Chapter 9

Suicide

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INTRODUCTION

An estimated 804,000 deaths by suicide occurred globally in 2012 (WHO 2014a). Of these, 75.5 percent were in low- and middle-income countries (LMICs), which have limited resources to address the issue. The reasons for suicides are multifactorial, but suicides are preventable.

Suicide is operationally defined for the purpose of this chapter as the deliberate act of killing oneself. *Suicide attempt* describes any nonfatal suicidal behavior, such as intentional self-inflicted poisoning, injury, or self-harm. The inclusion of deliberate self-harm (DSH) within the definition of suicide attempt is potentially controversial, because it includes some acts carried out without suicidal intent. Nevertheless, suicide intent can be difficult to ascertain. Accordingly, the approach in this chapter follows that used by the World Health Organization (WHO) and classifies DSH under *suicide attempt.*

EPIDEMIOLOGY OF SUICIDE IN LMICs

The WHO report on suicide (WHO 2014a) provides the most up-to-date estimates of the global burden of suicide, but it is important to keep in mind the limitations of these data. The report uses vital registration data provided by countries and recorded in the WHO mortality database to generate estimates of cause-specific mortality globally—the Global Health Estimates (GHE). However, many countries, particularly LMICs, do not have high-quality vital registration systems; 78 of the 140 LMICs do not have any vital registration system at all. Most estimates of suicide rates in LMICs are based on subnational reports, which may not be nationally representative, and modeling algorithms. The number and quality of the subnational studies have increased and these modeling algorithms have improved, but serious questions remain about the accuracy of the estimated suicide rates. This problem is most evident in the WHO Africa and Eastern Mediterranean regions, where 98 and 75 percent, respectively, of estimated suicides occur in countries with no vital registration system.

The GHE estimates (WHO 2014b) provide the best available *estimates* of the number and demographic characteristics of suicides in 2012 for 197 countries and territories. The WHO report provides global and regional estimates and country-specific results for 172 of the 194 member states that have populations greater than 300,000. The estimates and results can help to inform the discussions of decision makers in LMICs interested in reducing suicides, but independent assessments of the accuracy and reliability of the estimates in specific jurisdictions are needed.

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Suicide Mortality

WHO reports that 804,000 suicide deaths occurred globally in 2012. The demographic characteristics and regional distribution of suicides, and the changes in suicide rates between 2000 and 2012, are shown in table 9.1 and figure 9.1. Substantial differences exist in the rates and characteristics of suicide between LMICs and high-income countries (HICs) as well as among LMICs in the six WHO regions. To facilitate the comparison of rates between regions and countries, the rates reported here per 100,000 population are all standardized to the age distribution of the global population in 2012.

Overall Suicide Rates

The 2012 age-adjusted suicide rate in HICs (12.7) was slightly higher than that in LMICs (11.2); over 75 percent of all global suicides occur in LMICs, given their larger proportion of the global population. Among LMICs, the region-specific suicide rate in the six regions varies over a threefold range (from 6.1 to 17.7); the country-specific rate varies over a 100-fold range, from 0.44 in the Syrian Arab Republic to 44.2 in Guyana.

Suicide Rates by Gender

The suicide rate among males in HICs is higher than among males in LMICs, 19.9 versus 13.7, respectively; the suicide rate among females in HICs is lower than among females in LMICs (5.7 versus 8.7). This results in a substantially lower male-to-female ratio of suicide rates in LMICs (1.6) than HICs (3.5). Suicides among females account for 43 percent of all suicides in LMICs, and 22 percent in HICs. However, the comparison of all HICs to all LMICs obscures region-specific differences. For example, the male-to-female ratios in LMICs in Europe and the Americas are higher (not lower) than in HICs.

Suicide Rates by Age

Figure 9.2 shows the gender by age pattern of suicide for several regions in 2012. All regions have low rates in those younger than age 15 years and relatively high rates in those over age 70 years. The suicide rate by gender between ages 15 and 69 years varies by region. In most regions, rates among males are much higher than among females in all age groups other than the very young; however, in the Eastern Mediterranean and Western Pacific regions, male and female suicide rates are comparable in all age groups. The Africa region has a peak in suicide rates among young men, which is not seen in other regions, while the South-East Asia region has a peak in suicide rates among young women that is much more muted or absent in other regions.

The mean age of suicide in HICs is higher than in LMICs, 50.4 versus 42.0 years, respectively, a difference largely accounted for by the difference in the median ages of the populations. Despite the higher rates of suicide in the elderly, for males and females in LMICs, over 63 percent of all suicides occur in individuals ages 15–49 years.

Relative Importance of Suicide as a Cause of Death

Suicide accounted for 1.7 percent of all deaths in HICs and 1.4 percent in LMICs in 2012, making suicide the 11th most important cause of death in HICs and the 17th most important cause in LMICs. Among ages 15–29 years in LMICs, suicide accounts for 7.9 percent of all deaths and is the third most important cause of death; among persons ages 30–49 years, suicide accounts for 3.4 percent of all deaths and is the seventh most important cause of death. Another measure of the public heath importance of suicide is that it is the most important type of intentional violent death (which includes suicides, murders, and war-related deaths): in LMICs, suicide accounts for 44 percent of all violent deaths in males and 70 percent of all violent deaths in females.

Changes in Suicide Rates, 2000–12

The WHO report highlights the volatility of suicide rates. From 2000 to 2012, the absolute number of suicides in LMICs dropped by 11 percent, and the suicide rate dropped by 30 percent.

As shown in figure 9.1, among LMICs in the six regions, the percent change in suicide rates ranged from a drop of 58 percent in the Western Pacific, largely driven by the drop in rates in China (Wang, Chan, and Yip 2014), to an increase of 1.5 percent in the Africa region. In 54 (44 percent) of the 123 LMICs with populations greater than 300,000, the rate increased by more than 10 percent; in 22 countries (18 percent), the rate decreased by more than 10 percent. Given these rapid changes in suicide rates for the majority of LMICs, policies and programs to reduce suicides need to be based on recent information about suicide in the target community. The use of before versus after changes in suicide rates is not a reliable method for assessing the effectiveness of prevention initiatives.

Suicide Attempts

Prior suicide attempt is one of the strongest predictors of subsequent death by suicide, so monitoring the rate, demographic pattern, and methods of suicide attempts is a key component of suicide prevention efforts. However, there is a lack of high-quality data on suicide attempts in LMICs.

Table 9.1 Estimated Incidence and Characteristics of Suicide in HICs and LMICs, based on WHO Global Health Estimates

Region	Number of suicides in 2012 (thousands)	Global suicides (%)	Age-adjusted suicide rate in 2012 (per 100,000)			M:F ratio	Mean age of suicide	All deaths due to suicide (%)	Rank of suicide as a cause of death in 2012			Change in number of suicides from 2000 to 2012 (%)	Change in age-adjusted suicide rate from 2000 to 2012 (%)		
			Male + female	Male	Female				Male + female	Male	Female		Male + female	Male	Female
Global[a]	804	100.0	11.4	15.0	8.0	1.87	44.1	1.44	15	13	22	−9.0	−26.3	−22.8	−32.2
HICs[a]	197	24.5	12.7	19.9	5.7	3.49	50.4	1.69	11	9	21	−2.9	−14.3	−17.5	−4.5
LMICs[a]	607	75.5	11.2	13.7	8.7	1.57	42.0	1.37	17	17	21	−10.8	−29.7	−24.2	−36.7
LMICs in six WHO regions															
Africa	61	7.6	10.0	14.4	5.8	2.47	37.6	0.66	24	27	37	38.0	1.5	2.0	0.7
Americas	35	4.3	6.1	9.8	2.7	3.61	40.4	1.02	22	15	33	17.5	−6.8	−7.0	−6.3
Eastern Mediterranean	30	3.7	6.4	7.5	5.2	1.45	39.7	0.77	27	27	26	32.0	−1.2	3.9	−7.2
Europe	35	4.3	12.0	20.0	4.9	4.08	45.3	1.35	11	8	22	−30.3	−37.9	−38.3	−37.2
South-East Asia	314	39.1	17.7	21.6	13.9	1.55	36.7	2.28	11	11	12	9.5	−10.8	−5.7	−17.4
Western Pacific	131	16.3	7.5	7.2	7.9	0.91	57.0	1.16	13	16	11	−46.6	−57.7	−55.9	−59.1

Note: HICs = high-income countries; LMICs = low- and middle-income countries; WHO = World Health Organization.
a. Global figures, overall HIC figures, and overall LMIC figures include data for three territories that are not member states: Puerto Rico and Taiwan, China, are included with HICs; the West Bank and Gaza is included with LMICs. The figures for LMICs in the six WHO regions only include WHO member states.

