Suicide Prevention Through Restricting Access to Suicide Means and Hotspots

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Suicide Prevention Through Restricting Access to Suicide Means and Hotspots

Ying-Yeh Chen, Kevin Chien-Chang Wu, Yun Wang, and Paul S. F. Yip

Introduction

In this review, the terms *suicide* and *suicide deaths* refer to self-harm behaviors that have resulted in fatal consequences, and *suicide attempts* refers to self-harm behaviors (irrespective of apparent motive) that did not lead to death. Suicide is a complex phenomenon arising from the interplay of multiple factors such as psychiatric disorders, psychological characteristics, life events, and genetic/biological factors, to name a few. When someone feels hopeless and suicidal, access to specific methods of suicide is a vital issue; it serves as a crucial element in determining the likelihood of suicidal thoughts being translated into a suicide attempt or death (Hawton, 2007). In this chapter, we first review the concept of cognitive availability, namely, the awareness of certain methods of suicide, particularly technical information about novel suicide means that may be acquired through media reporting. We then illustrate the characteristics of individuals adopting different methods of suicide and explore the existing evidence on the effectiveness of prevention practices that restrict access to the means and sites of suicide. Our chapter complements that of Azrael and Miller (Chapter 36), which provides additional insights into restricting access to means.

Rationale and Evidence

Restricting access to suicide means and popular suicide locations is an important element of suicide prevention strategies in many countries (Chen, Chen, Chang, Wong, & Yip, 2015; Lee & Liao, 2006; The Hong Kong Jockey Club Centre for Suicide Research and Prevention, 2005; United Nations, 1996; US Department of Health and Human Services, 2001). Such activities reflect burgeoning evidence showing that restricting access to a wide variety of methods and sites of suicide is an effective and relatively simple approach to suicide prevention (Beautrais, 2007b).

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Several recent large-scale meta-analyses have demonstrated that method restriction is one of the few effective suicide prevention strategies (Mann et al., 2005; Pirkis et al., 2015; Yip, Caine, Yousuf, et al., 2012).

There are four key factors underpinning the effectiveness of these strategies. First, a suicide crisis is often short-lived, with impulsiveness and ambivalence believed to be common features of the suicidal process (Daigle, 2005). The impulsive nature of many suicides implies that these individuals tend to use the method most easily accessible to them, and if a dangerous method is not available at the time of the crisis, we may be able to "buy" some time so that (in some cases at least), a third party can intervene or suicidal impulses will pass spontaneously (Gunnell, 2005). Second, making a lethal method less available can potentially reduce suicide rates because using alternative and less lethal methods are less likely to result in death. In fact, historically, the most dramatic reductions in suicide rates have reflected changes in lethality of method rather than a reduction in attempts. Third, most survivors (>90%) of nonfatal attempts do not go on to die by suicide (Carroll, Metcalfe, & Gunnell, 2014), indicating that suicidal ideas/thoughts are usually short-lived. Lastly, not all methods are equally favored; individuals may have a particular preference for a certain method or may favor a particular place for their suicide (De Moore & Robertson, 1999). For individuals with specific preferences, the probability of turning to an alternative or less appealing method is less likely when the preferred suicide means/spots are restricted (Clarke & Lester, 1989).

Cognitive Availability

On the basis of a review of psychological models of suicide, Florentine and Crane (2010) indicated that "cognitive availability," namely, how accessible something is in one's mind, could be an important factor influencing the choice of suicide method. Hence, other than restricting the physical availability of suicide means and hotspots, it is important to regulate sensational reports of suicide in the mass media to prevent copycat suicides. In particular, it is important to discourage detailed reporting of the means used and/or references to identifiable suicide hotspots (i.e., restricting cognitive availability). For example, working with media to curtail the reporting of suicides in the subways of Vienna in Austria led to a marked reduction in suicides at these locations (Etzersdorfer & Sonneck, 1998). Similarly, studies have shown that when fencing has been erected to reduce access to popular jumping sites, the consequent reduction in media reporting helped to "demystify" the site and hence further decreased suicidal jumps in the surrounding areas (Bennewith, Nowers, & Gunnell, 2007; Chen, Gunnell, & Lu, 2009; Reisch & Michel, 2005). The most dramatic example of the relationship between cognitive availability and suicide is the case of charcoal burning in Hong Kong and Taiwan. Extensive media reporting of this novel method of suicide contributed to its dramatic rise in these regions. By contrast, although charcoal is readily available in Western countries, charcoal-burning suicide is still very rare as it is not culturally associated with suicide.

Alongside the development of information technologies, new forms of media have evolved immensely in the past decade; the growth of the Internet allows for more rapid, interactive, and accessible information exchange. Indeed, the cognitive availability of a novel method of suicide can permeate beyond national boundaries with

ease via the Internet. Sadly, it is not difficult to obtain detailed technical information about suicide methods on the Internet (Biddle, Donovan, Hawton, Kapur, & Gunnell, 2008); this is particularly concerning as searching online for information related to suicide methods is common among users who are suicidal (Harris, McLean, & Sheffield, 2009). In short, preventive actions that endeavor to curtail the dissemination of information about suicide methods via different media channels are crucial to restrict the "cognitive availability" of the means of suicide (especially novel means; Chen, Yip, Lee, Gunnell, & Wu, 2015).

