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**TITLE:** Firearm suicide decedents in the Republic of Ireland, 1980 to 2005.

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## **ABSTRACT**

**Objectives:** To compare the socio-demographic characteristics of firearms suicide decedents and other suicide decedents in the Republic of Ireland between 1980 and the December 2005.

**Study Design:** A cross sectional study of socio-demographic characteristics of those who committed suicide with a firearm and those who did not.

**Methods:** Suicide data from 1980 to 2005 inclusive, and provided by the Central Statistics Office of Ireland (CSO), were analysed. For the purpose of this paper suicide method was collapsed into two groups, firearm assisted suicide (FAS) and non firearm assisted suicide (n-FAS). Differences in gender, marital status (married vs. not married), area of residence (urban vs. rural), agri-employment (agri-employed vs. not agri-employed) and age across the two groups were examined. A logistic regression is presented using suicide method (FAS vs. N-FAS) as criterion variable and individual factors as predictors.

**Results:** A total of 9674 suicides were recorded from January 1st, 1980 to December 31<sup>st</sup>, 2005. 793 of these were suicides by 'firearms or explosives', with the remaining 8881 suicides involving other means. For both suicide profiles, the deceased were predominantly male, living in a rural setting and not-married. However, this profile was more salient in the FAS group. In comparison to the n-FAS group, a greater proportion of the FAS victims were male ( $X^2(1) = 152.5, p \leq .0001, OR=4.5, 95\% CI=3.4 \text{ to } 6.1$ ) from a rural setting ( $X^2(1)=153.5, p \leq .0001, OR=4.4, 95\% CI=3.2 \text{ to } 5.6$ ) and agri-employed ( $X^2(1)=21.3, p \leq .0001, OR=1.5, 95\% CI=1.3 \text{ to } 1.8$ ). FAS victims were also significantly younger than n-FAS victims, although the size of this effect was small ( $z=-8.4, p < .0005, r=-.1$ ). There was no difference in marital status across the two groups.

**Conclusions:** Risk factors for firearm suicide should inform policy making in this area, with particular attention paid to protecting young males resident in rural settings. Consideration should be given to targeting agri-employed individuals as one specific at-risk group.

## **INTRODUCTION**

Academics, policy makers and voluntary bodies in the Republic of Ireland are concerned that levels of suicide here are have increased dramatically over the past three decades.<sup>1-3</sup> Statistics provided by the Central Statistics Office of Ireland (CSO) suggest that annual suicide rates have more than doubled since the early 1980s, with young males most at risk and 'hanging' being the most prevalent suicide mechanism.

Firearm suicides in Ireland have been completely ignored in the literature to date. This largely reflects the reality that Ireland has, until recently, adopted a very conservative position on firearms ownership, restricting access to a wide range of guns including semi-automatic and automatic rifles and handguns. Since 2004 there have been many changes in firearms legislation, with liberalisation in 2006 followed by a policy of restriction in 2008. It would appear pertinent at this point to assess the extent and nature of firearms suicides here over the past 25 years. This paper takes a first step towards this goal and provides a comparative profile of firearm suicide deaths with all other suicide deaths recorded.

Many socio-demographic risk factors for suicide have been reported, a number of which are recorded by the Central Statistics Office, and thus lend themselves towards academic enquiry. Being male is perhaps the greatest risk factor, accounting for the majority of suicides across Europe.<sup>4</sup> Research would also tend to suggest that males make up a greater proportion of firearms suicides than other suicides,<sup>4</sup> in part explained by the reality that males are more likely to own, and have access to, a firearm than are females.<sup>5,6</sup>

There have been mixed findings on the relationship between age and firearms suicide. One US study reported that the rate of firearms suicides increased with age, although 66 percent of all firearms suicides were among those under 55.<sup>7</sup> A second study found that the odds of using firearms increased with age among white and black men and black women, but decreased with age among white women.<sup>8</sup> Other research has reported no age effect.<sup>9</sup>

There are similarly mixed findings relating to marital status, with some research suggesting that firearms suicide decedents are more likely to be married than other suicide deaths.<sup>10</sup> There may be gender effects with increased odds of firearms suicides for widowed men and married women.<sup>8</sup>

Suicide is also strongly associated with rural settings.<sup>11-13</sup> This has been linked to isolation and marginalisation, inferior access to mental and physical health services, and greater access to suicide methods. In some jurisdictions, including Ireland, firearms suicides have also been linked to rural living, reflecting ownership profiles where a significant proportion of all guns are owned by farmers and others involved in game and sport shooting.<sup>14,15</sup>

This study compares the socio-demographic characteristics of firearms suicide decedents and other suicide decedents in the Republic of Ireland between 1980 and the end of 2005. It is anticipated that those deceased through shooting will have a similar profile to those deceased through other forms of suicide, but that the salience of the profile will be more marked. That is, as firearms ownership in Ireland is strongly associated with being male, resident in a rural setting and agri-employed, we

would anticipate that these characteristics will be even more prominent among firearms deaths than other suicides. In addition to these variables, we prospectively included marital status and age in the comparison, as studies have reported mixed findings on related protective and risk factors.

