diageo and Pernod Ricard managing some of the world's leading brands (Babor and others 2010). These companies are headquartered in high-income countries (HICs), which are the leading exporters of alcoholic beverages, but about 95 percent of alcoholic beverages are produced locally (WHO 1999).

The size of these corporations allows them to devote considerable resources, directly or indirectly, to promote the industry's policy interests. For example, the alcohol producers and their nonprofit organizations are involved in collecting, funding, and providing scientific evidence to inform the public, as well as sponsoring prevention activities (Zhang and Monteiro 2013), especially those known to have no or small effects on behavior

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(Babor, Robaina, and Jernigan 2014). These activities challenge the public health sector and governments to respond with public health strategies to minimize the adverse health and societal consequences of the expanding global markets in alcoholic beverages (Babor and others 2010).

The high level of globalization has significant effects on markets. Transnational companies own the formulas and grant licenses to local subsidiaries. Most product development targets external markets, and advertising is usually produced externally. Transnational companies, supported by these economic advantages, are dynamic promoters of modifications in local drinking practices, including the types and quantity of beverages consumed (Room, Jernigan, Carlini, Gmel, and others 2013; Room, Jernigan, Carlini, Gureje, and others 2002).

Public Health Considerations

The substantial health and societal costs of alcohol consumption outweigh its economic benefits and contribute to the view of public health professionals that alcohol cannot be considered an "ordinary commodity" (Babor and others 2010). Special policies are needed to curb the consequences of harmful use, especially in LMICs where the burden is higher.

This public health perspective has received little attention in international negotiations concerning trade agreements and in resolutions of disputes under those agreements (Room, Jernigan, Carlini, Gmel, and others 2013; Room, Jernigan, Carlini, Gureje, and others 2002). This lack of attention reduces the ability of LMICs to ensure the internal regulation of markets (Grieshaber-Otto, Schacter, and Sinclair 2006; Zhang and Monteiro 2013). Governments in LMICs are deterred or forced to abandon alcohol controls as a result of trade disputes; for example, Thailand faces opposition from some World Trade Organization members to its proposed graphic warning labels on containers of alcohol sold within its borders (O'Brien 2013).

ALCOHOL-RELATED DISORDERS

Patterns of Alcohol Use, Alcohol Use Disorders, and Fetal Alcohol Spectrum Disorders

Alcohol is a major contributor to mortality, morbidity, and injuries. It is a causal factor in more than 60 diseases, including liver cirrhosis and cardiovascular disease, and it is involved in the etiology of more than 200 other conditions, such as neuropsychiatric conditions and diabetes mellitus. It also affects other people through the risky behavior and inattention of drinkers while intoxicated, resulting in acts of violence, driving while impaired, inconsistent family environments affecting normal child development, and workplace absenteeism (WHO 2014a).

An additional and increasingly significant consequence of maternal drinking during pregnancy is fetal alcohol syndrome (FAS), a pattern of retarded growth and development, both neuropsychological and physical, with typical facial dysmorphic features, that is found is some children exposed to alcohol in utero. A spectrum of physical and neurodevelopmental abnormalities, which includes FAS, that is attributed to the effects of alcohol on the fetus, is termed fetal alcohol syndrome disorders (FASD). The level of maternal alcohol consumption required to produce FASD, which has yet to be established, is influenced by genetic and other maternal and fetal characteristics (Gray, Mukherjee, and Rutter 2009; May and Gossage 2011).

Alcohol's impact on disease and injury is associated with two dimensions: the overall volume consumed and the drinking patterns of how the volume is distributed by drinking. Heavy drinking episodes have particularly damaging effects. The consequences associated with a high volume of drinking or recurrent heavy drinking occur through three mechanisms: toxic and other effects on organs and tissues, behavior during intoxication, and alcohol dependence and other alcohol-induced mental disorders (APA 2013; WHO 1992, 2013a).

The Burden

Patterns of Alcohol Use and Trends

One of the most commonly used indicators of overall alcohol consumption and comparison by location is per capita consumption. Although it is the best estimate available, it contains a substantial element of uncertainty, which increases where there are large proportions of unrecorded production, which is more common in LMICs.

Globally, per capita alcohol consumption in 2012 was an estimated 6.2 liters of pure alcohol by persons ages 15 years and older (WHO 2014a); 24.8 percent is consumed as unrecorded alcohol (Lachenmeier, Sarash, and Rehm 2009; WHO 2014a).

In general, HICs have the highest levels of per capita consumption and often the highest prevalence of heavy episodic drinking. The prevalence of heavy episodic drinking among adolescents ages 15–19 years mirrors that of the adult population, with the highest rates in the World Health Organization (WHO) regions of Europe, the Americas, and the Western Pacific (WHO 2014a).

Altogether, women drink less than men and have a lower prevalence of alcohol use disorders (AUDs);

in 2010, 52.3 percent of men and 71.1 percent of women did not drink alcohol in the previous year (WHO 2014a). Weekly heavy episodes are also more prevalent among men than women, 21.5 percent and 5.7 percent, respectively (WHO 2014a). Despite these lower rates of consumption, women in LMICs suffer greater social consequences per liter consumed, since this activity is often seen as inconsistent with their traditional roles (Medina-Mora 2001). The highest regional prevalence of AUDs for women was in the Americas; the highest regional prevalence for men was in Europe (WHO 2014a).

Global per capita consumption of alcohol is increasing, driven particularly by increases in China and India, as well as the Americas. The five-year trend in the WHO regions of Africa and Europe is stable, although some countries in these regions report significant reductions (WHO 2014a).

Consequences

Estimations made by the WHO indicate that the proportion of deaths attributable to alcohol (5.9 percent) is higher than the proportion observed for HIV/AIDS (2.8 percent), violence (0.9 percent), and tuberculosis (1.7 percent). Alcohol plays a prominent role in liver cirrhosis, oral cavity and pharynx cancer, pancreatitis, and laryngeal and esophageal cancer. Alcohol also plays a role in intentional injuries from interpersonal violence, self-harm and poisoning, and unintentional injuries and falls. Harmful use and dependence ranged from 0.1 to 3.4 percent (WHO 2014b).