Restricting Access to Suicidal Means and Hotspots in Suicide Prevention

Suicide by Poisoning

Medication Overdose Increased frequency of suicide by drug overdose was observed in the period between the 1950s and 1980s in several Western countries (Bille-Brahe & Jessen, 1994; De Leo, Conforti, & Carollo, 1997; Gunnell, Middleton, & Frankel, 2000; Hawkins, Edwards, & Dargan, 2007; Moens, Loysch, Honggokoesoemo, & van de Voorde, 1989; Whitlock, 1975). Agents commonly used for self-poisoning during this time period included barbiturates, dextropropoxyphene (an analgesic in the opioid category), and tricyclic antidepressants (Nordentoft, 2007). A declining trend in suicide by drug overdose occurred in the final decades of the twentieth century when safer medications were developed—and these were replaced with medications with lower case fatality rates, such as benzodiazepines for barbiturates and serotonergic agents for tricyclic antidepressants (McClure, 1987; Nordentoft, 2007). Numerous studies have shown that limited substitution effects occur when prescribing is reduced for the medicines with higher levels of lethality (Clarke & Lester, 1989; Ohberg, Lonnqvist, Sarna, Vuori, & Penttila, 1995; Schapira, Linsley, Linsley, Kelly, & Kay, 2001).

Medication overdose, however, is still a common method of suicide, particularly among women, in several Western countries, such as Canada, the Nordic countries, and the United Kingdom (Ajdacic-Gross et al., 2008). In the United Kingdom, self-poisoning with analgesics, especially paracetamol or co-proxamol (dextropropoxyphene in combination with paracetamol), has raised considerable concern. In the 1990s, the easy availability of these analgesics had been shown to make an important contribution to their use in overdoses, and this recognition led to a change in legislation to limit their availability (Gunnell et al., 1997; Hawton et al., 1995). Specifically, in 1998, legislation to restrict the pack sizes (and sales) of paracetamol was enacted in the United Kingdom; this change was associated with a small but favorable initial benefit as well as longer-term (3 years, 11 years) benefits on mortality and morbidity risks associated with paracetamol overdose in England and Wales (Hawton et al., 2013, 2004, 2001). It was also encouraging that only very limited evidence of substitution to other kinds of analgesic (e.g., ibuprofen, a relatively safer analgesic in overdose) was found (Hawton et al., 2004). Interestingly, though, no similar changes were evident in Scotland after the change in legislation (Bateman et al., 2006). After the 1990s (until the 2000s), there was a divergent suicide rate trend between England and Scotland, with a continuous rise in Scotland and a steady decrease in England (Mok et al., 2012, 2013). The lack of efficacy of paracetamol restriction in Scotland

may be related to many complicated underlying factors contributing to the constant rise of suicide rates in the region (such as alcohol use and mental health problems). In addition, the withdrawal of co-proxamol (a more toxic analgesic) from the U.K. market in 2005 has also reduced poisoning mortality (Hawton, Bergen, et al., 2009, 2012) and the incidence of nonfatal self-poisoning associated with this drug without significant increase in suicides by other analgesics (Hawton et al., 2011).

Overall then, there is reasonably encouraging evidence that legislative measures can reduce suicide deaths by analgesic overdose. Furthermore, a change of prescription practice, such as prescribing less toxic medication and smaller amounts of medication per visit, should be considered for psychotropic drugs in order to prevent suicide by overdose (Hawton, Saunders, & O'Connor, 2012).

Pesticide Poisoning Self-poisoning with pesticide is the most common method of suicide in many developing countries (Eddleston, 2000; Eddleston & Phillips, 2004; World Health Organization, 2006, 2012). The easy access to, and the high toxicity of, pesticides are thought to contribute to the high suicide rates in rural areas of several Asian countries with dominant agricultural economies (such as rural China and Sri Lanka; Chen, Wu, Yousuf, & Yip, 2012; Gunnell & Eddleston, 2003; Wu, Chen, & Yip, 2012). In Sri Lanka, however, the suicide rates halved in the mid-1990s after a series of legislative activities systematically banned the most highly toxic pesticides (Gunnell et al., 2007). Pesticide poisoning also accounts, in large part, for the higher female and young adult suicide death rates (Chen et al., 2012; Pearson, Phillips, He, & Ji, 2002; Phillips et al., 2002). In the 10 year period 2002–2011 suicide rates in China have gone down and this may be associated with the rapid urbanization and economic development witnessed in the same time frame (Wang, Chan, & Yip, 2014), which has meant that access to pesticides has decreased dramatically as fewer people are involved in the agricultural workforce (the possible improvement in living conditions may also explain, in part, the decline in suicides). A similar trajectory of pesticide suicides was also found in Taiwan in the late 1980s and early 1990s (Chang et al., 2012), again with very limited substitution to other methods of suicide observed (Chen, Kwok, Yip, & Wu, 2013). The age and sex profiles of suicide cases that are caused by pesticide poisoning mirror those who most frequently engage in nonfatal self-harm in Western countries (Gunnell, 2005; Mishara, 2007), suggesting that the accessibility of lethal suicide methods is a crucial element in determining the outcome of a suicide act. The easy accessibility to pesticides may partly explain the higher female suicide rates in Asian countries compared to Western countries (Chen et al., 2012; Wu et al., 2012).

Although many Western studies have found that those who die by suicide have suffered from a psychiatric illness (Cavanagh, Carson, Sharpe, & Lawrie, 2003; Mortensen, Agerbo, Erikson, Qin, & Westergaard-Nielsen, 2000), the pattern is very different in China, where the majority of people who attempt suicide or die by their own hand via intentional ingestion of pesticide do not have a psychiatric disorder (Pearson et al., 2002; Phillips et al., 2002). Rather, such suicides are usually an emotional reaction to family quarrels (Pearson et al., 2002). Despite the fact that such suicidal acts are often not premeditated or well planned, ease of access to highly lethal pesticides stored at home results in high rates of completed suicide. The context of pesticide self-poisoning hence suggests the possibility of preventing suicide through restricting the access to these dangerous household chemicals.

