

Epidemiology of suicide in Austria during 2000–2010: potential years of life lost: time for the national suicide prevention program

Elmar Etzersdorfer · Jakob Klein · Nicole Baus · Gernot Sonneck · Nestor D. Kapusta

Received: 29 July 2013 / Accepted: 19 January 2015 / Published online: 3 March 2015
© Springer-Verlag Wien 2015

Summary

Background This article investigates suicide rates from 2000 to 2010 in Austria, a country with now average rates that had started to decline in the mid-80s.

Results Rates declined in the observed period, to an average of 26.1 per 100,000 persons for men, 8.2 for women, and 16.9 in the general population. The decrease was found in all age-groups, but more marked in women, with a reduction by 26.3% compared with the previous decade than in men (20.0% reduction). Hanging still is the most common method, 49.1% for men and 35.0% for women, although also on the decline. Furthermore, person years of lost life were calculated, also reflecting a decrease from 40,702 years in 2000 to 29,883 in 2010. Altogether, 372,551 years of life were lost by suicide in Austria in the period 2000–2010, 277,998 years among men and 94,553 years among women.

Conclusions Concerning the still observed increase in old age-groups and the huge amount of lost life years, it is argued that implementation of the National Suicide Prevention Programme for Austria is strongly needed.

Keywords Suicide · Austria · Epidemiology · Years of potential life lost

Univ.-Prof. Dr. med. E. Etzersdorfer (✉)
Klinik für Psychiatrie und Psychotherapie, Furtbachkrankenhaus,
Furtbachstrasse 6,
70178 Stuttgart, Germany
e-mail: etzersdorfer@fbkh.org

Dr. J. Klein · Dipl.-Psych. N. Baus · Assoz.-Prof. Priv.-Doz. Dr. N.
D. Kapusta
Suicide Research Group, Department for Psychoanalysis and
Psychotherapy, Medical University of Vienna,
Vienna, Austria

Univ. Prof. Dr. med. G. Sonneck
Kriseninterventionszentrum Wien,
Vienna, Austria

Introduction

Suicidal behavior is a worldwide phenomenon, and has been acknowledged as a major public health problem. World Health Organization estimates almost 1 million people dying by suicide every year, contributing more than 2% to the global burden of disease by the year 2020 [1]. Suicide reflects one of the leading causes of death in many nations and particular among youths, where it constitutes the second leading cause of death in the age-group 15–19 years [2]. Numbers of suicide exceed the number of deaths in traffic accidents in many countries [3], and this is also the case in Austria [4]. Completed suicides can be understood as the tip of the iceberg, beside other forms of suicidal behavior, ranging from suicidal ideation to plans, threats, and suicidal attempts. Each individual engaged in some sort of suicidal behavior reflects an enormous amount of pain, suffering, and despair. It deserves attention, as “suicide is largely preventable” [1]. Furthermore, suicide creates great pain for the victims’ relatives and for other survivors, World Health Organization estimates six persons closely afflicted in each suicide [5].

Austria is well known as a country with a high suicide rate compared with other European countries. Already in the Austro-Hungarian Empire, rates were higher than in other parts of the Empire [6]. Also, in the past decades, Austria ranked high in Europe [7]. Since 1960, an increase had been observed [8], resulting in a peak in 1986 [9], with a decrease since then until the year 2000 [10].

Investigations of more recent suicide data in Austria are missing but needed as important prerequisite for preventive strategies. In several countries, national suicide prevention programs already have been established [11]. In Austria, efforts to establish such a national program have been initiated more than 10 years ago [4] and recently acknowledged by policy makers. In 2012, the Austrian Ministry of Health started an implementation

of a national suicide prevention program called *Suicide Prevention Austria—SUPRA* [12]. To plan and focus on preventive initiatives, data are needed to closely study developments in different age-groups, to identify specific risk groups, and in regard of methods eligible for specific preventive strategies that already have been proven to be successful [13]. The aim of this study was to examine Austrian suicide mortality in the past decade, as a continuation of analyses of the two previous decades [9, 10]. We focus on time trends, age-group risks, and the utilization of suicide methods as well as on the societal burden in terms of potential years of life lost due to premature deaths by suicide.