Figure 9.1 Percent Change in Age-Adjusted Suicide Rate in Different Regions of the World from 2000 to 2012 Based on WHO Global Health Estimates
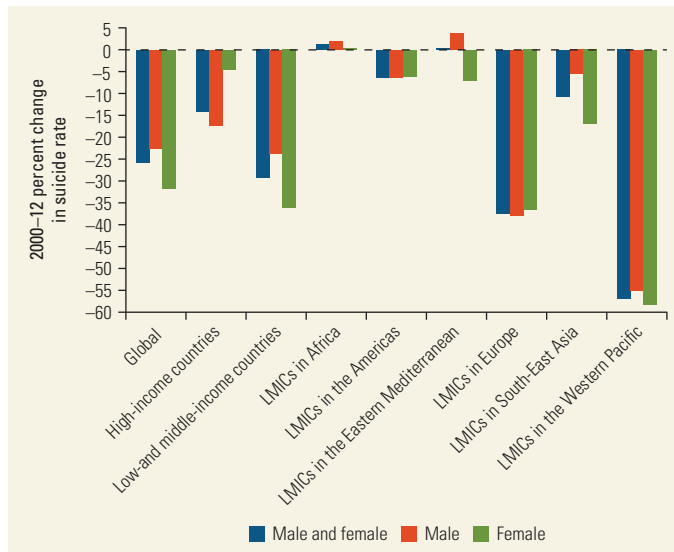
Note: LMICs = low- and middle-income countries; WHO = World Health Organization.

There are two sources of data for suicide attempts: self-reports from community surveys and reports from emergency departments of general hospitals (where most suicide attempts that receive medical care are treated). For the majority of the survey data and emergency department data about suicide attempts available from LMICs, the lack of standardized methods for identifying suicide attempts, methodological limitations, or unknown representativeness of the sample limit their usefulness.

One notable exception is the World Mental Health Survey, which collected self-reported data on suicide attempts from nationally representative samples in nine HICs, four middle-income countries (MICs), and one low-income country (LIC) (Kessler and Ustun 2008). Based on the results of this survey, of persons 18 years of age or older from 2001 to 2007, the self-reported one-year prevalence of suicide attempt is 0.03 per 100,000 for males and females in HICs, 0.03 for males and 0.06 for females in MICs, and 0.04 for males and females in LICs. Combining this very crude result from a small number of countries with the estimated global suicide rate in

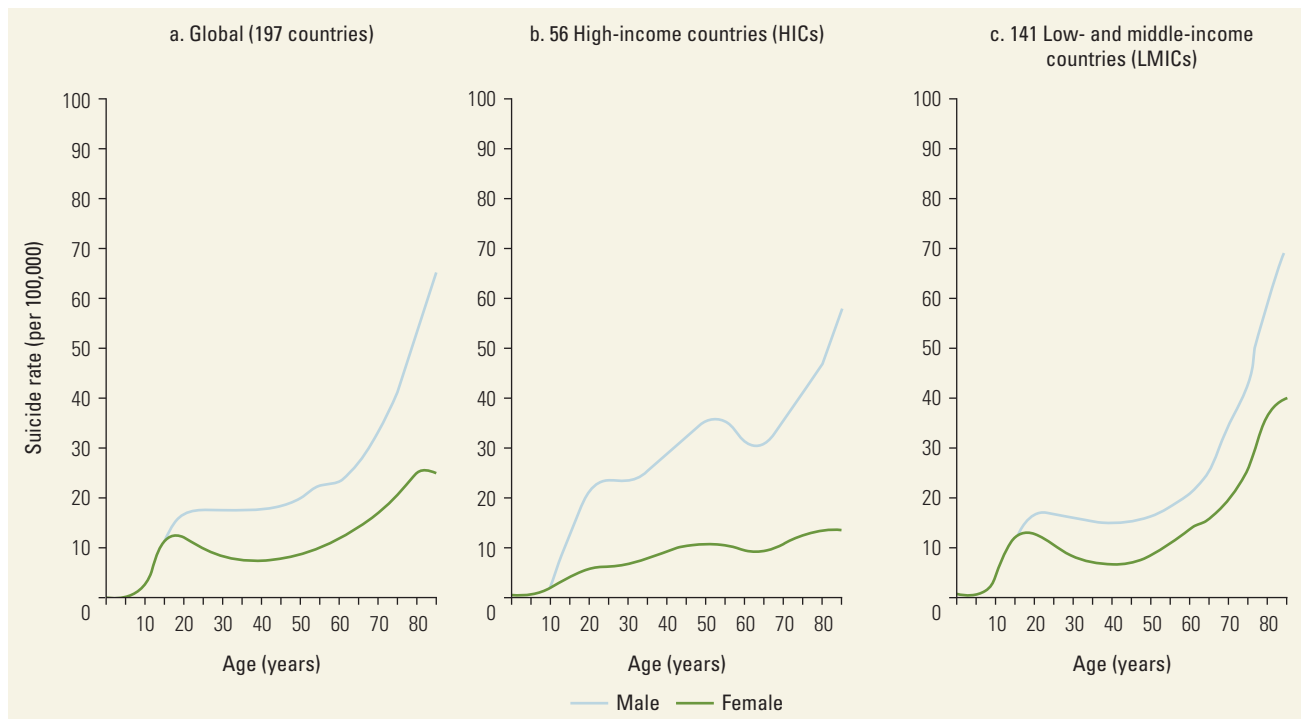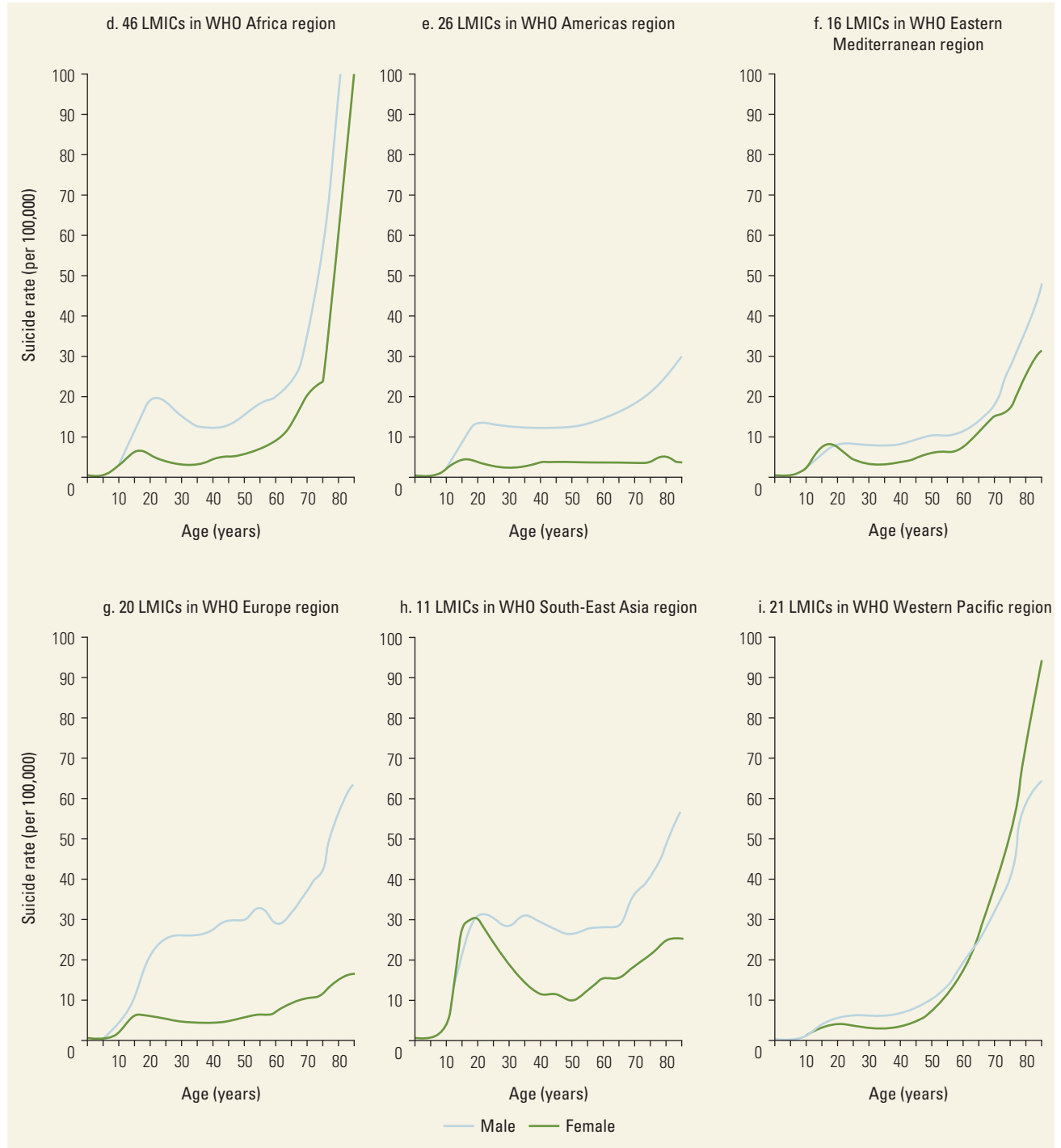**Figure 9.2** Suicide Rates by Gender and Age for Selected Regions, Based on WHO Global Health Estimates, 2012

