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Chances and Limits of Method Restriction: A Detailed Analysis of Suicide Methods in Switzerland

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Astrid Habenstein, Timur Steffen, Christine Bartsch, Katarzyna Michaud, and Thomas Reisch

The objective of this study was to estimate the potential of method restriction as a public health strategy in suicide prevention. Data from the Swiss Federal Statistical Office and the Swiss Institutes of Forensic Medicine from 2004 were gathered and categorized into suicide submethods according to accessibility to restriction of means. Of suicides in Switzerland, 39.2% are accessible to method restriction. The highest proportions were found in private weapons (13.2%), army weapons (10.4%), and jumps from hot-spots (4.6%). The presented method permits the estimation of the suicide prevention potential of a country by method restriction and the comparison of restriction potentials between suicide methods. In Switzerland, reduction of firearm suicides has the highest potential to reduce the total number of suicides.

Keywords method restriction, prevention, suicide, Switzerland

INTRODUCTION

Suicide has a detrimental impact on the life expectancy of the general public and is therefore a major public health problem. According to the World Health Organization (WHO), about 1 million persons die by suicide each year (World Health Organization, 1999). Restriction of means as a suicide prevention method has been considered controversial in suicide research due to the risk of method substitution. However, an extensive review by Daigle (2005) revealed a lack of or only minimal suicide method substitution in most of the included studies. Only 3 of 22 studies showed complete or near complete substitution effects. Furthermore, Mann, Apter,

Bertolote et al. (2005) concluded in their systematic review: “Restricting access to lethal methods reduces suicide rates” if those suicide methods are highly lethal and common (p. 2070). Therefore, reducing access to lethal means has become an important, but still discussed, strategy in suicide prevention (Johnson, Frank, Ciocca et al., 2011).

The implementation of method restriction measures as a public health strategy often has high costs (Florentine & Crane, 2010). Moreover, method restriction measures are difficult to evaluate because suicide rates depend on multiple and complex factors (Gunnell & Miller, 2010). Therefore, they have to be preceded and followed by systematic analyses and

evaluations of the national and local method-specific suicide rates pre- and post-intervention (Florentine & Crane, 2010). Nock, Borges, Bromet et al. (2008) even considered epidemiologic experiments on prevention and intervention procedures as “perhaps one of the most important directions for research on the epidemiology of suicidal behaviour” (p. 11). Such extensive and costly epidemiologic surveys fundamentally depend on official death registers (Allebeck, 2009). In most countries, death registers are based on the ICD-10 X-coding system. However, the ICD-10 X-coding system may only be of limited use for suicide prevention. This is true for nearly all major suicide methods and will be illustrated for each suicide method separately.

Suicide Methods

Intoxication (X60-64). In developed countries, self-poisoning is predominantly carried out using legally prescribed drugs (Michel, Ballinari, Bille-Brahe et al., 2000). A restriction potential could only be shown for singular drugs with a high toxicity such as tricyclic antidepressants (Carlsten, Waern, Ekedahl et al., 2001), barbiturates (Whitlock, 1975), or paracetamol (Hawton, 2002; Hawton, Bergen, Simkin et al., 2012; Hawton, Simkin, Deeks et al., 2004). For method restrictive measures, it is therefore important to have knowledge about the specific drug groups used for suicide. The ICD-10 X-system distinguishes only five categories within suicide by intoxication. Out of these, one category relates to “unknown drug,” and each of the other groups includes various medication groups. Most importantly, the category X61 comprises antidepressants as well as barbiturates, antipsychotics, sedatives, and psychostimulants and must therefore be considered an insufficient variable in terms of suicide prevention.

Suicide by Hanging, Strangulation, and Suffocation (X70). The ICD-10 X-code 70 does not differentiate among hanging, suffocation, and strangulation. However, most of the cases are suicides by hanging. The majority of suicides by hanging are carried out in privacy, usually at home, and can therefore hardly be prevented in terms of restriction of means (Cantor & Baume, 1998) by public health interventions. However, restrictive measures of this suicide method could be effectively applied in institutions like prisons and hospitals (Gunnell, Bennewith, Hawton et al., 2005). However, the ICD-10 X-coding system does not permit differentiating between suicides in custody and at other locations.

