

Suicide in Asia: Opportunities and Challenges

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Asian countries account for approximately 60% of the world's suicides, but there is a great mismatch in the region between the scale of the problem and the resources available to tackle it. Despite certain commonalities, the continent itself is culturally, economically, and socially diverse. This paper reviews current epidemiologic patterns of suicide, including suicide trends, sociodemographic factors, urban/rural living, suicide methods, sociocultural religious influences, and risk and protective factors in Asia, as well as their implications. The observed epidemiologic distributions of suicides reflect complex interplays among the traditional value/culture system, rapid economic transitions under market globalization, availability/desirability of suicide methods, and sociocultural permission/prohibitions regarding suicides. In general, compared with Western countries, Asian countries still have a higher average suicide rate, lower male-to-female suicide gender ratio, and higher elderly-to-general-population suicide ratios. The role of mental illness in suicide is not as important as that in Western countries. In contrast, aggravated by access to lethal means in Asia (e.g., pesticide poisoning and jumping), acute life stress (e.g., family conflicts, job and financial security issues) plays a more important role than it does in Western countries. Some promising suicide prevention programs in Asia are illustrated. Considering the specific socioeconomic and cultural aspects of the region, community-based suicide intervention programs integrating multiple layers of intervention targets may be the most feasible and cost-effective strategy in Asia, with its populous areas and limited resources.

Asia; primary prevention; suicide

INTRODUCTION

It is estimated that suicides claim approximately 1 million lives worldwide every year, and as many as 60% occur in Asia (1, 2). If commonly used estimates are applied to Asia, namely, approximately 10–20 times as many suicide attempts as deaths and 5–6 people affected by each suicide death, more than 60 million people may be affected by suicide annually (1). Yet despite such compelling figures and the fact that it is an enormous public health issue, suicide receives relatively less attention than it does in the West (3), resulting in underemphasis on related research and fragmented preventive approaches (4, 5).

A crucial challenge in studying suicide in Asia is the availability and quality of suicide data for monitoring and surveillance (1, 6). For approximately 20% of the population, suicide data are not available (6, 7). In countries where data are available, there are problems of underestimation due to inaccurate ascertainment and delay in reporting suicide deaths. Social, cultural, and religious elements affect the reporting of suicide and are compounded by poor population estimates

(1, 3, 5, 7, 8). In Hong Kong, Japan, Malaysia, Singapore, South Korea, and Taiwan, the procedure of certifying suicide is regarded as more reliable (4, 9). In these countries, all reported or suspected suicides need to be examined by a coroner, medical examiner, or forensic pathologist, and usually with a police investigation report to make sure the event is not a homicide. All certificates must be registered with the health department; thus, the quality of suicide estimates is considered reliable.

In contrast, the quality of suicide estimates in China, India, Thailand, and Sri Lanka is considered poor to fair (4). In these countries, there may be substantial underreporting. For example, in China, the official suicide rate is based on a random sampling of 145 surveillance sites, not a complete count of the entire population (10, 11). Similarly, in populous India, underreporting may be even worse because suicide is still regarded as illegal. In many other Asian countries such as Pakistan and Vietnam, national statistics on suicide are simply unavailable (4). When such limitations in the accuracy of suicide data are taken into account, the overall suicide rate in Asia is approximately 19.3 per 100,000, about 30% higher than the global rate of 16.0 per 100,000 (12, 13).

The epidemiologic patterns, risk, and protective factors of suicide in Asia are substantially different from those in Western countries, which are the source of the majority of the suicide literature (4, 14). Because of rapid transitions in the social and economic structures experienced by many countries in the region recently, as well as limited and underdeveloped mental health services, the mental well-being of the community is expected to worsen and suicide rates are expected to rise in the next 2 decades (15). Since suicide is the leading cause of death relative to other causes among younger adults, the potential years of life lost and the associated socioeconomic burden imposed by suicide are substantial in the region (16–18). Considering the scale of the problem and the foreseeable vicissitude of suicide in the region, an in-depth and comprehensive review of the current status of and recent trends in suicide in Asia is timely and will make a tremendous impact on suicide prevention at a global level.

This review describes the latest epidemiologic patterns of suicide in Asian countries where reliable data are available, and it highlights risk and protective factors for suicide. Considering the specific epidemiologic distributions, we also review some existing suicide prevention programs and propose future directions for suicide research and intervention measures in Asia.

METHODS

The US National Library of Medicine's PubMed electronic database, PsycInfo, Embase, and ISI Web of Science were searched by using the title and abstract search terms "suicide" in combination with each individual country in Asia (e.g., "suicide" and "Japan"). Articles related to epidemiologic studies including age, gender, method, geographic patterns, and risk/protective factors of suicide from January 2000 to April 2011 were retrieved. All psychological autopsy studies and intervention studies available in the region were also searched without restricting the period of search.

Articles dealing with other suicidal behaviors, such as suicide ideation and attempted suicide, were excluded. A literature search based on the Chinese search engines "China journals full-text database" (www.cnki.net) was performed by using the Chinese keywords "epidemiology" and "suicide." The search yielded 3 articles. The results of the literature search are presented in Table 1. Countries that yielded 0 articles (e.g., Philippines and Cambodia) were not listed in this table. Since more than 100 epidemiologic studies were identified, key findings from these studies were reviewed. (The complete list of retrieved articles is available from the authors upon request.)

The reference lists of articles identified by the search strategy were also searched for relevant articles. Reviews and book chapters were cited to provide opportunities for further reading. From the electronic database search, 9 East and Southeast Asian countries able to provide epidemiologic data on suicide for the current review were located. These countries were China, Hong Kong, India, Japan, Singapore, South Korea, Sri Lanka, Taiwan, and Thailand. Despite the more than 30 countries in this part of world, only these 9 were selected because they had shown either some unique features (e.g., risk

factors, distributions) or some significant changes in the suicide patterns (e.g., change in prevalence, methods used) in the past decade. We did not aim to review every country in Asia exhaustively in view of space constraints. These selected countries provided insights and helped further the discussion of suicide prevention in the region. The population in the 9 selected countries represented more than 40% and 90% of the world and Asia populations, respectively.

RESULTS

Epidemiologic characteristics

Suicide rate trend. Countries in Asia are very different in terms of socioeconomic development, religious beliefs, population size, gross national product, and literacy and suicide rates (3). Whenever possible and unless otherwise specified, we present the latest published suicide statistics and provide the sources of information (Figure 1). Countries with low suicide rates include Thailand and China at 5.7 and 6.6 per 100,000, respectively, followed by Singapore (8.0) and India (10.9). Hong Kong and Taiwan, with rates of 13.8 and 17.6, respectively, are countries with medium suicide rates (i.e., 12.0–18.0). The high-rate countries (>18.0) include Japan (24.0), South Korea (31.0), and Sri Lanka (23.0) (Figure 1).