Mortality. The Global Burden of Disease Study 2010 project (Murray and others 2012) estimated that alcohol as a risk factor increased from 1,988,502 deaths in 1990 to 2,735,511 in 2010, a (crude) increase of 37.6 percent. According to Lim and others (2012), alcohol is the leading risk factor for death in Eastern Europe, Andean Latin America, and southern Sub-Saharan Africa, and worldwide for people ages 15–49 years.

Disability-Adjusted Life Years. The WHO estimated the proportion of disability-adjusted life years accounted for by alcohol as a cause. Neuropsychiatric disorders rank first (24.6 percent of all disability-adjusted life years), mainly caused by AUDs, followed by unintentional injuries (20.4 percent), and cardiovascular diseases and diabetes collectively (15.5 percent). Globally, AUDs occur among 7.2 percent of men and 1.3 percent of women (WHO 2014a).

It has also been estimated that in LMICs, most of the harm is related to hazardous or harmful drinking rather than to alcohol dependence. This behavior is not often identified and treated within the first level of care; treatment for alcohol dependence is usually provided in specialized clinics. This situation calls for a shift of focus to cost-effective early interventions (Benegal, Chand, and Obot 2009).

Unintentional Injuries and Violence. Social consequences are also salient. Road traffic injuries cost LMICs an estimated 1 to 2 percent of their gross domestic product (GDP) (WHO 2014a).

Harmful alcohol use is a major contributor to violence. The alcohol-attributable portion of total violent deaths is approximately 30.0 percent: 32.5 percent in men, and 20.1 percent in women (WHO 2011a). Many perpetrators consume alcohol prior to assaults, with rates reported in special studies varying from 35 percent in the United States to 50 percent in China. Men are more likely than women to drink alcohol and to be perpetrators and victims of alcohol-related violence. For suicide, 11 percent of global mortality is attributed to alcohol, ranging from 2 percent in the Middle East and North Africa to 31 percent in Europe and Central Asia.

Injuries and social consequences are particularly related to patterns of drinking. A Patterns of Drinking score developed by Rehm and others (2003) measures this as a reflection of how people drink, a separate dimension of what total volume of alcohol they drink. Given the predominance of men among those drinking heavily in many cultures, the score may be predominantly comparing men's patterns of drinking (Gmel and others 2007). The score reflects how much of total consumption occurs on intoxicated occasions. The score includes the usual quantity of consumption, whether there is festive drinking, the proportion of events when drinkers get drunk, the proportion of drinkers who drink daily or nearly daily, and the proportion who drink with meals and in public places. Two attributes, drinking with meals and drinking daily or almost daily, are scored negatively, as reducing risk per liter. Low-risk patterns (risk score lower than 3) are usually found in upper-middle-income countries and HICs; more than 95 percent of LMICs have a risk score of at least 3 (WHO 2014a).

Disparate Burden. Within countries, there are generally more drinkers, more drinking occasions, and more drinkers with low-risk drinking patterns in the highest socioeconomic groups, and more abstainers in the lowest socioeconomic groups (WHO 2014a). However, drinkers in the lower socioeconomic groups are more likely to drink at higher levels of risk, with high quantities per drinking occasion (Room, Jernigan, Carlini, Gmel, and others 2013; Room, Jernigan, Carlini, Gureje, and others 2002), and they are more vulnerable to the consequences, at least partly reflecting their lower resources to cope with consequences and pay for treatment.

Many LMICs have higher alcohol-attributable mortality rates than HICs, despite the higher consumption in HICs. This can be explained by the fact that the harm derived from each liter of alcohol consumed is much greater because of a riskier pattern of alcohol consumption, a larger proportion of use of unrecorded alcohol, and the types of disorders with which alcohol is associated, with unintentional injuries the most salient (Room, Jernigan, Carlini, Gmel, and others 2013; Room, Jernigan, Carlini, Gureje, and others 2002). In a lower-income country, the built environment—for example, roads and footpaths—tends to offer less protection from injuries.

Societal Responses

Societies have used different strategies to cope with alcohol-related problems, depending on the specific ways in which the problem has been conceptualized. Strategies vary from total to partial bans on alcohol and from highly regulated markets to infrequent enforcement of the few existing regulations. Policies based on a combination of alcohol control and medical traditions—including normative measures to control availability and promote a safe environment for drinkers and the general population, as well as the prevention and treatment of the disorder—have had significant success in holding down rates of problems in HICs (Babor and others 2010). In LMICs, except those with a strong religious tradition that rejects drinking, the situation appears more challenging and offers few mitigating factors. Controls on the alcohol market that existed in many countries have been swept away, often by mandates from international aid agencies for market deregulation or privatization or as a result of trade disputes under free-trade agreements (Room, Jernigan, Carlini, Gureje, and others 2002). In many cultures, drunkenness is often tolerated, and regulations are not widespread; nevertheless, important lessons can be drawn from experiences where intervention measures have been used.

CHOICE OF INTERVENTIONS

The interventions in this chapter were identified with reference to a standardized matrix developed at a meeting of the volume editors and lead authors. The matrix divides interventions into three main groups:

- Population platform interventions, including universal prevention (IOM 1998)
- Community platform interventions
- Health care platform interventions.

This mapping exercise updates the DCP2 chapter on alcohol (Rehm and others 2006) and draws on three key previous exercises that reviewed the existing evidence (Babor and others 2010; Room, Jernigan, Carlini, Gmel, and others 2013; Room, Jernigan, Carlini, Gureje, and others 2002; WHO 2008, 2011b).

The search process consisted of an electronic review of the following databases: Medline (1994–2013), Embase (1994–2013), PsycINFO (1966–2013), Ovid (1970–2013), National Institute on Drug Abuse Database, SciELO (1994–2013), EBSCO (1994–2013), ISI Web of Knowledge (1994–2013), National Institute for Health and Care Excellence evidence search, Global Information System on Alcohol and Health, CINAHL, and Mental Health Gap Action Programme (mhGAP). The review resulted in identifying 42 articles; 21 additional records were identified through other sources. Of the 63 articles screened, 18 were excluded because they did not use a robust design; 45 were selected and assessed for eligibility, but three were excluded because of methodological limitations (Moher and others 2009).