figure continues next page

Figure 9.2 (continued)

d. 46 LMICs in WHO Africa region

e. 26 LMICs in WHO Americas region

f. 16 LMICs in WHO Eastern Mediterranean region

g. 20 LMICs in WHO Europe region

h. 11 LMICs in WHO South-East Asia region

i. 21 LMICs in WHO Western Pacific region

— Male — Female

Note: The countries included in each region are listed in annex 2 of WHO 2014a. HICs = high-income countries; LMICs = low- and middle-income countries; WHO = World Health Organization.

persons ages 18 years or older (15.4), globally there are about 20 self-reported suicide attempts for each death by suicide in persons ages 18 or older; this amounts to 15 million suicide attempts worldwide each year.

The limited nationally representative data available from HICs suggest that the case-fatality of medically treated suicide attempts is greater for males than females for all methods and increases with age, but it is unknown whether this pattern is also true in LMICs (WHO 2014a).

Methods of Suicide and Suicide Attempts

Collecting information about the methods used in fatal and nonfatal suicidal behavior, the demographic profile of individuals who use different methods, and the case-fatality of the different methods is an important component of a comprehensive suicide prevention plan. Unfortunately, only a minority of countries provides method-specific data when reporting mortality data to WHO, although International Classification of Diseases-10 (ICD-10) codes exist for all methods of suicide. Of the 140 LMICs, only 36 provided data on suicide methods at any time after 2005, and these countries only accounted for 11 percent of all suicides in LMICs in 2012.

In the absence of national-level data from WHO, it is necessary to consider reviews of subnational data. A systematic review (Gunnell, Eddleston, and others 2007) of the global literature from 1990 to 2007 estimated that about 30 percent of all suicides worldwide are caused by pesticide self-poisoning, most of which occur in LMICs, particularly in rural areas where residents practice small-scale agriculture and have easy access to pesticides. Based on this result, pesticide ingestion is the most common method of suicide globally. However, it is probable that the choice of method varies greatly by region, gender, age, urban versus rural residence, and over time, so each nation must develop standardized methods for routinely obtaining this information to help inform country-specific and community-specific means restriction strategies. For countries that already provide ICD-10 cause of death mortality data to WHO, this could be accomplished relatively easily by mandating that all reports of accidental deaths include the corresponding X-code.

Role of Surveillance in Suicide Prevention in LMICs

The available evidence suggests that substantial cross-national variation in the rates, demographic profile, and methods of suicide and attempted suicide is the rule rather than the exception. Other reports also indicate large differences in suicide rates between different geographic regions of large LMICs, like China (Phillips and others 2002) and India (Patel and others 2012). Some of these differences can be attributed to limitations or biases in the reporting of suicides, but most of the reported differences reflect real differences in suicide rates. Given the magnitude of these differences, policy makers and planners should be cautious when transposing a prevention strategy from HICs to LMICs, from one nation to another, or even from one region to another in a country. Development and ongoing quality control of registry systems that monitor the changing rates, demographic profile, and methods of fatal and nonfatal suicidal behavior in the country or region is essential for planning and implementing interventions.

RISKS AND PROTECTIVE FACTORS IN LMICs

The identification of risk and protective factors is a key component of any prevention strategy and guides the development of appropriate interventions. Risk factors can be present in different categories—individual, relationships, community, society, and health system—that can have multiple points of overlap (WHO 2014a). There are several theoretical ways to conceptualize how risk factors influence suicidal behaviors. One approach to conceptualize risk factors is to view their influence as being proximal versus distal. Proximal risk factors include psychiatric disorder, physical disorder, psychosocial life crisis, availability of means, and exposure to models of suicide. Distal risk factors include genetic susceptibility/loading, personality characteristics such as impulsivity or aggression, early traumatic events, and neurobiological disturbances such as serotonin dysfunction (Hawton and van Heeringen 2009).

There are also different patterns of risk across the lifespan. For example, risk factors for the elderly differ from those for adolescents and young adults. What is universal is that the greater the number of risk factors present, the greater is the likelihood of a range of suicidal behaviors (Phillips and others 2002).

Risk Factors

The relative importance of certain risk factors differs by country and region, such as age of onset of a psychiatric disorder, religious orientation and practice, geographical location, age ranges, and gender distribution. Even within a region, national and intranational differences exist in the prevalence of risk factors; any listing of risk factors may not apply to all LMICs, even in the same region.

Risk factors are variable over time and may be influenced by the rapidity of change occurring within

a country or region, such as by the increasing global influence of the Internet, migration from rural to urban areas, and movement of ethnic populations (Malakouti and others 2015). For example, in Chile, from 1998 to 2011, the age range with the highest suicide rates changed, from 40–59 years between 1998 and 2006 to 25–39 years between 2006 and 2009 (Otzen and others 2014). Qualitative studies are needed to identify culturally relevant risk factors and to understand how risk factors may be connected to suicidal behaviors in different sociocultural contexts (Mars and others 2014).

