

## Reducing access to means of suicide [2015]

### SCOPING QUESTION: Is reducing access to means of suicide effective in reducing deaths from suicide, suicide attempts and acts of self-harm at the population level?

#### **Background**

**Pesticides:** There are a limited number of studies available that evaluate the efficiency of interventions which aim to reduce the number of suicides and suicide attempts by pesticide ingestion. Existing studies mainly focus on rural areas within low-income countries which have the greatest burdens of these deaths, particularly Sri Lanka and India.

**Firearms:** There is a reasonable amount of literature available reviewing efficiency of implementations of a variety of laws, restricting access to firearms. There are no studies reporting on the efficiency of such interventions in reducing suicide attempts, possible because self-inflicted firearm wounds are highly lethal and numbers of survivors are low.

**Jumping:** There are a limited number of studies available evaluating the efficiency of interventions aiming to reduce numbers of suicides by jumping. They are limited to sites that have over the years acquired a status of iconic suicide 'hot-spots'. There are no studies reporting on the efficiency of such interventions in reducing suicide attempts, possibly because suicide by jumping is considered to be one of the most lethal methods and numbers of survivors are low.

**Charcoal burning:** It is a method to commit suicide especially in Hong Kong, Taiwan, and Japan. The number grew rapidly since late 1990s. Currently, charcoal burning are used in more than 20% of suicide in Hong Kong. It is used more often amongst those in the 24 to 39 age range. There are a limited number of studies available evaluating the efficiency of interventions aiming to reduce numbers of suicides by charcoal burning.

#### **Population/Intervention(s)/Comparator/Outcome(s) (PICO)**

**Population:** national population / population in an area implementing the specific prevention strategy, affected by a particular firearms law, or surrounding a particular suicide site.

**Interventions:** education on the dangers of pesticide ingestions; provision of lockable storage boxes for pesticides; reductions in the use of the most highly toxic pesticides; and use of alternative (natural) managements of land cultivation.

restrictions on firearms acquisition, waiting periods for firearms acquisition, firearms registrations, licensing and background checks of firearms licensees and owners, safer storage of firearms.

restricting access to sites, installation of barriers or safety nets, surveillance measures, muted media reporting, installation of signs and telephone help offers.

*Replacement of the traditional countryside charcoal barbecue with an electric grill, creation of barriers to charcoal access in supermarkets, putting "seek help" labels on the charcoal bag*

Comparisons: care as usual

Outcomes: reduction in numbers (or rates) of suicidal behaviours by ingestion of pesticides, using firearms, jumping

reduction in number of all suicides

### **Search strategy**

Electronic databases PubMed and Scopus were searched using the keywords "suicide", "pesticide", "firearms", "jumping", charcoal and "prevention". All English-language publications were retrieved and reference lists were scanned for further possible articles.

### **Inclusion and exclusion criteria**

Inclusion criteria: Observational studies, non-systematic reviews.

### **Narrative description of the studies**

#### **Pesticides**

Author	Title	Reference	Study Design	Description of the study	Results
Mishara BL (2007).	Prevention of deaths from intentional pesticide poisonings.	Crisis, 28 (Suppl. 1):10-20.	Review	This article reviewed current knowledge on the epidemiology of pesticide poisonings around the	The author concluded that pesticide suicides are mostly impulsive acts committed during an acute crisis and show little premeditation. So far, only a few studies have shown whether

