

This article appeared in a journal published by Elsevier. The attached copy is furnished to the author for internal non-commercial research and education use, including for instruction at the authors institution and sharing with colleagues.

Other uses, including reproduction and distribution, or selling or licensing copies, or posting to personal, institutional or third party websites are prohibited.

In most cases authors are permitted to post their version of the article (e.g. in Word or Tex form) to their personal website or institutional repository. Authors requiring further information regarding Elsevier's archiving and manuscript policies are encouraged to visit:

<http://www.elsevier.com/copyright>



Available online at
 ScienceDirect
 www.sciencedirect.com

Elsevier Masson France

 www.em-consulte.com



Short communication

Firearm suicides and availability of firearms: The Swiss experience

V. Ajdacic-Gross^{a,*}, M. Killias^c, U. Hepp^d, S. Haymoz^e, M. Bopp^b,
 F. Gutzwiller^b, W. Rössler^a

^a Research Unit for Clinical and Social Psychiatry, Psychiatric University Hospital, Militärstr. 8, POB 1930, 8021 Zürich, Switzerland

^b Institute of Social and Preventive Medicine, University of Zurich, Hirschengraben 84, 8001 Zürich, Switzerland

^c Institute of Criminology, University of Zurich, Rämistrasse 74/39, 8001 Zürich, Switzerland

^d Psychiatric Services of the Canton of Aargau, Externer Psychiatrischer Dienst EPD, Haselstrasse 1, 5400 Baden, Switzerland

^e Federal Office of Statistics, Espace de l'Europe 10, 2010 Neuchâtel, Switzerland

ARTICLE INFO

Article history:

Received 10 November 2009

Received in revised form 14 April 2010

Accepted 14 April 2010

Keywords:

Firearms

Suicide

Prevention

ABSTRACT

This study aimed to examine the association between the availability of firearms at home, and the proportion of firearm suicides in Switzerland in an ecological analysis. The data series were analysed by canton and yielded a fairly high correlation (Spearman's rho = 0.60). Thus, the association holds also at a sub-national level.

© 2010 Elsevier Masson SAS. All rights reserved.

1. Introduction

The link between the availability of firearms at home and firearm suicide has been unequivocally demonstrated since the 1990s using international data [5,9,10,12,15]. Nevertheless, many people concerned have expressed doubts about the association between these two entities at a sub-national or at a local level. For example, the Swiss Federal Minister Samuel Schmid defended the home storage of military weapons in Switzerland in 2006 by suggesting: "A person, who wants to commit a suicide or homicide, will always find an opportunity to do that." (Tagesanzeiger, 02 september 2006)

Switzerland is known to be one of the countries with the highest proportion of firearm suicides [10,13,20,21], and with a high prevalence of firearms in private households [1]. Thus, it provides an interesting basis for analyses on a sub-national level. This study aims to examine the association between the proportion of firearm suicides, and the prevalence of firearms in private households in Switzerland by comparing data by canton. In Switzerland, this is the lowest aggregation level justifiable with respect to suicide and firearm frequencies.

2. Material and methods

This study relies firstly on suicide data extracted from computerised individual records of Swiss mortality statistics 1998–2007 [4,16]. The analysis included the ICD-10 codes X72 (handguns), X73 (rifles, shotguns, and larger firearms), and X74 (unspecified firearms). For the analysis described below we calculated the proportion of firearm suicides out of all suicides.

Secondly, data on firearms ownership (proportion of households owning – legal or illegal – firearms) was taken from the International Crime Victims Surveys and the Swiss Crime Victims Surveys (SCVS) (see also <http://www.unicri.it/www/analysis/icvs/index.php>) [3,10,11,19]. We calculated the average proportion of households owning firearms using data from the surveys of 1998, 2000, (see also <http://www.unicri.it/www/analysis/icvs/data.php>) and 2005 [11].

Further data used in this study included variables which are common predictors of suicide:

- the proportion of the service industry work force (Swiss enterprise census 1998) as an indicator of the rurality–urbanicity dimension;
- the proportion of Catholics (census 2000) as an indicator of religious affiliation.

The data was organized by canton with the exception of smaller cantons, which were aggregated into regions:

* Corresponding author. Tel.: ++41 44 29 67 433; fax: ++4144 29 67 449.
 E-mail address: vajdacic@dgsp.uzh.ch (V. Ajdacic-Gross).

- Uri, Nidwalden and Obwalden;
- Schwyz and Glarus;
- Appenzell Innerrhoden and Appenzell Ausserrhoden.