Population-based interventions are usually evaluated by before-and-after population surveys, analyses of archival and official statistics, time-series analyses, qualitative research, and quasi-experimental studies. Quasi-experimental studies involve before-and-after measurements of communities or jurisdictions exposed to the intervention, compared with similar communities or jurisdictions where the intervention has not been implemented.

Natural experiments take advantage of the implementation of a new policy to test the effects; accordingly, they lack the random assignment of communities to the interventions being tested and so provide a lower level of evidence. Randomized controlled trials (RCTs), considered the gold standard for evaluating the effect of health interventions, are rarely used to test population-based interventions (Babor and others 2010). Although individual-based interventions are more suitable for RCTs, they must meet rigid standards to be considered robust (Guyatt and others 2011).

Interventions at a populationwide level that do not use experimental methodology were assessed using less stringent criteria, so quasi-experiments and natural experiments were rated as very good (+++) or good (++), depending on the strategies for data analysis. Time-series analysis or statistical modeling were considered to have a *very good* level of evidence. Other strategies, such as key informants or reports where information was lacking, were rated as *limited* + and not included in the analysis.

Community and health and social care interventions were assessed using primarily the Grading of Recommendations Assessment, Development and Evaluation (GRADE) guidelines. Using these, RCTs are regarded as having high quality (very good +++). When only some

criteria included in the GRADE guidelines were used, the rank was lower (*good* ++). Studies with limitations in the methods (the sample size or follow-up period assessment), inconsistencies (low reliability due to low variable control), lack of directedness (use of surrogate variables), or imprecision (confidence intervals not reported) were ranked as having a lower level of evidence (*limited* +). Only articles rated as very good or good were included in this review.

POPULATION PLATFORM INTERVENTIONS

Reducing the Availability of Alcohol

To control the physical availability of alcohol, governments need to be able to control its production, distribution, and sale. This control can be achieved by prohibition, monopolization, or other measures grouped in three clusters:

- Limiting the availability by means of taxes and minimum prices
- Limiting advertising and promotion
- Constraining access by licensing producers and wholesalers and retailers: when and where beverages can be available, to whom can they be sold, and how they can be sold.

Licensing systems facilitate the enforcement of regulations, the assessment of the origin of the alcohol, the determination of whether it has been legally produced and sold, and the collection of taxes. Settings in which unrecorded alcohol is highly available require additional controls. The following section describes evidence for these measures by region; tables 7.1, 7.2, and 7.3 provide additional information.

Prohibition, Rationing, and Partial Bans

Bans on sales, when effectively enforced, have proved effective in reducing consumption and harm. However, evidence suggests that these measures encourage the black market, which is difficult and expensive to eliminate (Lachenmeier, Taylor, and Rehm 2011). Several experiments on prohibitions and bans have been conducted in recent years, showing a reduction in use, followed by an increase when controls were abolished (Room, Jernigan, Carlini, Gmel, and others 2013; Room, Jernigan, Carlini, Gureje, and others 2002).

Indigenous Communities. Margolis and others (2011) studied four remote Australian Indigenous communities; three implemented prohibition, and the fourth allowed low-alcohol beer within licensed premises. Serious injury rates declined in all four communities. Similar results were observed in the First Nation Communities in Canada (Gliksman, Rylett, and Douglas 2007). The remoteness of the communities studied is likely to have enhanced the effectiveness of the intervention.

Table 7.1 Population-Based Interventions to Reduce Alcohol Availability

Population	Type of study	Main results
Prohibition, rationing, and partial bans		
Indigenous communities/*Australia and Canada*	Doctor service data, quasi-experimental (+++)	Prohibition and allowance of low-alcohol beer at licensed premises reduced serious injury (Gliksman, Rylett, and Douglas 2007; Margolis and others 2011).
Latin America/*Venezuela, RB*	National statistics, quasi-experimental time-series analysis, modeling (++)	Restriction intervention ("dry laws") reduced use and accidents (Herrera and others 2009).
Taxation		
East Asia/*Thailand*	Data from alcohol producers, national alcohol use surveys and statistics; theoretical evaluation, simulation and empirical analysis; price elasticity analysis; quasi-experimental, time lapse analysis (+++)	Taxation on distilled spirits led to a reduction in overall consumption (Chaiyasong and others 2011; Sornpaisarn, Shield, and Rehm 2012); prevented the onset of drinking among youth (ages 15–24 years) (Sornpaisarn and others 2013); *but* use of beer rose as a substitution effect (Chaiyasong and others 2011).
East Asia and Pacific/*China, Thailand;* Central and South Asia/*Turkey and India;* Sub-Saharan Africa/*Kenya, Tanzania*	Systematic review, PRISMA (+++)	Twelve studies showed evidence of a link between alcohol prices or taxation and consumption in LMICs; unrecorded alcohol was not considered (Sornpaisarn and others 2013).

Note: LMICs = low- and middle-income countries; PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses; ++ = good; +++ = very good.

Table 7.2 Restrictions on Alcohol Sale and Advertising: Density, Hours, Days, and Locations

Population	Type of study	Main results
Indigenous communities/ *Australia*	Data from admissions to local hospitals, women's refugee centers, sobering-up shelters, and police records; time-series analysis, quasi-experimental (+++)	After two years of constraints on the days, hours, and amounts of different beverages allowed for sale, annual per capita consumption of pure alcohol (19.4 percent) and hospital admissions declined (Gray and others 2000).
Latin America and the Caribbean/ *Brazil, Colombia, and Peru*	Police records; time-lapse analysis on homicides; linear regression analysis, quasi-experimental (+++)	A significant reduction in violence was reported in Brazil following the implementation of a municipal law preventing the sale of alcohol after 11 p.m., followed by a public information campaign (Duailibi and others 2007). Similar results have been observed through restrictions on alcohol service hours in cities in Colombia (Sánchez and others 2011) and Peru (Málaga and others 2012).

Note: +++ = very good.

Table 7.3 Law Enforcement Measures to Reduce Impaired Driving

Population	Type of study	Main results
East Asia and Pacific/*China*	Serial cross-sectional telephone surveys; time-lapse analysis; liquor sales; quasi-experimental (+++)	Random breath tests reduced impaired driving rates (Kim and others 2013).
		Arrests of impaired drivers who exceeded blood alcohol limits were associated with a reduction in fatal accidents in Taiwan, China (Chang and Yeh 2004).
Latin America and the Caribbean/*Brazil*	Representative sample of trauma care centers; time-series analysis, quasi-experimental (+++)	Low blood alcohol rates reduced traffic injuries and deaths (Andreuccetti and others 2011).