				<p>world and the contexts in which these deaths occur. It also reviewed the public health initiatives (announced by the WHO in 2006), which aim to reduce the global burden of morbidity and mortality related to pesticide poisonings. These included the prevention of problems leading to these deaths, educational activities used to change attitudes and knowledge about pesticides and, particularly, the control of access to dangerous pesticides.</p>	<p>specific community interventions are effective. These have included the education of farmers on the dangers of pesticide ingestion and safer storage practices (Nicaragua); reduction of availability of the most lethal types of pesticides (Samoa); and, promotion of the secure storage of pesticides, most commonly by providing farmers with lockable boxes (Sri Lanka). Contrarily, one study found an increase in suicides by another type of pesticide after restricting access to the most potent organophosphate (Jordan), and Turkey observed no decline in pesticide ingestion related deaths after offering an alternative to control pests and insects. However, all these studies lack sufficient methodological designs to confirm long-term, stable impacts of implemented suicide prevention strategies. Further, community and national policies suggested in the article that still await evaluation include: modifications of existing pesticides to reduce their lethality in self-poisoning; restriction of purchase of pesticides to intoxicated persons; and, the improvement of medical treatment of such poisonings.</p>
Gunnell D et al (2007).	The impact of pesticide regulations on suicide in Sri Lanka.	International Journal of Epidemiology, 36:1235-42.	Ecological study	This article studied suicide rates in Sri Lanka from 1975 to 2005 in relation to introductions of legislative activities in the mid 1990s	The authors found a marked decline in Sri Lanka's overall suicide rates over the studied time period which coincided with the restrictions on the import and sales of toxic pesticides. However, hospital data showed no

				that systematically banned the most highly toxic pesticides which were responsible for the majority of pesticide-related deaths in the two decades prior to this legislation.	decline in admissions for pesticide self-poisoning. This suggested that people continued to self-poison with the pesticides available but the lower toxicity reduced case-fatality. Secular trends in unemployment, alcohol misuse, divorce or periods of civil war did not appear to be associated with these declines. The improved management of pesticide self-poisonings in Sri Lanka may have, to some extent, contributed to the declining trend of suicide rates. Nevertheless, the authors proved that restricting the availability of toxic pesticides effectively reduced the rate of fatal suicidal acts.
Hawton K et al (2009).	Evaluation of acceptability and use of lockable storage devices for pesticides in Sri Lanka that might assist in prevention of self-poisoning.	BMC Public Health, 9:69-81.	Observational study	Acceptability and effective use of lockable storage boxes for pesticides was assessed in 400 farming households in Sri Lanka and followed up for 18 months. Data on the incidence of suicide and self-harm was also collected for this time period.	The authors reported that 30 weeks after the introduction of lockable metal boxes, the majority of participating households were using them all or most of the time (compared to less than 2% at the start). There was a slight decline in the consistency of their usage 18 months after their introduction. In this time, there were no suicides by pesticides reported in these households but there was one suicide using a different method. There were 4 attempted suicides by the ingestion of pesticides. The small number of households included in the study and the low numbers of self-harming episodes does not provide firm evidence for the efficiency of this strategy in the prevention of suicides. However, the largely positive

					responses to the use of lockable boxes suggest that this may provide an effective approach to reducing the numbers of pesticide-related suicides.
Vijayakumar L, Kumar RS (2009).	Does “no pesticide” reduce suicides?	International Journal of Social Psychiatry, published online: 17 July 2009.	Observational study	This article compared the number of suicides before and after the discontinuation of chemical pesticides in four villages in India, compared to villages with continual use of pesticides.	The introduction of non-pesticide management in cultivating land with locally available natural materials reduced the number of suicides in villages studied. The authors also discovered a high rate of suicides by this means which were not reported to the authorities (47%).

## Firearms

Author	Title	Reference	Study Design	Description of the study	Results
Mann JJ et al (2005).	Suicide prevention strategies: a systematic review.	Journal of the American Medical Association, 294:2064-74.	Systematic review	The aim of this review was to examine evidence for the effectiveness of specific suicide interventions, including those restricting access to firearms.	Authors identified 6 studies that have demonstrated a decrease in firearms-related suicides after introduction of firearm control legislation, two of which also proved a positive effect on overall suicide rates without substitution of methods (in Canada and the USA).
Daigle MS (2005).	Suicide prevention through means restriction: Assessing the risk of substitution – a critical review and synthesis.	Accident; Analysis and Prevention, 37: 625-32.	Systematic review	The article summarizes findings of studies assessing the risk of substitution after interventions restricting access to firearms.	This review identified 8 observational studies and 2 reviews that measured effects of legal restrictions on firearms access in Canada (4), the USA (3) and Australia (1). The latter study included a sample of males only, whereas other included total populations. While all