Material and methods

The data analyzed here represent all suicides in Austria during the period 2000–2010. Data on the suicide victims' sex, age, and method used (registered as external cause-of-death ICD-9 codes E950–E959 and ICD-10 codes X60–X84), together with sex- and age-stratified general population figures, were obtained from Statistics Austria. Suicide rates were calculated and reported as the annual number of suicides per 100,000 inhabitants of the reference population.

The reliability and validity of the Austrian suicide statistics is rather high in comparison with other countries, especially due to the infrequent use of the “unknown” and “undetermined” cause of death categories, relatively high autopsy rates, and further investigations by coding officials of Statistics Austria in uncertain cases [14–16].

In Austria, for all deaths, a certificate has to be completed by a physician authorized by the local health authority, coding the cause of death. In cases where the mode of death remains unclear (accident, murder or suicide) during a death examination, a police commission has to be involved and a forensic autopsy might be requested. In other cases, a sanitary autopsy is requested, and in hospital related deaths, clinical autopsies are per-

formed [16]. The autopsy rate in Austria has traditionally been high by international standards, at 34% of all deaths in Austria (data for 1983), with a local maximum of 51–53% in the capital Vienna (data for 1983–1987) [17]. However, following the international trend of decreasing autopsy rates [18], also in Austria, the autopsy rate has declined (31.2% in 1988–1997 to 23.3% in 1998–2007, representing a decline of 8% points or a reduction to about three-fourth of the earlier value [14]).

The crude potential years of life lost (PYLL_c) analyses were first based on the difference between the age at the time of suicide and life expectancy of the cohort at birth in the year 2000, which was 76 years for men and 81 for women according to Statistics Austria [19]. Furthermore, to control for the age structure of the population, we calculated age standardized PYLL_s per 100,000 persons based on the old European standard population [20]. We assumed that persons not dying due to suicide would otherwise have lived until the age of 70 years according to The Organisation for Economic Co-operation and Development (OECD) (2008) recommendations [21]. Where possible, analyses were performed for each gender. For time trend analysis, we used Spearman tests for trend using the year of observation as the independent variable. For comparisons of decades, we used nonparametric two-sample Wilcoxon–Mann–Whitney test.

Results

For the whole period 2000–2010, the mean suicide rate for the overall Austrian population was 16.9 per 100,000 persons, 26.1 for men and 8.2 for woman, resulting in a male to female ratio of 3.2.

The suicide rate decreased for both sexes during the examined period. Among men, the decrease was from 29.3 in 2000 to 23.7 (–20.6%, $\rho = -0.96$, $p < 0.001$) in 2010. Among women, the highest suicide rate was observed in 2000 (10.4) and the lowest 2010 (6.8; –34.8%, $\rho = -.92$, $p < 0.001$). For the Austrian population as total, the sui-

Table 1 Change of the suicide rates by method in Austria for the period 2000–2010 compared with 1990–2000 [10]