Suicide by Firearms (X72-74). Suicide by firearms is a highly lethal method and applied predominantly by men, often without any preceding psychiatric treatment (Frei, Han, Weiss et al., 2006; Haw, Sutton, Simkin et al., 2004). The availability of guns seems to be strongly related to the number of suicides using this method (Ajdacic-Gross, Killias, Hepp et al., 2010; Killias, Van Kesteren, & Rindlisbacher, 2001). In several studies, a relationship between gun ownership and suicide rate was demonstrated (e.g., Ajdacic-Gross, Killias, Hepp et al., 2006; Hemenway & Miller, 2002; Miller, Azrael, Hepburn et al., 2006). Studies based on changes in legislation aiming at restricting the accessibility of firearms could demonstrate a reduction of method-specific suicide rates (Beautrais, Fergusson & Horwood, 2006; Kapusta, Etzersdorfer, Krall et al., 2007; Miller, Azrael, Hepburn et al., 2006).

In Switzerland, several circumstances can contribute to the presence of firearms in a household. First, private ownership of weapons is permitted by liberal national legislation. Second, army recruits have to store the military weapon at home during their military service until the age of 30. Furthermore, veterans also keep the

weapon, usually for the rest of their lives. The ICD-10 X-code classification system permits differentiating long and short guns, but does not provide any information about whether the weapon used was a military weapon or a private gun.

Fall From Height (X80). Unlike other suicide methods, suicide by fall from height is tied to topographic aspects and architecture, and it is related to suicide in public (Owens, Horrocks, & House, 2002). People jump from bridges and cliffs, as well as from private or public buildings. Like in hanging, it seems difficult to effectively apply method restriction to private places. Correspondingly, most publications investigating method restriction effects focus on hotspots like bridges (Reisch, Schuster, & Michel, 2007) or public places like the Niagara Falls (Gunnell & Nowers, 1997), or the Bern Muenster Terrace (Reisch & Michel, 2005). Several studies demonstrated significant effects on the secured hotspot itself (e.g., Bennewith, Nowers, & Gunnell, 2007) and partially on regional rates of suicide by jumping (e.g., Reisch & Michel, 2005). Suicide hotspot bridges were defined by Reisch, Schuster, Jenny et al. (2006) as bridges that exceeded 0.5 suicide jumps per year in a 10-year period. The ICD-10 category X80 (fall from height) neither differentiates between jumps from buildings and bridges nor between private and public places. Therefore, it is insufficient to attribute suicides to known hotspots and to estimate the prevention potential of a region or a country.

Jumping or Lying before Moving Object (X81). Thirty-four percent of all railway suicides in Germany occur in railway stations or at suicide hotspots (Erazo, Baumert, & Ladwig, 2004). Such suicides can be secured by installing additional sliding doors, e.g., in metro stations in Shanghai, China. Similar to suicide by jumping, it often occurs at well-known hotspots,

which are often close to psychiatric hospitals (Erazo, Baumert, & Ladwig, 2004), indicating that local interventions may have a preventive effect (Aitken, Owens, Lloyd-Tomlins et al., 2006). Again, the ICD-10 coding system does not permit localizing hotspots and/or differentiating between suicides committed in railway stations versus suicides on open track.

Other Suicide Methods (X71, X76, X79, etc.). Suicide methods such as traffic accidents, fire, sharp objects, suicide in traffic, drowning, or electrocution have not been a target for method restriction efforts, although some of the suicides might be restrictable if they take place at public hotspots (King & Frost, 2005). However, up to now, little research about the possible localization of those hotspots exists (Owens, Lloyd-Tomlins, Emmens et al., 2009).

Altogether, a massive gap between the importance of a detailed situational survey as a background for public health decisions to implement effective suicide prevention measures and the insufficient national registrations based on the ICD-10 classification system must therefore be addressed. Whereas some countries provide outstanding examples of national death registry systems, including even supplementary surveys (e.g., Church & Ryan, 2006), other countries have little to no additional data recordings.

Aims of the Study

The main objective of this study was to obtain data on national suicide methods that permit the determination as to which proportion of all suicides can be prevented by method restriction measures. The results were used to estimate the method-specific suicide prevention potential by method restriction in Switzerland by public health interventions. To our knowledge, this is the

first study to carry out such in-depth analyses.