A review of risk factors reported that the profiles in LMICs differed from HICs in some respects, while certain risks were universal (Phillips and others 2002; Vijayakumar and others 2005). In Africa, reported risk factors were similar for suicide and suicide attempts, and included interpersonal difficulties, mental and physical health problems, socioeconomic problems, and drug and alcohol use and abuse (Mars and others 2014).

In a recent review of 17 published studies from Latin America and the Caribbean, the main risk factors for suicide attempts included major depressive disorder, family dysfunction, and prior suicide attempt; the main risk factors for death by suicide were male gender and major depressive disorder. Although the methodological quality of most of the studies was low, the authors concluded that the majority of relevant risk factors for suicide and suicide attempts in the region were similar to those observed in Western societies, but they were different from those reported in Eastern societies (Teti and others 2014).

Risk factors that appear to be universal include youth or old age, a mental disorder, low socioeconomic standing, substance use, and previous suicide attempts. Mental disorders occupy a premier position in the matrix of causation, although their relative contribution to suicide differs across countries. Loss, interpersonal conflict, suicide bereavement, chronic pain, chronic illness, and intimate partner violence increase the risk of suicide when they are associated with one another or when they are associated with another high-risk condition.

Recent stressful life events play a role in HICs and LMICs, although their nature may differ. For example, agents such as social change are more important in LMICs (Vijayakumar and others 2005). Access to means heightens risk in HICs and LMICs, but the specific means used may vary. Regional and national suicide rates vary in relation to geographic preferences for, and access to, high-lethality methods (Yip and others 2012).

Proximal Risk Factors

Mental Disorders and Alcohol Misuse

The classic method of investigating characteristics of individuals who have died by suicide is through a psychological autopsy, involving interviews with key informants and examination of official records (Hawton and others 1998). This approach has shown that in many HICs, psychiatric disorders are present in about 80–90 percent of people who kill themselves and contribute 47–74 percent to population risk of suicide (Cavanagh and others 2003; Cheng and others 2000). Affective disorder is the most common psychiatric disorder, followed by substance (especially alcohol) misuse and schizophrenia. A study based on the Global Burden of Disease 2010 stated that the relative risk of suicide in an individual with major depressive disorder was 19.9 (odds ratio (OR) = 9.5–41.7); with schizophrenia, 12.6 (OR = 11.0–14.5); and with alcohol dependence, 9.8 (OR = 9.0–10.7) (Ferrari and others 2014).

Psychological autopsy studies reveal that 40 percent of suicides in China, 35 percent in India, and 37 percent in Sri Lanka had a diagnosis of depression (Abeyasinghe and Gunnell 2008; Phillips and others 2002; Vijayakumar and Rajkumar 1999). However, a study in Pakistan found that 73 percent had depressive disorder (Khan and others 2008). In LMICs, the role of mental disorders is accorded less importance; equal or more importance is given to other sociocultural and environmental factors. Although their absolute level of risk is somewhat lower in LMICs, people with depression, mental disorders, or alcohol abuse or dependence are at a higher risk of suicide (WHO 2012).

Alcohol misuse, particularly dependence, is strongly associated with suicide risk in HICs and LMICs. The severity of the disorder, aggression, impulsivity, and hopelessness seem to predispose to suicide. Life events, stressors, and depression are not necessarily mutually exclusive, although they may be located at different points along the pathway to suicide.

Physical Disorders

Suicide is associated with several physical disorders. In a study from Nigeria (Chikezie and others 2012), 34.7 percent of HIV/AIDS patients versus 4.0 percent of controls expressed suicidal ideation in the preceding month, with 9.3 percent attempting suicide in the six months prior to the study.

Psychosocial Life Crises

Poverty, low education, social exclusion, gender disadvantage, conflict, and disasters are the major social determinants of mental health in LMICs (Patel 2007);

these factors are also associated with suicide. In Turkey, from 1990 to 2010, economic problems, relationship problems, and educational failure were the most common reasons for suicide (Oner, Yenilmez, and Ozdamar 2015). In Brazil, from 1980 to 2006, the most dominant sociodemographic characteristics of those who died by suicide were low educational level and single status (Lovisi and others 2009). Another study from Brazil found that income inequality represents a community-level risk factor for suicide rates (Machado, Rasella, and Dos Santos 2015).

Urban versus Rural Locations

Globally, suicide rates are higher in urban than in rural areas, but these can vary across countries by age and gender. In LMICs, living in a rural area increases risk. In China, the suicide rates are three times higher in rural areas than urban areas (Cao and others 2000; Phillips and others 2002); in Sri Lanka, the rural suicide rate is twice that of urban areas (Jayasinghe and de Silva 2003); and in India, about 90 percent of the suicides occur in rural areas (Gajalakshmi and Peto 2007; Joseph and others 2003).

Availability of Means and Methods

When a person is contemplating suicide, access to specific methods might be the factor that leads from suicidal thoughts and plans to action.

The easy availability of highly lethal methods is a significant factor in suicides in LMICs. As many as 30 percent of global suicide deaths might involve ingestion of pesticides (Gunnell, Eddleston, and others 2007). This situation is compounded by the limited availability of appropriate health care services and professionals, and by the complexity of managing pesticide overdoses that lead to increased fatalities.

In Turkey, from 1990 to 2010, the most common suicide method was hanging, and men used firearms more frequently than women did (Oner, Yenilmez, and Ozdamar 2015). In Brazil, the most common methods were hanging, firearms, and poisoning (Lovisi and others 2009). In Africa, the most frequently used methods of suicide were hanging and pesticide poisoning (Mars and others 2014).

In a systematic review and meta-analysis of the most common methods of suicide in the Eastern Mediterranean region, the pooled proportions of hanging, self-immolation, and poisoning were 39.7, 17.4, and 20.3 percent, respectively (Morovatdar and others 2013). More females died by self-immolation than males (29.4 percent versus 11.3 percent); more males died by hanging than females (38.8 percent versus 26.3 percent); and more females died by poisoning than males (32.0 percent versus 19.0 percent).

Exposure to Models

Risk of suicidal behavior can be influenced by exposure to similar behavior by other people.

A substantial body of evidence indicates that certain types of media reporting and portrayal of suicidal behavior can influence suicide and self-harm in the general population (Pirkis and Blood 2010). Newspaper reporting of suicides can be particularly influential if it is sensational, if it includes dramatic headlines and pictures, if it reports methods of suicide in detail, and if the subject is a celebrity (Stack 2003).

One of the most distressing features of suicide in LMICs is the frequent occurrence of suicide pacts and family suicides, which constitute an estimated 1 percent of suicides. Family suicides are often a suicide-homicide, in which the adults murder their children prior to their own suicide. These suicides are frequently driven by debt, poverty, and other social issues rather than by depression or mental disorders (Gupta and Gambhir Singh 2008; Vijayakumar and Thilothammal 1993).

Distal Risk Factors

Several biological systems might be involved in suicidal behavior, particularly with regard to the serotonin, noradrenalin, and hypo-thalamic-pituitary-adrenal axis systems (Mann 2003).

Family history of suicide increases the risk at least twofold, particularly in girls and women, independent of family psychiatric history (Qin, Agerbo, and Mortensen 2003). Studies from India (OR = 1.33; confidence interval (CI) = 0.59–3.09) (Vijayakumar and Rajkumar 1999) and China (OR = 3.9; CI = 2.4–6.3) (Phillips and others 2002) corroborate these findings.

History of Suicide Attempts

A history of self-harm or suicide attempts is seen as a very strong risk factor. Studies from China, India, and Sri Lanka reveal that around one-third of those who died by suicide had made a prior suicide attempt (Abeysinghe and Gunnell 2008; Phillips and others 2002; Vijayakumar and Rajkumar 1999).