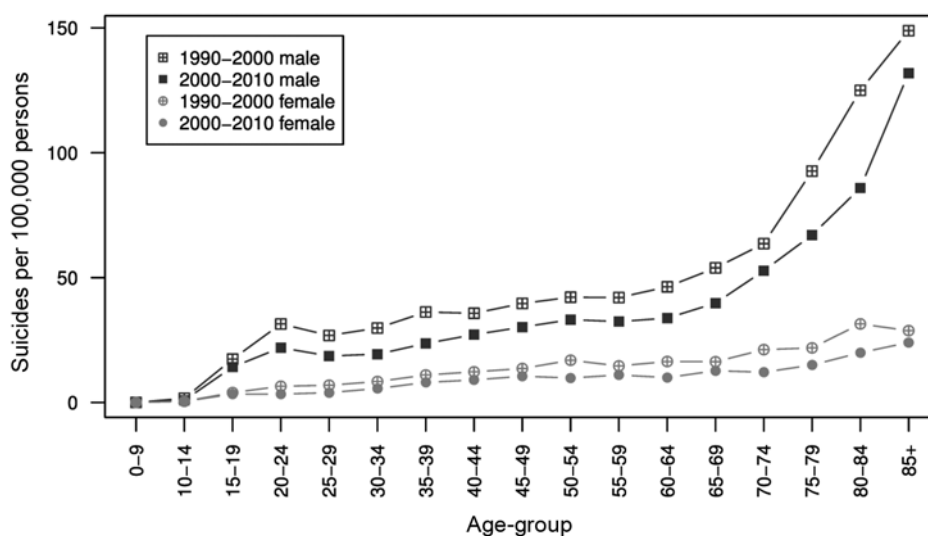
Method	Suicide rate ^a 2000–2010		Change of suicide rates ^b						Proportion of suicides ^c	
	Men	Women	Men			Women			Men	Women
			Percentage	W	p	Percentage	W	p		
Hanging	12.85	2.87	–17.3	7.50	<0.001	–25.8	7.50	<0.001	49.1	35.0
Drowning	0.79	0.85	+2.3	61.50	0.97	–31.3	12.50	0.002	3.0	10.4
Shooting	5.49	0.26	–28.4	1.50	<0.001	–33.7	16.50	0.004	21.0	3.2
Jumping	2.19	1.52	–4.3	46.50	0.38	–22.5	19.50	0.008	8.4	18.7
Poisoning	1.94	1.49	–38.7	2.50	<0.001	–33.6	8.50	<0.001	7.4	18.2
Other	2.89	1.18	–11.2	19.50	0.008	–14.5	10.50	0.001	11.0	14.5
All	26.14	8.18	–20	3.50	<0.001	–26.3	5.50	<0.001	100.0	100.0

^aSuicide rates as number of suicides per 100,000 persons

^bChange of the mean suicide rate from the period 1990–2000 [10] to the period 2000–2010 in percentage, with Wilcoxon W statistics and p-value

^cPercentage of methods relative to number of all suicides per sex in the period 2000–2010

Fig. 1 Median suicide rates in Austria per age-group (years) of the period 2000–2010 compared with 1990–2000 [10]



cide rate significantly decreased from 19.8 per 100,000 persons in 2000 to 15.0 in 2010 corresponding to an overall decrease by 24.2% during this period ($\rho = -0.98$, $p < 0.001$).

The mean suicide rate for the period has decreased compared with the previous decade 1990–2000 ($W = 2.5$, $p < 0.001$). The change of the mean suicide rate in the period 2000–2010, compared with the period 1990–2000, has been higher for woman than men, with a reduction by 26.3% (from 11.1 in 1990–2000 to 8.2 in 2000–2010; $W = 3.5$, $p < 0.001$) versus 20.0% (from 32.7 in 1990–2000 to 26.1 in 2000–2010; $W = 5.5$, $p < 0.001$; also see Table 1, last row).

In all age-groups among both men and women, a decrease of suicide rates was observable (Fig. 1). Among both men and women, suicide rates still increase with age. Especially in men, there was an exponential increase of suicide rates with age-groups, especially over 65 years, as has been shown also in previous decades (1980–1990 and 1990–2000). The highest median suicide rate was found in the age-group of 85+ years in men (131.8 per 100,000) as well as in women (24.0). These rates reflect fivefold, respectively 2.9-fold higher rates, than the median of the corresponding population.

Regarding suicide methods, hanging is still the most common method for suicide in Austria (45.6% in total, 49.1% for men and 35.0% for women). For men, hanging is followed by shooting (21.0%), jumping (8.4%), poisoning (7.4%), and drowning (3.0%), while other heterogeneous methods account for 11.0% of all cases in the examined period 2000–2010. For women, hanging is followed by jumping (18.7%), poisoning (18.2%), drowning (10.4%), and shooting (3.2%), while other methods account for 14.5% of cases in the period (Table 1).