Cantons are sovereign units constituting the federal state of Switzerland. The largest cantons are Zurich (1,250,000 inhabitants at the census in 2000), and Bern (950,000 inhabitants). The smallest units in this analysis are Jura and Schaffhausen totalling about 70,000 inhabitants.

The comparison between the availability of firearms at home, and firearm suicide was done initially by means of Spearman's correlation coefficient, which is commonly used in correlation analysis of ordinal data. In the second analysis step we carried out an ordinal regression analysis including the proportion of the Catholic population and the proportion of the service industry work force. The latter variables were introduced as logits to mitigate floor and ceiling effects.

The analyses were performed using SAS for Windows (Version 8) and SPSS for Macintosh (Version 17).

3. Results

In the ten-year period 1998–2007 there were 13,410 suicides in Switzerland, of which 3,169 (23.6%) were recorded as firearm suicides. Most of these records occurred within the code X74 “unspecified firearms” (2,658, i.e. 83.9%), the rest being divided between codes X72 “handguns”, and X73 “rifles”. There was generally no information available from death records regarding the origin (i.e. civil or military) of the weapon.

The proportion of firearm suicides differed considerably between men and women. In men, there were 3,027 firearm suicides (32.6% of all suicides), and in women the figure was much lower at 142 (3.4%). Moreover, the proportions diverged also by age: below age 40 there were 1,015 firearm suicides (29.9% of all suicides), and 2,154 above age 40 (21.5% of all suicides). The range between cantons is shown in Fig. 1.

It is noteworthy that the proportion of firearm suicides increased up to the end of the 1990s (413 or 30.1% in 1998),

Table 1
Ordinal regression analysis on the proportion of firearm suicides.

| | Estimate | SE | Wald | df | p value | LCI | uCI |
|---|----------|-------|-------|----|---------|--------|------|
| Households owing firearms | 0.14 | .048 | 8.568 | 1 | .003 | .047 | .235 |
| Proportion of catholic population | -0.39 | .447 | .776 | 1 | .378 | -1.270 | .483 |
| Proportion of service industry work force | -2.10 | 1.224 | 2.962 | 1 | .085 | -4.506 | .292 |

and since then has decreased to 264 or 19.3% in 2007. If assisted suicides were to be excluded, the figures would be 31.0% in 1998, and 22.6% in 2007.

The overall proportion of households owning firearms in Switzerland decreased from 38.2% in 1998, to 35.4% in 2000, and 28.0% in 2005. Cantons with high average proportions of firearms-owning households calculated from all three SCVS surveys are Basel-Land, and cantons from Central Switzerland, i.e., Uri, Nidwalden and Obwalden (> 45%). Cantons with rather low proportions (< 25%) encompassed urban cantons (Basel-Stadt, Geneve), and cantons from the French speaking part of Switzerland (Vaud, Neuchatel). The range of firearm ownership can be viewed in Fig. 1.

The Spearman correlation between the two data series was 0.60 ($p < .01$). It was 0.53 ($p < .05$) in men, and 0.50 ($p < .05$) in women. The latter result should be interpreted cautiously because of the small frequencies in women's firearm suicides. In persons at age below 40 the correlation was .38 ($p < .1$), and in persons at the age of equal or above of 40 it was .57 ($p < .01$).

The association was checked with a regression analysis by adjusting for further variables of interest, which represented the urbanicity–rurality and religious affiliation dimensions. The initial Spearman correlation between the proportion of the service industry work force and the proportion of firearm suicides was moderate ($-42, p < .06$), and the correlation between the proportion of Catholics and the proportion of firearm suicides was low (.04, n.s.). In the ordinal regression analysis the proportion of households owing firearms remained the only relevant predictor of the proportion of firearm suicides (Table 1).