				Included studies are examined from the individual- and population point of view.	studies reported decreasing suicide rates after the introductions of, for example, restrictions on firearm possessions or laws on safer storage of firearms, only half found no increase in rates of suicide by other methods, two reported a subsequent shift towards other methods and further two observed the effect of substitution in males only.
Lambert MT, Silva PS (1998).	An update on the impact of gun control legislation on suicide.	Psychiatric Quarterly, 69:127-134.	Systematic review	The authors reviewed available literature examining the impact of gun control legislation on suicide rates.	This review concludes that reducing the availability and accessibility of firearms appears to decrease firearms-related suicide rates without this leading to substitution of means of suicide.
Miller M, Hemenway D (1999).	The relationship between firearms and suicide: a review of the literature.	Aggression and Violent Behaviour, 4:59-75	Review	This article presents a review of most commonly cited empirical studies on firearms and suicide, focusing largely on the United States. Studies are divided by their unit of analysis (individual/population) and design (cross-sectional/longitudinal).	This review found strong confirmation for gun availability increasing the risk for youth suicide in the United States, and a moderate evidence for this association in adults. While included case-control studies all confirmed that having a gun in the home represents a higher risk for suicide at an individual level, strength of findings from ecological studies was impacted by methodological limitations, in particular by lack of reliable data on firearms availability and by not controlling for possible confounders.
Hahn RA et al (2005).	Firearms laws and the reduction of violence: a systematic review.	American Journal of Preventive Medicine, 28:40-70.	Systematic review	This review, conducted by the Task Force on Community Preventative Services, included journal articles, governmental	Several firearms laws were reviewed for their efficiency in reducing suicide rates (e.g. bans on specified firearms, introductions of waiting periods or restrictions on firearms acquisition, licensing of firearms owners,

				reports and books on the association between implementations of firearms laws and subsequent reductions of all types of violent deaths, including suicides. Overall change in rates of suicides (not only firearms-related) was measured as the outcome variable.	child access restriction laws), following the criteria set by the Guide to Community Preventive Services. Despite identification of a few studies that found subsequent reductions of suicide rates, authors concluded that available evidence was insufficient to determine the effectiveness of reviewed firearms laws (or their combinations), due to small numbers of available studies, limited designs and inconsistent findings. It should be noted that this review was performed only on firearms laws in the United States.
Johnson RM, Coyne-Beasley T (2009).	Lethal means reduction: what have we learned?	Current Opinion in Pediatrics, 21:635-40.	Review	This article reviews evidence regarding lethal means reduction as a suicide prevention strategy.	Authors concluded that 'means reduction' is an effective part of suicide prevention strategies and that implemented laws limiting access to firearms effectively lead to reduction of suicide rates, in part via changing social norms regarding firearms.
Ajdacic-Gross V et al (2010).	Firearm suicides and availability of firearms: The Swiss experience	Journal of European Psychiatry, 25(7), 432-434	Ecological study	This study examines the association between the availability of firearms at home, and the proportion of firearm suicides in Switzerland using ecological data.	Cantons where firearms ownership in private households is more frequent also tend to have higher proportions of firearm suicides.
Fleegler et al (2013).	Firearm legislation and firearm-related fatalities in the United States	JAMA Intern Med, 173(9):732-740	Cross Sectional Study	All reported firearm-related deaths from 2007 through 2010 were examined. State-level firearm	Higher number of firearm laws in a state are associated with a lower rate of firearm fatalities in the state, overall and for suicides and homicides individually.

				legislation across 5 categories of laws were used to create a “legislative strength score,” and measured the association of the score with state mortality rates.	
Andres AR, Hempstead K (2011)	Gun control and suicide: The impact of state firearm regulations in the United States, 1995-2004	Health Policy, 101(1):95-103	Empirical study	In this study, A negative binomial regression model was used to identify the association between several firearm regulations and male suicide rates in the US between 1995-2004.	This study found that firearms regulations which function to reduce overall gun availability have a significant deterrent effect on male suicide, while regulations that seek to prohibit high risk individuals from owning firearms have a lesser effect.
Sarchiapone M et al (2011)	Controlling Access to Suicide Means	International Journal of Environmental Research and Public Health, 8(12), 4550-4562	Systematic Review	Authors conducted a systematic review of the empirical and clinical literature on controlling the access to means of suicide. The review identified all English articles with the keywords “suicide means”, “suicide method”, “suicide prediction” or “suicide prevention” and other relevant keywords.	The review showed that easy access influences the choice of method. In many countries, restrictions of access to common means of suicide has lead to lower overall suicide rates, including suicide by firearms in USA. Restriction to means of suicide may be particularly effective in contexts where the method is popular, highly lethal, widely available, and/or not easily substituted by other similar methods.