During the past decades, suicides decreased for each method, except that for men, the suicides by drowning have slightly increased (+2.3%, from 0.77 mean suicide rate in 1990–2000 to 0.79 mean suicide rate in 2000–2010), although from an originally low level (Table 1).

PYLL_c analyses of the 2000–2010 decade showed a general decrease from 40,702 years in 2000 to 29,883 in 2010 ($\rho = -0.95$, $p < 0.001$), with an average of 33,868 \pm 4,180 person years of life lost per year (25,274 \pm 2,890 in men and 8596 \pm 1,465 in woman). This resulted in a total PYLL_c of 372,551 person-years lost in this period in Austria due to suicide, 277,998 (74.6%) among men and 94,553 (25.4%) among women. Every person who committed suicide lost, on an average, 29 years of life expectancy (29.2 years lost in men and 29.3 years lost in women).

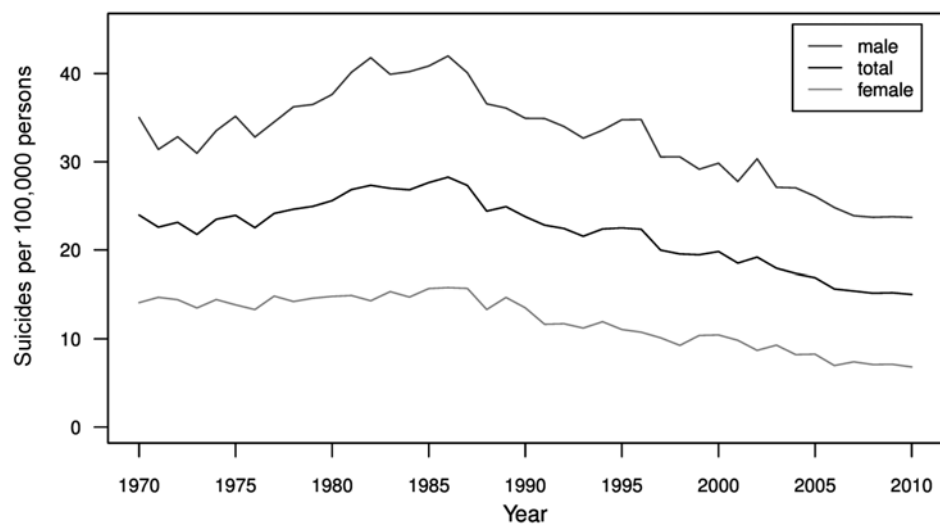
Age-standardized PYLL_s among men showed a steady decrease from 531 years per 100,000 population in 2000 to 388 per 100,000 in 2010 ($\rho = -0.95$, $p < 0.001$). Among females, PYLL_s decreased similarly from 161 in 2000 to 96 in 2006 and remained nearly constant afterward with a slight increase to 114 per 100,000 in 2010 ($\rho = -0.83$, $p < 0.003$).

Discussion

General decrease

In the past decade, a further decrease of suicide rates can be observed in Austria (Fig. 2). The decrease can consistently be found in all age-groups in both sexes, thus reflecting a general decrease rather than to age/gender specific changes. However, the change of the median suicide rate in the period 2000–2010, compared with the period 1990–2000, has been larger for woman, with a reduction by 26.3%, than for men, where a reduction by 20.0% was observed. This continuation of the decreasing trend, which began in 1987 [10], has been discussed to coincide with important social and other changes in Austria. For example, the density of psychotherapists increased by +86% and the prescription of antidepressants increased by more than +415% alone during the period 1991–2005 [22]. Besides substantial increases in psychologists, general practitioners, and psychiatrists, an increased inpatient treatment of depressive disorders

Fig. 2 Suicide rates in Austria, 1970–2010



accompanied the decrease of suicide rates after 1986 in Austria [23].