The latest trends in countries for the period 1995–2009 are shown in Figure 2. China, Sri Lanka, and Singapore showed a steady decline. The magnitude of reduction in Sri Lanka for the period was phenomenal, from 46.9 to 20.3. No substantial change was observed in Thailand and India, whereas suicide rates for Japan, South Korea, and Taiwan increased significantly since 1995 and remained at a high level and above the global average (16.0). The ever-increasing trend in South Korea is worrisome and reached a historical high of 31.0 in 2009. The 3-fold increase in Taiwan for the same period is also disturbing (from 7.6 in 1995 to 17.6 in 2009). In Japan, the suicide rate increased abruptly during the Asian financial crisis in 1997, from 17.0 in 1995 to 24.0 in 1997, and has remained at this high level ever since. News from Hong Kong is somewhat encouraging, where the suicide rate increased from 12.0 to 18.6 for the period 1997–2003 and then decreased and leveled off to about 13.8 in 2009. The Hong Kong suicide rate went up by more than 50% in the first 6 years and decreased by 25% in the later 6 years.

Age and gender patterns of suicide. Unlike in Western countries, where suicide rates for males are about 3–4 times higher than those for females (19), in several Asian countries, the gap between male and female suicide rates is smaller (Figure 3). For example, Australia and Hong Kong have similar suicide rates, but the gender ratios (male-to-female) are about 4 and 2, respectively. This finding implies that the suicide rate for females in Hong Kong is relatively higher than that for Australian females, whereas a relatively lower rate is observed for Hong Kong males compared with Australian males. The gender ratio in the United States was 3.8 in 2009.

China still has the smallest male-to-female gender ratio of all selected countries. Total female suicides outnumbered male suicides before 2005, but the number of male suicides has increased since; the latest gender ratio was 1.2 in 2009. The

Table 1. Summary of the Literature of Suicide Studies in Asia

Country	Epidemiologic Studies					No. of Psychological Autopsy Studies	No. of Intervention Studies
	Initial No. of Articles Retrieved	No. of Articles Excluded			Final No. of Articles Reviewed		
		Not Representative of the Population	Other Suicidal Behavior (Ideation, Attempts)	Not Directly Relevant, Reviews, Case Reports, etc.			
Afghanistan	1	1	0	0	0	0	0
Bangladesh	14	7	3	4	0	0	0
China	188	48	69	60	11	8	4
Egypt	7	4	0	3	0	0	0
Hong Kong	166	29	45	73	19	5	9
India	202	75	25	97	4	4	3
Indonesia	2	1	1	0	0	1	0
Iran	92	40	39	12	0	0	1
Iraq	1	1	0	0	0	0	0
Israel	39	3	10	23	3	2	0
Japan	369	117	82	155	15	2	4
Jordan	5	2	0	3	0	0	0
Kuwait	2	0	0	2	0	0	0
Lebanon	3	0	2	1	0	0	0
Malaysia	24	7	4	12	1	0	0
Nepal	16	3	9	3	1	0	0
Oman	3	0	3	0	0	0	0
Pakistan	39	9	14	14	2	1	0
Palestine	1	0	0	1	0	0	0
Singapore	22	1	4	10	7	0	1
South Korea	32	2	9	8	13	0	1
Sri Lanka	58	20	9	27	2	2	1
Taiwan	178	36	44	71	27	2	2
Thailand	19	3	5	7	4	0	0
Turkey	143	42	61	37	2	1	0
Vietnam	0	0	0	0	0	0	1

observed low gender ratios in India and China come from the high rates for young women, especially in rural regions (4, 20). Narrower male/female suicide ratios are also found in other Chinese communities such as Taiwan, Hong Kong, and Singapore (21, 22). However, an increasing male-to-female suicide gender ratio was also observed in all 3 societies in the past decade. In Singapore, the increasing suicide gender ratio is due to decreased suicides of young women (23); in Taiwan and Hong Kong, it is mainly driven by the increased use of charcoal-burning suicide by middle-aged men (24).

Despite the veneration and respect for older adults in East Asia (e.g., China, South Korea, Hong Kong, Taiwan, and Singapore), where Confucianism is practiced, suicide rates for the older age group are paradoxically high. The elderly-to-general-population suicide ratio ranges from 4 to 6 (25–27). Although suicide rates are also higher for older adults in Western countries, especially males, the elderly-to-general-population ratio is not as striking as that observed in East Asian countries.

Japan is an exception. Traditionally, it has the highest suicide rate for the elderly. However, after the Asian finan-

cial crisis of 1997–1998, the suicide rate for middle-aged men (50–59 years) surpassed that for the older age group (≥ 65 years) (28, 29). In Thailand, the highest suicide rates are found for young men (aged 25–34 years), a group at the height of its productive years (30). A posited explanation is chaotic sexual relationships, human immunodeficiency virus infection, and alcohol abuse, especially in the central part of Thailand (30, 31). The sources of data for the figures are provided in the Appendix.

Urban/rural patterns of suicide. After the 1990s, increased suicides in rural areas, particularly among males, have been reported in many Western countries (32, 33). Higher rural rates are also found in several Asian countries, including India, Sri Lanka, Japan, Taiwan, and China (10, 34–38). Rural disadvantage in suicide rate trends can be caused by the relative deprivation, stigma and/or insufficient knowledge of mental illness, social isolation and disconnection, difficulty in accessing services, and ready access to lethal means of suicide (e.g., pesticides) (32, 33).

Particularly disturbing is the high rural suicide rate in China, where it is 2–3 times higher than in urban areas (10, 36). The