One other possibility for reducing the availability of toxic pesticides is to design a secure storage policy such that only the licensed owner can have access to the

pesticides stored in the locked containers. An evaluation of the acceptability and use of a lockable pesticide storage device in Sri Lanka has indicated that it is an acceptable measure in reducing suicides and accidental poisoning (Hawton, Ratnayeke, Simkin, Harriss, & Scott, 2009). Similarly, in a community-randomized controlled study (Vijayakumar et al., 2013) in the Indian town of Kattumannarkoil Taluk, the feasibility and usefulness of a central storage facility as a means of limiting access to pesticides was confirmed.

Gas Poisoning

Domestic Gas Poisoning The "coal gas story" is probably the most salient example of reducing overall suicide rates through restricting access to a lethal method of suicide (Kreitman, 1976). Prior to the 1960s in the United Kingdom, the most common method of suicide was self-poisoning by domestic coal gas, with this mode accounting for approximately half of the suicide deaths at this time. Then, during the late 1950s through to the early 1970s, natural gas (i.e., gas supplies with lower carbon monoxide [CO] content) was introduced on a region-by-region basis. Kreitman (1976) analyzed suicide data throughout this period and found that the decrease in the CO content of domestic gas was concomitant with a steady decrease in both male and female suicide rates in England and Wales. Similar findings were also reported in Australia (Burvill, 1990), Japan (Lester & Abe, 1989b), and the United States (Lester, 1990b), although partial substitution toward motor vehicle exhaust gas suicide (MVEGS) was found in Australia, the United Kingdom, and the United States, particularly among males during the period 1970–1990s (Burvill, 1990; Lester, 1990b; McClure, 2000).

MVEGS MVEGS is a common method of suicide in several motorized countries, in particular, among middle-aged males (Brennan, Routley, & Ozanne-Smith, 2006; Routley, 2007; Routley & Ozanne-Smith, 1998). As this method involves some preparation, presumably such suicides tend to be premeditated and well planned rather than impulsive. It seems that MVEGS is particularly appealing to individuals who prefer to end their lives at places away from their homes, so that they can spare their family members the trauma of discovering the body (De Leo, Evans, & Neulinger, 2002; Pirkola, Isometsa, & Lonnqvist, 2003; Routley, 2007). Countermeasures to prevent MVEGS deaths include installing catalytic converters to decrease CO emission levels (Amos, Appleby, & Kiernan, 2001; Lester, 1989; Lester & Abe, 1989a; Lester & Clarke, 1988; Mott et al., 2002; Shelef, 1994), the development of CO detectors in vehicles, modification of exhaust pipes to be incompatible with hose attachments, and signs displaying helplines at MVEGS hotspots (Routley, 2007). For example, Mott has reported that in the United States, legislation to install catalytic converters in new vehicles was enacted in 1975, and the MVEGS rates declined by 43% over the period 1968–1988 (Mott et al., 2002). As the United Kingdom did not have such legislation until 1993, Clarke and Lester compared the United States and the United Kingdom in 1987 and revealed that the relatively early introduction of the legislation in the United States reversed the MVEGS pattern in these two countries (Clarke & Lester, 1987): specifically, in the 1950s, the MVEGS rate was five times higher in the United States compared to the United Kingdom, whereas by 1984, the MVEGS rate in the United Kingdom was twice the U.S. rate. Although the legislation was originally introduced for environmental reasons (to decrease CO pollution) and not specifically intended as a suicide prevention measure, the associated benefit in decreasing suicide is nonetheless remarkable. As noted above, a reduction in MVEGS deaths has also

been reported following the erection of helpline signage at MVEGS hotspots (King & Frost, 2005). The impact of other measures on MVEGS deaths, such as the modification of exhaust pipes to render them incompatible with hose attachments and the development of sensors to detect harmful CO levels in vehicles, are still in need of further evaluation.

Charcoal Burning Suicides Burning barbecue charcoal in an enclosed space to create CO intoxication has become a popular method of suicide in both Taiwan and Hong Kong in the past 15 years (Chen, Yip, et al., 2015; Kuo et al., 2008; Liu et al., 2007; Yip & Lee, 2007). Having been portrayed by the media as a calm, painless, nonviolent, yet highly lethal way to end one's life, the novel method, first reported in Hong Kong, quickly spread to Taiwan and other nearby Asian countries (Chang et al., 2014; Liu et al., 2007; Yip & Lee, 2007). The rapid adoption of the method in both Hong Kong and Taiwan was not related to celebrity suicides; it was the repetitive reporting of this novel method in the media that has attracted a new cohort of individuals who would not have considered suicide if death by charcoal burning had not been widely publicized (Chen, Chen, Gunnell, & Yip, 2013; Chen, Yip, et al., 2015; Yip & Lee, 2007). Currently, the method has outstripped several traditional methods of suicide, and it has become the second most common method used in Taiwan (after hanging), and the third most common method of suicide in Hong Kong (after jumping and hanging; Chen, Yip, et al., 2015; Lee, Lin, Yeh, Chi, & Guo, 2008). It is also concerning that this increase in charcoal burning suicide has not been accompanied with a compensatory reduction in other suicide means (Chen, Yip, et al., 2015; Liu et al., 2007). Furthermore, the sociodemographic and clinical characteristics of suicides by charcoal burning appear to be distinct from those by other means: individuals who adopted the novel method were more likely to be economically active middle-aged men under financial stress, who otherwise had no pre-existing psychiatric disorders (Chen, Liao, & Lee, 2009; Kuo et al., 2008; Liu et al., 2007). In addition, as mentioned above, previous studies indicate that suicide attempters who used this novel method tended to state that they would not consider using an alternative method if the method they used had not been available (Chan, Yip, Au, & Lee, 2005; Kuo, Gunnell, Chen, Yip, & Chen, 2012; Tsai et al., 2011). The high desirability of the new method among specific subgroups hints at the possibility of suicide prevention through controlling the easy accessibility to charcoal. Supporting evidence for this comes from a preliminary community intervention study in Hong Kong: this has revealed that removing charcoal from open shelves and making it necessary for the customer to ask a shop assistant to obtain charcoal for purchase has considerably reduced the number of local suicides (Yip, 2009; Yip et al., 2010). The intervention has now been adopted in several cities in Taiwan since 2012, and its effectiveness has been demonstrated in one recent study (Chen, Chen, et al., 2015). This success further supports the feasibility of employing means restriction initiatives in the fight against suicide.