Early Traumatic Events

Childhood adversities, including physical, emotional, and sexual abuse, have been associated with higher risk for suicide. A highly significant relationship between domestic violence and suicidal ideations has been found in many LMICs, with 48 percent of women in Brazil, 61 percent in the Arab Republic of Egypt, 64 percent in India, 11 percent in Indonesia, and 28 percent in the Philippines reporting suicidal ideations and domestic violence (WHO 2001).

In a study of the relationship between childhood trauma and current suicide risk in 1,380 individuals ages 14–35 years, in the city of Pelotas, Brazil (Barbosa and others 2014), suicide risk was associated with all types of childhood trauma. Suicide risk was increased in emotional neglect (OR = 3.7), physical neglect (OR = 2.8), sexual abuse (OR = 3.4), physical abuse (OR = 3.1), and emotional abuse (OR = 6.6).

Vulnerable Groups in LMICs

Women

Several social and cultural factors make women vulnerable, especially in LMICs in South Asia. These include the practice of arranged and often forced marriages that trap women in unwanted marriages; some opt for suicide as a means of escape. Young persons who love each other, but whose families disapprove of their relationship, may take their lives, either together or alone.

In Turkey, from 1990 to 2010, the number of suicides in females ages 15–24 years was significantly higher than in males. The leading reason for suicide in females was relationship problems (Oner, Yenilmez, and Ozdamar 2015).

Self-immolation, seen almost exclusively in LMICs (10–30 percent versus 0.06–1.00 percent in HICs), has emerged as a major cause of death and disability in parts of the Middle East and Central Asia, especially among young married Muslim women (Campbell and Guiao 2004). Self-immolation remains the only lethal means used more by women than men. In the Islamic Republic of Iran and in Pakistan, 81 percent of self-immolation is by women; in Sri Lanka, the rate is 79 percent; in India, it is 64 percent. Marital conflicts and failed love affairs were identified as the most common reasons (Ahmadi and others 2009).

Pressure on women to bear children soon after marriage, failure to become pregnant, and infertility carry severe social stigma, leading some women to resort to suicide. Domestic violence is fairly common; its practice is, to a large extent, socially and culturally condoned in many LMICs. In a population-based study on domestic violence, 9,938 women were studied in different parts of India and across sections of the society. An estimated 40 percent experienced domestic violence (Kumar and others 2005); 64 percent showed a significant correlation between domestic violence and suicidal ideation (WHO 2001). Domestic violence was found in 36 percent of suicides and was a major risk factor (OR = 6.82; CI = 4.02–11.94) (Gururaj and others 2004). However, relatively little is known about domestic violence as a risk factor across LMICs, and it is an important area for future research.

Youth

Many LMICs experience peaks in suicide rates among young adults. These peaks likely reflect a combination of factors, including the use of high-lethality methods in impulse (low intent) suicide attempts; relationship stresses and arranged marriages, particularly in young women; and the high incidence of impulsive suicide attempts in response to socioeconomic stressors, such as job loss, substantial disparities in incomes, and inability to meet role obligations in a changed environment following large-scale privatization and liberalization of the economy (Schlebusch 2005). The breakdown of the joint family system that had provided emotional support and stability was also an important contributing factor (Thara and Padmavati 2010).

Farmers

In Brazil, suicide risk was higher among agricultural workers than nonagricultural workers, elevated in regions that used more pesticides, and greatest in regions that produced more tobacco. These findings suggest that the combined effects of pesticide and tobacco exposure may be linked to higher suicide risk among agricultural workers (Krawczyk and others 2014). Farmer death from pesticide self-poisoning is very common in several LMICs, including China, Fiji, India, Indonesia, Sri Lanka, and Suriname (Phillips and others 2002; Vijayakumar and others 2005). A common reason includes falling into debt traps following crop failure. When this difficulty is coupled with the easy availability of a lethal means of suicide, the situation becomes particularly dangerous.

Refugees and Internally Displaced Persons

Refugee status, or seeking asylum, puts individuals at significant risk for suicide (Kalt and others 2013). More than 59 million people were displaced in 2014; 86 percent of these were in LMICs. The least-developed nations provided asylum to 3.6 million people (UNHCR 2014). Most refugees in LMICs are residents of refugee camps with poor infrastructure and limited services (McColl, McKenzie, and Bhui 2008).

Suicidal behavior in refugees is often not reported, because it is considered politically sensitive. A review suggests that the overall prevalence of suicidal behavior among refugees ranges from 3.4 percent to 34.0 percent (Vijayakumar and Jotheeswaran 2010). The results of a study of adults in refugee camps showed that 50 percent of the sample had serious psychological problems, with interventions often not available; suicidal thoughts were common among mothers (Rahman and Hafeez 2003). Children and adolescents formed an especially vulnerable group, since they constitute almost 50 percent of

the world's internally displaced and refugee populations. Accordingly, it is essential to take steps to provide appropriate interventions (Reed and others 2012).

Sexual Minorities

In many LMICs, discrimination against sexual minorities, such as lesbians, gays, bisexuals, and transgenders, is ongoing, endemic, and systemic. This problem can lead to the continued experience of stressful life events, such as loss of freedom, rejection, stigmatization, and violence that can lead to suicidal behaviors (Haas and others 2011). There have been no studies that have compared suicide rates among sexual minorities in countries with or without social acceptance of alternative lifestyles.

Survivors of Suicide Loss

People bereaved by the suicide of loved ones or a close contact often experience significant emotional distress as a result of their loss. These feelings are often accompanied by feelings of stigma, loss of trust, and social isolation. Many survivors experience suicidal thoughts themselves.

Every year, an estimated four million people may be actively experiencing the aftermath of a suicide, many of them children, due to the high proportion of young married women in China and India who die by suicide. Many LMICs do not provide programs for survivors in any systematic way. Families in which suicide has occurred may be ostracized and isolated, and the marriage prospects of sisters and daughters of people who die by suicide may be marred (Khan and Prince 2003). These attitudes may affect the ways in which people respond to survivors and may reduce the likelihood that survivors seek what limited services might be available.

Protective Factors

The role of protective factors, such as resiliency, social support, self-esteem, problem-solving skills, and religious affiliation have not been as well studied as risk factors.

Strong Personal Relationships

The promotion and maintenance of healthy close relationships can increase resilience and act as a protective factor against the risk of suicide. In a study in Brazil, the protective factors for boys and girls included having good family relationships and feeling liked by friends and teachers, and these factors seemed beneficial (Anteghini and others 2001). Similarly, a survey of adolescents from nine Caribbean countries reported that strong connections with family and school provided the best protective factors (Blum and others 2003). Relationships are especially protective for adolescents and elderly persons, who have higher levels of dependency.

Religious and Spiritual Beliefs

Religious and strong cultural beliefs that discourage suicide are seen as major protective factors. The protective value of religion and spirituality probably arises in part from providing access to a socially cohesive and supportive community. Islam and Christianity, and specifically Catholicism, prohibit the taking of one's own life, and this prohibition can have a strong inhibitory effect on suicidal behavior. Data from Islamic countries and from countries in Latin America and the Caribbean that are predominantly Catholic bear this out; however, the strong stigma associated with suicide in these cultures may mean that underreporting is likely. The rates of suicide in Islamic countries are very low; for example, Saudi Arabia and Syria have a similar rate of 0.4 per 100,000 (WHO 2014a). Islam also prohibits alcohol consumption, a known risk factor for suicide.