## Jumping

Author	Title	Reference	Study Design	Description of the study	Results
Gunnell D, Nowers M (1997).	Suicide by jumping.	Acta Psychiatrica Scandinavica, 96:1-6.	Systematic review	The article reviewed published literature on epidemiology of suicide by jumping, with particular focus on sociodemographic characteristics and psychiatric morbidity in people who chose this method, and opportunities for prevention of suicides by jumping.	Efficiency of protective barriers is difficult to prove due to jumping representing a relatively small proportion of all suicides in majority of countries. Nevertheless, author summarizes few prevention strategies that have been found to be useful, e.g. suitable designs of tall buildings and particularly general and psychiatric hospitals, installation of safety barriers and telephone helplines at public places that seem to attract suicides by jumping.
Daigle MS (2005).	Suicide prevention through means restriction: Assessing the risk of substitution – a critical review and synthesis.	Accident; Analysis and Prevention, 37: 625-32.	Systematic review	The article summarized findings of studies assessing the risk of substitution after interventions, aiming to restrict access to certain means of committing suicide.	The issue of means substitution in this systematic review is examined from the individual- and population point of view. Three studies that have proven efficiency of installation of safety barriers on bridges, without this leading to a substitution of methods of suicides, are identified. Two studied long term efficiency of restricting access to means in preventing suicides by jumping. One of them demonstrated that installation of anti-suicide barriers on a bridge lowered the total population suicide numbers, while the other showed that protective nets on a well-know suicide 'hot-spot' terrace helped reduce numbers of all suicides by jumping from heights. The third study demonstrated an increase in not only number of suicides from the observed overpass after a

					removal of anti-suicide fence, but also an increase in numbers of all suicides by jumping from heights.
Beautrais A (2007).	Suicide by jumping: A review of research and prevention strategies.	Crisis, 28(Suppl.1):58-63.	Review	The article summarized available research on characteristics of individuals who suicide by jumping and efficiency of different intervention strategies (mainly through observational studies).	Following numerous studies showing causal relationship between media reporting and subsequent increase in specific methods of suicide, three studies were identified that implied similar effects on increasing suicides by jumping. The following interventions have been suggested to reduce suicide by jumping at the targeted site and surrounding areas: installing barriers or safety nets at jumping sites (5 studies), telephone helpline (1 study), surveillance measures, such as police patrols (1 study), and muted media reporting (2 studies). Author lists a few other alternative preventative measures, whose efficiency is yet to be evaluated (e.g. training gatekeepers, such as bridge staff and traffic officers, improvements in rescue and response efforts, restriction of pedestrian access to sites).
Glasgow G (2011)	Do local landmark bridges increase the suicide rate? An alternative test of the likely effect of means restriction at suicide-jumping sites	Social Science and Medicine, 72(6), 884-889	Cross-sectional study	This study examines the relationship between large, well-known bridges of the type that are often used as suicide-jumping sites, and the local suicide rate. The relationship between suicides and local landmark bridges is examined across 3116 US counties	The author found that while exposure to local landmark bridges was associated with an increased number of suicides by jumping, no positive relationship between these bridges and the overall number of suicides was detected.
Cox G R et al	Interventions to	BMC Public	Systematic	This systematic review	The authors found that in addition to encouraging

(2013)	reduce suicides at suicide hotspots: A systematic review	Health, 13,214	Review	looked at studies that could inform the following question: 'What interventions are available to reduce suicides at hotspots, and are they effective?'	help seeking, increasing likelihood of intervention by a third-party, and promoting responsible media reporting, restricting access to means through installation of physical barriers has been shown to be effective in suicide by jumping from tall structures.
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### Charcoal