Suicide by Jumping From a Height

Jumping from a height is a common method of suicide in populated cities or in countries where high-rise buildings are widely available, such as Hong Kong, Singapore, New York City, and Taipei City, Taiwan (Beautrais, 2007a; Chen, Gunnell, et al.,

2009; Gunnell et al., 1997; Marzuk et al., 1992; Yip & Tan, 1998). In these places, most of the suicides by jumping take place at residential buildings (Abrams, Marzuk, Tardiff, & Leon, 2005; Chen, Gunnell, et al., 2009; Wong, Caine, Lee, Beautrais, & Yip, 2014; Yip & Tan, 1998). This method is particularly favored by older citizens, as it is an easily accessible, assuredly lethal, and technically simple way for physically fragile older adults residing in tall buildings toward the end their lives (Abrams et al., 2005; Chen, Gunnell, et al., 2009; Copeland, 1989; Yip & Tan, 1998). Jumping from residential buildings is also commonly adopted by youths whose suicides are impulsive, and ease of access to tall buildings increases the risk of fatality especially for those unplanned, impulsive jumping suicide attempts (Park et al., 2014; Yip, 1997; Yip & Tan, 1998). People with recognized psychiatric disorders are also more likely to take their own lives by jumping from high-rise buildings (Chen, Lee, Chang, & Liao, 2009).

Restricting access to potential jumping sites requires much more effort in view of the large number of high-rise buildings in populated areas. For example, hotspots in public buildings such as department stores and hospitals have been identified in Taipei City (Chen, Gunnell, et al., 2009; Chen & Yip, 2009). However, as over 80% of jumping from buildings occurs from home (Chen, Gunnell, et al., 2009; Chen & Yip, 2009), prevention measures might include installing simple padlocks for windows in residential households and raising awareness of the risk of suicide by jumping in the community, in particular, among family members who share a home with someone who is considered to be vulnerable (The Hong Kong Jockey Club Centre for Suicide Research and Prevention, 2005). The security guard in residential and commercial buildings could also be trained to look out for potentially suicidal people and be trained in how to intervene, as necessary. On a practical level, access to the roof and entry to the top of buildings could be closely monitored. At a strategic level, building regulations should be enhanced to incorporate safety measures into the design of new buildings/structures to prevent building jumping (Beautrais, 2007a).

Other types of locations or jumping "hotspots," mostly bridges (Beautrais, 2007a), also require attention. They are frequently used because of their reputation, media attention, easy access, cultural significance, or the aesthetic appeal of the spot (Beautrais, 2007a; Gunnell et al., 1997; Reisch & Michel, 2005). Examples of these hotspots include the Golden Gate Bridge in San Francisco (Lafave, LaPorta, Hutton, & Mallory, 1995), Jacques Cartier Bridge in Montreal (Prevost, Julien, & Brown, 1996), Westgate Bridge in Melbourne (Coman, Meyer, & Cameron, 2000), Bosphorus Bridge in Istanbul (Cetin, Gunay, Fincanci, & Ozdemir Kolusayin, 2001), Muenster Terrace in Bern (Reisch & Michel, 2005), Clifton Suspension Bridge in Bristol (Bennewith et al., 2007), and Tsing Ma Bridge in Hong Kong (Wong, Chan, Lau, Morgan, & Yip, 2009). The characteristics of those who jump from these popular spots differ from suicides in general; they tend to be younger, predominantly male, and more likely to have comorbid psychotic disorders (Beautrais, 2001; Cantor, Hill, & McLachlan, 1989; Coman et al., 2000; Lindqvist, Jonsson, Eriksson, Hedelin, & Bjornstig, 2004). The appeal or mystique of such places may serve as an important element of method selection, making replacement by other suicide means or places less likely (if access is restricted). Indeed, erecting safety barriers has been shown to be effective in reducing suicides at some jumping hotspots (Beautrais, 2001; Bennewith et al., 2007; O'Carroll & Silverman, 1994), although one meta-analysis suggests that the introduction of such measures may be associated with more suicides at nearby

jumping sites. Nonetheless, the net effect still indicates an overall decrease in the number of jumping suicides in the intervention areas (Pirkis et al., 2013). It is important to note that erecting barriers at potential jumping sites usually has no marked effect on the overall suicide rates (Pirkis et al., 2013) as suicide by jumping is a relatively rare method of suicide (except for some city-states, such as Hong Kong and Singapore). Despite the relatively small numbers, jumping as a method of suicide is highly lethal, deaths are often very public, and they usually have a huge impact on witnesses. In addition, it tends to attract widespread media reporting and may result in subsequent contagion (Pirkis et al., 2013). Hence, erecting barriers at potential jumping sites should be a policy priority for suicide prevention.