## **METHODS**

### **Dataset**

The dataset used for this research was provided by the Vital Statistics Section of Central Statistics Office of Ireland (CSO). The CSO maintains a register of all deaths occurring in the 26 counties of the Republic of Ireland, a sub-set of which contains those notified as occurring by suicide. It is important to note that the CSO traditionally reports suicides by year registered. The analyses here are for year the death occurred. The file is based on the amalgamation of all suicides reported to the CSO and included in their end-of-year reports and a supplementary data file of late suicide notifications. As such there will be marginal differences in the suicide numbers reported in this paper (death by year and late suicide notifications included) and those present in some CSO reports.

The dataset is informed by a police incident report form (form 104). Suicides occurring between January 1980 and December 2005 were included in this analysis. Those occurring after 2005 were excluded as records for recent years are incomplete due to delays in notification caused by police investigations and the scheduling and hearing of coroners' inquests.

## **Factors**

The CSO records the suicide method employed in each case using ICD9 codes under 9 headings. For the purposes of this research, however, we recoded suicide method as being a Firearm Assisted Suicide (FAS) or non-Firearms Assisted Suicide (n-FAS).

Analyses centred on the profile of FAS deaths compared to n-FAS deaths and specifically focusing on variables present in the dataset and that are pertinent to existing research in this area. The following variables were included:

Gender.

Place of residence: Coded by the CSO by county and city, and recoded here as urban or rural, with the cities of Dublin (and its environs), Cork, Galway, Waterford and Limerick coded as 'urban' and all other areas as 'rural' (as per CSO counting rules).

Employment in the agricultural sector: The CSO codes employment profession under 10 headings. Two of these relate to agricultural activity. These were coded as 'agri-employed', with all others coded as 'not-agri employed'. It should be noted that fishermen are included in one of the CSO farm employed sub-groups (with 'farm labourers') and could not be isolated. Thus the 'agri-employed' sample contains a small number of suicides by fishermen. Also, the headings used by the CSO to record occupation are dated and quite subjective and we are concerned about the validity of this factor. We were also concerned about the reliability of the 'unskilled manual labourer' caseness as this was not coded to a number, but rather as a hyphen, and could be confused with missing values. We excluded these deaths, and deaths whose occupation was coded as 'unknown' from the OR analysis below

Marital status: Coded under 5 headings by the CSO and recoded here as being 'married' or 'not married'.



Age of victim: This is a scale variable in the data, but also categorised into 5 year age brackets in line with past research.

### **Statistical analysis**

Odds Ratios for firearm suicide and other suicides were calculated for each of the socio-demographic factors. In addition a model logistic regression was conducted to determine the extent to which these socio-demographic variables could, together, predict suicide method. A Mann Whitney U test was used to compare the age profiles of FAS deaths and n-FAS deaths. SPSS was used for all statistical procedures.

### **RESULTS**

Between January 1<sup>st</sup> 1980 and December 31<sup>st</sup> 2005, 9674 suicides were registered in Ireland. Over that 25-year period suicides in Ireland have risen dramatically. The average annual suicide rate in the 1980s was 257, which rose to 409 in the 1990s and 502 in the 2000 to December 2005 period. Drawing on four census periods, average annual suicide rates per 100,000 appear to be considerably higher after 1990 (1980-1990 = 7.7; 1991-1995 = 10.6; 1996-2001 = 13.3; 2002-2005 = 12.7). Seventy-nine percent (n=7615) were male and 66 percent (n=6341) were 'not married'. More than three quarters (77%, n=7440) were resident in a rural setting at the time of the death. Sixteen percent (n=1574) were employed as farmers, relatives assisting farmers, farm labourers, farm managers or fishermen.

'Suicide by hanging, strangulation and suffocation' is the most common suicide method recorded, accounting for 42 percent (n=4031) deaths. This was followed by 'suicide by drowning' (24%, n=2280) and poisoning by 'solid or liquid substance'

(16%, n=1509). There were differences in the prevalence rank order of suicide method across gender, with males most likely to die by 'hanging, strangulation and suffocation' (47%, n=3575) and females by poisoning by 'solid or liquid substance' (32%, n=662).