Note: +++ = very good.

Latin America and the Caribbean. The impact of partial bans on alcohol consumption on traffic accidents and injuries was evaluated in República Bolivariana de Venezuela during one week of national holidays (Herrera and others 2009). During the week the law was in effect, alcohol use was reduced and fewer accidents were reported.

Alternative solutions to prohibition include measures to regulate the alcohol market. Evidence has shown that alcohol consumption and related problems decrease when accessibility is diminished (for example, by pricing alcohol higher than other products) and consumption is more difficult (for example, by limiting the hours of sale). Alcohol prices may be increased through taxes, curbing consumption problems while increasing government revenues. Evidence has shown that this measure impacts heavy drinkers (defined as an average of more than 20 grams of pure alcohol per day for women and more than 40 grams for men) and light to moderate drinkers (less than 20 grams for women and less than 40 grams men), as well as younger and older drinkers (underage and legal age) (Babor and others 2010).

Taxation

The effects of taxation can be measured by price elasticity, which reflects the change in consumption in relation to the size of the price increase (percentage of change in quantity purchased/percentage change in price); an elasticity of less than –1.0 indicates that demand is relatively responsive to changes in price or is "elastic." Elasticities between –1.0 and 0 indicate that the demand is less responsive to prices or is "inelastic" (NIAAA 2000). An inelastic response to a tax increase may still have positive public health effects.

Evidence, mostly from HICs, shows a range of elasticities from –0.3 for the beverage ranked first in the target population's preferences to –1.5 for the one ranked last (Rehm and others 2003). Accordingly, an elasticity of –0.3 with respect to a tax on alcohol means that consumption will be reduced 3 percent by a 10 percent tax increase, while the alcohol tax revenue for the government will rise by 6.7 percent.

Latin America and the Caribbean. In Mexico, the price elasticity of demand was near –0.2 (Galindo, Robles,

and Medina-Mora 2012); in República Bolivariana de Venezuela, the price elasticity was quite low, between –0.074 and –0.058 (Herrera and others 2009).

East Asia and Pacific. In China, using data from the China Health and Nutrition Surveys for 1993, 1997, 2000, 2004, and 2006 in nine provinces in China, the price elasticity was virtually zero for beer and only –0.12 for liquor (Tian and Liu 2011). A previous estimate derived from household surveys conducted in 1993 and 1998 in three main cities and one province of China found elasticities of –0.51 for wine coolers, –0.85 for beer, and –1.39 for wine (Pan, Fang, and Malaga 2006). Using time-series data for consumption and retail prices in Taiwan, China, the price elasticity for alcohol was –0.771 (Lee and others 2010).

A study conducted in Thailand showed the effectiveness of two taxation approaches (Sornpaisarn, Shield, and Rehm 2012). One tax schedule is based on *alcohol content,* aimed at discouraging harmful patterns by promoting beverages with low alcohol content, suitable for contexts with a high prevalence of current drinkers. The other tax scheme is estimated as a *function of price*, which increases taxes on beverages consumed by heavy drinkers and potential new drinkers. Since the first scheme has the potential risk of promoting consumption in abstainers who are a large segment of the population in LMICs (WHO 2013a), a combination of both measures is proposed, together with interventions designed to control the promotion of alcoholic beverages.

East Asia and Pacific, South Asia, and Sub-Saharan Africa. In a systematic literature review and meta-analysis, Sornpaisarn and others (2013) found 12 studies with evidence of the link between alcohol prices or taxation and consumption in LMICs (China, India, Kenya, Tanzania, Thailand, and Turkey), although unrecorded alcohol was not considered. Elasticity estimates were –0.64 (95% confidence interval [CI]: –0.80 to –0.48) for total alcohol consumption, –0.50 (95% CI: –0.78 to –0.21) for beer consumption, and –0.79 (95% CI: –1.09 to –0.49) for consumption of other alcoholic beverages. They concluded that the price elasticity of demand for alcohol in LMICs is similar to that in HICs, and suggested more research was needed on the association between alcohol price or taxation and alcohol-related harm and drinking initiation in LMICs.

Control of the Unrecorded Market
Quantitative studies of the effects of policy options for controlling the unrecorded market are scarce. The main concern for controling unrecorded alcohol is that it can undercut the effects of regulatory measures by offering people an alternative. Some successful control examples include the centuries-old requirement of official sealing labels over corks or stoppers; this measure has been widely used, and the attendant threat to withdraw the liquor license of any place caught using untaxed alcohol has been effective (Lachenmeier, Rehm, and Gmel 2007).

Another concern about unrecorded alcohol is its potential toxic effects. Although according to Lachenmeier, Rehm, and Gmel (2007) the contribution of these effects to mortality is still unclear, because of their public health importance some measures to reduce harm can be included in policies. For example, such measures could include abolishing denatured alcohol; abolishing the use of methanol, which is a simple form of alcohol closely related to ethanol and found in unregistered alcoholic beverages, but more toxic (Pincock and ABC Health & Wellbeing 2013); or treating products not intended for human consumption with bittering agents to prevent people from using them (Lachenmeier, Rehm, and Gmel 2007). For example, recently in Mexico, after an increase in the number of seizures of unrecorded alcohol, a new regulation was issued requiring that all ethyl alcohol and methanol produced in the country be mapped to the primary manufacturing process. This regulation prevents diversions to informal channels, where unrecorded alcohol can be mixed with alcoholic beverages. The regulation prohibits the sale of alcohol in bulk and the incorporation of methanol as a raw product in beverages (CSG 2014).

Following a review of policy options for regulating unrecorded alcohol, Lachenmeier, Taylor, and Rehm (2011) classified policies in:

- *Reducing health risks*: prohibiting the toxic compounds that are used to denature alcohol and substituting them with substances with acceptable toxic profiles, for example, via the use of bittering agents, to prevent accidental deaths
- *Reducing cross-border shopping*: narrowing tax differences between unrecorded and recorded beverages or introducing stricter controls
- *Limiting illegal trade and counterfeiting*: implementing tax stamps and electronic surveillance systems for the alcohol trade.