Parry Jane(2010)  <i>editorial</i>	Restricting sales of barbecue charcoal helps in suicide prevention, study shows	BRITISH MEDICAL JOURNAL Volume: 340 Article Number: c1324	At least 10 cases in the past 12 month in UK
Yip Paul S. F(2010)  <i>Exploratory controlled trial</i>	Restricting the means of suicide by charcoal burning	BRITISH JOURNAL OF PSYCHIATRY Volume: 196 Issue: 3 Pages: 241-242	We conducted an exploratory controlled trial to examine the efficacy of restricting access to charcoal in preventing suicides from carbon monoxide poisoning by charcoal burning in Hong Kong. All charcoal packs were removed from the open shelves of major retail outlets in the intervention region for 12 months', in the control region, charcoal packs were displayed as usual. The suicide rate from charcoal burning was reduced by a statistically significant margin in the intervention region ( $P<0.05$ ) but not in the control region. We observed no significant change in the suicide rate using other methods in either location.

Wong Paul W. C(2009)  Evaluation of a prevention program	An Integrative Suicide Prevention Program for Visitor Charcoal Burning Suicide and Suicide Pact	SUICIDE AND LIFE-THREATENING BEHAVIOR Volume: 39 Issue: 1 Pages: 82-90	An integrative Suicide prevention program was implemented to tackle an outbreak of visitor charcoal burning suicides in Cheung Chau, an island in Hong Kong, in 2002. This study evaluated the effectiveness of the program. The numbers of visitor suicides reduced from 37 deaths in the 51 months prior to program implementation to 6 deaths in the 42 months post-implementation period. The number of visitor suicide pacts decreased from 7 pacts (15 individuals) to 1 pact (2 individuals). No statistically significant differences in the numbers of visitor suicide attempts and resident suicides were observed in the two time periods. No statistically significant changes in visitor suicides during the study period were observed on the comparison islands. The consistency and timing of reduction in visitor suicides correlated with the development and delivery of the integrative program on the intervention island, suggesting a causal association between program delivery and reduction of visitor suicides. The possibility of displacement seems small because there was no increase in visitor suicides on the comparison islands during the study period. This integrative approach in preventing target-specific suicides may serve as an example for other communities to develop suicide prevention programs that make use of the existing local resources.
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Kuo Chian-Jue(2008)  Analysis of surveille	Suicide by charcoal burning in Taiwan: Implications for means substitution	SOCIAL PSYCHIATRY AND PSYCHIATRIC EPIDEMIOLOGY Volume: 43 Issue: 4 Pages: 286-290	Results The 1-year incidence rate of suicide mortality was 0.017: 0.026 in males and 0.013 in females. There was a strong association between burning charcoal as the method used at the index attempt (relative hazard = 4.1, $P < 0.001$ ) and completed suicides. Those who used the method of burning charcoal at the index attempt frequently used the same means in a subsequent attempt leading to suicide mortality. However, a majority of suicide completers (59.1%) who died by burning charcoal had used a different method at their index attempt. Conclusions Persons who attempt suicide by charcoal burning are a high-risk group for completed suicide. Those who burned charcoal in a suicide attempt were likely to use the same method in a later lethal attempt, and charcoal burning was a frequent cause of death among those who used different methods in earlier attempts. Charcoal burning should be a target for suicide prevention efforts.
Yip Paul S. F(2007)  Report	Charcoal-burning suicides and strategies for prevention	CRISIS-THE JOURNAL OF CRISIS INTERVENTION AND SUICIDE PREVENTION Volume: 28 Supplement: 1 Pages: 21-27	This paper examines the emergence of a new method of suicide in Hong Kong by carbon monoxide poisoning generated by the burning of charcoal. In just 6 years, it has become the second most common means of suicide after jumping from heights. The profile of these charcoal-burning suicide victims is different from that of other suicide deaths. It seems that a significant