Other possible strategies to reduce hotspot suicides may include restricting access to the site (e.g., restricting pedestrian access to popular suicide bridges), installation of on-site telephone helplines, introduction of surveillance and patrols, and improved rescue and response efforts (Beautrais, 2007b; Cox et al., 2013; Pirkis et al., 2015).

To minimize unexpected consequences, if fencing is installed at sites that are not well-known jumping sites, this should be done without publicity. In South Korea, for example, the press extensively reported the installation of a higher fence with some special lighting effect to warn people not to jump on one bridge over the Han River—and sadly, there was a 30% increase in jumping from this bridge afterward (Woo, 2013).

Firearms Suicide

Suicide through firearm use is common in countries where guns can be obtained legally and there are high rates of firearm ownership; this suicide method is extremely rare in countries with stringent gun control laws (Ajdacic-Gross et al., 2008; Leenaars, 2007). The United States has the highest rate of firearm suicide among industrialized countries (Brent & Bridge, 2003) and, unsurprisingly, studies have consistently found that in states where there is strict gun control legislation, there are lower suicide rates (Boor & Bair, 1990; Lester, 1990a; Lester & Murrell, 1980). Furthermore, there is evidence from quasi-experimental studies indicating that the implementation of firearms control laws is associated with decreasing suicide rates (Brent, 2001) in the United States (Loftin, McDowall, Wiersema, & Cottey, 1991), Canada (Caron, 2004; Lester & Leenaars, 1993), Australia (Cantor & Slater, 1995; Ozanne-Smith, Ashby, Newstead, Stathakis, & Clapperton, 2004), New Zealand (Beautrais, Fergusson, & Horwood, 2006), Austria (Kapusta, Etzersdorfer, Krall, & Sonneck, 2007), Switzerland, and Norway (Ajdacic-Gross et al., 2006). Such gun control legislation has been found to be particularly effective in decreasing suicide rates among youths (Beautrais et al., 2006; Leenaars & Lester, 1997). Although there has been some evidence of method switching (Klieve, Barnes, & De Leo, 2009; Rich, Young, Fowler, Wagner, & Black, 1990) and some studies did not show a corresponding decrease in firearm deaths following the regulation (Lee & Suardi, 2010; McPhedran & Baker, 2012), the overall impact on the youth suicide rate has been, by and large, favorable.

Existing laws relating to gun controls in the United States, Canada, Australia, New Zealand, and the United Kingdom include mandatory firearm registration, the requirement for ownership licensing, setting/enforcing a minimum age for licensing, periodic examination and renewal of licenses, requirements for a mandatory cooling-off period (a waiting period in which a certain amount of time must pass between

gun purchase and gun possession), and interviewing/home visiting of new applicants/gun owners before licensing or renewing a license (Ajdacic-Gross et al., 2006). Other measures to prevent firearms suicide through method restriction also include firearm safety counseling, and safer firearm storage practices (Barton & Kologi, 2015), especially for homes in which there are high-risk individuals. However, the effectiveness of these approaches requires further empirical examination (Brent & Bridge, 2003).

Studies directly evaluating the relationship between suicide and gun ownership also provide ample evidence for the association between firearm availability and suicide (Brent & Bridge, 2003; Brent et al., 1988, 1991, 1993; Shah, Hoffman, Wake, & Marine, 2000). Such studies often employ case-control designs to compare the prevalence of guns in the homes of those who have taken their own lives to that of controls (i.e., those who have not killed themselves). Most of these studies are from the United States, with the results consistently supporting a significant association between household gun ownership and suicide (Brent et al., 1988, 1991, 1993; Shah et al., 2000). These studies also indicate that having guns in the home confers an increased risk for younger members of the household in particular and for people with no apparent psychopathology. Restriction of access to firearms at home has been shown to be effective in preventing suicide in these two groups of people (Brent & Bridge, 2003).

Suicide by Hanging

Hanging is the most common method of suicide in many countries (Ajdacic-Gross et al., 2008). As ligature points and ligatures are universally available, preventing suicide by hanging in the community through method restriction is very difficult, if not impossible. However, it is possible to intervene in institutional settings, such as psychiatric hospitals and prisons, by removing ligature points. Although such interventions are important, in many cases, for example, among patients in contact with mental health services, only a small proportion of hangings actually take place in controlled environments; the majority (90%) of such deaths occur in the community (Gunnell, Bennewith, Hawton, Simkin, & Kapur, 2005).

For the interested reader, in Table 35.1 we have summarized the recent publications on restriction of suicide means and hotspots for suicide prevention (January 1, 2001 to February 1, 2015).

Key Achievements and Opportunity

In our review, we have shown that the research literature supports the arguments that many suicide impulses are short-lived, most suicide attempters do not die by suicide in the long run, and some suicide means or hotspots are preferred over others. Thus, restriction of lethal suicide means and hotspots could buy some time for a third party to intervene or an intense suicidal impulse to pass, help the suicidal person drop their suicidal plans, and in the long run to reduce the number of deaths by suicide. Supported by quasi-experimental findings, restriction of access to lethal means and suicide hotspots have been repeatedly shown to be the most strongly evidence-based components of suicide prevention strategies (Mann et al., 2005; Yip, Caine, Yousuf, et al., 2012).