When suicide method was recoded into firearm assisted suicide (FAS) and not-firearm assisted suicide (n-FAS), FAS made up 8% (n=793) of all suicides recorded.

Odds ratios for each of the socio-demographic variables included in the dataset across FAS and n-FAS groups are presented below (Table 1).

TABLE 1 ABOUT HERE

Ninety-four percent (n=745) of the FAS cases were male, in comparison with 77 percent (n=6870) of all other suicide deaths. Thus, males made up a greater proportion of deaths by firearms suicides than of all other types of suicide combined ( $\chi^2(1) = 152.5, p \leq .0001$ ). FAS deaths were 4.5 times more likely to be male (95% CI=3.4 to 6.1) than were n-FAS deaths.

Similarly those in the FAS group were more than 4 times (OR=4.4, 95% CI=3.2 to 5.6) more likely to come from a rural background than were other suicide victims ( $\chi^2(1)=153.5, p \leq .0001$ ). Ninety-three percent (n=738) of those committing suicide with a firearm were living in a rural area, compared to 75 percent (n=6702) of those who used other methods.

Sixty-eight percent (n=537) of the FAS group and 65 percent (n=5804) of the n-FAS group were 'not married' at the time of death. This difference was marginal (OR=1.1) and not statistically significant ( $\chi^2(1)=1.8$ ,  $p=.180$ ).

Thirty-six percent (n=213) of those completing suicide with a firearm were employed in an agricultural setting. Of those committing suicide using other means, 27 percent were agri-employed (n=1361). FAS deaths were thus 1.5 times more likely to have been working in farm-related activities at the time of death than n-FAS victims (95% CI, 1.3 to 1.8,  $\chi^2(1)=21.3$ ,  $p\leq.0001$ )

People who completed suicides by firearms were significantly younger (M=36, SD=17) than those who did so by other means (M=41, SD=17), although the size of this effect was small ( $z=-8.434$ ,  $p<.0005$ ,  $r=-.1$ ). In further exploring this we created age categories based on five year intervals and using the same brackets as De Leo, Evans and Neulinger (2002) (see Figure 1, below). This would tend to suggest that the increased risk of death by suicide in those aged 20 to 25, in particular, is even more strongly present in the firearms deaths.

FIGURE 1 ABOUT HERE

Finally, these variables were included as potential predictors of suicide method in a logistic regression. A significant Hosmer and Lemeshow goodness of fit was achieved ( $\chi^2(5)=1.27$ ,  $p=.97$ ,  $R^2=.05$ ). With the exception of marital status, all the socio-demographic variables included in the model were statistically significant contributors ( $p<.0005$ ) (Table 2).

TABLE 2 about here

## **DISCUSSION**

Socio-demographic information on suicide decedents recorded by the CSO is limited. This means that there was no opportunity to include potential mediators or moderators of 'suicide method choice' in the analyses. What has been presented here, then, is a tentative comparison of the socio-demographic profiles of firearms suicides and all other suicides in Ireland.

Just over eight percent of all suicides in Ireland involve shootings, a higher proportion than recorded in England and Wales,<sup>16</sup> but lower than recorded elsewhere (the US,<sup>7,17,18</sup> Australia,<sup>18</sup> and some European countries,<sup>4, 18</sup>). To a certain extent this may reflect lower prevalence of firearms ownership, and particularly handgun ownership, in Ireland in comparison to the US and Australia.

The central objective of this research was to develop an understanding of the profile of those taking their own lives with a firearm and ascertain whether or not this profile differs appreciatively from that of suicide deaths in general. The general picture emerging here is that the socio-demographic victim profile is similar to that of other suicides, but simply more salient. Males, those resident in rural areas, employed in an agricultural setting and aged 20 to 25 tend to form a greater proportion of firearm suicides than other suicides.

These findings are largely consistent with international research. Such research tends to suggest that males are more likely than females to use firearms in committing suicide.<sup>4,16,19-22</sup> In this study the proportion of males in the FAS group was 4.54 times the proportion in the n-FAS group. This is traditionally rationalised as reflecting the

fact that males are more likely to own a firearm than females and that males tend to use more violent and lethal methods.<sup>23-25</sup> In Ireland, for instance, females are more likely to die through ‘poisoning’ than ‘hanging’, but the opposite is true for males. Almost 10 percent of all male suicides occur through the use of a firearm, but just two percent of female suicides are firearm-assisted. The psychological literature has concluded that the prevalence of violent suicide among males is the manifestation of greater suicidal intent, aggression, familiarity with violent means and less concern about body disfigurement.<sup>25</sup>