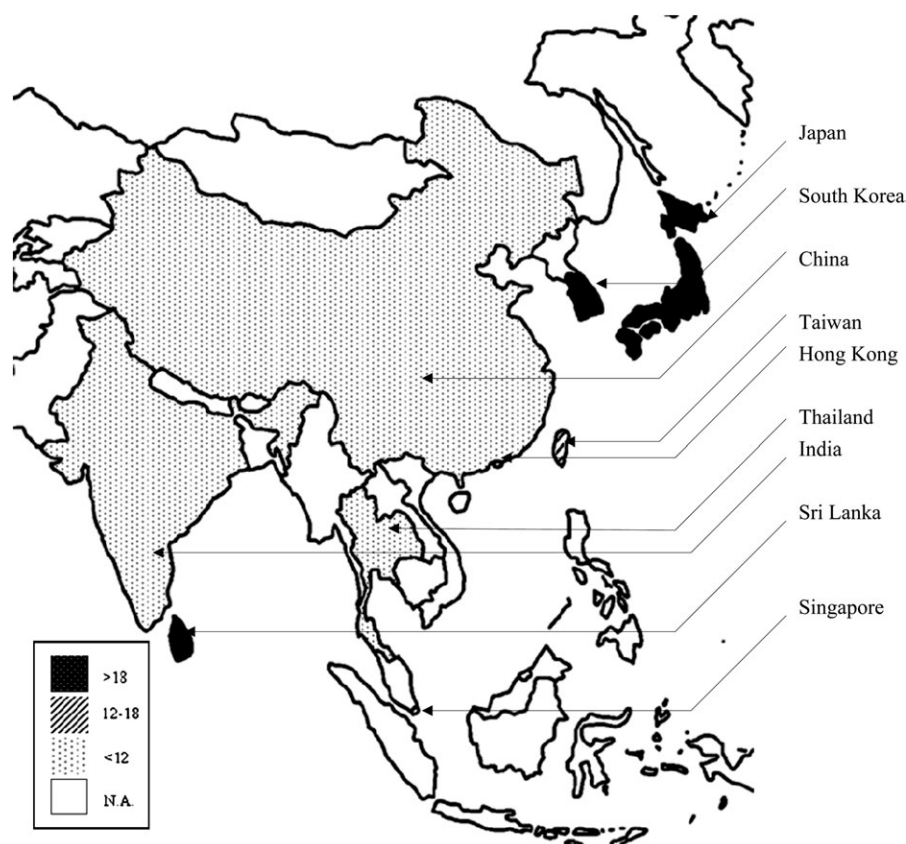


Figure 1. Suicide rates (per 100,000) in the 9 selected countries/regions of Asia, 2009. N.A., data not available.

distinctive age and gender patterns of suicide observed in China are further divided along rural versus urban lines. The rural-urban gap of up to 5-fold is found among the elderly and among young women aged 25–34 years (10, 36). Since traditional values and practices (e.g., dominance of the extended family system, filial piety) are most entrenched in rural areas, rapid social changes in China may be taking a heavier toll there (39).

Risk and protective factors for suicide

Individual-level risk/protective factors from psychological autopsy studies. Researchers in several Asian countries have conducted psychological autopsy studies to elucidate risk factors for suicide (Table 2). The identified risk factors, such as mental disorders, substance/alcohol misuse, prior history of suicide attempt, and an acute life event, are very similar to research findings in Western countries. However, the reported prevalence of depression or other psychiatric diagnoses among suicides is lower than that in Western countries. For example, in a Chennai study (India), mood disorder was found in only 25% of the sample, although 88% of the cases had mental disorders (40). In a more recent psychological autopsy study conducted in rural south India, major depression was found in only 2% of suicide cases (41).

In China, Phillips et al. (42) reported that 40% of suicides suffered from depression and that the overall rate of mental disorders in suicide completers is 63%. The prevalence of mental disorders is reportedly even lower among young rural Chinese suicide victims, at less than 50% (43, 44). In Hong Kong, depression was found in 51% and 53% of middle-aged and old adult suicides, respectively (45, 46). However, a psychological autopsy study in eastern Taiwan consisting of mainly rural and indigenous people found the rate of depression in suicide victims to be 87%, comparable to results of many Western studies (47). A recent study from Bali, Indonesia, also found a high prevalence of mental disorders (80%) among suicides (48).

The frequency of any mental disorder among suicides in Asian countries derived from psychological autopsy studies ranges from 37% to 97%–100% (Table 2). The prevalence of mood disorders and of alcohol-related disorders is in the range of 2%–87.1% and 2.9%–56.7%, respectively. Several factors may contribute to the variations. First, the distribution of mental disorders differs among different cultures and countries in Asia. Second, diagnostic tools used to elicit mental disorders may vary across different studies. Third, methods of interviewing (e.g., personnel training, interview structure) may lead to both underdiagnosis and overdiagnosis of mental disorders (49).

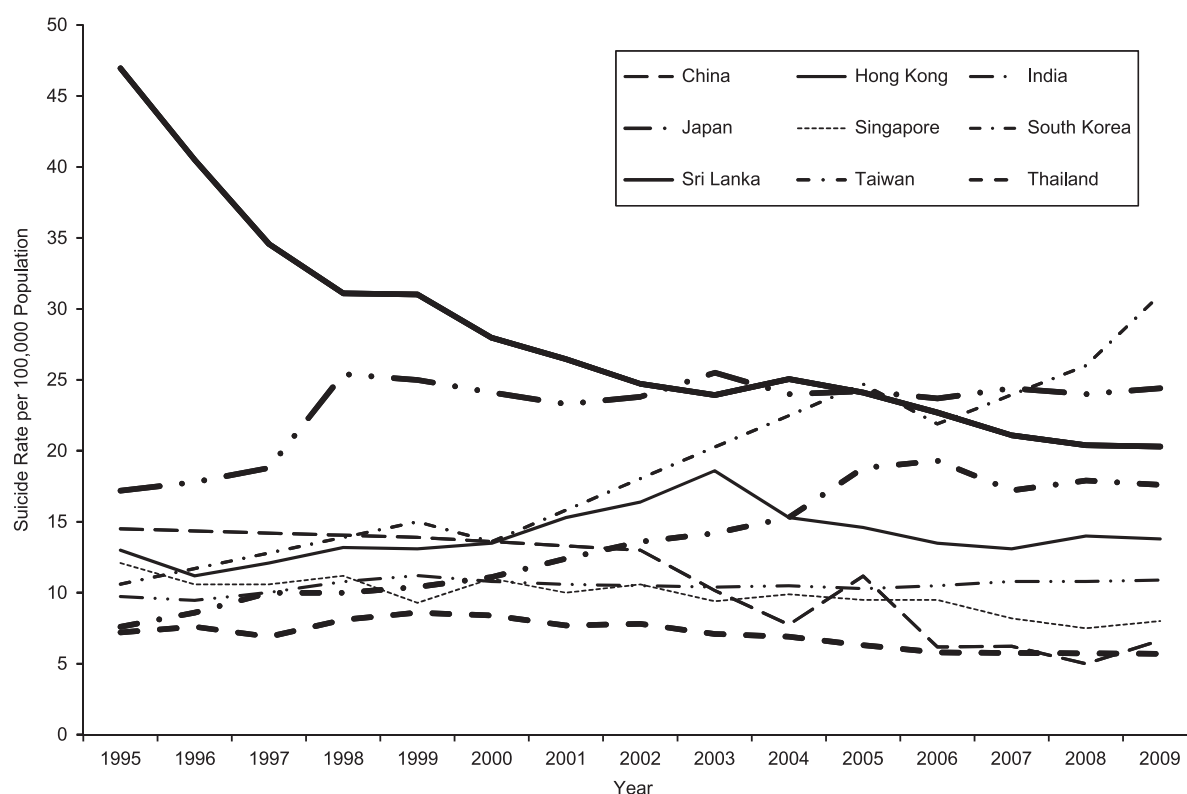


Figure 2. Suicide rates (per 100,000) for males and females in 9 selected countries/regions of Asia, 1995–2009.

