

Suicide prevention through means restriction: the example of firearms control in Croatia

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Introduction

Restricting access to lethal means of suicide is one of the most effective approaches to suicide prevention, as supported by successive systematic reviews of the international literature (Mann et al., 2005; Yip et al., 2012; Zalsman et al., 2016). Means restriction can operate as a population-based approach to suicide prevention or as part of individual's personal suicide risk management strategy, designed to hamper opportunities to attempt suicide. It is based on the observation that even though suicide is the consequence of multiple complex factors, the urge to act on one's suicidal ideation is usually not long-lasting, which means that an individual's access to highly lethal means has a critical influence on their likelihood of death (Ajdacic-Gross, 2008; Fleischmann & De Leo, 2014). Approaches to means restriction include limiting the toxicity and availability of specific medications to prevent self-poisoning, and architectural interventions to prevent deaths by jumping (Mann et al., 2005).

The reach of any means restriction intervention relates to how common a suicide method is in a specific region. Hanging, pesticide suicide, and firearm suicide are the three methods dominating country-specific suicide patterns, with jumping from a height and self-poisoning also being prevalent in specific countries (Ajdacic-Gross, 2008). Pesticide suicide is common in Asian countries and in Latin America, whilst firearm suicide predominates in several countries in the Americas and some European countries, particularly where firearm ownership is common in private households (Ajdacic-Gross, 2008; Kellermann et al., 1992) Limiting access to a specific means of suicide may be a calculated approach or it may arise indirectly from other influences on availability. For example, serendipitous means restriction interventions include the reduction in toxicity of gas used for domestic ovens when British energy supplies were switched from coal gas to natural gas for economic reasons, following which the number of suicides by gas

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poisoning fell dramatically (Kreitman, 1976) . In contrast, deliberate legislative changes include the 1998 restriction on paracetamol pack sizes in Britain, following which there was a significant reduction in suicides by that method (Hawton et al., 2013) .

Firearms restriction, control, and safeguarding measures are an important means of suicide prevention because firearms are a highly lethal means of suicide (Elnour & Harrison, 2008). In a US epidemiological study, firearm suicide attempts accounted for 5% of all attempts, yet an estimated 91% of all suicide attempts involving firearms were fatal (Matthew Miller et al., 2004). In another US sample only 12% of people who died by firearm suicide had a prior history of suicide attempt, compared with 29% for those who died by other means of suicide, with both studies suggesting its greater lethality at first attempt (Anestis, 2016). There is a clear association between firearm ownership and firearm suicide rates at both the individual and regional level (Anestis & Houtsma, 2018; Killias et al., 2001; RAND Corporation, 2018b) . One approach to reducing firearm suicide has been the regulation of firearm ownership at the national or state level (Goldstein et al., 2019; Hurka & Knill, 2018). Where such legislation has been introduced, for example in Canada in 1978 (Bridges & Kunselman, 2004; Rich et al., 1990) and Australia in 1996 (De Leo et al., 2003; Goldney, 2006), a reduction in firearm suicides has been observed (Leigh & Neill, 2010; RAND Corporation, 2018b), although this may be explained by other factors (Gilmour et al., 2018; RAND Corporation, 2018a). However, US studies have consistently found a heightened suicide risk in households that own firearms compared to those that do not, regardless of factors such as psychopathology (Miller et al., 2009) gender and age (Miller et al., 2015). Although the households with and without firearms do not differ in the proportions of those with suicidal ideation or plans, the likelihood of any suicidal thoughts or plans to involve

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firearms is seven times greater in households with firearms than those without (Betz et al., 2011).

This report represents a rare opportunity to study firearms control as a serendipitous suicide prevention strategy in a country where firearms ownership was uncommon prior to a period of armed conflict: the Republic of Croatia. This is a country that tends to be under-represented in the suicide literature, despite being in an area of comparatively high suicide rates following a period of political and socio-economic disruption (Kölves et al., 2013; Mäkinen, 2000) . We report here the changes in suicide rates that occurred after a legislative change concerning firearms that was not directly intended to reduce suicide by this means, but nevertheless was effective in doing so.