The FAS group were also significantly younger (mean age 36 years, SD = 17) than the n-FAS group (mean age 41, SD = 17), although this effect was small. Analysis across age categories suggested that the difference may be attributable to the presence of young people aged from 20 to 25 forming a high proportion of firearms deaths. Reaching a thorough understanding of what lies behind this finding requires further research that takes cognisance of the demographic profile of firearms owners in the Republic of Ireland. However it is suspected that there is some multivariate loading involved - suicide in Ireland is associated with being young and male,<sup>26</sup> and then exacerbated by the comparatively high proportion of males in the FAS group and the lethality of firearms in suicide attempts.

While living in a rural setting is associated with suicide in general, this study found that it was particularly associated with death through firearm suicide. Those committing suicide through ‘shooting’ were 4.3 times more likely to come from a rural background than those taking their own lives using an alternative method. This finding is in line with studies from other countries, such as the UK,<sup>10, 16</sup> Australia,<sup>27</sup> USA,<sup>8,28</sup> and Finland.<sup>19</sup> Ready access to firearms is likely to at least partially explain the prevalence of firearm suicides in rural areas.<sup>27</sup> It has been demonstrated that when

access to firearms is high, there is an increased risk of suicide.<sup>9, 29-32</sup> This would also go some way towards explaining our finding that those employed in an agricultural setting formed a greater proportion of firearm suicides than other suicides.

Finally, the analysis found no evidence that being single was a greater risk factor for firearms suicide than other form of suicide. Inclusion of this variable was an exploratory endeavour. Past research suggested that being single is a risk factor for suicide,<sup>33, 34</sup> but there is contradictory findings in relation to firearms suicides.<sup>8, 10, 16, 19,</sup>

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In drawing this together into some form of coherent explanation of the socio-demographic differences across the FAS and n-FAS groups, it would appear that availability and socio-cultural acceptability are at the root of these findings. Certainly acceptability of firearms is greater among males than females, and game hunting is associated with rural settings and those close to the agricultural setting. Related to this is the reality that males tend to be more attracted to firearms, are more likely to own a firearm and that guns are very often present in farm settings and rural locale. This conceptualisation of differential risk patterns is in line with De Leo, Evans & Neulinger's explanation for differences in victim profiles across suicides by firearms, hanging and non-domestic gas in Queensland, Australia. Firearms, they note, are often part of normal life in rural settings, and used for pest control and 'recreational hunting'. Specific suicide methods, they also note, may be 'more acceptable to certain subgroups of individuals than other methods'.

The picture that may be emerging here is that FAS victims share the socio-demographic features of other suicide victims, but that the risk factors are simply more potent for firearms suicide. This may reflect the interaction of two distinct sets of risk factors, that in the presence of access to a particularly lethal

suicide mechanism, lead to augmented suicide rates. In this case, the two distinct sets of risk factors are demographic (age, gender and rural locale) and social (occupation). When these risk factors occur in the presence of a rifle, shotgun or handgun, which are among the most lethal mechanisms for suicide, what may occur is heightened suicide rates.

Some comments about the firearms climate in Ireland should be noted. Prior to 2004 private ownership of handguns was prohibited, a position adopted by the Irish police but that was without legislative backing. In 2004 a sport shooting enthusiast took a successful High Court challenge to the refusal by the Irish police to license a Toz-35 pistol. What followed was a legislative vacuum where the police were forced into a position where they had to issue firearms certificates for any gun that could be used in sport shooting. In 2006 the State legislated for handguns (the Criminal Justice Act, 2006) and made provisions for safe storage of weapons, vetting procedures and standards for pistol shooting clubs. It appeared at that stage that handguns would have a place on the shooting scene into the future. In late 2008 concern over the rise in gang-land related handgun crime led the Minister for Justice, Equality and Law Reform to introduced snap legislation banning handguns above .22 calibre and a range of other guns (the Firearms (Restricted Firearms and Ammunition) Order, 2008). The sport-shooting community and representative bodies are currently considering responses to this new legislation. Thus the firearms scene in Ireland has undergone a period of rapid change, with the potential for more change to come. There is little evidence that the risk of firearms suicide has played any significant role this evolution and this may due to the fact that it is an under-researched area here. This said, a growing number of commentaries have very recently been published on the topic.<sup>36, 37, 38</sup>

In this context, the findings here offer a number of important insights. First, it highlights the prevalence of firearms suicides and the need to respond to this specific form of suicide method. Second, it highlights the risk profile of firearms suicide decedents. In doing so those involved in primary suicide prevention can consider ways of targeting individuals most at risk. Third, the research provides a baseline snapshot of firearms suicide under the pre-2004 firearms climate where there was a highly restrictive and under-legislated environment. When the period of legislative flux has passed there will be an opportunity to conduct pre-post analyses. It will be interesting to see if increased access to and ownership of handguns, even small calibre handguns, will lead to significant increases in firearms suicides, as experienced in other jurisdictions, and if the socio-demographic profile of firearms suicides may also change.