Having in mind the specific situation of Switzerland, we expected that a considerable number of the suicides by fall from height would be committed by jumping from bridges, because Switzerland has a relatively high number of bridges. More importantly, suicide by firearm is the method most often used in Switzerland, as opposed to most countries in Europe (Ajdacic-Gross, Weiss, Ring et al., 2008). Following the hypothesis of availability (Marzuc, Tarduff, & Hirsch, 1992), a high number of preventable suicides are carried out with military or private weapons.

METHOD

Data

The Swiss Federal Statistical Office (FSO) continuously registers suicides in Switzerland using the given ICD-10-X-codes (FSO data set). The necessary supplementary survey is, like in most of the countries, not routinely carried out in Switzerland. The relevant data for the analyses of accessibility were gained by examining Forensic Institutes documentations (IFM data set). The study focused on suicides committed during the year 2004.

FSO Data Set. The 2004 Swiss death register consists of all suicides committed by persons with residency in Switzerland by suicide methods. Altogether, data of 1284 suicides were included. After excluding assisted suicides that were not examined in this study ($n = 132$), the FSO data set comprises 1152 suicide cases classified according to the X-coding system.

IFM Data Set. A detailed survey of suicide methods and circumstances was carried out on the basis of all suicide documentations from the year 2004 in five Swiss Institutes

of Forensic Medicine (IFM Bale, Berne, Lausanne, St. Gallen, and Zurich). These institutes cover about 82.6% of the total Swiss population (6.4 million inhabitants). The IFM data set includes IFM findings from autopsy results and corpse examinations, and in most of the cases, police reports. It comprises 386 cases. The IFM data set only comprises about one third of all suicides, which is due to the fact that most deaths are registered by doctors who are on site examining the death. The IFM is only engaged if death is unclear or homicide has to be ruled out.

In addition to epidemiological data such as age, gender, and marital status, in accordance to the FSO data set, the following variables were collected: (a) the particular substance(s) attributed to the deceased in the case of intoxication; (b) the localisation of the suicide (private vs. institutional surroundings) in the case of hanging; (c) the exact localization of the suicide with relevant information (bridges vs. buildings/hotspots vs. non-hotspots) in the case of fall from height; and (d) the circumstances of ownership (private vs. military) in the case of suicide by firearms.

Undetermined deaths, e.g., accidents with possible suicide intent, and assisted suicides, were excluded. In cases with combined suicide methods, all methods were documented, but only the method leading to death according to IFM documentation was used for the main analyses. Most of these cases (80%, 16 out of 20 cases), stemmed from suicide methods that cannot easily be influenced by method restriction, such as suffocation or hanging in private settings, or other methods (fire, sharp objects, exposure to gases, chemicals, drowning, electrocution). These cases were considered as not accessible for method restriction. The presence of alcohol and illegal drugs in deaths by other suicide methods were not considered in this study for having no impact on method restriction accessibility.

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Procedures/Calculation

Differentiation. The little-differentiated FSO data set served as a base for the general proportions of suicide methods used. The IFM data set was used to calculate submethods within one suicide method, according to circumstances relevant for method restriction measures.

Estimation of the Method-Specific Accessibility to Method Restriction. Suicides were analyzed for their accessibility to method restriction measures, based on existing investigation results in the current literature. The proportions of suicides accessible and not accessible to restrictions of means within one suicide method were determined.

Our study focuses on restrictability in the view of a legal or public health approach. Some suicide methods might nonetheless be accessible at an individual or social support level (e.g., family members securing medications at home, physicians prescribing non-lethal amounts of medications, etc.), which will not be addressed in this study. A submethod was classified as “accessible” if it could be, due to its circumstances, influenced by method restriction. A Swiss-specific example in this category is suicide by army weapons, as these are (in contrast to other countries) stored at home, often lifelong. This accessibility could theoretically be easily altered by changes in legislation. This category also accounts for the use of private guns (Beautrais, Fergusson, & Horwood, 2006; Kapusta, Etzersdorfer, Krall et al., 2007; Miller, Azrael, Hepburn et al., 2006). In Switzerland, different types of restriction would be necessary (change in military versus general gun legislation). Because of the importance for suicide prevention measures in Switzerland, the categories will be listed separately. Fall from heights from hotspots was also categorized as accessible, because it could be

demonstrated that even in the existence of other heights nearby, most of the cases were preventable by securing the spot through barriers (Reisch & Michel, 2005). Additionally, jumps from hospital balconies or hospital roofs were also categorized as “jumps from hotspots,” as described in the literature (Chen, Gunnell, & Lu, 2009) and were correspondingly categorized as “accessible.” In drug intoxications, suicides by highly toxic drugs/medications like barbiturates, tricyclics, and paracetamol (Carlsten, Waern, Ekedahl et al., 2001; Hawton, 2002; Hawton, Simkin, Deeks et al., 2004; Whitlock, 1975) were defined as “accessible.” In hanging, only suicides committed in institutions (Gunnell, Hur, Bhaumik et al., 2005) were counted as “accessible.”