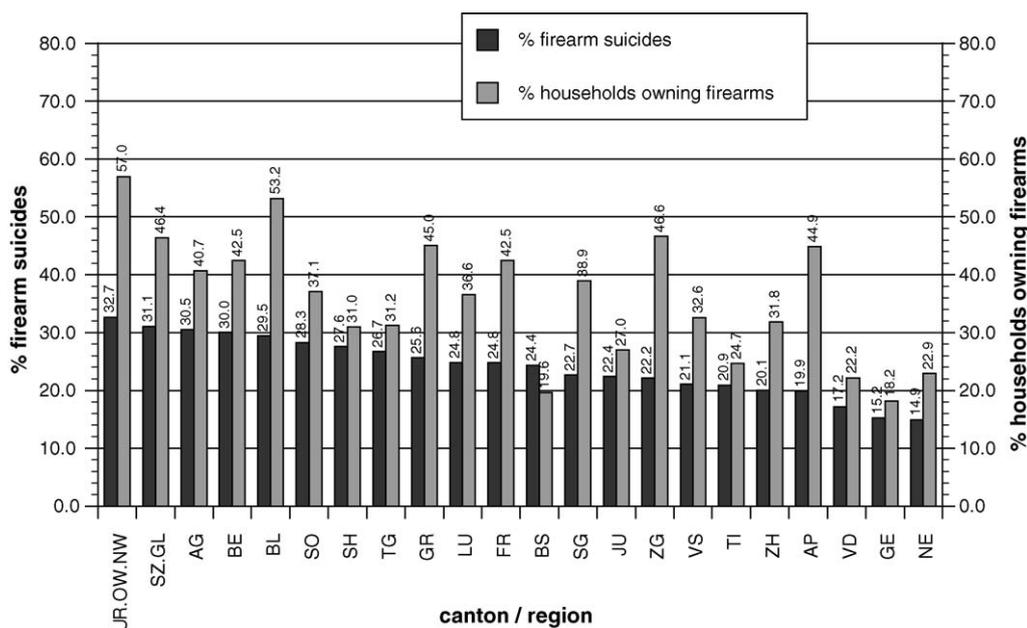


Fig. 1. Average proportion of firearm suicides in Switzerland, 1998–2007, and average proportion of households owning firearms in Switzerland according to the SCVS surveys 1998, 2000 und 2005; by canton/region.

UR/OW/NW: Uri/Obwalden/Nidwalden, SZ/GL: Schwyz/Glarus, AG: Aargau, BE: Bern, BL: Basel-Land, SO: Solothurn, SH: Schaffhausen, TG: Thurgau, GR: Graubünden, LU: Luzern, FR: Fribourg, BS: Basel-Stadt, SG: Sankt Gallen, JU: Jura, ZG: Zug, VS: Vallais, TI: Ticino, ZH: Zürich, AP: Appenzell I/R, VD: Vaud, GE: Geneve, NE:Neuchâtel.

4. Discussion

This study aimed to examine the association between the availability of firearms at home, and the proportion of firearm suicide using ecological data. It showed that the analysis of sub-national data from a small country such as Switzerland provides no exception to the international results as regards firearm ownership: cantons where firearms ownership in private households is more frequent also tend to have higher proportions of firearm suicides. It is striking that in recent years the proportion of firearm suicides began to decrease around the same time as the decline in the availability of firearms in private households. There is an obvious parallel with recent findings from Austria [8].

The association between firearms availability and firearm suicides can be easily explained by the situational properties of firearm suicides. Firearm suicide is a quick and particularly lethal suicide method [18]. It is the typical method in “rash act” suicides normally associated with impulsive reactions on painful stressors such as the loss of a beloved person, a separation, loss of job, or imprisonment. Personality traits such as impulsivity and alcohol abuse provide a frequent background [6]. In accordance with the situational characteristics, victims of firearm suicides have distinctly fewer previous suicide attempts in their psychiatric history than have victims of other suicide methods [17], and moreover they have less frequently a record of psychiatric inpatient treatment [7].

A particularly important issue in Switzerland are suicides with military weapons. Switzerland has a civil army. Almost all men but only few women are knowledgeable about the use of firearms, which is an additional clue to the discrepancy between Swiss men and women regarding firearm suicides. Young men keep their equipment at home as long as they are members of the armed forces (for a period of about 10 years). They are also allowed to retain their firearm after service discharge for a small fee. We conclude that the broad availability of military weapons in young Swiss men accounts for the paradoxical constellation that the proportion of firearm suicides is higher in young men than in elder men, but the association found in correlational analysis of data by canton is lower.

Unfortunately, we could not differentiate in this study between civil and military ownership of firearms. According to data from both Basel [7] and unpublished data from two other cantons (Thurgau, Zug), military firearms account consistently for about 40% of all firearm suicides in Switzerland. This study also did not differentiate between legal and illegal ownership of firearms, which is a minor limitation due to the particularly liberal firearm legislation in Switzerland. Further study limitations are that of an ecological study. Moreover, small frequencies of firearm suicides and of households with firearms in small cantons introduced some “noise” into the data and tended to smooth the associations.

5. Conclusion

To sum up, this study provides further evidence suggesting an association between the availability of firearms and the proportion of suicides committed with a firearm. In Switzerland as in other

developed countries with a high proportion of firearm suicides (USA, Nordic countries, France, Austria, Croatia, Serbia) [2], enhancing preventive efforts is an urgent issue for public health and health policy. Although the issue of method substitution remains unresolved, means restriction for firearm suicides may present a lesser policy challenge than other strategies for suicide prevention [14].