Croatia's Homeland War

In the period from 1983 to 1990, rates of suicide by firearms in Croatia, then a part of the Socialist Federal Republic of Yugoslavia (SFRY), were lower or similar to rates of suicide by jumping, and around six times lower than hanging, the most common method in Croatia at that time (Jakovljevic et al., 2004) . This changed after 1990, a year in which Croatia declared independence from the SFRY and established democracy. Immediately following Croatia's independence it was invaded by the Yugoslav National Army (YNA), which led to what is known in Croatia as the Homeland War (1991-1995). At the start of the war, Croatian fighters faced numerous armament challenges. Personal weapon ownership had previously been uncommon, but in 1991 the United Nations (UN) issued an embargo on arms imports to the whole area of the former SFRY, and the YNA seized all existing weapons on Croatian territory. Croatian fighters gained access to weapons either by breaking into abandoned barracks of the YNA, using the black market, donations from Croats living abroad, or from increased domestic production of firearms (Mujkic et al., 2008; Sanjurjo & Kožina, 2019) . Such unregulated acquisition of weapons

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meant that the Croatian authorities had no official registry of weapons in citizens' possession to monitor during or after the war.

Over the period 1991 to 1996 a rise in suicides by firearms was observed in Croatia, with a corresponding fall in suicides by hanging (Jakovljevic et al., 2004). During the war, the proportion of suicides by firearms rose significantly from 7.2% in the mid-80s to 26% between 1992 and 1995 (Bosnar et al., 2005; Silobrčić-Radić & Vrbanec, 2018). These changes were also observed at the level of individual regions (Alan Bosnar et al., 2004; Čatipović et al., 2014; Karlović et al., 2005) , and were more prominent in younger age groups and men (Kozarić-Kovačić et al., 2002), matching the age and gender profile of Croatian fighters. It is presumed that these changes reflected the increased availability of guns in this group. At the end of the war many Croatian volunteer fighters returned to civilian life, often taking their firearms with them. This increase in household gun ownership was followed by increased rates of suicide by firearms (Bosnar et al., 2005), as well as an overall rise in attempted and completed suicides by any method, as seen in Figure 1 (Sanjurjo & Kožina, 2019). This, and the observed increase in domestic violence, was thought to be explained, at least in part, by the increased incidence of post-traumatic stress disorder (PTSD) amongst ex-combatants and war victims as well as increased use of drugs and alcohol (Jakovljevic et al., 2004; Sanjurjo & Kožina, 2019) in view of the high prevalence of suicidality among victims of domestic violence (Munro & Aitken, 2020), and the established associations between PTSD and suicide (Gradus et al., 2010), substance misuse and suicide (Chesney et al., 2014), and between alcohol misuse and domestic violence (Gil-González et al., 2006).

Weapons collection campaigns

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When Croatia's Homeland War ended, its leaders sought a solution to the widespread unregulated ownership of guns by ex-combatants and launched a voluntary weapons-collection programme (VWCP). Citizens were invited to surrender their weapons or apply for legal ownership without repercussions. The aims of these campaigns, a series of which ran following the end of the war, were to increase general levels of security in the country and to prevent illegal weapon manufacturing and trade (Narodne Novine, 2009). The campaigns included one led by the United Nations Transitional Administration in Eastern Slavonia, Baranja and Western Sirmium (1996-1997); the *Farewell to Arms* (Zbogom oružje) campaign (2001-2002) led by the Croatian government; and the campaign *Less firearms, Less tragedies* (Manje oružja, manje tragedija) led by the Croatian Ministry of the Interior and the United Nations Development Programme (UNDP). This last campaign, launched in 2007, was intended not only to remove weapons from circulation but also to raise awareness about the potential dangers of weapon possession, including accidents, particularly involving children, and the reduction of crime and violence.

Whilst monetary incentives are usually considered key to a successful VWCP, the repurchasing campaign of 1996-1997 was observed to have provided criminal groups with the opportunity to profit from returning their surplus stocks (Sanjurjo & Kožina, 2019). Partially because of this, the subsequent campaign, *Farewell to Arms*, omitted financial incentives. However, its success is thought to have been due to widespread public and governmental backing in efforts to communicate the unacceptability of having a firearm in the household. During the campaign all public TV and radio stations, and half of those owned by the private sector, offered free airtime dedicated to advertising the campaign, with major news outlets providing updates continuously. The campaign also collaborated strategically with war veterans' groups, hunters' associations, police forces,

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and the Roman Catholic Church to raise awareness, including targeting women and children via women's groups and schools to reach men indirectly (Sanjurjo & Kožina, 2019). Such widespread media coverage and societal support for the social marketing effort was also a feature of the most recent *Less firearms, Less tragedies* campaign (Narodne Novine, 2009).