Acute life stresses such as job loss, gambling, and work-related factors are important precipitants of suicide among Asian men (42, 50, 51), whereas family conflicts are a key risk factor for Asian women (42, 52). Financial problems are more commonly found among suicides in Asia than in the West (53). A study of the unemployed in Hong Kong identified social support and hope as 2 important protective factors (54, 55). The role of acute life stresses seems to be more significant in Asia than in the West, particularly for those who do not have diagnosed psychiatric disorders. Yang et al. (56) examined the interrelationships among urban/rural residents, gender, methods of suicide, and acute life stress in China. They found that, of all sex/age groups, young rural women who died from suicide had the highest rate of pesticide ingestion, lowest rate of mental illness, and highest rate of acute events prior to suicide.

Physical environment and sociocultural conditions associated with risk/protective factors. Physical environment: availability of suicide methods. International variations in the distribution of methods of suicide generally reflect the availability of methods used (57). In Asian countries with large rural populations, such as China, India, and Sri Lanka, pesticide poisoning is the most common method (10, 58–60). Pesticide poisoning is also a common suicide method in rural areas of several well-developed Asian countries such as South Korea and Taiwan (61–63). In South Korea, the incidence of suicide from pesticide poisoning has continued to rise in the

last decade, and this method is currently the second most common in that country (29, 64).

Although pesticide poisoning is a common problem in rural areas of Asia, the dramatic increase in charcoal-burning suicide (carbon monoxide poisoning by burning charcoal in a closed space) in urban Taiwan and Hong Kong is worth noting (65). After widespread media publicity (print media and the Internet), it has emerged as one of the leading methods of suicide in these 2 places (65, 66). Furthermore, the method has spread to other Asian countries such as Japan, where it now accounts for 8% of all suicides (67).

In addition to charcoal burning, recent media reporting of suicide by hydrogen sulfide poisoning (mixing a bath additive and toilet detergent to produce hydrogen sulfide gas) claimed 208 lives in less than 3 months in Japan in 2008 (68). The toxic gas threatened the rescuers and neighbors as well and has become a significant method of suicide.

Jumping from a height is the most common method of suicide in Hong Kong and Singapore, where more than 90% of residents live in high-rise buildings. It is also a common method in other populated Asian cities such as Taipei (21, 69, 70). The method is particularly common among older citizens because it is easily accessible, assuredly lethal, and technically simple for physically fragile older adults residing in tall buildings (21, 70, 71). Moreover, jumping from residential buildings is also commonly adopted by youths whose suicides are impulsive (21, 72). However, there are still

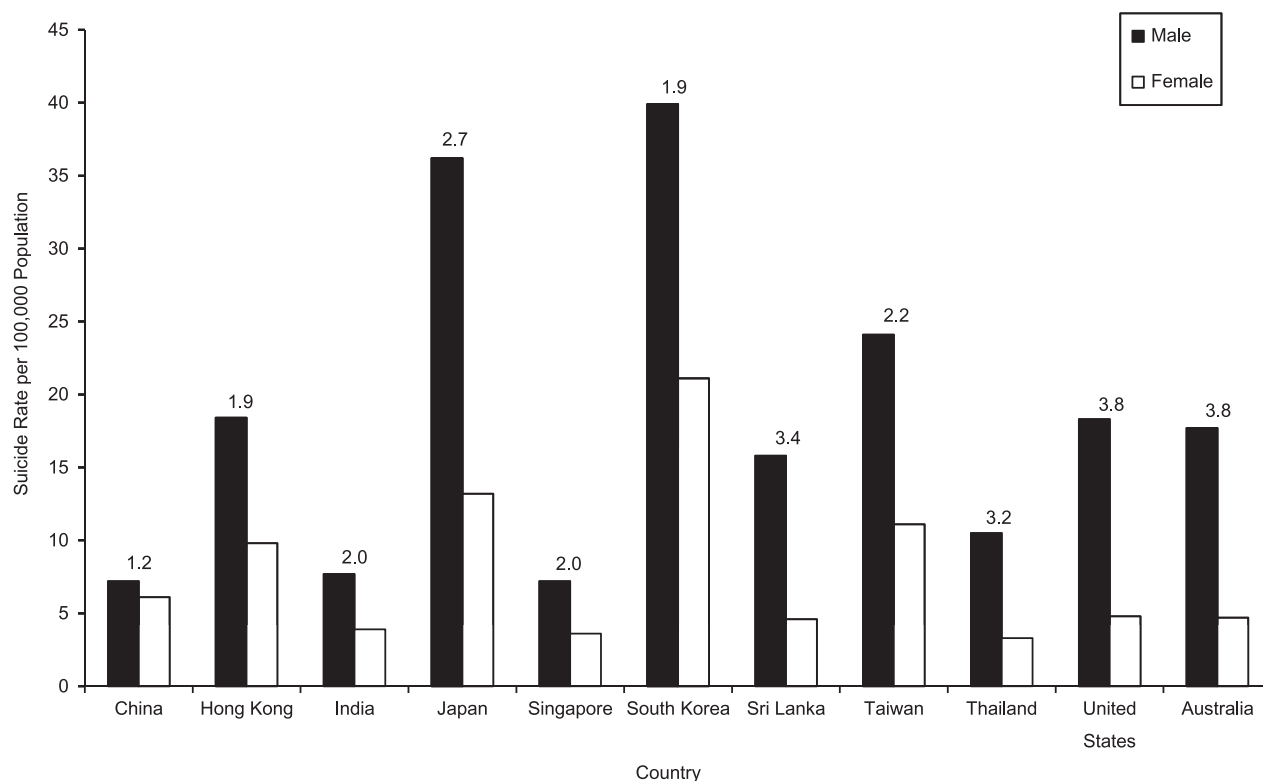


Figure 3. Gender-specific suicide rates and male-to-female suicide gender ratio in 9 selected Asian countries and 2 comparative Western countries (Australia and the United States), 2009.

differences in the proportion of those using jumping as a suicide method (80% vs. 50%) in Singapore and Hong Kong despite similarities in the percentage of high-rise buildings in these 2 areas. Other factors, including competition from other methods perceived as more appealing in Hong Kong (e.g., charcoal-burning suicide), may cause the observed differences (73). The factors availability and acceptability are indeed a major concern in the choice of a suicide method.