Railway suicides are partially committed at hotspots as well (Erazo, Baumert, & Ladwig, 2004) and are therefore partially accessible for method restriction (Aitken, Owens, Lloyd-Tomlins et al., 2006). Until now in Switzerland, no study has been undertaken concerning hotspots in the Swiss railway system; therefore, the exact proportion of railway hotspot suicides is unknown. The best possible estimation of the percentage of preventable suicides may be found in the neighboring country. In a survey on railway suicides carried out in Germany, Erazo, Baumert, and Ladwig (2004) found that 34% of all railway cases are carried out at hotspots and may therefore be preventable. This proportion was applied in the current study as the current best possible estimate.

Methods “not accessible” for method restriction are those that cannot be easily influenced by public health interventions, such as suicide by hanging, other than those in institutions (Gunnell, Bennewith, Hawton et al., 2005), mixed intoxications, fall from height at non-hotspots, and other methods (fire, sharp objects, exposure to gases, chemicals, drowning, electrocution).

Analyses. In order to compare the two data sets, we applied chi-square tests to

depict differences in gender and t-tests to compare the age distribution between the FSO and IFM data sets. All analyses were carried out for the total sample as well as for each of the common suicide methods (hanging, shooting, jumping, moving object, and drug intoxication). The frequencies of the suicide submethods were taken from the IFM data set. All analyses regarding submethods were derived from additional data that also stem from the IFM data set. In jumping, we compared jumps from bridges versus jumps from buildings in terms of hotspots using a chi-square test. We expected the proportions of hotspots in bridges to be higher than in jumps from buildings.

The overall potential of method restrictive measures for Switzerland was calculated using data from both data sets. We first calculated the proportion of each submethod within each method in the IFM data set. These proportions of each method were transferred to the FSO data set. Such a procedure allows for the control of systematic confounders (e.g., the fact that shooting is regularly investigated by the IFM, whereas cases of intoxication may be less often sent to the IFM). The transferred data of the submethods were finally summed up to estimate the total method restriction potential of Switzerland. Bonferroni corrections were used in multiple testing. All analyses were carried out using SPSS 17.

RESULTS

Comparing FSO with IFM Data

The IFM database includes 33.5% of the 1152 suicides registered by the FSO during the year 2004. Only a few differences between the two datasets could be detected. The proportion of cases referring to suicides by fall from height was higher in the IFM than in the FSO data set (18.4% of

all suicides in the IFM data versus 12.6% in the FSO data; $\text{Chi}^2 = 8.08$; $p < .05$ [Bonferroni corrected]; Odds ratio: 1.57, CI 1.15–2.14). The IFMs were more often involved in younger persons dying by intoxication by drugs (48.8 vs. 60.1 years; $t = 13.32$, $p < .01$ [Bonferroni corrected], CI (of the age difference: 4.61–18.13 years). Beside this, no differences were found. Table 1 gives a synopsis of the used suicide methods, submethods, and their restriction potential.

Intoxication (X60-64). Around 15% (FSO: 14.8%; $N = 171$) of the suicides were due to overdose of legal drugs. The majority (60.9%; 25 out of 41) of all intoxications (IFM data) were intoxications with one specified drug. Such monosubstance intoxications with a described restrictability (paracetamol, tricyclics, barbiturates) accounted for 45.8% (11 out of 25) of all monointoxications (tricyclics 24% [6 out of 25], barbiturates 16% [4 out of 25], Paracetamol 4% [1 out of 25]). Of note, 66.7% (16 out of 25) of all monointoxications emanate from the category X61.

Suicide by Hanging, Strangulation, and Suffocation (X70). Altogether, 27.2% (FSO: $N = 313$) of the suicides accounted for hanging, strangulation, and suffocation. A differentiation of the submethods showed, as expected, that the majority committed suicide by hanging (complete/incomplete; 73 out of 89; 90.1%, IFM data) and only a small part by suffocation (plastic bags; 8 out of 89; 9.9%). About 16% (13 out of 89) took place in an institution, with all of the suffocation suicides taking place at private settings.