Impact of campaigns

According to a 2006 report by the South Eastern and Eastern Europe Clearinghouse for the Control of Small Arms and Light Weapons (SEESAC), an organisation charged by the UNDP to control and reduce the proliferation and misuse of weapons in the region, these amnesties and campaigns were judged to have been successful (The South Eastern and Eastern Europe Clearinghouse for the Control of Small Arms and Light Weapons, 2006). The 2013 Eurobarometer poll, conducted in the year that Croatia joined the European Union, found that 6% of respondents reported current firearm ownership, compared to 11% that had reported previously owning a gun (Duquet & Van Alstein, 2015). While this suggests that gun ownership in Croatia has reduced, it is not possible to give time frame for or quantify said reduction. More recently it has been estimated that, on average, four firearms are collected every day in Croatia as the campaign is still ongoing (UNDP in Europe and Central Asia, 2019). The UN official who served as UN Resident Coordinator in Croatia from 2005 to 2010, Yuri Afanasiev, has identified the *Less firearms, Less tragedies* campaign as the most successful disarmament campaign in the history of the UN (Odak, 2011). Empirically, due to such long and intertwined disarmament efforts, the specific effects of each campaign on ownership are virtually impossible to quantify (Sanjurjo & Kožina, 2019), but the range of strategies used are likely to have influenced the behaviour of a range of groups.

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In terms of the specific effects of those campaigns on injuries and mortality, there was a statistically significant fall in suicides by firearms over the post-war years (A. Bosnar et al., 2005; Silobrčić-Radić & Vrbanec, 2018) that is assumed to reflect restricted availability (Figure 1). Over the same period, suicide attempts (by all means) were growing steadily, but attempts involving firearms halved between 1993 and 2016 (Sanjurjo & Kožina, 2019). Explanations for the rise in suicide attempts were thought to relate to the impact of conflict and socio-economic disruption on children and adolescents, as well as the lack of a national suicide prevention strategy (Boričević Maršanić et al., 2014; Franić et al., 2012; HINA, 2018). However, deaths by suicide in Croatia fell steadily from 2000 to 2017 (Hrvatski Zavod za Javno Zdravstvo, 2018), with their lowest rate in 2009, despite a period of recession from 2009 to 2012 (Fountoulakis et al., 2014). This rise in suicide attempts contrasting with a fall in suicide deaths may have reflected decreased availability of firearms as a highly lethal means of suicide.

(Figure 1 here)

It is important to notice that suicide prevention was not an overt goal of any of the Croatian disarmament campaigns. In a country where 86% of the population identify as Roman Catholic (Državni zavod za statistiku, 2018), a religion that strongly prohibits suicide, an explicit suicide prevention approach could have offended devout communities. Furthermore, the stigma associated with suicide might have dissuaded media agencies from propagating disarmament messages. Instead, the emphasis was placed on overall safety, with a focus on accident prevention, especially in children, and a reduction of crime and violence. In being perceived as a safety crusade, the campaigns have circumvented a common social dilemma in universal interventions for suicide means restrictions; that the majority of the society tends to consider such interventions redundant, intrusive, and only benefitting a small section of the community (Yip et al.,

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2012). In the example of Croatian disarmament strategies, the reduction in suicides by firearms is likely to have been a positive outcome of safety measures that were presented as affecting the whole community, with wide societal benefits. This case study provides valuable insights for countries in a post-conflict era, when the aftermath of conflict increases the prevalence of those with multiple risk factors for suicide, where lethal means of suicide are readily available, and where cultural sensitivities must be considered. It also provides potentially helpful lessons for public health agencies and others involved in suicide prevention in countries such as the US, where there may be strong political or individual objections to firearm legislation (Lewiecki & Miller, 2013), and any country where discussion of suicide is stigmatised. Some of the evidence over the effectiveness of legislative restrictions in reducing firearm suicides is mixed (Gilmour et al., 2018; Leigh & Neill, 2010; RAND Corporation, 2018a, 2018b). In this context, it may be more acceptable, and ultimately more effective, to appeal to householders' desire to prevent paediatric injuries and deaths if seeking to effect behaviour change on access to guns. The current emphasis of the American Public Health Association is on safe firearm storage during high risk periods. However, given the experience of Croatia, this focus on adult householders' risk might have a stronger impact if augmented with messages around child safety. It is important to note that apart from being context or culture specific, strategies to reduce availability might be specific to the method in question. The example is suicide by pesticide poisoning for which systematic reviews have noted that national ban on hazardous pesticides seem to be efficient in reduction of both pesticide-related and overall suicides, while improved household storage of pesticides does not produce the same reduction (Gunnell et al., 2017; Pearson et al., 2017). However, careful social marketing of such safety messages

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(Evans, 2006), tailored to respect local sensitivities, may have the potential to reduce suicides and accidental deaths without the need for legislative change.

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