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#### **ETHICAL APPROVAL**

Ethical approval was not sought for this research.

#### **COMPETING INTERESTS**

There were no competing interests in this research.

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Table 1: Odds ratios, 95% confidence intervals and probability values of comparison between FAS deaths and n-FAS deaths on four socio-demographic variables.

<b>Variable</b>	<b>Firearm Assisted Suicide (FAS)</b> n <sup>^</sup>	<b>Not Firearm Assisted Suicide (N-FAS)</b> n	<b>Odds Ratio</b>	<b>95% CI</b>	<b>p</b>
<b>Gender</b>					
Female	48	2011	1.0		
Male	745	6870	4.5	3.4 to 6.1	≤.0001
<b>Place of Residence</b>					
Urban	55	2179	1.0		
Rural	738	6702	4.4	3.2 to 5.6	≤.0001
<b>Marital Status</b>					
Married	256	3077	1.0		
Not Married	537	5804	1.1	1.0 to 1.3	0.180
<b>Agri-Employment</b>					
Not Farm Employed	383	3756	1.0		
Farm Employed	213	1361	1.5	1.3 to 1.8	≤.0001
<b>Age</b>					
Aged 0-19 and 26+	620	7783	1.0		
Age 20-25	173	1098	2.0	1.7 to 2.4	≤.0001

<sup>^</sup>Where total suicides within each variable do not sum to 9674 this is due to missing or inexplicable values in the CSO dataset. In 3961 cases the occupation of the deceased was not recorded.

Figure 1: Percentage of deaths falling into each 5-year interval for FAS and n-FAS deaths.

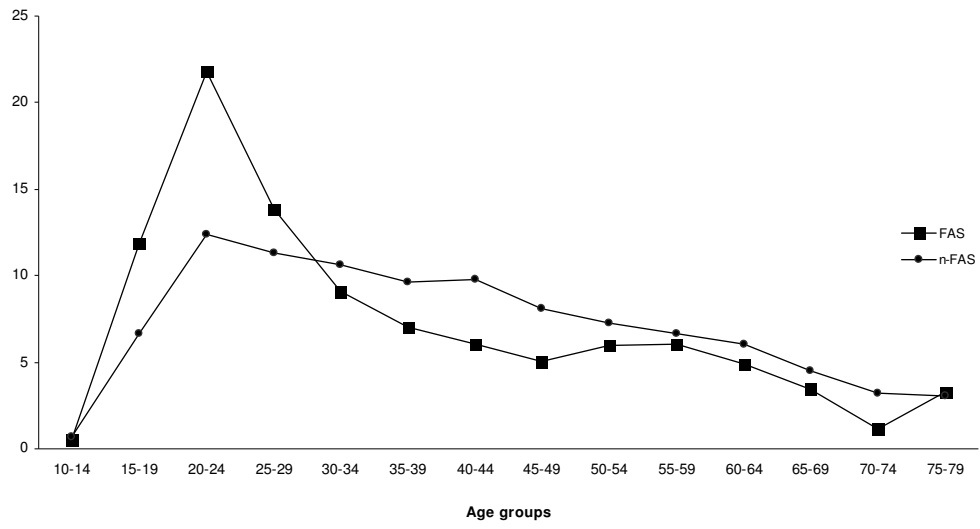


Table 2: Logistic regression with suicide method as criterion and socio-demographic variables as predictors.

FAS Vs Not-FAS	Risk Factor	B(SE)	Exp(B)	95% CIs	
				Lower CI	Upper CI
	Male	1.39(.19)*	4.0	2.8	5.8
	Rural Dwelling	.98(.17)*	2.7	1.9	3.7
	Agri-employed	.27(1.0)*	1.3	1.1	1.6
	Age 20-25	.81(.12)*	2.24	1.8	2.8
	Single	-.13(1.0)	.871	0.7	1.1
	Constant	-4.4(.24)*	0.01		

Note:  $R^2=.03$ (Cox and Snell),  $.07$ (Nagelkerke),  $.05$ (Hosmer & Lemeshow), Model  $X^2$  (Hosmer & Lemeshow) = 1.27. \* $p<.0005$ .