These authors also suggested that the introduction of education campaigns could increase awareness of the risks associated with drinking illegal alcohol. They concluded that the most problematic category was the control of home and small-scale artisanal production; the

most promising option was to offer financial incentives to producers to ensure registration and quality control. There is a need for further research in countries with different cultures and traditions (Lachenmeier, Taylor, and Rehm 2011).

Minimum Prices and Bans on Discounts and Promotions

Evidence in HICs suggests that price discounts—such as happy hours and grocery store promotions—increase consumption and that higher prices for distilled spirits shift consumption to beverages with lower alcohol content, resulting in lower total intake. Enforcing minimum prices for a standard unit of alcohol is one of the most effective ways to reduce alcohol-related problems (Babor and others 2010). No evidence is available for LMICs.

Restrictions on Density, Hours, Days, Locations of Sale, and Advertising

Control of the physical availability of alcohol through measures such as restricting the hours, days, and locations of sale; limiting the density of concentration of retail drinking establishments and off-sales stores (shops licensed to sell alcoholic beverages for consumption off the premises); and establishing a minimum legal purchase age have diminished alcohol use and related problems in HICs (Babor and others 2010).

Although such measures have also been implemented in LMICs, only a few impact studies have been identified in these settings.

Latin America and the Caribbean. A significant reduction in violence was reported in Brazil following the implementation of a municipal law preventing the sale of alcohol after 11 p.m. Enactment of this law was followed by a public information campaign, the law was strictly enforced, and the measure was assessed by an interrupted time-series analysis. The results suggest that the law prevented an estimated 319 homicides over three years (Duailibi and others 2007). Similar results have been observed through restrictions on alcohol service hours in cities in Colombia (Sánchez and others 2011) and Peru (Málaga and others 2012).

Indigenous Communities. Some studies are available for indigenous groups within HICs. A study conducted in Tennant Creek in the Northern Territory, Australia, assessed the effectiveness of interventions and community attitudes toward increased restrictions on the availability of alcohol that included constraints on the days, hours, and amounts of different beverages allowed for sale. After two years, annual per capita consumption of pure alcohol declined by 19.4 percent,

accompanied by declines in hospital admissions (Gray and others 2000).

In HICs that have banned advertising, an econometric analysis showed that these measures had only a modest effect on alcohol use (Rehm and others 2006). However, other research indicates that banning advertising, accompanied by taxation and availability restriction, combine to constitute the best buy in reducing alcohol-related problems (WHO 2014a). Research on restrictions on advertising has not been replicated in LMICs. However, research from Taiwan, China, has replicated findings from HICs showing that exposure to alcohol marketing is associated with greater likelihood of initiation and persistence of drinking among youth (Chang and others 2014).

Countermeasures to Alcohol-Impaired Driving

The harmful consequences of alcohol can be curbed by risk-reducing measures, such as drinking and impaired driving countermeasures. Impaired driving laws, when accompanied by strategies for reinforcing them, such as regular random breath testing of drivers, have been shown to reduce the number of fatal and non-fatal traffic injuries. These strategies modify the drinking practices of high-risk alcohol users and protect other members of the population, such as passengers, other drivers, and pedestrians.

- Various blood alcohol concentration (BAC) limits are in place globally. Setting and enforcing legislation on BAC limits of 0.05 grams per deciliter (g/dL) can lead to significant reductions in alcohol-related crashes (Babor and others 2010). Setting lower BAC limits (0.02 g/dL or less) or zero tolerance is recommended for inexperienced drivers and young adults as an effective means of reducing crashes related to impaired driving; HICs are more likely to have these laws in place than LMICs. These laws are more effective when random breath testing for all drivers is conducted, and when drivers perceive a high likelihood of being arrested if they break the law (WHO 2013b).
- Rehm and others (2006) estimated that random breath testing could reduce fatalities between 6 and 10 percent if partially implemented, and up to 18 percent if implementation were extended. For nonfatal injuries, they calculated a reduction of 15 percent. However, these estimates are based on information obtained from HICs, where road infrastructure and driving patterns may significantly differ from those in LMICs.
- A related measure—sobriety checkpoints—has a high level of research support, with a robust, although lower, level of evidence of effectiveness in HICs (Babor and others 2010).

- Administrative license suspension for driving under the effects of alcohol, allowing licensing authorities to suspend a driver's license without a court hearing at the time of the offense or shortly after, has a good level of evidence; when punishment is swift, effectiveness is increased, particularly in countries where it is consistently applied (Babor and others 2010). Evidence in LMICs is scarce.

East Asia and Pacific. Studies conducted in China found that random breath tests and the perceived potential legal consequences of conviction reduced impaired driving rates (Kim and others 2013). The arrest of intoxicated drivers on BAC limits and enforcement were associated with a reduction of fatal accidents involving impaired driving in Taiwan, China (Chang and Yeh 2004).

Latin America and the Caribbean. In Brazil, low BAC rates reduced traffic injuries and deaths (Andreuccetti and others 2011).

COMMUNITY PLATFORM INTERVENTIONS

The impact of this measure is generally evaluated in terms of knowledge and attitudes. The most common target group is young drinkers; school-based interventions are one of several education and persuasion initiatives tested.

Indigenous Communities

The effectiveness of web-based alcohol screening versus web-based screening and a brief intervention for reducing hazardous drinking was tested in Maori university students, an indigenous population from New Zealand. The study used a parallel, double-blind, multisite RCT with a five-month follow-up assessment. The results indicated that the web-based screening and brief intervention reduced hazardous and harmful drinking among non-help-seeking respondents (Kypri and others 2013).

Babor and others (2010) concluded from their review that the effects of the interventions on the onset of drinking and on drinking problems are equivocal and minimal. Evidence shows that classroom education may increase knowledge and change attitudes, but it has no long-term effect on drinking behavior. Similar results were observed in college students exposed to a multicomponent program comprising mass media campaigns and impaired driving campaigns, warning labels, and social marketing.