			proportion of the increase in the number of suicides for the period is attributable to the charcoal burning. The effect of mass media reporting and strategies on how to contain the contagious effect of charcoal-burning deaths are discussed.
Chan, Lee (2002).	Charcoal burning suicide: trends and prevention strategies	<a href="http://www.civic-exchange.org/wp/wp-content/uploads/2010/12/2002_Lin_Yee_and_Wei_Wei.">http://www.civic-exchange.org/wp/wp-content/uploads/2010/12/2002_Lin_Yee_and_Wei_Wei.</a>	<p>Virtually nonexistent prior to 1998, charcoal burning suicide has quickly become the third most common form of suicide, behind jumping and hanging.</p> <p>The evidence suggesting that accessibility to specific methods of suicide is causally related to suicide rates is temporal and correlational. This relationship has been demonstrated through studies of domestic gas, drug poisoning, car exhaust, firearm, and jumping suicides. A controlled experiment verifying causation would be impossible to conduct, but the temporal and correlational evidence is strong and recurring. Easy availability may contribute to high suicide rates.</p>

### **Methodological limitations**

Pesticides: International evidence is accumulating which indicate that pesticide self-poisoning is one of the most commonly used methods of suicide in the world (estimated to account for about 30% of all suicide deaths). However, due to a lack rigorous surveillance data in many countries, the magnitude of the

problem and the assessment of reductions of deaths by pesticide ingestion after the implementation of specific intervention strategies are difficult to ascertain. Apart from the study by Gunnell et al (2007), the available literature lacks appropriate study design; in particular, insufficient length of time periods before and after a particular intervention approach. A further methodological limitation remains the absence of systematic reviews on this specific issue.

Firearms: Majority of evidence comes from ecological studies or case-control studies, both of which are affected by methodological limitations. While the latter often lack accurate data obtained from informants about suicide victims, the former lack consensus on how to measure the overall degree of gun regulation. Furthermore, such study designs provide only limited support for causality of measured phenomena. The most frequent approach, observed in reviewed studies, was examination of either firearms-related or overall suicide rates before and after implementation of a particular law. However, the time before the effect of a law can be detected and the duration of any such effects remains unknown.

Further methodological restraint of majority of available studies was insufficient adjusting for confounders, not only factors that increase the risk for suicide on a level of the individual (e.g. mental disorders, precipitating life events, alcohol consumption), but also, if not particularly, those associated with political and social environment in which a particular law is implemented. Differences in suicide risk between birth cohorts has rarely been controlled, however one recent study from Australia suggested that decrease in firearm-related suicides could only partly be attributed to introduction of more stringent firearms policies, but also reflected a shift in social acceptability of firearms between studied cohorts.

Jumping: Conclusions on the prevalence of suicides by jumping and effectiveness of intervention strategies, aiming to prevent these deaths, are limited by low numbers of such incidents. This makes difficult comparisons of numbers of suicides before and after, for example, installation of barriers or safety nets on sites with frequent suicides. Longer periods of time are needed to assess the impact of such measures on the overall suicide rates in a population or a region surrounding a particular site, to exclude the possibility of 'method substitution'. There are limited numbers of systematic reviews available on the subject, and absence of meta-analytical studies. There is a lack of information about attempts to prevent suicides by jumping from high-rise buildings, from which a majority of suicides by jumping occur.

### **Directness (in terms of population, outcome, intervention and comparator)**

Pesticides: The great burden of suicide by pesticide ingestion in developing countries, particularly Western Pacific region, is mainly associated with the unrestricted accessibility to pesticides and the high toxicity of chemicals used in land cultivation. One proposed interventions, which aim for safer storage of pesticides within households and the introduction of governmental legislations that provide less toxic substitutions, are suggested to yield the most effective

results in reducing the numbers of these deaths. Further, other health issues related to exposure to pesticides are likely to be reduced with restricting access to pesticides. Lastly, improvements in the accessibility to medical facilities and quality of care for pesticide poisonings are needed in rural areas.

Firearms: Despite above mentioned limitations of studies on efficiency of laws restricting access to firearms, there is sufficient evidence in the literature showing that after implementation of specific intervention strategies, both firearm-related and overall suicide rates have been substantially lowered. However, majority of studies were derived from the United States or Canada, and generalizability of findings to other environments with non-comparable political and social characteristics is limited. Further, several different laws have so far been reviewed, from stricter registrations of firearms, introductions of cooling-off periods to total bans (particularly for sub-groups at higher risk, such as children, psychiatric patients and convicted criminals), hindering a global understanding of which types of restrictions are more efficient than others. Nevertheless, it has been reported that in the United States, states with stricter firearms laws have lower suicide rates.