Suicide by Firearms (X72-74). Nearly one quarter of all suicides (FSO: 23.6%; $N = 272$) were carried out by firearms. The detailed analysis (IFM data; $N = 92$) allowed the identification of origin of the

TABLE 1. Proportions of Suicides in Switzerland and the Accessibility to Method Restriction Strategies

Method	FSO (N = 1152)		IFM (N = 386)		Percentage of total suicides	Accessibility to method restriction	
	N	%	N	%			
Selfpoisoning by drugs (X60-64)	171	14.8	Intoxications with paracetamol, tricyclics, barbiturates	11	27	4.0	accessible
			Other/mixed intoxications	30	73	10.8	not accessible
Hanging, Suffocation (X70)	313	27.2	Institutional environment	13	15	4.0	accessible
			Private environment	76	85	23.2	not accessible
Suicides by firearms (X72-74)	272	23.6	Army weapon	38	44	10.4	accessible
			Private weapon	48	56	13.2	
Jump from height (X80)	145	12.6	Hotspots	28	41	5.2	accessible
			Non hot spots	40	59	7.4	not accessible
Railway (X81)	87	7.6	Station and hotspots*	32	34	2.5	accessible
			others		66	5.1	not accessible
Others (X71, X76, X79 etc.)	164	14.3	No distinction for method restriction found	–	–	14.3	not accessible
TOTAL	1152	100				39.2	Accessible

Note. *estimated from Erazo et al. (2004).

weapon (military versus non military weapon) in 93.5% (86 out of 92) of the cases. The army weapon was found responsible in 44.2% (38 out of 86) of the investigated cases.

Fall From Height (X80). About 12.6% of all suicide victims in Switzerland died by fall from height (FSO: $N=145$). Detailed analyses (IFM data) revealed that around 40% (28 out of 68) jumped from sites known as hotspots, and 60% (40 out of 86) from buildings. Leaps from suicide hotspots were mostly carried out from bridges and were significantly less frequent from buildings (21 out of 28, 75%, $\text{Chi}^2 = 11.07$, $p = .001$, Odds Ratio: 6.06, CI: 2.01–18.18).

Jumping or Lying before Moving Object (X81). The FSO shows 7.6% (FSO:

$N=87$) of suicides for this category. The 32 cases in the IFM data set consisted of 97% in railway suicides. From Erazo, Baumert, and Ladwig (2004) it can be estimated that a total of 34.1% of them are open to restriction of means.

Estimation of the Total Method Restriction Potential in Switzerland. Altogether, the proportion of suicides accessible for method restriction is 39.2% (approximately 500 suicides per year). The great majority of accessible suicides were committed by weapons (60.2%). When extrapolated on all Swiss cases, 120 suicides were carried out by the use of army weapon in the year 2004 in Switzerland, corresponding to a method specific suicide rate of 1.62/100 000 (120 suicides/7,415,102 total population [FSO, 2004]) (Figure 1).

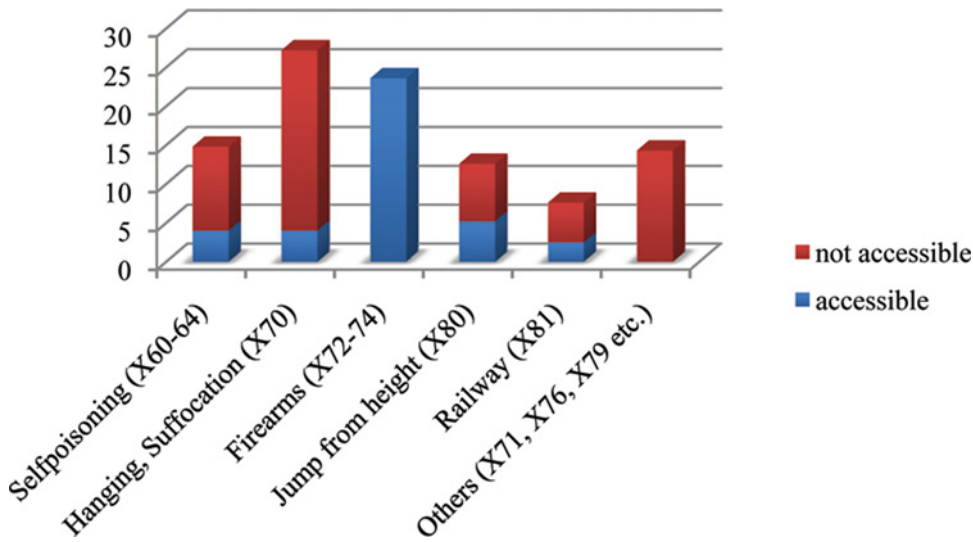


FIGURE 1. Proportion of suicide methods according to accessibility for suicide prevention by method restriction (in percent). (Color figure available online)