Suicide by hanging is the most common method of suicide in many Asian countries, such as Japan, Korea, and Taiwan. In fact, hanging is also the most common method in many Western countries (57, 74).

Sociocultural conditions. Asian countries have traditionally been characterized by the dominance of the extended family system, and individual interests are generally secondary to those of kinship or family (75). The fact that being married is not necessarily a protective factor for female suicide may be partially explained by the characteristics of family relationships in Asia, where young married women are situated in the lowest rank (52, 76). In India, it is estimated that 98.7% of suicides of women involved dowry disputes (60). When dowry expectations are not met, the young brides may be harassed and abused, and many die from self-immolation (60). The marked rise of familicide-suicide perpetrated by a male household head when facing job loss in some Asian countries is also an expression of the family-centered culture (77). The number of familicide-suicides has increased considerably in

the last decade because of the widespread use of charcoal-burning suicide, which makes a suicide pact easier to carry out (77).

At the individual level, unemployment or job-related stress is a more common precipitant of suicide among Asian men compared with their Western counterparts (42, 50). Similarly, at the contextual level, societal economic situations seem to have greater impact in Asia. For example, a recent meta-analysis of the association between suicide and socioeconomic characteristics of geographic areas showed that studies from Asian countries, compared with research from the West, were more likely to have found a significant impact from adverse socioeconomic conditions on increased suicide rates (78).

Suicide is culturally sanctioned in some circumstances in Asia. Examples include the Hara-kiri (belly cutting), an honorable and altruistic suicide practiced in Japan (79), and the “Suttee,” a socially acceptable form of self-immolation by widows in India (34).

The role of religion and suicide in Asia is more complex. Islam provides clear rulings about suicide and alcohol (an important risk factor for suicide). Thus, Muslim countries generally have lower suicide rates. Malays in Singapore also have a lower suicide rate than the rates of other ethnic groups such as Indians and Chinese (4). Countries that have a stronger religious identity tend to have lower suicide rates, such as the practice of Buddhism in Thailand (5.7 per 100,000) and Catholicism in the Philippines (5.0 per 100,000). The protective

effect of religion against suicide may be mediated by the degree to which a given religion sanctions, or prohibits, suicide (4).

However, the protective effect of other religions is not clear in Asia. For example, one study from China indicated that religious affiliation predicted a higher suicide risk (52). In fact, religious practice in many Chinese communities involves a mixture of Buddhism and local religions, and the myth of incarnation may inadvertently sanction suicide as an acceptable solution.

Suicide intervention programs

Since suicide is a relatively underresearched area in Asia, evidence on the effectiveness of prevention programs is limited. Nevertheless, in many Asian countries, both government and nongovernment organizations have been conducting different types of suicide prevention initiatives. Even though many of these programs may lack adequate evidence about their effectiveness and efficacy, they reflect culturally specific and locally applicable experiences.

These implementation initiatives generally adopt the prevention framework defined by Silverman et al. (80, 81) that categorizes suicide prevention interventions into 3 levels—universal, selective, or indicated—based on how their target groups are defined. Universal interventions target whole populations, with the aim of shifting risk factors across the entire population. Selective interventions target subgroups that have not yet manifested suicidal behaviors but exhibit risk factors that may predispose them (e.g., depression). Indicated interventions are designed for people already beginning to show suicidal thoughts or behaviors.

A list of intervention programs implemented in Asia is shown in Web Table 1 (posted on the *Epidemiologic Reviews* Web site (www.epirev.oxfordjournals.org)). It is evident that these programs are mainly from a limited number of countries, where there is greater readiness to implement preventive measures and, probably, with more available resources to allow for interventions. Many developing countries in Asia lack coordinated national suicide prevention plans. Mental health providers in these areas are severely underresourced (5, 82), and there is a heavy reliance on nongovernment organizations to provide suicide prevention services. Such services typically take the form of crisis centers or hotline services, usually staffed by volunteers. Most of these interventions/services are not included in Web Table 1 because of a lack of published information about the evaluation of their outcomes in relation to suicide.

Of the 26 studies listed in Web Table 1, 6 programs focused on restriction of suicide means (83–88) and 13 on psychosocial education (89–94). Most programs ($n = 25$) did not need regular input from health care professionals, and the estimated cost was at the low or low/medium level. In total, 6 of them were effective and 17 were promising in terms of reducing suicide-related outcomes.

However, 3 caveats are worthy of caution. First, 6 studies evaluated intermediate outcomes (e.g., whether media reporting guidelines were followed, whether knowledge of suicide improved, level of acceptance/use of lockable pesticide storage boxes) (87, 88, 95–99), and no solid evidence

linked these outcome measures to the change in suicide rates. Second, not all interventions were equally beneficial to all age and sex subgroups. For example, in Japan, the intervention significantly reduced suicide rates for elderly females, whereas suicide rates for elderly men did not change prominently after the intervention (91–94). Third, maintaining the intervention effect is challenging; for instance, for the qigong intervention, the rate of depression returned to preintervention levels as the practice discontinued (96, 100).

A centrally coordinated government suicide prevention effort is currently lacking in most countries in Asia except in Taiwan, South Korea, and Japan (5, 89, 101, 102). In these 3 countries, the governments have provided support to implement nationwide suicide prevention programs for the entire community. The models of prevention in these 3 countries, similar to those in many Western countries, cover multilevel preventive efforts including universal, selective, and indicative prevention strategies (5). In some populous countries (e.g., China, India, Indonesia), the demand for prevention efforts is high, but resources are limited and available programs are scarce. With a more detailed cost-effectiveness analysis, government and nongovernment organizations would be able to allocate resources more efficiently for different suicide prevention programs.

DISCUSSION

In view of the diversity and heterogeneity of epidemiologic patterns and risk or protective factors for suicide in the Asian countries studied, suicide prevention programs should be closely examined to determine whether they are directly relevant to local situations. Given the limited resources provided, understanding and implementing suicide prevention programs are extremely challenging and rewarding in terms of making a considerable impact on preventing a large number of suicides. On the basis of observations about epidemiologic characteristics, risk and protective factors, and some intervention programs in Asia, a list of priority areas that are important in helping to clarify and guide evidence-based suicide prevention programs catering to local needs is proposed.