Jumping: Large body of evidence suggests that restricting access to a specific method of suicide tends to reduce suicide rates of mortality and morbidity by that method, at least in the short term. Direct effects of restricting access to means when trying to prevent suicides by jumping are difficult to observe, as is an eventual shift towards other means, since this suicide method is rarely used in the population. All reviewed studies derived their conclusions from comparison of numbers (and not rates) of suicides before and after implementation of such measures. Nevertheless, a few of them have shown that after erection of barriers or safety nets there have been no suicides from the targeted site. Authors of reviews summarized in the table above caution that since methods of suicides vary greatly across countries and even regions, interventions restricting access to means might not prove to be effective in different environments. Further studies are therefore needed to learn more about the people who use these methods of suicides, since available findings from published literature are not easily generalizable due to significant variations in studied samples (e.g. jumps from buildings, jumps from bridges, psychiatric patients, and suicide attempters).

### **Narrative conclusion**

Pesticides: There is a well-recognized need for the development of intervention strategies to reduce the great number of suicides by pesticides ingestion, particularly in the Western Pacific region and the rural areas of low-income countries. To date, there are limited reports in the literature on their practical implementations and limited evidence of their effectiveness. Nevertheless, the few available studies show some positive outcomes after the provision of lockable boxes for household pesticides storage and governmental bans on the most highly toxic pesticides. Further research is needed to deepen the understanding of attitudes, knowledge and beliefs concerning pesticides and their use in suicide attempts in different cultural contexts.



Firearms: There is evidence in the literature that introduction of policies, restricting access to firearms, efficiently reduces both firearms-related and overall suicide rates.

Jumping: There is some, though limited, evidence in the literature that installation of barriers or safety nets on bridges and other outdoors 'suicide hot-spots' effectively prevents subsequent suicides by jumping from that particular site. However, small numbers of suicides by jumping hinder firm conclusions whether this leads to a substitution of locations of jumping or shift in used method of suicide. More research is needed on designing and introducing similar interventions in attempts to prevent suicides by jumping from high-rise buildings, from which a majority of suicides by jumping occur.

Charcoal: Charcoal burning is used as a method to commit suicide especially in Hong Kong, Taiwan, and Japan. The number grew rapidly since late 1990s. Currently, charcoal burning are used in more than 20% of suicide in Hong Kong. It is used more often amongst those in the 24 to 39 age range. It is suggested that widespread media coverage of this method and easy access to barbeque charcoal may have contributed to the epidemic. *Yip Paul S. F(2010)* concludes that restricting access to barbeque charcoal in stores reduced the suicide rate from charcoal burning.

**Any additional information (safety and tolerability issues, cost, resource use, other feasibility issues, as appropriate)**

Pesticides: It has been argued that the implementation of several proposed intervention strategies may not be practically enforceable in many areas of the world due to heavy reliance on the usage of these chemicals in agriculture and concerns that banning some of these pesticides may lead to an emergence of black market sales. Furthermore, the pesticide industry is highly profitable and there are clear conflicts of interest where such initiatives may compromise profits. Therefore, the reduction of pesticide suicides requires a multi-level strategy involving local governments, national and international health policy makers working in collaboration with agricultural and chemical industries and other various other stakeholders.

Firearms: Implementations of interventions restricting access to firearms are often met with public oppositions. In the future, evidence based on sound research designs and longitudinal observations of effects of restriction laws is needed to guide policy making decisions.

Jumping: Installation of barriers or safety nets on sites with common suicides by jumping are often met with public opposition and disagreements regarding worthiness of, often costly, investments into designing such intervention. Further research is therefore needed to support designing appropriate solutions already when building tall structures, not only on outdoors locations but also, if not particularly, in high-rise residential buildings and institutions, housing particularly vulnerable populations, such as psychiatric patients.