DISCUSSION

This is to our knowledge the first study trying to estimate the theoretical suicide prevention potential of a country by means of method restriction and to compare the restriction potentials between suicide methods. The combination of the complete, but little differentiated data set extracted from official registers (FSO data) and the incomplete, but highly differentiated data of the IFM disclosed relevant new findings.

More than two thirds of overdoses by medications fell in the category ICD-10 \times 61, and only the detailed data showed more elucidating results. Substances most often found in Switzerland were tricyclic antidepressants and barbiturates. The involvement of assisted suicide organizations in non-official suicides insinuates not only the increasing number of assisted suicides being a problem in Switzerland (Fischer, 2008), but also that their methods are being copied. A significant number of suicides by tricyclics was due to their toxicity and their indication

for severe depression. These results again underline that such drugs have to be used with care or under close supervision in suicidal patients (Gibbons, Hur, Bhaumik et al., 2005), a message that has to be taught to GPs and psychiatrists who predominantly prescribe such drugs. However, the absolute number of suicides by these drugs in Switzerland is small. About one third of all suicides by intoxications were polyintoxications. At least a part of these may be restricted by the collection of unused medicaments stored at home. However, in contrast to intoxications by analgesics or barbiturates, there are contradictory opinions towards restricting drugs with a low toxicity (Florentine & Crane, 2010).

Only suicides by hanging committed in institutions are accessible for method restriction (Bennewith, Gunnell, Kapur et al., 2005) by architectural modifications. The proportion is significantly higher in the IFM data set than is to be expected from studies in other countries like Great Britain (e.g., Gunnell, Bennewith, Hawton

et al., 2005). However, suicides in institutions may be relatively overrepresented in the given sample because of the compulsory involvement of IFMs in those deaths for legal reasons. It, therefore, cannot be ruled out that this result may at least be partly confounded. In the case of hanging (ICD-10 \times 70), an accessory variable indicating the location of the suicide in national registers would be a considerable benefit for suicide prevention. As this situation is transferable to a number of other countries, an extension of the ICD-10 \times 72-code, including the location of death (e.g., prison, other institution, private place) would be helpful in terms of suicide prevention efforts on a national and international perspective.

Compared to the average of Western Europe (7.6%; Värnik, Kilves, Van Der, Feltz-Cornelius et al., 2008), the rate of suicide by firearms is high, accounting for about one quarter of all suicides in Switzerland. Nearly half of the cases are committed by an army weapon, which without any doubt is a historical Swiss-specific pattern: Switzerland has a militia army leading to a situation unique in Europe in that most of the soldiers take their gun home and, moreover, keep the gun even after service. This results in a high number of army weapons stored in Swiss households. The idea of a militia army may further impact the general reason licensing is poorly regulated in Switzerland, given the fact that guns are widely available. A restriction by safe storage of the service weapon (storage in military institution outside the period of service) appears evident from a suicide preventive perspective, but it is currently ruled out by the majority of the political parties in Switzerland. However, several changes like the necessity to have a gun licence in order to keep the army weapon after the service (since 2010) may in the near future have an influence on the number of suicides by firearms. It therefore was deemed necessary that, in the future, the Swiss FSO registers

this submethod systematically to better understand effects of modifications in military organization on the number of suicides. Furthermore, suicides by private guns, even after excluding suicides by army weapon, are far above the European average, a finding that could correlate with a generally much less restrictive legislation for gun ownership in Switzerland compared to the rest of Europe. This also suggests a significant prevention potential in this suicide method in Switzerland. In contrast to other analyzed submethods, a general modification of the internationally used ICD-10 X code system does not seem suggestive, as this situation seems to be almost Swiss-specific.