A recent comprehensive study has shown for 29 European countries that suicide rates decreased when antidepressant prescriptions increased [24]. The authors further discuss that the increasing antidepressant prescriptions in many countries are associated with increased funding for mental health systems and a growing need for treatment and support in Europe. As reported, we believe that the increases of antidepressant prescriptions in Austria reflect major changes in the psychosocial system and a higher utilization of mental health professionals and hospitals during the past 2 decades [22]. Of course, other important aspects may account for this decrease of suicide mortality as well, such as the implementation of media recommendations for suicide reporting in 1987 [25], introduction of mandatory catalytic converters in 1986, the effects of which in Austria have not been examined yet but are well known from other countries [13], or changes in the availability of potentially lethal prescription drugs [26].

Method changes

The decrease of suicides in comparison with the period 1990–2000 is reflected by a decrease of suicides by all methods, with the exception of suicides by drowning for men, which has slightly increased (+2.3%), although from a low level. The proportion of methods underlies a large variation in different regions of the world, hanging being the predominant method in most countries [27].

Hanging also traditionally represents the most common method of suicide in Austria since many years, and with 49.1% among men and 35.0% among women in the past decade, reflects a method that is not easily preventable by selective or restrictive prevention programs, reducing the availability of this suicide mean [28, 29]. Hanging suicides can rather be addressed by universal prevention strategies such as media coverage regulation or the treatment of psychiatric disorders [13].

Firearm suicides have been shown to decrease continuously since the strengthening of firearm laws in 1997 [30] still constituted 21% of all suicides by men during the last examined period. It might be considered by policy makers whether further regulations of firearm acquisition and possession, such as longer cool-off periods after sales, stricter gun-storage regulations, or continuous relicensing procedures, can be adopted to save further lives.

Besides hangings and shootings, suicides by poisoning contributed most to the general decrease of the suicide rate. With a reduction of more than 30%, poisonings became a very uncommon suicide method in Austria. Previous studies have shown that restriction of the availability of toxic medications and the introduction of catalytic converters reduces suicide rates by these means [13]. A fact that might have contributed also to the decrease in Austria, as some preliminary results suggest that poisonings by some hypnotics as well as by carbon monoxide from car exhaust gases have substantially declined. A national suicide prevention program, therefore, would need to take these results into account and should develop interventions to address these specific characteristics of suicide mortality in Austria.

Old men

The highest suicide rates still are found in old men, with a fivefold higher rate than the general male population in the age-group 85 years and older. The increase of suicide risk with age is also observable in women of the same age-group, albeit with only a 2.9-fold higher rate in comparison with the average female population. An increase of suicide rates with age in both sexes has also been found in previous decades [10], and reflects the so-called “Hungarian pattern,” which can be found in many European countries, in contrast to the “Camel pattern” in some other countries. Comparing the periods 1980–1990 and 2000–2010, all age-groups of men (with the exception of those aged 85+ years) have a lower median suicide rate in the past decade. The male age-group of 85+ years still

has a median rate in 2000–2010 of 131.8, which is higher than 128.0 in 1980–1990, but lower than the peak of 148.9 in 1990–2000. This reflects the fact that old men still constitute the group with the highest suicide risk and need to remain in the focus of suicide prevention [10]. In this regard, the fivefold risk in old male individuals reaches a ratio, which is comparable with some of the most important risk factors for suicide such as alcoholism or personality disorders [31].

Person years of life lost (PYLL)

The usual calculations of suicide rates represent a traditional count measure of suicide, where each death is weighted equal. It has been discussed that PYLL analyses, in contrast to suicide rates, allow weighting each death according to age, and thus allow to account for the assumption that suicides by younger persons represent a larger burden to society than suicides of old persons [32, 33]. Of course, the individual and subjective burden of suicide to survivors cannot be accounted for in this way. PYLL analyses enable, for example, to calculate the loss of earnings by lost labor force, which is typically calculated as lost years up to the age of 65 or 70 years in studies. However, such an age limit based on labor participation in PYLL analyses of suicide has been described to be discriminating the elderly population [34].

We used, therefore, both age limits to account for lost labor force and the average life expectancy to calculate the years of potential life lost. We have found that, on an average, 29 years of life are lost due to a suicide, which accumulates to a tremendous average of 33,868 potential years of life lost every year. Our standardized PYLL_s analyses showed that 388 productive years were lost per 100,000 persons per year among men and 114 among women in 2010, which is comparable with results from Australia [32] and UK [34].