Unique epidemiologic and socioeconomic characteristics of suicides

Several Asian countries such as Hong Kong, Korea, Japan, Taiwan, and Thailand experienced an increase in suicide rates during and after the Asian economic crisis of 1997 (28, 103). However, the impact on suicide rates from the economic recovery beginning in 2004 has been mixed. Suicide rates improved after the economic recovery in Hong Kong and Thailand (31, 103) but remained high in Japan, Taiwan, and South Korea (29, 64, 104). In other words, the economic slump is generally associated with an increase in suicide rates in Asia, but economic recovery is neither a necessary nor sufficient condition for suicide rates to improve (103).

The highest suicide rates for middle-aged men in Japan may reflect the neo-liberal restructuring of the corporate sectors. In the name of “labor flexibility,” the once-lifetime employment guarantee has been destroyed. Job insecurity and lack of social protection for the economically active group are

Table 2. Psychological Autopsy Studies Conducted in Asian Countries/Regions

First Author, Year (Reference No.)	Country/ Region	Sample Size ^a	Sample	Study Design	Risk Factors
Phillips, 2002 (42)	China	Case: 519; control (injury deaths): 536	All age/sex groups	Case-control	Depression, previous suicide attempt, acute and chronic stress, low quality of life, interpersonal conflict, suicidal behavior in family or friends
Zhang, 2004 (151)	China	Case: 66; control: 66	All age/sex groups in rural areas	Case-control	Mental disorders, acute life stress, poor physical health, low social status, poor social support, family disputes, religious belief
Conner, 2005 (126)	China	505 suicides	Age >18 years	Case series	Women and younger individuals, acute stress, pesticides stored at home
Yang, 2005 (56)	China	895 suicides	All age/sex groups	Case series	Availability of pesticide, high lethality of pesticide and limited availability, acute life stress (particularly for young, rural women)
Li, 2008 (43)	China	Case: 114; control (unintentional injury deaths): 91	Ages 15–24 years	Case-control	Life events, depressive symptoms, low quality of life, acute stress, mental illness, prior suicide attempt
Zhang, 2009 (152)	China	105 suicides	Ages 15–34 years in rural areas	Case series	Depression, mental disorders, psychological strain, negative life events
Kasckow, 2010 (153)	China	Case: 74; control (unintentional injury deaths): 24	Schizophrenics	Case-control	Depression, prior history of suicide attempt
Tong, 2010 (154)	China	Case: 895; control (injury deaths): 701	All age/sex groups	Case-control	Mood disorder, anxiety disorder, psychotic disorder, substance use disorder
Zhang, 2010 (52)	China	Case: 392; control: 416	Ages 15–34 years in rural areas	Case-control	Mental disorder, females, married, religious affiliation, impulsiveness, psychological strain
Zhang, 2010 (44)	China	Case: 392; control: 416	Ages 15–34 years in rural areas	Case-control	Mental disorder, low educational level, not married, low social support, life event
Chiu, 2004 (46)	Hong Kong	Case: 70; control: 100	Aged ≥60 years	Case-control	Major depression, mental disorder, medical problems, history of past attempts
Chen, 2006 (155)	Hong Kong	Case: 150; control: 150	All age/sex groups	Case-control	Unemployment, indebtedness, single, poor social support, psychiatric illness, history of past attempts
Chan, 2007 (55)	Hong Kong	Case: 76; control (unemployed): 15	Unemployed	Case-control	Male, psychiatric illness, previous suicide attempt, poor social problem-solving skills
Wong, 2008 (45)	Hong Kong	Case: 85; controls: 85	Ages 30–49 years	Case-control	Psychiatric disorder, indebtedness, unemployment, never married, living alone
Chan, 2009 (156)	Hong Kong	Case (charcoal burning): 53; control (other suicides): 97	Charcoal-burning suicide vs. suicide by other methods	Case-control	Lower prevalence of schizophrenic spectrum disorder in charcoal-burning group
Wong, 2010 (51)	Hong Kong	Case (gamblers): 150; control (suicide without gambling behaviors): 150	Ages 15–59 years, gamblers vs. suicides without gambling behaviors	Case-control	Higher rates of psychiatric disorder, major depressive disorder, substance-use disorders, lower rate of psychiatric treatment seeking by gamblers
Vijayakumar, 1999 (40)	India	Case: 100; control: 100	All age/sex groups	Case-control	Psychiatric disorder, family history of psychopathology, life event
Gururaj, 2004 (76)	India	Case: 269; control: 269	All age/sex groups	Case-control	Previous suicide attempt, interpersonal conflicts, marital disharmony, alcoholism, mental illness, sudden economic bankruptcy, domestic violence, unemployment
Chavan, 2008 (157)	India	101 suicides	All age/sex groups	Case series	Young males, migrant, psychosocial stressors, psychiatric illness
Manoranjitham, 2010 (41)	India	Case: 100; control: 100	All age/sex groups	Case-control	Psychiatric disorder, stress, chronic pain, living alone, relationship breakup

Kurihara, 2009 (48)	Indonesia (Bali)	Case: 60; control: 120	All age/sex groups	Case-control	Mental disorders, low religious involvement, interpersonal problems
Apter, 1993 (158)	Israel	43 suicides	Young males aged 18–21 years	Case series	Major depressive disorder; narcissistic and/or schizoid traits
Arieli, 1996 (159)	Israel	44 suicides	Ethiopian Jews	Case series	Male, married, depressed, psychiatric admissions, dissatisfied with their occupation
Amagasa, 2005 (50)	Japan	22 suicides	Case series of work-related suicide	Case series	Male, problems with promotion or transfer, low social support, high psychological demand, low decision latitude and long working hours, depression, somatic complaints
Khan, 2008 (160)	Pakistan	Case: 100; control: 100	All age/sex groups	Case-control	Psychiatric disorders (especially depression), being married, unemployment, negative and stressful life events
Abeyasinghe, 2008 (161)	Sri Lanka	372 suicides	All age/sex groups in 3 rural districts	Case series	Previous suicidal gestures, being depressed, male with alcohol dependence, family history of suicide, accessibility to pesticides
Samaraweera, 2008 (162)	Sri Lanka	31 suicides	All age/sex groups among Sinhalese	Case series	Male, alcohol abuse, domestic violence
Cheng, 1995 (47)	Taiwan	Case: 113; control: 226	Two aborigines (Atayal and Ami) and Han Chinese in rural Taiwan	Case-control	Depression, substance abuse, previous suicide attempt, family history of suicide and depression
Cheng, 2000 (163)	Taiwan	Case: 113; control: 226	Two aborigines (Atayal and Ami) and Han Chinese in rural Taiwan	Case-control	Loss event, suicidal behavior in first-degree relatives, major depressive episode, emotionally unstable personality disorder, substance dependence
Lee, 2002 (164)	Taiwan	Case: 60; control: 120	Two native Taiwanese groups (Atayal and Ami)	Case-control	Low social assimilation in Atayal group and in men
Liu, 2011 (165)	Taiwan	Case: 113; control: 226	Two aborigines (Atayal and Ami) and Han Chinese	Case-control	Higher rates of substance dependence, emotionally unstable personality disorder, family history of suicidal behaviors, pesticide poisoning in Atayal group
Altindag, 2005 (166)	Turkey	Case: 26; control (other causes of deaths): 25	Females	Case-control	Young females, health problems, family disruption, negative social status