Table 35.1 Studies Published between (Jan 2001–Feb 2015) Examining Changes in Suicide Trends Following Restriction of Methods and Proposed Method-Specific Measures for Future Research

Suicide method	*Authors (year)*	*Location (period)*	*Intervention*	*Other proposed measures**	*General concerns*
Medication overdose	Bateman et al. (2006)	Scotland (1995–2003)	Legislation on packing of analgesics introduced in 1998	1. Store medicines safely in the home 2. Prescribe less toxic medication and smaller amounts of drugs per visit 3. Solicit support from family members for closer monitoring and surveillance	Case fatality 1.5%–4% (Chen et al., 2009; Spicer & Miller, 2000; Yip, Caine, Kwok, & Chen, 2012) Danger of switching to more lethal method of suicide should be considered Studies in England (Bateman et al., 2006; Hawton, 2002; Hawton, Bergen, et al., 2009; Hawton et al., 2004; Hawton et al., 2001) generally suggested a positive effect, but in Scotland the intervention did not seem to be effective (Bateman et al., 2006)
	Corcoran et al. (2010)	Ireland (1998–2008)	Withdrawal of distalgesic from the Irish market in January 2006		
	Hawton et al. (2001)	United Kingdom (1996–1999)	Legislation (1998) restricting pack sizes of over-the-counter paracetamol and salicylates		
	Hawton (2002)	United Kingdom (1996–2000)	Legislation on packing of analgesics introduced in 1998		
	Hawton et al. (2004)	England and Wales (1993–2002)	Legislation on packing of analgesics introduced in 1998		
	Hawton, Bergen, et al. (2009)	England and Wales (1998–2007)	Withdrawal of co-proxamol from U.K. market in 2005		
	Hawton, Bergen, et al. (2012)	England and Wales ([2005–2010] & [1998–2004])	Partial withdrawal of co-proxamol between 2005 and 2007, and full withdrawal in 2008		
	Hawton et al. (2013)	England and Wales (1995–2009)	United Kingdom legislation introduced in September 1998 to restrict pack sizes of paracetamol		
	Morgan, Griffiths, & Majeed (2005)	England and Wales (1993–2002)	Legislation on packing of analgesics introduced in 1998		
	Morgan, Griffiths, & Majeed (2007)	United Kingdom (1993–2004)	Legislation on packing of analgesics introduced in 1998		
	Nordentoft, Qin, Helweg-Larsen, & Juel (2007)	Denmark (1970–2000)	Restriction on availability of barbiturates and dextropropoxyphene in 1986		
	Sandilands & Bateman (2008)	Scotland (2000–2006)	Phased withdrawal of co-proxamol from U.K. market in 2005		

Pesticides	Gunnell et al. (2007)	Sri Lanka (1975–2005)	1984–1995 Banning of WHO Class I and II drugs by Pesticide Registrar	1. Registration during purchase, addition of emetics 2. Centralized communal storage 3. Education of users, retailers and community leaders (WHO) 4. Improved medical treatment of pesticide poisoning (WHO) 5. Safe storage of pesticides such as the locked boxes (Hawton, Ratnayeke, et al., 2009; Konradsen et al., 2007; Pearson et al., 2011; Weerasinghe et al., 2008)	Case fatality 6%–75% (Banerjee et al., 2009; Chen et al., 2009; Dawson et al., 2010; Lee et al., 2008) Substitution to another pesticide available was possible (Roberts et al., 2003), but banning high-toxicity pesticides generally decreased overall suicide rates
	Hawton, Ratnayeke, et al. (2009)	Sri Lanka (2006–2008)	Lockable boxes for storing pesticides in 2006		
	Roberts et al. (2003)	Sri Lanka (Anuradhapura) (1986–2000)	Legislative changes on pesticide access (depending on toxicity) from 1991 to 1995		
	Vijayakumar & Satheesh-Babu (2009)	Four villages in one part of India (1998–2006)	Complete removal of pesticides from villages through local NGO and some international agencies to implement Non-Pesticide Management in 2003		
	Vijayakumar et al. (2013)	India (2012–2013)	Central storage facility as a means of limiting access to pesticides in 2012		
Car exhaust gas	Amos et al. (2001)	England & Wales (1987–1998)	Removal of carbon monoxide (CO) from gases by catalytic converters in 1993	1. Modification of exhaust pipes to be incompatible with hose attachments 2. Development of alarm sensors to detect harmful CO levels in vehicles	Case fatality 40%–60% (Elnour & Harrison, 2008; Spicer & Miller, 2000) High planned suicide associated with careful preparation Substitution by hanging among youths or other methods was observed
	Mott et al. (2002)	United States (1968–1998)	National Vehicle Emission policies in 1975		
	Nordentoft et al. (2007)	Denmark (1970–2000)	Introduction of catalytic converters since October 1, 1989		
	Skilling, Sclare, Watt, & Fielding (2008)	Grampian and Scotland (1980–2003)	Legislation on compulsory use of catalytic converters since 1993		
	Studdert, Gurrin, Jatkar, & Pirkis (2010)	Australia (2001–2006)	Legislation of 1986 and 1999 on permissible levels of CO emissions		

(*Continued*)

Table 35.1 (*Continued*)