A survey of young people from nine Latin American and Caribbean countries reported that attendance at religious services and connectedness with parents and school reduced risk behaviors (Blum and others 2003). A study from India revealed that religiosity acted as a strong protective factor against suicide (Vijayakumar 2002). Due to the lack of reliable data, the debate remains open as to whether it is the religious beliefs per se or the social connectedness that occurs in the context of religious involvement that is protective.

Positive Coping Strategies and Well-Being

Subjective personal well-being and effective positive coping strategies seem to be protective against suicide (Sisask and others 2008). However, ample debate remains regarding the international measures of national and individual well-being, making the relationship between well-being and suicide less than simple.
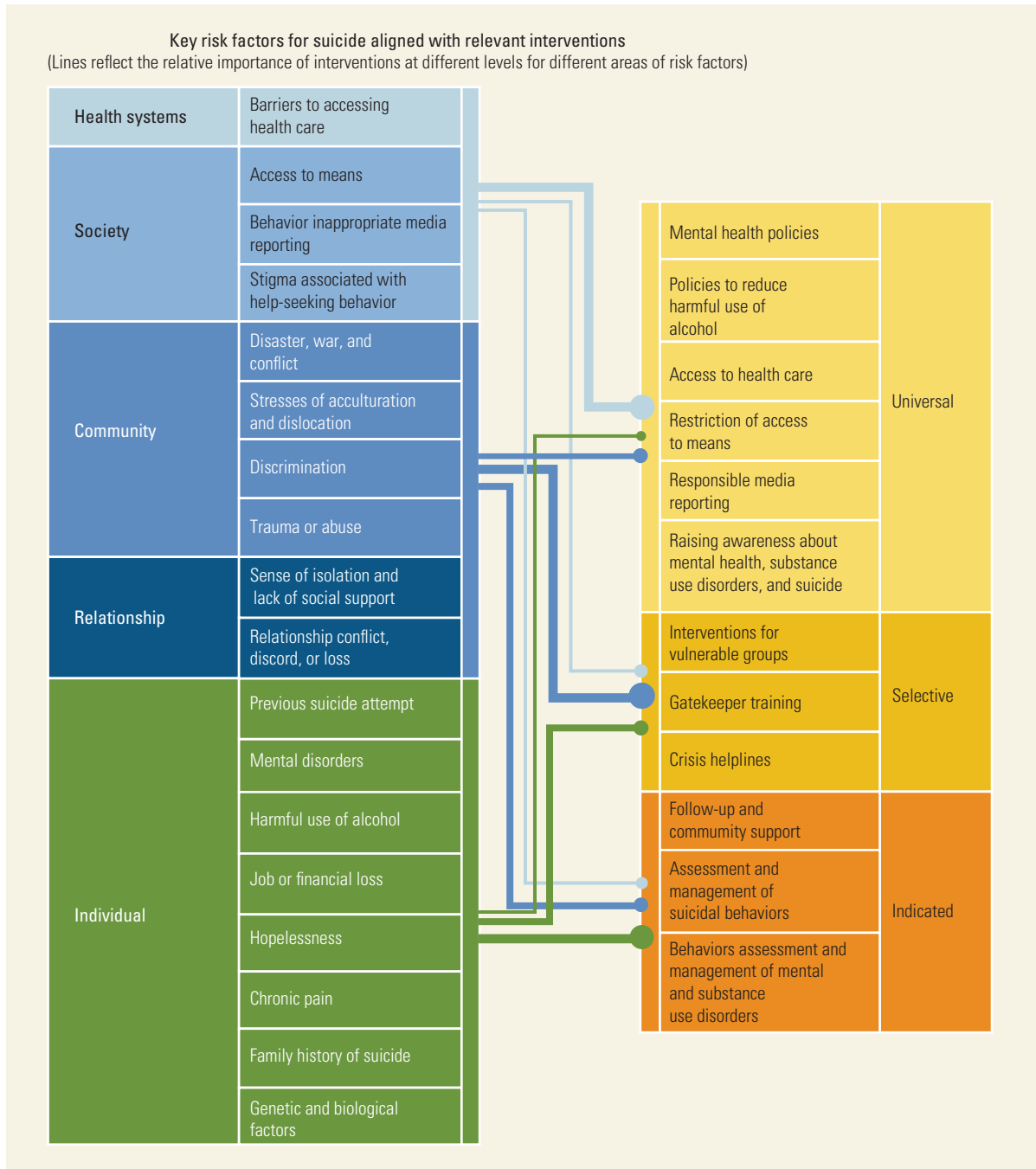
Use of upstream approaches, such as addressing risk and protective factors early in the life course, has the potential to shift the odds in favor of more adaptive outcomes. Moreover, upstream approaches may simultaneously impact a wide range of health and societal outcomes, such as suicide, substance abuse, violence, and crime (Jané-Llopis and others 2005).

Figure 9.3 provides a list of key risk factors for suicide aligned with their possible interventions.

SUICIDE PREVENTION IN LMICs

This section summarizes the evidence for suicide prevention in LMICs. It provides an overview of potential populationwide, community-based, and health and social care interventions and describes the development of national suicide prevention strategies.

Figure 9.3 Risk Factors and Possible Interventions

Key risk factors for suicide aligned with relevant interventions
(Lines reflect the relative importance of interventions at different levels for different areas of risk factors)

Source: WHO 2014a.

Suicide was once commonly viewed as a mental health problem that needed to be addressed primarily by clinical intervention, especially by the treatment of depression. Suicide is now recognized as a public health issue that should be addressed by social and public health programs, as well as clinical activities targeting mental disorders. Moreover, in LMICs, the availability of mental health professionals needed to deliver mental health interventions is often limited.

WHO has produced several documents on suicide prevention. Based on these documents and recent literature, table 9.2 highlights potential interventions in LMICs;

Table 9.2 Potential Interventions for Suicide in LMICs

Population platform interventions
Universal prevention and health promotion

Restrict the availability of toxic pesticides and other commonly used methods

Decriminalize suicide

Reduce the availability and excessive use of alcohol and illicit drugs

Work with national and local media organizations to limit inappropriate reporting of suicides

Conduct campaigns to reduce the stigma associated with suicide and mental disorders and to encourage help-seeking behavior

Provide adequate economic and welfare support to individuals who are unemployed, disabled, or destitute

Community platform interventions
Selective prevention and health promotion

NGOs: provide suicide hotlines and crisis centers, and promote social cohesion and interpersonal support in communities and families

Initiate school-based mental health promotion programs to enhance psychological resilience, problem-solving skills, and appropriate help-seeking behavior

Organize community-based safe storage activities for pesticides, other poisons, and medications

Provide gatekeeper training to teachers, people looking after refugees, police, social workers, practitioners of alternative systems of medicine, traditional healers, and other individuals who interact with suicidal individuals

Implement communitywide health promotion programs to encourage help-seeking for psychological problems and reduce alcohol and drug abuse, child abuse, and domestic violence

Health care platform interventions
Indicated (targeted) prevention and care for persons with mental, neurological, and substance disorders and their families

Conduct brief interventions for people who have attempted suicide

Train primary health care workers in the identification and management of individuals at high risk of suicidal behavior

Improve health care professionals' identification and treatment of depression and alcohol or drug abuse

Provide regular follow-up, social support, and (if appropriate) cognitive behavioral therapy or other psychological treatment to individuals who have attempted suicide

Improve the medical management of poisoning with pesticides and other poisons associated with high case-fatality

Establish services to support individuals bereaved by suicide (postvention services)

Note: Given the wide variability of suicidal behavior between and within countries, any interventions must be based on local conditions (for example, commonly used high-lethality methods); interventions from other countries or jurisdictions can be considered but should not be implemented prior to conducting a formal assessment of their local feasibility and appropriateness. However, many LMICs do not have quality vital registration systems to identify suicidal deaths, or community-based or hospital-based monitoring programs to identify suicide attempts. This deficit poses a serious dilemma for stakeholders in LMICs. It is not feasible to delay the initiation of suicide prevention activities until a comprehensive monitoring system of suicidal behavior is operational; it is appropriate to integrate monitoring in the target communities in parallel with the initiation of the intervention programs. LMICs = low- and middle-income countries; NGOs = nongovernmental organizations.

the relevance of these to a particular LMIC depends on its epidemiology of suicide, key risk factors, and social context, as well as the available resources in the country.