One third of all suicides by fall from height in Switzerland are carried out at hotspots. The ICD-10 \times 80-code at present does not permit any differential registration. A differentiation of the existing variable (e.g., in leap from a bridge, a hospital, another public building, a residential building) in the ICD-10 system would be important for suicide prevention in Switzerland as well as other countries. On the basis of such a detailed survey (Reisch, Schuster, Jenny et al., 2006) in Switzerland, 23 hotspots have already been identified in Switzerland.

The potential of restriction railway suicides (ICD-10 category jumping or lying before a moving object X81) was estimated from a study of a neighboring country. Further studies evaluating railway hotspots are urgently needed to get a database in order to improve suicide prevention in Switzerland on the railway system.

Total Method Restriction Potential in Switzerland. Theoretically, 39.2% of the suicides in Switzerland, and therefore more than 500 suicides per year, are accessible for suicide prevention by method restriction. The highest prevention potential in Switzerland by far can be found in the very

law-sensitive submethod “army weapons,” which amounts to 10.6% of all suicides, as well as to private weapons, whose 13.2% fraction of suicides is partly reducible by changes in legislation. This is followed by fall from heights at hotspots, which accounts for 4.6% of almost all theoretically preventable suicides, by securing the hotspot. Of less significance, but still relevant, are suicide submethods like hanging in institutions, suicides by highly lethal substances (tricyclics, barbiturates), or railway suicides. In most of the methods, only a reduction and not a complete prevention can be expected. For other suicide methods the current state of investigation does not permit calculating the theoretically accessible proportion.

However, our data also demonstrate that most of the suicides in Switzerland (60.8%) could probably not be influenced significantly by method restriction. Suicide prevention therefore needs to be complemented by other measures, such as educational primary care programs, follow-up care after suicide attempts, and optimized treatment of depression as advocated by European Alliance Against Depression (EAAD; Hegerl, Wittenburg, Arensman et al., 2009).

The present study shows in detail how the actual national registration based on the ICD-10 X-codes is insufficient for suicide prevention, as it does not capture fundamental variables. The health policy decision makers therefore have to rely on a very poor base for decisions on cost-effective public health method restriction measures and are mostly dependent on additional epidemiological surveys. Unfavorably, surveys with a research purpose always require adequate funding, which is difficult to obtain in some countries (Allebeck, 2009). Our study strongly underlines the need to modify the ICD-10 X-codes in order to improve suicide prevention efforts. This would also allow comprehensive comparisons of suicide prevention potentials between different

countries. Such registration of differences in international statistics (Michel, Ballinari, Bille-Brahe et al., 2000) was an important element in reducing suicides by analgesics in Great Britain (Hawton, 2002; Hawton, Simkin, Deeks et al., 2004).

LIMITATIONS

This study has several limitations. First, only 2004 data were included. A greater number of cases would have permitted a closer look on detailed submethods such as specific medications. IFM documentation shows a lack of consistency in reporting procedures due to its orientation on legal tasks, which are not directed at gaining the information required in this study (Bennewith, Gunnell, Kapur et al., 2005). The legal assignment of the IFM may have caused a data bias. For example, when comparing FSO and IFM data, the number of suicides by fall from height was more often found in the IFM than in the FSO data set. Such discrepancies can produce a certain inaccuracy in the estimation of the total prevention potential. As in most other countries, a number of suicides may have not been detected or may be undetermined. No data of undetermined deaths is currently available for Switzerland. The accessibility of railway suicide had to be estimated from published foreign (German) data. We cannot exclude the possibility that the proportion of accessible suicides may differ between countries.

Altogether, this study provides a comprehensive picture of the chances and limits of suicide method restriction for Switzerland. The findings can constitute a basis of decision-making for public health strategies, which ultimately decide where engagement and finances are directed, be it in the construction of bridges, changes in firearm laws, or the education of gatekeepers, doctors, or prison staff. The formation of submethods applied in the

study serves to evaluate the potential and actual effects of method restriction measures in a more specific manner than the actually used ICD-10 X-classification system.

AUTHOR NOTE

The authors declare that no potential conflicts of interests exist.

We confirm that all the research meets the ethical guidelines as being approved by the Expert Commission for secrets in medical research, Swiss Federal Department of Home Affairs. We have seen, read, and understood your guidelines on copyright. The names of all the co-authors have been included in the manuscript. These co-authors all had an active part in the final manuscript.

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