Family-Based Interventions

Family interventions have improved communication skills, parental supervision of children and adolescents,

the setting of rules and norms, and modeling behavior within families, yet have little impact on behavior on their own. In LMICs, some interventions have been implemented to help families cope with members who have developed disorders, but the research designs used to evaluate interventions for substance use disorders have not included clinical trials (Natera and others 2011; Tiburcio and Guillermina 2003). Outcomes are more compelling when family programs are combined with the other measures described in this chapter (Babor and others 2010).

Mass Media Campaigns

Awareness initiatives include mass media campaigns. When combined with policies and regulatory controls, awareness campaigns can help to increase public support for policy measures and compliance with laws and regulations. Warning labels related to drinking during pregnancy have been introduced in HICs and LMICs. A review of published literature testing the effectiveness of alcohol warning levels in the prevention of FASD in Canada, France, New Zealand, and the United States showed that although alcohol warning labels are popular, their effectiveness in changing behavior is limited (Thomas and others 2014). FASD, whether complete or incomplete, is a growing problem that warrants further attention. There is insufficient evidence, even in HICs; however, studies show that warning labels, when delivered through channels that are perceived to be useful, can be beneficial and can influence behavior if they are part of a comprehensive strategy (Wilkinson and Room 2009).

The mhGAP (WHO 2008) recommends advising women who are pregnant, breastfeeding, or planning to become pregnant to avoid alcohol completely, and offering social support services for those who require additional assistance (WHO 2014b). Treatment in some cases could be helpful.

Studies in South Africa show that treatment using case management interventions to reduce alcohol intake among high-risk pregnant women had positive effects. The effects included stopping drinking, changing drinking behavior reflected in reduced Alcohol Use Disorders Identification Test scores, and reducing problem drinking (Maraisa and others 2011) (table 7.4).

HEALTH CARE PLATFORM INTERVENTIONS

Screening and Brief Interventions

Key elements of brief interventions include feedback, responsibility, advice, strategies, empathy, and self-efficacy. Strong evidence supports clinically significant effects on drinking behavior and related problems

Table 7.4 Community-Based Interventions: School and Family Interventions and Media Campaigns

Population	Type of study	Main results
Indigenous communities/*Maori in New Zealand*	Parallel, double-blind, multisite RCT with a five-month follow-up assessment (+++)	Web-based screening and brief intervention reduced hazardous and harmful drinking among non-help-seeking respondents (Kypri and others 2013).
South Africa	Pragmatic cluster randomized trial with no evidence of a diagnostic test used in the assessment phase (++)	Treatment using case management interventions to reduce alcohol intake among high-risk pregnant women reduced risk (Maraisa and others 2011; Rendall-Mkosi and others 2013).

Note: RCT = randomized controlled trial; ++ = good; +++ = very good.

(Diaz and others 2011; Nagel and others 2009). The mhGAP Intervention Guide (WHO 2011b) identifies three levels of interventions with individual problematic drinkers:

- Screening and brief interventions by trained primary health care professionals
- Early identification and treatment of AUDs in primary health care
- Referral and supervisory support by specialists.

The WHO mhGAP action plan promotes scaling up services for mental, neurological, and substance use disorders, with more cases treated at the first level of care (WHO 2008). The program is based on a review and evaluation of the strength of the evidence to submit recommendations for action. Psychosocial support was found to be more effective than no treatment, while motivational interviewing and motivation enhancement were possibly more effective than standard psychosocial treatment involving families and friends (mainly spouses), or no treatment, or individual counseling. Evidence in LMICs is widespread and consistent, showing positive results (table 7.5).

Medical and Social Detoxification, Treatment, Follow-Up, and Referral

The recent evidence for LMICs is consistent with what had previously been reported (Patel and others 2007) (table 7.6).

The mhGAP recommends referral from first-level care and supervisory support by specialists for patients with established alcohol dependence. The recommended actions include the planning of cessation of alcohol consumption and detoxification; if necessary, the treatment of withdrawal symptoms with diazepam; the use of medications to prevent relapses, such as naltrexone, acamprosate, or disulfuram; and the assessment and

Table 7.5 Screening and Brief Interventions in Low- and Middle-Income Countries

Site	Main results
Thailand (++)	Motivational interviewing was tested in low-resource settings (Noknoy and others 2010; Segatto and others 2011).
China (+++)	Counseling was supported with health promotion booklets (Tsai and others 2009).
Brazil (+++)	Brief advice was provided on cognitive behavioral interventions (Marques and Formigoni 2001).
Mexico (++)	Motivation therapy showed a greater reduction of alcohol use compared with cognitive behavioral therapy (Diaz and others 2011).
Indigenous communities/ *Australia* (++)	Brief psycho-educational intervention that included motivational care planning, problem solving, and impulse management showed significant benefits, compared with a control group (Nagel and others 2009).
Kenya (++)	Intervention was among people with HIV/AIDS (Papas and others 2010).

Note: ++ = good; +++ = very good; HIV/AIDS = human immunodeficiency virus and acquired immune deficiency syndrome.

treatment of comorbidity and possible referral to self-help groups (WHO 2008).

Self-Help and Support Groups

Mutual help and self-help organizations for those interested in reducing or ceasing drinking have been an important part of the social response to alcohol in many societies. Given that many religions forbid or discourage drinking, adherence to a religious congregation or group often carries with it an expectation of mutual help to stop drinking. In many social groups in Latin America and the Caribbean, joining a Protestant sect has often been a way out of sociocultural expectations of heavy drinking, particularly for

Table 7.6 Medical and Social Detoxification, Treatment, Follow-Up, and Referral

Site	Main results
Brazil (++)	There were no significant differences between naltrexone versus placebo during detoxification (Castro and Laranjeira 2009).
	Acamprosate was superior to a placebo in supporting abstinence in men undergoing treatment (Baltieri and Guerra de Andrade 2003).
Iran (++)	Naltrexone demonstrated better results than placebo when used as a maintenance treatment for a 12-week period (Ahmadi and Ahmadi 2002).
India (++)	Lorazepam and chlordiazepoxide showed similar efficacy in reducing the symptoms of alcohol withdrawal (Kumar, Andrade, and Murthy 2009).