^a Unless otherwise specified, case indicates suicide cases, control indicates living controls.

related to the high level of suicides among middle-aged men in Japan (29). In fact, all of the changing corporate environments are occurring in several other developed Asian countries such as Korea, Hong Kong, and Taiwan, where there has also been a marked upsurge in suicides among middle-aged men in the past decade (28). Not only the pain induced by being unemployed but also the fear of losing one's job have induced tremendous stress in those still employed. Communities are facing excessive anxiety and stress brought about by a rapidly changing society, which might lead to an increase in suicide rates.

In South Korea, a steep increase in suicide rates is observed not only in the middle-aged group but also in older adults, where a 300% increase among adults older than age 64 years in the past 20 years is even more striking. Suicide rates in South Korea surpassed those in Japan after 2000, mainly because of this steep increase among the elderly (29). Unpreparedness for population aging and rapid breakdown of the traditional extended family system in South Korea have been proposed as possible explanations for the upsurge in suicides among older adults (29, 64). Globalization and the cultural transition have resulted in disrupted traditional values and norms the elderly hold dear (21, 64).

Although Japan similarly faces the issue of population aging, its relatively well-developed welfare program for the elderly may have protected them and prevented an upsurge in suicides (105, 106). However, the growing number of never-married persons and couples without children entering old age in the community has become a major concern in meeting the physical and mental needs of the elderly without the support of their children (107).

Suicide rates in China have been halved in the past decade; the downward trend seems to parallel the process of urbanization and economic development (108–110). The decline is most prominent among young, rural women. It is hypothesized that the migration of young, rural women to urban cities has successfully helped them avoid 3 main risk factors for suicide: their subordinate position in the family, family disputes, and access to pesticides (111). It is anticipated that the proportion of people living in the urban areas will continue to increase and reach 50% in 2012 and 70% in 2030. Hence, if the rural and urban suicide patterns prevail, it is likely that the overall suicide rate in China will be reduced further in the near future. Of course, these predictions must be considered in light of the limitations of the quality of suicide data in China (4), wherein underreporting might be caused by sampling counts at surveillance regions (10, 11), and the criteria used to ascertain suicide may also affect suicide rates.

Similarly experiencing a dramatic decline in suicide rates, Sri Lanka has promulgated a series of legislative measures that systematically banned the most highly toxic pesticides (58), which may be a factor in the reduction in suicides. Setting up barriers for lethal methods helps reduce suicides, especially regarding impulsive ones that are prevalent in Asia. In interpreting the results, we also need to bear in mind the potential data quality problem (4).

A more systematic and organized effort to address suicide and its prevention should be initiated and evaluated. On the basis of the current review, there is a likely and considerable underestimation of the overall suicide burden in Asia.

For example, in India, it is estimated that the true figure may be up to 9 times higher than the official suicide figures reported (8). In Islamic countries, religious sanction against suicide may contribute to not only low incidence of suicide but also its underreporting (112). A good surveillance system to assess the scale and extent of the suicide problem will provide better information to guide policy and lead the development of effective suicide prevention programs.

Risk and protective factors for suicide

The current review reveals that the profiles of risk and protective factors in Asia differ somewhat from those in Western countries. Risk factors that appear to be universal include mental disorders, alcohol-related disorders, and previous history of suicide attempt. In Western countries, about 90%–95% of suicide victims had mental illness (113). According to current psychological autopsy studies in Asia (Table 2), the highest frequencies of mental disorders among suicides came from studies in Taiwan (97%–100%) and Pakistan (96%). The lowest frequencies are those in China (45%–76%) and India (33.6%–88%). For the rest of the countries and regions, the values are in the range of 59%–85.7%.

Since more than half of the world's suicide cases are concentrated in China and India (114), and bearing in mind the limitations of psychological autopsy studies (49), we could reasonably infer that mental disorders reportedly have a much lower prevalence among suicide victims in Asia. Some factors are more specific to the region, such as the role of family disputes in female suicides and the impact of changing corporate practice on suicide of middle-aged men. These specific risk factors, coupled with available or culturally favorable suicide methods (often very lethal) in the region, may create very different suicide patterns than those in the West.

In many well-developed Asian countries, mental health care systems are more ready to provide services for groups at high risk of suicide. Treatment of depression and establishment of a case management program for suicide attempters are available. However, in these better resourced Asian countries, help-seeking barriers may arise from the social stigma still attached to mental illness (115, 116). Although stigmatization of mental disorders may be similarly prevalent in the West, the discrimination in the family-oriented Asian culture can be more severe because the stigma of mental illness influences the entire family (117). In developing Asian countries, the problem of access to mental health care not only arises from such stigmatization but also is severely affected by poor mental health provisions. In these countries, mental health care has not become a high health care priority, and the respective resources are scarce (118).

Because of poorly equipped emergency services in local hospitals in developing countries and the very lethal pesticides readily available, case fatality rates from any pesticide poisoning are very high (119, 120). Many suicide-attempt cases die before reaching the hospital. Even in well-resourced areas in Asia, because of the reluctance to seek psychiatric help, together with the high case fatality associated with common methods of suicide (e.g., jumping from buildings, charcoal burning), utilization of mental health care before suicide remains relatively low (121). These factors imply that more

community-based suicide intervention strategies should be more feasible and relevant in Asia (122).

Family dispute is a crucial precipitating factor for suicide among women in many Asian countries. Their low social status has been suggested as a potential link to the high suicide rates for Asian women involved in abusive family relationships (123, 124). In India and Sri Lanka, where arranged marriages remain prevalent, women marry at a very young age and are usually pressured to stay in the marriage despite abusive relationships (34). In China, the pressure to bear sons under the “one-child policy” and the relatively permissive cultural attitudes toward suicide may also explain the higher rates for young women (10, 123, 125). The easy access to highly lethal pesticides in rural areas in developing Asian countries is believed to result in “impulsive” and “low-planned” suicides among young women without preexisting mental disorders (10, 126).

Nonetheless, there should be caution against interpreting suicides among young women as simply “impulsive” and “reckless” decisions. In the traditional Confucian family system, the subordinate position of young women provides very little opportunities for self-expression (75). Thus, their suicide planning may be internal. Informant-based psychological autopsy studies are unlikely to capture the repressed frustrations.