References

- [1] Ajdacic-Gross V, Killias M, Hepp U, Gadola E, Bopp M, Lauber C, et al. Changing times: a longitudinal analysis of international firearm suicide data. *Am J Public Health* 2006;96:1752–5.
- [2] Ajdacic-Gross V, Weiss MG, Ring M, Hepp U, Bopp M, Gutzwiller F, et al. Methods of suicide: international suicide patterns derived from the WHO mortality database. *Bull World Health Organ* 2008;86:726–32.
- [3] Alvazzi del Frate A, Van Kesteren JN. Criminal victimisation in urban Europe. Key findings of the 2000 International Crime Victims Survey. Turin: UNICRI; 2004.
- [4] Bundesamt für Statistik (BFS). Schweizerische Todesursachenstatistik: Richtlinien für die ärztliche Bescheinigung der Todesursachen. Bern: BFS; 1996.
- [5] Brent DA, Bridge J. Firearms availability and suicide. *Am Behav Sci* 2003;46:1192–210.
- [6] de Moore GM, Robertson AR. Suicide attempts by firearms and by leaping from heights: a comparative study of survivors. *Am J Psychiatry* 1999;156:1425–31.
- [7] Frei A, Han A, Weiss MG, Dittmann V, Ajdacic-Gross V. Use of army weapons and private firearms for suicide and homicide in the region of Basel, Switzerland. *Crisis* 2006;27:140–6.
- [8] Kapusta ND, Etzersdorfer E, Krall C, Sonneck G. Firearm legislation reform in the European Union: impact on firearm availability, firearm suicide and homicide rates in Austria. *Br J Psychiatry* 2007;191:253–7.
- [9] Killias M. International correlations between gun ownership and rates of homicide and suicide. *Can Med Assoc J* 1993;148:1721–5.
- [10] Killias M, van Kesteren J, Rindlisbacher M. Guns, violent crime, and suicide in 21 countries. *Can J Criminol* 2001;43:429–48.
- [11] Killias M, Haymoz S, Lamon P. Swiss Crime Survey. Die Kriminalität in der Schweiz im Lichte der Opferbefragungen von 1984–2005. Bern: Stämpfli; 2007.
- [12] Klieve H, Svetovic J, De Leo D. Who uses firearms as a means of suicide? A population study exploring firearm accessibility and method choice. *BMC Med* 2009;7:52.
- [13] Krug EG, Powell KE, Dahlberg LL. Firearm-related deaths in the United States and 35 other high- and upper-middle-income countries. *Int J Epidemiol* 1998;27:214–21.
- [14] Mann JJ, Apter A, Bertolote J, Beautrais A, Currier D, Haas A, et al. Suicide prevention strategies: a systematic review. *JAMA* 2005;294:2064–74.
- [15] Miller M, Hemenway D. The relationship between firearms and suicide: a review of the literature. *Aggression Violent Behav* 1999;4:59–75.
- [16] Minder CE, Zingg W. Die Sterblichkeitsstatistik in der Schweiz. Datenqualität der Todesursachen und der Berufsbezeichnungen. Amtliche Statistik der Schweiz, Nr. 155. Bern: Bundesamt für Statistik; 1989.
- [17] Pirkola S, Isometsa E, Lonnqvist J. Do means matter? Differences in characteristics of Finnish suicide completers using different methods. *J Nerv Ment Dis* 2003;191:745–50.
- [18] Shenassa ED, Catlin SN, Buka SL. Lethality of firearms relative to other suicide methods: a population based study. *J Epidemiol Community Health* 2003;57:120–4.
- [19] Van Kesteren JN, Mayhew P, Nieuwebeerta P. Criminal victimisation in seventeen industrialised countries: key-findings from the 2000 International Crime Victims Survey. The Hague: Ministry of Justice; 2000.
- [20] Varnik A, Kolves K, van der Feltz-Cornelis CM, Marusic A, Oskarsson H, Palmer A, et al. Suicide methods in Europe: a gender-specific analysis of countries participating in the “European Alliance Against Depression”. *J Epidemiol Community Health* 2008;62:545–51.
- [21] Varnik A, Kolves K, Allik J, Arensman E, Aromaa E, van Audenhove C, et al. Gender issues in suicide rates, trends and methods among youths aged 15–24 in 15 European countries. *J Affect Disord* 2009;113:216–26.