Similar results were also found in Switzerland for 2006, with 448 PYLL_s per 100,000 persons for men and 187 in women, thus demonstrating that suicide mortality was the leading cause of premature death quantified by PYLL_s analyses [35]. Although PYLL_s allow to estimate the socioeconomic costs incurred by each death to society, there is much debate about the appropriateness of such measures [33]. However, some studies have estimated that the loss of productivity and costs to society may sum up to 1 million € per suicide [36, 37]. While such calculated costs represent raw approximations, even a small fraction of the costs of suicides in Austria would be well allocated in the national suicide prevention program.

Conclusion

Austrian suicide rates are on the decline since 1986, but Austria still belongs to European countries with average rates in comparison [7, 14]. Current rates and potential years of life lost thus still urge for the need to implement

the Austrian suicide prevention program in a sustainable way. Due to numerous available effective suicide prevention strategies, and clear targets for prevention, a *laissez-faire* approach to suicide is ethically not appropriate [33].

Conflict of interest

The authors declare that there are no actual or potential conflicts of interest in relation to this article.

References

1. World Health Organization. Public health action for the prevention of suicide. A framework. World Health Organization; Geneva; 2012.
2. Patton GC, Coffey C, Sawyer SM, et al. Global patterns of mortality in young people: a systematic analysis of population health data. *Lancet*. 2009;374(9693):881–92.
3. Schmidtke A. Perspective: suicide in Europe. *Suicide Life Threat Behav*. 1997;27(1):127–36.
4. Sonneck G. Suizid und Suizidprävention in Österreich. *Wien Klin Wochenschr*. 2000;112(22):943–6.
5. Clark SE, Goldney R. The impact of suicide on relatives and friends. In: Hawton K, van Heeringen K, editors. *The international handbook of suicide and attempted suicide*. Chichester: Wiley; 2000. pp. 467–87.
6. Ausenda G, Lester D, Yang B. Social correlates of suicide and homicide in the Austro-Hungarian Empire in the 19th century. *Eur Arch Psychiatry Clin Neurosci*. 1991;240(4–5):301–2.
7. Chishti P, Stone DH, Corcoran P, Williamson E, Petridou E, EUROSAVE Working Group. Suicide mortality in the European Union. *Eur J Public Health*. 2003;13(2):108–14.
8. Strauss F, Sonneck G. Statistische Untersuchungen über die Selbstmorde in Österreich in den Jahren 1960 bis 1970. *Mitt Österr Sanitätsverwalt*. 1975;76:169–87.
9. Etzersdorfer E, Fischer P, Sonneck G. Zur Epidemiologie der Suizide in Österreich 1980 bis 1990. *Wien Klin Wochenschr*. 1992;104(19):594–9.
10. Etzersdorfer E, Voracek M, Kapusta N, Sonneck G. Epidemiology of suicide in Austria 1990–2000: general decrease, but increased suicide risk for old men. *Wien Klin Wochenschr*. 2005;117(1–2):31–5.
11. Wolfersdorf M. Suizidalität und Suizidprävention. *Wien Klin Wochenschr*. 2002;114(15–16):657–9.
12. BMG. SUPRA-Suizidprävention Austria. Bundesministerium für Gesundheit. Wien. 2012. http://www.bmg.gv.at/cms/home/attachments/3/5/1/CH1329/CMS1327510505216/supra_gesamt10092012.pdf. Accessed 16 July 2013.
13. Mann JJ, Apter A, Bertolote J, et al. Suicide prevention strategies: a systematic review. *JAMA*. 2005;294(16):2064–74.
14. Kapusta ND, Tran US, Rockett IR, et al. Declining autopsy rates and suicide misclassification: a cross-national analysis of 35 countries. *Arch Gen Psychiatry*. 2011;68(10):1050–7.
15. Rockett IRH, Regier MD, Kapusta ND, et al. Leading causes of unintentional and intentional injury mortality: United States, 2000–2009. *Am J Public Health*. 2012;102(11):84–92.
16. Koger R. Die Qualität der österreichischen Suizidstatistik auf politischer Bezirksebene. Wien: Diplomarbeit; 2013.
17. Sakr L, Bibus B, Dutz W, et al. Zur hohen Autopsierate in Wien. *Wien Klin Wochenschr*. 1989;101(15):511–4.
18. Burton JL, Underwood J. Clinical, educational, and epidemiological value of autopsy. *Lancet*. 2007;369(9571):1471–80.