Work or unemployment-related stresses are common precipitating factors for suicide among Asian men. The Confucian notion of hierarchy and familial relationships usually extends to enterprise as well (127–129). Rising unemployment rates during economic recessions in countries adopting Confucian values represent not only stress induced by economic crisis but also disruption of social orders and trust, resulting in a much steeper increase in suicide after economic downturns in Asia (28).

Findings regarding the protective role of religion in suicide are mixed in Asia, where a variety of religions are practiced. It is well known that suicide rates in Islamic countries are generally low because the Koran strictly prohibits suicide. In fact, all religions are against suicide. The promise of having a better next life by committing suicide to leave the present world and enter another one is a myth rather than reality. In view of its relatively low cost and possible high impact, support from religious groups and leaders can benefit suicide prevention in Asia.

Enhancing the quality of epidemiologic research on suicide in Asia is timely and warranted in order to provide evidence to understand the biomedical, socioeconomic, and psychological risks of and protective factors for suicide. It is also extremely important to assess how suicide deaths and suicide attempts are being accounted for in the disease burden to the community and their impact on affected families and friends (130). The economic cost of suicide in Hong Kong and Taiwan is estimated to be approximately US\$200 million and US\$1 billion, respectively (16, 17). However, relatively few resources are being allocated to combat the rise in suicide.

Plausible suicide intervention strategies

On the basis of the current review of epidemiologic characteristics and risk/protective factors for suicide in Asia, social support is a protective factor for preventing suicidal behavior.

Strong family and community ties in Asia can be used to design appropriate community-based suicide intervention programs. Efforts of community-based stakeholders should be organized, recognized, and properly acknowledged so they will make their resources available in the communities to contribute to suicide prevention. Some proposed intervention strategies follow.

Develop community-based suicide prevention programs. The aim is to use community resources to enhance the connectivity of individuals in the community. Some programs have shown encouraging results by connecting the service provider to needy individuals (Web Table 1), such as the Eastern District Project on Prevention of Deliberate Self-Harm in Hong Kong (131) and community-based suicide prevention programs conducted in Japan (89, 101). These are all broad-based community programs that aim to empower the community as a whole. Other successful examples of community-based suicide prevention programs can also be found outside Asia (132).

Restrict access to lethal means. Restricting access to lethal means has been shown to be one of the most effective ways of preventing suicides (133). A number of interventions such as enacting gun control (134, 135), erecting barriers to prevent suicide by jumping (69, 136), placing restrictions on pesticides (58), repackaging paracetamol and salicylates (137), restricting sales of charcoal in the supermarket (83), and installing railway-platform screen doors are good examples (84). More effort to restrict lethal means should be made by the community. The rationale is to develop ways of limiting access to these means to delay any impulsive self-harm behaviors of vulnerable individuals (138). While achieving a balance between saving lives and the inconvenience of restrictions is challenging, a certain level of inconvenience is justifiable and acceptable when many valuable lives can be saved.

Studies from the West indicate that fencing potential jumping sites (mostly bridges) is an effective strategy to reduce suicide by jumping (136, 139). However, restricting access to potential jumping sites is particularly challenging in Asia, since most of the incidents occur at home (69, 70). Potential preventive measures include raising awareness among family members who share their homes with vulnerable individuals, monitoring entry to the tops of buildings, placing higher railings along balconies, raising awareness of building security guards, and enhancing building codes that incorporate safety measures into new buildings.

Although hanging is a common method of suicide in many Asian countries, prevention through method restriction is not possible for this highly lethal method; ligatures and ligature points are widely available (140). However, most hangings occur at home, and enhancing family awareness of suicide risk for vulnerable members is important. Method restriction to prevent hanging in a controlled environment such as jails or psychiatric institutions should also receive sufficient priority when implementing certain measures. For instance, monitoring and surveillance cameras make hanging in jail cells difficult, if not impossible.

Improve media portrayal of suicide. Media portrayal of suicide has been associated with copycat suicides, especially if the reported suicide is glorified or sensationalized or if the method is explicitly described (141–144). In addition,

media can be a source of misinformation about suicide, often simplistically giving the impression that it is caused predominantly by immediate stressors rather than being linked to mental illness and/or substance use/misuse (144). In addition, media can help enhance mental health literacy in the community. It is important to make use of available media channels (relatively less expensive) to educate high-risk groups, their gatekeepers, and the public to enhance mental health literacy, encourage help-seeking behaviors, and convey the message that suicide is preventable and mental illness treatable (145). Such public awareness programs can be developed through collaboration with local media professionals. The World Health Organization has developed guidelines to encourage responsible reporting of suicide (146). Many European countries, the United States, and some Asian countries have also developed guidelines (147).

It is well recognized that media glamorizing charcoal burning as a painless, peaceful, and effective suicide method is a crucial contributing factor to the rapid adoption of the method in Taiwan and Hong Kong (65, 103, 148, 149). In addition to charcoal burning, the chain reaction of the hydrogen sulfide suicide fad in Japan has prompted the national police agency in Japan to instruct Internet providers to shut down a number of Web sites that provided suicide information (150). In developed Asian countries, engaging media and regulating media that glamorize new suicide methods is an imperative task.

Incorporate the component of evaluation into every suicide prevention program. Most suicide prevention programs in Asia have not been rigorously evaluated using sound methodologies and controls. There are strong indications for developing detailed criteria and guidelines for evaluating the effectiveness of both innovative and existing programs to ensure that suicide prevention works. An evaluation framework can provide quality assurance and ensure and monitor proper implementation. Moreover, the framework needs to provide detailed instructions on how stated outcomes can be achieved. These factors are important in identifying the most cost-effective strategies.

Conclusions

The epidemiologic characteristics and recent trends in suicide in Asia reflect specific sociocultural situations and economic transitions in the region. Some changes create social stress and may increase suicide rates, whereas others help reduce suicide risk factors. Nonetheless, research in Asia is still limited and sporadic. Without sound research evidence, a comprehensive and updated list of risk and protective suicide factors that can help identify the target groups will still be missing, and cost-effective interventions will not be possible. Moreover, suicide is a complex and multifaceted problem that often involves several interdisciplinary efforts for prevention.

In view of large population sizes with limited available resources, a public health approach that emphasizes community-based intervention strategies is viable and practical. The Asian suicide profiles clearly speak of the need to design more culturally sensitive interventions. Simply applying Western-based suicide prevention schemes without considering the specific Asian socioeconomic-cultural context will certainly fail in

providing relevant remedies. There are many challenges ahead and ample opportunities to make suicide prevention work and work well in Asia.

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APPENDIX

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