The evidence is of mixed quality; in some cases, it extrapolates from research in HICs. Furthermore, because of the low incidence of suicide, the evidence for several of the interventions comes from trials that have used suicide attempts, rather than suicide, as the primary outcome measure.

Some of the interventions highlighted in other chapters, such as those to reduce the incidence of alcohol misuse and depression, will help to decrease the incidence of suicide. In this section, we consider interventions specific to suicidal behavior, such as restricting access to commonly used methods of suicide, and those to improve the mental health of the population in general, where an impact on suicide seems probable.

Population Platform Interventions

Restricting Access to Lethal Means

Research has demonstrated that one of the most effective approaches to reducing suicide is restricting access to highly lethal and commonly used methods (Mann

and others 2005). Suicidal impulses are often short lived; if access to high-lethality methods is restricted, the impulse may pass or a less lethal method may be chosen. Most people who survive a suicide attempt do not go on to kill themselves.

Pesticide self-poisoning accounts for a high proportion of all suicides in LMICs. In Sri Lanka, where pesticide poisoning accounted for two-thirds of all suicides in the 1980s, a series of bans on the import of the most toxic pesticides was followed by a halving in suicide rates (Gunnell, Fernando, and others 2007). In recent years, China and the Republic of Korea have followed Sri Lanka's lead by banning some of the most toxic pesticides. Other methods of suicide potentially amenable to means-restriction interventions include gun control legislation and protective barriers at suicide hotspots.

Decriminalization
In a recent study, 25 of the 192 countries investigated had specific laws and punishments for attempted suicide (Mishara and Weisstub 2014). These countries are principally LMICs. The impacts of criminalizing suicide are the following:

- People may not present for care following a suicide attempt and so not receive the medical or psychological help they may require.
- It stigmatizes suicide and may discourage help-seeking.
- Police interrogation of people who have attempted suicide causes increased distress, shame, and guilt, and may lead to further suicide attempts.
- There may be gross underreporting of attempted suicides, leading to underestimation of the magnitude of the problem.

Changing the laws should result in improved help-seeking behavior, reduce stigmatization, provide better data, and save lives.

Alcohol and Drug Misuse
The contribution of alcohol and drug misuse to the burden of suicide varies from country to country depending on cultural norms. Evidence from HICs suggests that restricting alcohol availability by pricing or restrictions on purchasing may lead to reductions in suicide (Pridemore, Chamlin, and Andreev 2013), but this has not been evaluated in LMICs.

Media Reporting
Improving the portrayal of suicide in the media is an important component of suicide prevention. Sensational reporting can raise awareness (cognitive availability) of high-lethality suicide methods that, if popularized, may have an adverse impact on suicide rates (Chen and others 2014). Many LMICs do not have effective media regulatory bodies or media guidelines such as those developed by WHO (http://www.who.int/mental_health/prevention/suicide/resource_media.pdf). If poor reporting is an issue, it is important to work with national media organizations and journalists to develop local guidelines and provide regular feedback on their reporting.

Other Populationwide Interventions
Stigma. Many people who die by suicide have not sought help for their emotional distress. The stigma associated with mental disorder, the belief that nothing can be done, and, in some countries, the criminalization of suicide contribute to this reluctance to seek help. Media, school-based, and other campaigns to address this issue may promote appropriate help-seeking, although robust research evidence to support this approach is lacking (Dumesnil and Verger 2009).

Examination Stress. In many LMICs with fierce competition for places in higher education, examination failure is a recognized risk factor for suicide. In India, 1.8 percent of suicides were by students following failure in examinations (NCRB 2014). Similar patterns have been reported in Malaysia, Pakistan, and Sri Lanka. An example of good practice in this area is work by Sneha, a nongovernmental suicide prevention organization in India. Sneha worked with the media to raise awareness of the issue and undertook education and awareness training for parent associations. In Tamil Nadu, India, a new law came into effect in 2003 that allowed students who failed examinations to be able to retake them within one month and pursue higher studies without losing an academic year (Vijayakumar and Armson 2005). In 2004, there were 407 suicides due to examination failure (suicide rate 61.6 per 100,000 students), whereas in 2013 there were 277 suicides (suicide rate 24.7) among students in Tamil Nadu. Other states in India, including Andhra Pradesh and Maharashtra, have enacted similar laws.

Economic Issues. Poverty, debt, chronic ill-health, and low socioeconomic position are risk factors for suicide in LMICs (Knipe and others 2015). Adequate welfare provision for these more vulnerable members of society is important to reduce risk but poses a challenge to the struggling economies of many LMICs.

Community Platform Interventions
Services of Nongovernmental Organizations
Most LMICs do not have the financial or personnel resources to support suicide prevention programs,

especially health care system–driven models. It has become imperative to develop low-cost interventions that can be delivered by lay volunteers or community health workers.

This enormous gap in mental health services has been the catalyst for the emergence of nongovernmental mental health organizations. Many African and South-East Asian countries have such organizations, often taking the form of suicide prevention centers, staffed largely by volunteers and operating as crisis centers or hotlines, providing free service in many LMICs. For example, the Beijing Suicide Research and Prevention Center in China established a national hotline and provides standardized training to other hotline services around the country.

The primary goal of these prevention centers is to provide emotional support to suicidal persons through befriending and counseling in person or by telephone. In many countries, as the primary or sole agency for suicide prevention, they have enlarged their perspectives by being proactive in rural and remote areas and in special populations. Although many innovative programs for raising awareness and increasing help-seeking behavior have been developed, most have not been evaluated (Vijayakumar and Armson 2005).

School-Based Interventions

There is mixed evidence concerning the effectiveness of school-based interventions for preventing suicide. In the largest randomized control trial (RCT) carried out to date—the Saving and Empowering Young Lives in Europe trial—mental health awareness and skills training reduced the incidence of suicidal thoughts and attempts among secondary school children (Wassermann and others 2015). More research is needed in this area in LMICs.

Safe Storage of Pesticides

Multiple projects have investigated approaches to restricting access to pesticides in farming communities in rural Asia. These include studies of lockable safe storage boxes in Sri Lanka (Hawton and van Heeringen 2009; Konradsen and others 2007) and a centralized community pesticide storage facility in southern India (Vijayakumar and others 2013). These approaches show some promise, although the possibility of adverse effects has been raised. A randomized trial of locked storage devices that is enrolling 200,000 people is underway in Sri Lanka (Pearson and others 2011).

Gatekeeper Training

A gatekeeper is anyone in a position to identify whether someone may be at risk of suicide. Gatekeepers include schoolteachers, people caring for refugees and victims of disaster, hospital emergency department staff, practitioners of traditional and alternative medicine, police, prison staff, and youth leaders. Training gives these individuals the skills to identify and respond to at-risk individuals (WHO 2012, 2014a).

Although research evidence to support this activity is limited to institutional settings (Mann and others 2005), it appears to be intuitively sensible and is valued by front-line personnel and communities.

Other Community Platform Interventions

Recently, there has been interest in multifaceted, community-based approaches to improving the identification and treatment of depression and reducing suicide. Hungary participated in the European Alliance against Depression Programme. The program includes four levels of intervention: general practitioner training workshops, a public information campaign, training community facilitators (gatekeepers), and interventions targeted at high-risk groups. Szekely and others (2013) report data from the intervention (population 77,000) and control (population 163,000) regions of Hungary; they find evidence of a significantly greater reduction in suicide in the intervention region compared with the control area.