19. Statistik Austria. Lebenserwartung gemäß Sterbetafeln 1970/72 bis 2000/02. 2007. http://www.statistik.at/web_de/statistiken/bevoelkerung/demographische_masszahlen/sterbetafeln/index.html. Accessed 4 June 2013.
20. Doll R, Cook R. Summarizing indices for comparison of cancer incidence data. *Int J Cancer*. 1976;2:269–79.
21. OECD. OECD glossary of statistical terms. Potential years of life lost. 2008. <http://stats.oecd.org/glossary>. Accessed 4 June 2013.
22. Kapusta ND, Niederkroenthaler T, Etzersdorfer E, Voracek M, Dervic K, Jandl-Jager E, Sonneck G. Influence of psychotherapist density and antidepressant sales on suicide rates. *Acta Psychiatr Scand*. 2009;119(3):236–42.
23. Vyssoki B, Willeit M, Blüml V, et al. Inpatient treatment of major depression in Austria between 1989 and 2009: impact of downsizing of psychiatric hospitals on admissions, suicide rates and outpatient psychiatric services. *J Affect Disord*. 2011;133(1–2):93–6.
24. Gusmão R, Quintão S, McDaid D, et al. Antidepressant utilization and suicide in Europe: an ecological multi-national study. *PLoS One*. 2013;8(6):e66455.
25. Niederkroenthaler T, Sonneck G. Assessing the impact of media guidelines for reporting on suicides in Austria: interrupted time series analysis. *Aust N Z J Psychiatry*. 2007;41(5):419–28.
26. Kapusta ND, Zormann A, Etzersdorfer E, Ponocny-Seliger E, Jandl-Jager E, Sonneck G. Rural-urban differences in Austrian suicides. *Soc Psychiatry Psychiatr Epidemiol*. 2008;43(4):311–8.
27. Ajdacic-Gross V, Weiss MG, Ring M, et al. Methods of suicide: international suicide patterns derived from the WHO mortality database. *Bull World Health Org*. 2008;86:726–32.
28. Yip PS, Caine E, Yousuf S, Chang SS, Wu KC, Chen YY. Means restriction for suicide prevention. *Lancet*. 2012;379(9834):2393–9.
29. Sarchiapone M, Mandelli L, Iosue M, Andrisano C, Roy A. Controlling access to suicide means. *Int J Environ Res Public Health*. 2011;8(12):4550–62.
30. 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.
31. Harris EC, Barraclough B. Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry*. 1997;170:205–28.
32. Doessel DP, Williams RFG, Whiteford H. Policy-appropriate measurement of suicide: headcount vs. potential years of life lost, Australia, 1907–2005. *Arch Suicide Res*. 2009;13(1):87–99.
33. Doessel DP, Williams RFG, Whiteford H. The trend in mental health-related mortality rates in Australia 1916–2004: implications for policy. *Aust New Zealand Health Policy*. 2010;7(3):1–10.
34. Gunnell D, Middleton N, Whitley E, Dorling D, Frankel S. Influence of cohort effects on patterns of suicide in England and Wales, 1950–1999. *Br J Psychiatry*. 2003;182:164–70.
35. Savidan A, Junker C, Cerny T, Ess S. Premature deaths in Switzerland from 1995–2006: causes and trends. *Swiss Med Wkly*. 2010;140:1–6.
36. Kennelly B. The economic cost of suicide in Ireland. *Crisis*. 2007;28(2):89–94.
37. O’Dea D, Tucker S. The cost of suicide to society. Wellington: Ministry of Health; 2005.