Suicide method	*Authors (year)*	*Location (period)*	*Intervention*	*Other proposed measures**	*General concerns*
Barbeque charcoal gas	Liu et al. (2009)	Cheng Chau Island (Hong Kong SAR) (2002–2003)	Combination of interventions (universal, selective, and indicative) for visitors in 2002	Installation of CO detectors in hotel rooms and residential buildings	Case fatality 40%–50% (Chen et al., 2009; Yip, Caine, Kwok, et al., 2012)
	Yip et al. (2010)	Two districts of Hong Kong SAR (2006–2007)	Removal of charcoal packets from open shelves in major outlets of intervention region for 12 months from July 1, 2006 to July 31, 2007		High planned suicide associated with careful planning
	Chen et al. (2015)	Taiwan	Removal of charcoal packets from open shelves in New Taipei City, Taiwan from May 1, 2012 to December 31, 2013		No obvious substitution by other methods
Jumping	Beautrais (2001)	Australia (1992–2000)	Removal of safety barriers from a central city bridge in 1996	***PUBLIC SITES:*** 1. Installation of on-site telephone helplines, 2. Introduction of surveillance and patrols 3. Improved rescue and response efforts ***PRIVATE/HOMES:*** 1. Installing padlocks for windows 2. Raising awareness of the risk of jumping suicide among family members to enhance restriction to site	Case fatality 35%–60% (Elnour & Harrison, 2008; Spicer & Miller, 2000; bridge jumping), building jumping 70% (Yip, Caine, Kwok, et al., 2012) Substitution seen in suicides from other bridges near the intervention site was found in one study (Sinyor &
	Beautrais, Gibb, Fergusson, Horwood, & Larkin (2009)	New Zealand (1991–2006)	Removal of bridge barriers followed by their reinstallation 7 years later at the Grafton Bridge, Auckland in 2003		
	Bennewith et al. (2007)	England (1994–2003)	Installation of barriers on Clifton Suspension Bridge, Bristol in December 1998		
	Bennewith, Nowers, & Gunnell (2011)	United Kingdom (1994–2003)	Two-meter high wire fencing installed on main span in 1998		
	Isaac & Bennett (2005)	United Kingdom (1987–2001)	Road access blocked in 2001 due to outbreak of foot and mouth disease		
	Law et al. (2009)	Hong Kong (1997–2007)	Installation of platform screen doors at most of the mass transit railway stations in 2002		

Pelletier (2007)	Maine (1960–2005)	Safety fence installed at Memorial Bridge, Augusta in 1983	3. Monitoring entry to the top of buildings	Levitt, 2010), but a meta-analysis, pooling data from nine studies, found there was an overall gain in terms of a reduction in all suicides by jumping (Pirkis et al., 2013)
Reisch & Michel (2005)	Switzerland (1969–2002)	Safety net installation at the Meunster Terrace; City of Bern in 1998		
Sinyor & Levitt (2010)	Canada (1993–2001) & (2003–2007)	Construction of a barrier at the Blood Street Viaduct, Toronto (Ontario), in 2003	4. Enhancing building codes that incorporate safety measures into the design of new buildings	Bridge jumping – 1) a low-prevalence method, therefore difficult to estimate the effectiveness 2) Potential to reduce copycat jumping suicides through avoiding high-profile media reporting Building jumping—a very common and widely available method in populated cities, hence difficult to restrict
Skegg & Herbison (2009)	New Zealand (1996–2006 & 2006–2008)	Temporary (2-year) restriction following road closure of vehicle access to a rocky headland in Dunedin from August 2006 to January 2008		

(*Continued*)

Table 35.1 (*Continued*)

Suicide method	*Authors (year)*	*Location (period)*	*Intervention*	*Other proposed measures**	*General concerns*
Firearms	Ajdacic-Gross et al. (2006)	Western countries (1983–2000)	Legislation and regulatory measures on households owning firearms	Firearm safety counseling and safer firearm storage practices	High case fatality 80%–90% (Elnour & Harrison, 2008; Spicer & Miller, 2000)
	Beautrais et al. (2006)	New Zealand (1984–2002)	Amendment to the Arms Act (1992)	Introduce high fees for annual renewal and/or registration	Switching to other less lethal methods would still lead to a decrease in suicide rate
	Blackman, 2000; Ludwig & Cook (2000)	United States (1985–1997)	The Brady Handgun Violence Prevention Act implemented in 1994		Substitution observed for all other methods (Bridges, 2004; Caron, 2004; Cheung & Dewa, 2005) or young males (Klieve et al., 2009) in some studies
	Bridges (2004)	Canada (1984–1990 & 1992–1998)	Before and after Bill C-17 (1991); waiting period of 28 days and screening of applicants		
	Caron (2004)	Canada (1986–1997)	Canadian Firearms Act (1992) ensuring safe storage of firearms		
	Caron, Julien, & Huang (2008)	Canada (Quebec) (1987–2000)	Bill C-17 (safe storage of firearms) in 1992		
	Chapman, Alpers, Agho, & Jones (2006)	Australia (1979–2003)	1996 Major Gun Law reforms		
	Cheung & Dewa (2005)	Canada (1979–1999); 15–19 years group	Changes in firearms act in 1991		
	Conner & Zhong (2003)	United States (1999–2000)	States assigned scores of restrictiveness of firearm laws and divided into three categories		1996 legislative changes (increased firearms restriction) in Australia did not show favorable outcomes on youth suicide (McPhedran & Baker, 2012)
	De Leo, Dwyer, Firman, & Neulinger (2003)	Australia (1971–1998)	Legislative changes in Australia and possible changes in social acceptability of method following massacres		
	Marinho de Souza Mde, Macinko, Alencar, Malta, & de Morais Neto (2007)	Brazil (year 2004)	2003 Gun control laws		