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### **From evidence to recommendations**

Factor	Explanation
<b>Narrative summary of the evidence base</b>	<p>Pesticides: There is limited evidence in the literature on the effectiveness of strategies that aim to reduce suicides by pesticide ingestions. Nevertheless, the available studies show some positive outcomes after providing lockable boxes for the household storage of pesticides and governmental bans on the most highly toxic pesticides. Further research is needed to deepen the understanding of attitudes and knowledge concerning pesticides and their use in suicide attempts in different cultural contexts.</p> <p>Firearms: There is epidemiological evidence that introduction of policies restricting access to firearms efficiently reduces both firearms-related and overall suicide rates.</p> <p>Jumping: There is some epidemiological evidence that installation of barriers and safety nets efficiently prevented further suicides by jumping from targeted sites (mainly bridges) and has not lead to subsequent increase in suicides by jumping from other sites or even suicides in general.</p>

	Charcoal:
<b>Summary of the quality of evidence</b>	<p>Pesticides: The quality of evidence is low, mainly based on observational studies and one ecological study.</p> <p><u>Firearms</u>: Quality of evidence is moderate, based on ecological and case-control studies. Major methodological concern in examining the effectiveness of intervention strategies restricting access to firearms is absence of longitudinal study designs and insufficient understanding of environmental factors, such as social acceptability and changing cultural norms regarding firearms.</p> <p><u>Jumping</u>: Quality of evidence is moderate, mainly based on observational studies.</p> <p>Charcoal:</p>
<b>Balance of benefits versus harms</b>	<p>Pesticides: Although the evidence on the effectiveness of strategies that aim to reduce suicides by pesticide ingestions is limited, no harm has been reported as a result of implementing the described intervention strategies. However, one study suggested that restricting access to one targeted type of pesticide leads to an increase in the ingestion of another organophosphate. Nevertheless, shifts to a less toxic means would still save lives - under the condition that timely and sufficient health care is provided.</p> <p>Firearms: Benefits of intervention approaches restricting access to firearms have been confirmed by reducing rates of firearm-related and overall suicide deaths. Furthermore, some studies suggested that such interventions lead to reduction of all violent deaths by firearms, besides suicides (e.g. accidental deaths and homicides).</p> <p>No harm has been reported as a result of implementing described intervention strategies. While some studies suggest that restriction of access to firearms might lead to an increase in utilization of an alternative suicide method, in case of firearms suicides this might lead to a shift towards a less lethal mean.</p> <p>Jumping: Benefits of intervention approaches, restricting access to sites of frequent suicides by jumping, have been confirmed by reducing the numbers of suicides from sites where barriers or nets</p>

	<p>have been installed. Further benefits from reducing these deaths come from alleviating the emotional trauma in people who witness these acts.</p> <p>No harm has been reported as a result of implementing described intervention strategies; however, some studies suggest that restriction of access to means of one targeted method of suicide might lead to an increase in utilization of a substitute method.</p> <p>Charcoal:</p>
<b>Values and preferences including any variability and human rights issues</b>	None.
<b>Costs and resource use and any other relevant feasibility issues</b>	<p>Pesticides: The high profitability of the agricultural industry and a heavy reliance on these toxic chemicals in land cultivations may present obstacles in the implementation of the suggested prevention strategies (e.g. by providing safer storage for pesticides within communities).</p> <p>Resources for training should include the WHO publication "Clinical Management of Acute Pesticide Intoxication: Prevention of Suicidal Behaviours".</p> <p>Firearms: Implementations of interventions restricting access to firearms (e.g. stricter firearms laws) are often met with public oppositions.</p> <p>Jumping: Development and implementation of intervention strategies to prevent access to sites of suicides by jumping (e.g. installation of barriers and safety nets) need to be supported by local communities and/or national government, in particular on the grounds of justifications of their costs and aesthetics.</p> <p>Charcoal:</p>

**Recommendation(s)**

At the population level, restricting access to means of self-harm (such as pesticides, firearms, high places, charcoal) is recommended.

Strength of recommendation: **STRONG**

Collaboration between health and other relevant sectors should be established and the community should be involved actively to find locally feasible ways to implement interventions at the population level to reduce access to means of suicide to decrease deaths from suicide, suicide attempts and acts of self-harm.

Strength of recommendation: **STRONG**