Note: ++ = good.

men (Butler 2006; Eber 2001). Many mutual help groups that are not affiliated with particular religions or that are entirely secular have formed in different countries (Room, Jernigan, Carlini, Gmel, and others 2013; Room, Jernigan, Carlini, Gureje, and others 2002). The most well-known and widespread is Alcoholics Anonymous, which has proved adaptable to many cultural settings (Eisenbach-Stangl and Rosenqvist 1998; Mäkelä 1991).

Affiliation with Alcoholics Anonymous and similar groups is not considered a form of formal treatment— although some groups have affiliations with treatment institutions—and incorporating mutual help groups into a treatment system is likely to undercut their effectiveness. The principles of voluntary mutual help organizations often do not allow random-assignment clinical trials to test their effectiveness; consequently, not much research has been conducted on the impact of these groups (Ferri, Amato, and Davoli 2006; Terra and others 2007). However, survey results support the important role of these groups; 71 percent of the countries included in WHO's *Atlas on Substance Use* (2010) reported the presence of Alcoholics Anonymous.

Latin America and the Caribbean. In Mexico according to a National Household Survey (Medina-Mora and others 2012), 44 percent of persons in treatment for alcohol problems reported being affiliated with self-help groups, while only 35 percent received professional treatment. A study conducted in a nonprobabilistic sample of 192 members of Alcoholics Anonymous found that the level of affiliation or involvement with the organization was negatively related to relapse; with more involvement, mean participation time was higher, and activities related to service were more frequent. Most of the nonrelapsed subjects were sponsors helping newcomers, practiced the 12 steps more often, and reported spiritual awakening experiences more frequently (Gutiérrez and others 2007; Gutiérrez and others 2009).

The WHO (2011b) makes a standard recommendation— that indicates that it can be offered to the majority of patients but might not be applicable to all cases—for nonspecialist health care workers to be encouraged to familiarize themselves with locally available self-help groups. These groups should offer services at no cost to patients, and they should provide support for recovery and new social connections unrelated to drinking. Relatives of patients with alcohol dependence should be encouraged to participate in appropriate self-help groups for families, so that they can better understand their relatives' conditions and support their recovery.

COST-EFFECTIVENESS OF INTERVENTIONS

The addition of a cost component or economic dimension to health impact assessment introduces the opportunity to identify alcohol prevention and control strategies that have better or worse value for money. For example, devoting scarce resources to interventions that do not discernibly reduce ill-health caused by the consumption of alcohol—as is the case for information and education—is a clear case of investing in interventions that are not cost-effective. At the other end of the spectrum, in contrast, imposition and enforcement of taxation policies offers an example of a highly cost-effective public health intervention that costs relatively little to implement but reaps substantial health returns.

The available body of economic evidence to inform decisions around these alcohol control measures in LMICs remains modest and is based on a modeling approach that relies on data from higher-income settings for some of its inputs. Rehm and others (2006) reported on the comparative cost-effectiveness of a group of interventions—enactment of legislation on drinking and driving, random breath testing, taxation of alcoholic beverages, reduced hours of sale, and advertising bans— in East Asia and Pacific, Latin America and the Caribbean, South Asia, and Sub-Saharan Africa. Increased taxation was the most cost-effective strategy, although it may have a regressive impact on the incidence of alcohol consumption if accompanied by a rise in an already high level of unrecorded consumption. The authors found reductions from 2 to 4 percent in the incidence of high-risk alcohol use, depending on regional drinking patterns. The strategy of reducing the hours of sale produced a modest reduction of 1.5–3.0 percent in the incidence of high-risk drinking, together with a 1.5–4.0 percent reduction in alcohol-related traffic fatalities.

The overall conclusion from this study was that countries with a high prevalence of high-risk drinking should begin with taxation, because in such contexts it appears to have the largest impact for the fewest resources. In settings where high-risk drinking is less of a public health burden, other strategies that restrict the supply or promotion of alcoholic beverages appear to be promising and relatively cost-effective mechanisms, although there is a clear need for greater empirical support of their efficacy. In Mexico, a combination of interventions yielded the best results, with higher taxation (by 50 percent) ranked first (Medina-Mora and others 2010). Tax increases were also the measure recommended in India (Mahal 2000). Banning advertising, in conjunction with taxation and restrictions on availability, is considered the best combination of measures (WHO 2014b).

In terms of individual-level measures, trial-based economic evaluations have been conducted in HICs, the results of which have been used to model expected costs and health gains in LMICs (Chisholm and others 2004; Rehm and others 2006). Although found to be the most costly intervention to implement, brief interventions also lead to a large health gain in the population as a result of an estimated 13–34 percent reduction in consumption among high-risk drinkers, making it a relatively cost-effective measure.

The relative cost-effectiveness of these alcohol control and prevention measures is further discussed and reviewed in chapter 12 in this volume (Levin and Chisholm 2015).

CHALLENGES AND OPPORTUNITIES

Challenges for LMICs

Alcohol is responsible for a high proportion of the global burden of disease. Although drinkers in LMICs consume relatively smaller quantities of alcohol compared with drinkers in HICs, those in LMICs are more adversely affected. They tend to drink high quantities of alcohol per occasion, increasing the negative effects on health as well as increasing the rates of intentional and unintentional injuries.

The challenge of implementing a health-oriented alcohol policy is high, especially in LMICs, with higher burdens and fewer mitigating factors for harm, such as those derived from a temperance tradition that supports control over availability and limits quantities of alcohol intake. The public health perspective has received little attention in international negotiations affecting alcohol markets (Casswell and Thamarangsi 2009; Grieshaber-Otto, Schacter, and Sinclair 2006; Zeigler 2006). Financial aid to LMICs from international agencies has often

been conditioned on market deregulation, which has diminished controls on alcohol sales. In many countries, drunkenness is often tolerated, awareness of the consequences of alcohol is limited, multinational alcohol industry interests have been politically influential, and resources to fund policy measures to reduce the societal burden are scarce.

In settings in which alcohol use is well established, prohibition has not proved to be an effective way to curb the problem. The most promising alternatives are measures that increase the cost of alcoholic beverages and reduce the availability, accompanied by efforts to reduce unrecorded alcohol. Public health campaigns may be needed to increase awareness of the seriousness of alcohol problems in society and build support for intervention measures.