A multifaceted suicide prevention program in a Brazilian municipality, the Program for Promotion of Life and Suicide Prevention, was designed to reduce suicide rates in the general population (Conte and others 2012). The components of the program included trying to break taboos and talking about death, improving and streamlining the process of care, and reorganizing work processes in the basic network. Although suicide rates fell in the municipality, the lack of comparison information from control areas means it is not possible to determine whether the reduction was due to the program or other influences.

Campaigns to reduce stigma associated with suicide and encourage help-seeking have been suggested as a population-level intervention; such campaigns may also be appropriately carried out by local communities. Activity might also focus on groups identified as being at high risk in the particular community, such as victims of domestic abuse, people who abuse alcohol, or those who engage in gambling.

An unusual intervention in the Islamic Republic of Iran used videos documenting the stories of self-immolation victims (Ahmadi and Ytterstad 2007). Young women from socioeconomically deprived groups who were identified as at high risk were targeted. There was some evidence of a beneficial effect on self-immolation and overall suicide attempts compared with a nonintervention city.

Such interventions need to be designed carefully to avoid possible unanticipated effects, such as glamorizing suicide.

Health Care Platform Interventions

Brief Intervention and Contact

Few interventions for people presenting to clinical services have been evaluated in LMICs. An exception is the WHO's multisite RCT of the provision of brief intervention and contact (BIC) to people who presented to hospital emergency departments in Brazil, China, India, the Islamic Republic of Iran, and Sri Lanka. BIC comprised a one-hour individual information session, as close to the time of discharge as possible, combined with periodic follow-up after discharge. The 18-month follow-up reported significantly fewer deaths from suicide in the intervention arm than the control arm (treatment as usual) (Fleischmann and others 2008), although surprisingly there was no impact on the incidence of repeat (nonfatal) suicide attempts (Bertolote and others 2010).

Another brief intervention that has attracted attention in recent years is mailing a series of supportive postcards to people in the 12 months after a suicide attempt. A recent systematic review found no strong evidence of an effect of this sort of intervention in studies largely carried out in HICs (Milner and others 2015). However, the one RCT conducted in an LMIC, the Islamic Republic of Iran (Hassanian-Moghaddam and others 2011), was more promising. The study showed a reduction in suicidal ideation, suicide attempts, and number of attempts at one-year follow-up. This trial should be replicated in other LMICs.

In China, intervention by messaging through mobile phones was piloted in 15 people who had attempted suicide; most participants considered the text message contacts an acceptable and useful form of help (Chen, Mishara, and Liu 2010). However, a subsequent three-arm RCT comparing telephone contact, cognitive therapy, and controls showed no evidence of a beneficial effect on repeated suicide attempts, depression scores, or quality of life at one-year follow-up, although loss to follow-up was high in all three treatment groups (Wei and others 2013).

Improving the Medical Management of Poisoning with Pesticides

The appropriate medical management of pesticide self-poisoning may reduce case-fatality. The WHO has produced guidelines on the clinical management of pesticide intoxication (WHO 2008); these guidelines should be reviewed by local health services. The guidelines cover training and initial and longer-term care, and include notes of caution about overuse of gastric lavage, the appropriate use of antidotes—for example, atropine for organophosphate poisoning—and careful attention to respiratory failure.

Disasters and Refugees

LMICs are particularly prone to natural disasters, war, and food shortages. These problems often result in large numbers of displaced people or refugees. These people are at heightened risk not only because of their displacement, but also because of the traumas, physical and psychological, they may have experienced. Those in contact with such individuals should be appropriately trained to be aware of their vulnerabilities and how to respond.

Monitoring and Reporting Systems

Reliable and timely information on the prevalence, demographic patterns, and methods employed in suicides and suicide attempts is essential for the development and monitoring of suicide prevention efforts (WHO 2012). It is essential to involve community and nongovernmental organizations at multiple levels to address this issue in terms of monitoring, reporting, and providing interventions.

A direct transference of the methodologies used in HICs is unlikely to be efficacious in LMICs. The significant differences in gender ratio, age structure, and methods for suicide between HICs and LMICs mean that interventions have to be suitably adapted to address local requirements and be consistent with local social and cultural practices.

National Suicide Prevention Strategies

A key step in acting to prevent suicide is to identify and engage the key national stakeholders in developing a national suicide prevention strategy. The Ministry of Health is the most appropriate body to lead strategy development.

Under the WHO Mental Health Action Plan 2013–2020, member states have committed to work toward the global target of reducing the suicide rate in countries by 10 percent by 2020. WHO has produced recommendations for suicide prevention interventions in several documents, including the Mental Health Global Action Program (WHO 2010a), *Public Health Action for the Prevention of Suicide* (WHO 2012), and *Preventing Suicide: A Global Imperative* (WHO 2014a), which provides evidence-based technical guidance to expand service provision in countries. Sadly, few LMICs have developed national prevention strategies. Malaysia and Sri Lanka are exceptions, although Sri Lanka's strategy

is no longer operational. In India, suicide prevention is included in the country's national mental health program.

Although many risk factors for suicide are shared by all countries, their relative importance in determining the local incidence of suicide varies. The first step in informing priority areas for suicide prevention is to collect good quality, nationally representative data on the age- and gender-specific incidence of suicide, the methods used by those who take their lives, and the key risk factors. Guidelines by WHO to set up a surveillance system and the process to be followed can be accessed from the STEPwise approach to surveillance at http://www.who.int/chp/steps/en.

COST-EFFECTIVENESS OF PREVENTION EFFORTS

The cost of treating suicide attempts, particularly self-poisoning by pesticides in LMICs, is high (Sgobin and others 2015; Wickramasinghe and others 2009). Suicide prevention control measures may need to be tailored to the context of a specific country, taking into consideration the epidemiological, geographic, and gender distribution of suicide, political will, perceptions of stigma, legislation, and resource availability to deliver appropriately designed prevention programs. As such programs are developed, there will be a need to generate cost and cost-effectiveness information. Although there have been some promising interventions in LMICs, the evidence of cost-effectiveness remains sparse, and evidence on costs and cost-effectiveness from HICs may not be relevant (WHO 2010b). No economic evaluation was conducted for the multicountry RCT of BIC (Fleishmann and others 2008), but the clinical costs were equal to treatment as usual. Chapter 12 in this volume (Levin and others 2015) provides a review of costs and cost-effectiveness for mental health interventions more broadly.

CONCLUSIONS

Suicide is a major public health problem in LMICs. The magnitude of the problem and the paucity of resources in these countries necessitate a need for collaboration and cooperation across a variety of stakeholders to implement strategies that are culturally relevant and cost-effective. The huge variability in the prevalence, demographic patterns, and methods of suicide should be considered when making global cross-national prevention recommendations. LMICs need to adopt a process whereby they can decide on the interventions that are appropriate for their cultures and populations.

A substantial minority of individuals who attempt suicide or die by suicide in these settings does not have a mental disorder. Psychosocial and economic risk factors need to be acknowledged, and interventions need to be developed that target these factors. In LMICs, suicide prevention is more of a social and public health objective than a traditional mental health sector objective.

Before intervening, information about the prevalence, demographic patterns, and methods of suicide in the country or community is needed. Data from representative locations on the pattern of deaths is particularly important in countries without effective registry systems. Several evidence gaps exist. A more refined estimate of the burden and modeling that focuses on risk factor abatement, resilience enhancement, and intervention effects will effectively direct future suicide prevention activities.

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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