Gagne, Robitaille, Hamel, & St-Laurent (2010)	Canada (Quebec) (1981–2006)	National Firearms control initiative enacted in 1991
Kapusta et al. (2007)	Austria (1985–2005)	Austrian Firearms Law 1997
Klieve et al. (2009)	Australia (Queensland) (1968–2004)	National Firearms Agreement 1997
Lee & Suardi (2010)	Australia (1915–2004)	1996–1997 National Firearms Agreement
Lubin et al. (2010)	Israel (2003–2005 & 2007–2008)	Change in policy of Israeli Defense Forces regarding adolescents' access to firearms in 2006
McPhedran & Baker (2012)	Australia (before and after 1996)	Policy change (increased firearms restriction) in 1996
Ozanne-Smith et al. (2004)	Australia (Victoria) (1979–2000)	Two waves of legislative reforms including tightened restrictions on semiautomatic longarms (1988) and buyback scheme (1996), firearm act (1996/98), and new handgun regulations with buyback (2003)
Reisch, Steffen, Habenstein, & Tschacher (2013)	Swiss (2003–2004)	Reduce availability of military guns in 2003
Rodriguez Andres & Hempstead (2011)	United States (1995–2004)	Firearm regulations from 1998
Rosengart et al. (2005)	United States (Columbia district) (1979–1998)	Laws issuing license to carry concealed weapon, minimum age restriction, restriction on handgun purchase frequency and ban on cheaply constructed guns
Webster, Vernick, Zeoli, & Manganello (2004)	United States (1976–2001)	Youth-focused firearm laws and general firearm regulations

(*Continued*)

Table 35.1 (*Continued*)

Suicide method	*Authors (year)*	*Location (period)*	*Intervention*	*Other proposed measures**	*General concerns*
Drowning	—	—	—	Patrolling of drowning sites	Case fatality 65%–80% (Elnour & Harrison, 2008; Spicer & Miller, 2000)
Hanging	—	—	—	Training family members of high-risk population in restriction of opportunities at home	Case fatality 60%–85% (Chen et al., 2009; Elnour & Harrison, 2008; Spicer & Miller, 2000; Yip, Caine, Kwok, et al., 2012)

Note. # The wide variation in pesticide fatality is because human toxicity varies widely by pesticide.
*Method-specific means restriction measures that need evaluation but presently lack evidence base.

Beyond the achievement of preventing suicide by restricting the physical availability of lethal suicide means and hotspots, current research also points to the importance of reducing their cognitive availability. Thus, the suicide prevention strategies addressed in the chapter actually are intermingled with suicide prevention strategies through management of media reports and knowledge transfer/spread of novel suicide means or hotspots. Models such as social networking and technology diffusion developed by other disciplines are frameworks that have the potential to contribute to the construction of more upstream suicide prevention policy by reducing cognitive availability (Chen, Yip, et al., 2015).

Key Questions and Challenges

There are several questions and challenges both in knowledge and suicide prevention practice specific to the issue of restricting means and hotspots.

First, restriction of means may not be effective in all methods of suicide. Suicide by hanging, which is a prevalent method in many countries, has been an eternal challenge to suicide prevention. As noted earlier in the chapter, as ligature points are universally available (unless in highly secured facilities or environments), it is extremely difficult to intervene in community settings to reduce risk. How to reduce cognitive availability or acceptability of suicide by hanging is a further related challenge.

Second, restricting access to means and hotspots requires the successful navigation of what can be difficult political and economic concerns. Some potential suicide means, such as pesticides, have their original sociocultural instrumental value. For example, if one is to prohibit some very lethal pesticides or is to design safety into agricultural technologies, they often need to find the balance between agricultural needs, commercial interests, and politics at the same time. Thus far, we have yet to develop and agree such principled strategies to handle these issues.

Third, to address the second question and challenge, policy makers often require scientific evidence to persuade them of the merit of changing a specific policy. However, as is well recognized within the field of suicide prevention, there are many difficulties in conducting well-designed, large-scale, and long-term experiments/studies to demonstrate the effectiveness of restricting a specific suicide means. In such cases, an alternative approach may be open discussion with policy makers about what level of evidence they would require in the domain of suicide prevention by restricting access to means and hotspots.

Fourth, if one takes a historical perspective, it is evident that the prevalence of specific suicide methods varies as a function of country and locality as well as by time period. However, a systematic review of the literature to address how novel suicide methods emerge, how old methods fade away or persist, and how we could learn from and utilize the knowledge is lacking. Consequently, such further research is required urgently to inform the development of suicide prevention policy.

Finally, it is still unresolved whether fragmented or integrative law making is more favorable for means/hotspot restriction suicide prevention. From the above, we learn that means/hotspot restriction is related to different areas of sociocultural, political, and economic practices. On the one hand, there is shortage of evidence regarding whether and how laws in different domains might singly or cumulatively exert suicide prevention or aggravation effect. On the other hand, it is still debated whether a specific suicide prevention act, like those of Japan and Korea, are necessary for effective

integrative suicide prevention policy making. Furthermore, we have yet to resolve the boundary between legitimate assisted suicide and suicide means restriction. It seems that an integrated approach combined with detailed regulations in different domains is more comprehensive. However, research into the complexity of roles and effects of laws in means/hotspots restriction, both physically and cognitively, has been neglected for too long.

Conclusion

International patterns of suicide deaths reflect differences in method availability and acceptability according to variations in national policies/laws and sociocultural influences (Ajdacic-Gross et al., 2008; Farmer & Rohde, 1980; Stack & Wasserman, 2005). Although there are still many gaps in our knowledge, there is now ample evidence that restricting the access to suicide methods and hotspots is an effective strategy in preventing suicide, particularly for unplanned, impulsive suicides and in those circumstances where a particular method of suicide is favored (e.g., because it is perceived to be painless or glamorous). Furthermore, limiting the "cognitive availability" of novel suicide methods through encouraging responsible media reporting and social media should be a policy priority. Although not directly tackling the underlying causes of suicide, policies around means restriction are important as they can be promptly pursued, and they have the potential to reduce overall suicide deaths. In short, limiting the accessibility, availability, and lethality of suicide methods is key to saving lives.

Key Resources

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