Measures to Control Price

- Market regulation, prevention, and treatment have been identified as strategies of choice for diminishing alcohol-related harm.
- Price discounts can increase consumption. Although research on the policy impact is scarce, evidence from HICs supports the use of minimum prices for a standard unit of alcohol as one of the most effective ways to reduce alcohol-related problems.
- Tax increases have proven to be cost-effective, independent of the level of income, even in countries with relatively low price elasticity.

Control of Alcohol Availability

Measures to control the availability of alcohol are typically adopted as part of a system of alcohol control that includes licensing sellers. Enforcement of the licensing regime is accomplished most efficiently in civil rather than criminal law. These measures include restricting the hours, days, and locations of sale; the density of the concentration of on-premises and retail drinking establishments; and the exposure to the intoxicating effects of alcohol. Although these measures have been implemented in LMICs, only a few studies have been identified in these contexts regarding a significant reduction in violence; no evidence is available on the level of enforcement of regulations.

Unrecorded Alcohol

Research shows that in LMICs where unrecorded alcohol is widely available, the strategy of tax increases needs to be accompanied by reductions in the supply and sales of unrecorded alcohol. Strategies to control the unregulated market can include regulating or raising the cost of nonbeverage alcohol products (such as mouthwashes and cleaning agents) that are used as substitute

beverages, narrowing the tax gap between beverages, introducing stricter controls to reduce cross-border shopping, and implementing tax stamps and electronic surveillance systems of alcohol trade sites to limit illegal trade and counterfeiting. Education campaigns could increase awareness of the risks associated with drinking illegal alcohol. The most promising option for the control of home and small-scale artisanal production is to offer financial incentives to producers to ensure registration and quality control.

Other Opportunities

Other substantial opportunities exist to reduce the burden of alcohol when the political will to do so exists.

Alcohol-Impaired Driving Laws

Impaired driving laws and strategies for reinforcing them influence the rates of fatal and nonfatal traffic injuries by modifying the drinking practices of high-risk alcohol users. These measures also protect others affected by the behavior of drinkers. BAC limits of 0.05 g/dL can lead to significant reductions in alcohol-related crashes, particularly if accompanied by enforcement.

Interventions to Reduce the Risk of FASD

Although alcohol warning labels are popular, their effectiveness in changing behavior is unknown. More positive results have been linked to treatment interventions to reduce alcohol intake among high-risk pregnant women.

Advertising Bans

Bans on advertising, a measure not widely tested across cultures or in LMICs, have at least a modest effect on alcohol use. Producers and sellers tend to transfer their advertising budgets to promotions that fall outside the bans. Effects may be greater in young and abstaining populations. Implementation of such bans is generally inexpensive and can be included in the package of interventions. Such packages that include banning advertising, accompanied by higher taxation and availability restrictions, constitute the best buy in reducing problems related to alcohol use (WHO 2014b).

School-and Family-Based Interventions

The effects of school-based interventions on the onset of drinking and drinking problems, if not accompanied by effective interventions aimed at the general population, are equivocal and minimal. Evidence shows that classroom education may increase knowledge and change attitudes, but it has no demonstrated long-term effect on drinking behavior. Family interventions have proved to change communication skills within the family, yet have little impact on behavior on their own. More promising outcomes are obtained from programs that combine this approach with alcohol regulations.

Screening and Brief Interventions

Screening and brief interventions by trained primary health care professionals, early identification and treatment of AUDs in primary health care settings, and referral and supervisory support by specialists have been widely tested in LMICs and have demonstrated clinically significant effects in reducing drinking behavior and related problems.

Treatment of Withdrawal

Treatment of withdrawal symptoms—a potential life-threatening condition that can occur when a person reduces or stops drinking after a period of heavy drinking—is recommended as a prerequisite to treatment of alcohol dependence. The quality of evidence on the effectiveness of medications for the treatment ranges from low to very low. Psychosocial support has been found to be more effective than no treatment. Motivational interviewing and motivation and motivation enhancement were more effective than standard psychosocial treatment involving families and friends (mainly spouses), and more effective than no treatment or individual counseling. Referral and supervisory support by specialists for patients with established alcohol dependence are a beneficial complement, as is the involvement of patients and their families in mutual help groups. Evidence suggests that packages that combine interventions are more promising and have added effects on curbing the alcohol problem.

Interventions for Alcohol Use during Pregnancy

Women who are pregnant, breastfeeding, or planning to become pregnant are recommended to avoid alcohol. Screening and brief interventions, detoxification and quitting programs, and management of infants exposed to alcohol tailored to the needs of the pregnant women and the infants should be included in the services provided.

Cost Analysis

The available body of economic evidence to inform decisions around alcohol *control measures* in LMICs, constituting *fiscal instruments*, *legal limits,* and *regulation*, remains modest. It is based on a modeling approach that relies on data from HICs for some inputs (involving effect sizes, for example). Although more research is needed, results from this approach support further action.

In terms of individual-level measures, brief interventions can result in substantial health gains. Although these measures are among the most costly interventions to implement, they can produce an estimated 13–34 percent reduction in consumption among high-risk drinkers, thereby making this type of measure relatively cost-effective. Evidence suggests that packages that combine interventions are more promising and have a greater effect on curbing the alcohol problem.

CONCLUSIONS

LMICs have a high burden of disease derived from alcohol use, medium-to-low levels of policy implementation for reducing alcohol use and consequences, insufficient evidence of the impact of measures to reduce the burden, and a paucity of research. The combination of these factors constitutes a compelling argument that more decisive action is needed by national and international organizations to reduce the burden derived from alcohol use, which is a preventable cause of death and disability. This chapter documents the urgent need to increase research support to assemble evidence, monitor progress, and reduce the gap between evidence, its application in communities, and its inclusion in policies (Barnes 2000).

NOTE

World Bank Income Classifications as of July 2014 are as follows, based on estimates of gross national income (GNI) per capita for 2013:

- Low-income countries (LICs) = US$1,045 or less
- Middle-income countries (MICs) are subdivided:
  a) Lower-middle-income = US$1,046 to US$4,125
  b) Upper-middle-income (UMICs) = US$4,126 to US$12,745
- High-income countries (HICs) = US$12,746 or more.

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