Alcohol consumption and suicide: a country-level study

Emine M. Inelmen[1], Marialuisa Gazerro[2], Erol Inelmen[3], Giuseppe Sergi[1], Enzo Manzato[1]

[1]Department of Medical and Surgical Sciences, University of Padua, Italy; [2]Geography Expert, Padua, Italy; [3]School of Applied Sciences, Bogazici University, Istanbul, Turkey
Correspondence to: Giuseppe Sergi, Clinica Geriatrica, Ospedale Giustinianeo, via Giustiniani 2, 35128, Padova, Italy. E-mail: giuseppe.sergi@unipd.it

Abstract

Background: The relationship between suicide and alcohol consumption is well established at the individual level. In this article we examine this relationship at a national level across 98 different countries.
Methods: The suicide and alcohol consumption rates considered were those calculated by the WHO (2008 and 2004 database respectively). A simple correlation analysis was conducted and cross-national variations were shown in cartograms with the values of the standard deviation as class breaks.
Results: A significant positive association (r = 0.42 in the case of men, r = 0.34 in the case of women) emerged between per capita alcohol consumption and gender-specific suicide rates when we considered all the 98 countries around the world for which data were available. When considering the group of ex-communist countries alone, the correlation coefficient between alcohol consumption and suicide rates was higher and statistically significant for both men (0.51) and women (0.47).
Conclusions: Bivariate analysis at the country level delineates a worldwide association between suicide rates and alcohol consumption. There were no countries where a high or moderate-high alcohol consumption rate coincided with a low or medium-low suicide rate. Where alcohol consumption is high, there is an impact on suicide rates. Where it is low, this seems to have a protective effect, unless other suicide determinants acquire a major role.
Suicide is multi-factorial and the determinants may be different in any given country, multivariate analysis and local studies are therefore required.

Key words: suicide, alcohol, country-level

Introduction

Suicide is a major health problem worldwide [1] and alcohol is a significant contributor. [2] Alcoholics are at higher risk of attempted and completed suicide than those without alcohol problems [3] and suicide is consequently the cause of death for a substantial proportion of individuals with alcoholism. [4] Bilban and Skibin [5] showed that a number of suicide victims had alcohol problems.

The association between alcohol dependence and suicidal behaviour is complex because suicide can be the outcome of a variety of different factors (age, gender, marital status, religion, unemployment, mental disorders, drug or alcohol abuse), that can be related to one another in different ways.

Alcohol consumption, as with other substance use disorders, is a diagnosis associated with suicide. [6] Moreover the risk of suicide increases greatly when co-morbid conditions such as alcoholism

and depression exist. [7]
Therefore the association between alcohol dependence and suicidal behaviour is well established at the individual level. [4]
This study aims to take a more global view analyzing whether there is any association between alcohol consumption and suicide rates at the country level.
Seeking any association between variables on a national level poses the problem of "ecological fallacy", since factors associated with national disease rates may not be associated with diseases in individuals. [8] The advantages and disadvantages of ecological studies have already been discussed. [8, 9] The source of the problem concerns the confounders, as in any observational study, as well as aggregation bias, which is specific to ecological studies. [10] As Pearce [8] pointed out, however, "even when studying individual level risk factors, population level studies play an essential part in defining the

most important public health problems to be tackled, and in generating hypotheses as to their potential causes". The population setting is an effect modifier and a determinant of individual risk factors for diseases. [8] Moreover, using individuals as observation units, there may be substantial evidence to support the conclusion that ecological correlations between variables arise from associations between the relevant variables in individuals, as is the case for socioeconomic deprivation and health. [11] Concerning suicide, Neumayer [12] demonstrated that "socioeconomic factors are relevant for explaining variation in suicide rates at the country level, even after controlling for country specific fixed effects".

There is substantial evidence of a link between alcohol abuse and suicide at the individual level. Furthermore, alcohol consumption, particularly in European countries, is one of the factors that have been shown to be statistically significant at the country level [12]. This study analyses the relationship between national suicide rates and alcohol consumptions around the world.

Methods

The data for each country concerning the prevalence of suicides, expressed as per 100,000 population, were those published by WHO (Suicide statistics, online database, accessed in September 2008). Although these data are official, there are variations from one country to another, depending both on the political and cultural phenomena, and on differing degrees of efficiency in data collection. The African countries, in particular, are unable to provide reliable data, while there is a tendency everywhere to underestimate the phenomenon for well- known reasons. [13]

The data considered on per capita alcohol consumption in litres among adults aged 15 years and over were those made available by WHO (2004) [1], based on the sum of alcohol production and imports, less alcohol exports, divided by the adult population, expressed as litres of pure alcohol. The statistics on alcohol abuse do not include illicit alcoholic beverages or those with an alcohol content below the legal definition, and they are affected by the tendency to conceal the phenomenon for political and religious reasons (as may be the case in Muslim and communist countries, for instance).

Moreover, some data on alcohol consumption by nationals of a given country are in fact recorded in other countries, as a result of travellers' imports, cross-border shopping, smuggling, and consumption by tourists abroad.

This leads to underestimation in most countries and overestimation in a few, such as Luxembourg, where visitors account for a sizeable proportion of the total alcohol consumption.

As above mentioned, the available suicide (WHO, from 2008) and alcohol (from 2004) databases at the national level are from different years which makes comparisons problematic. WHO Global Alcohol Database from 2004 gives the adult per capita consumption for all available countries for the year 2000 or 2001, WHO Suicide Database from 2008 gives suicide rates for different years. For 78 of the 98 countries included in our analysis suicide rates cover the period 2000-2005. Among these 78 countries, 12 countries have suicide rates just for the year 2000 or 2001. Suicide data for the remaining 20 countries, which are located in different geographical areas (Asia, Middle East, Central and South America, Africa, and one European country), is taken from data prior to the year 2000.

However, when random-effect models were used to examine the between-country and the within-country stability of suicide rates, for 71 countries from 1950 to 2004, more than 90% of the variance in suicide rates was found to be due to between-countries differences, suggesting that geographical variation is more important than temporal variation [14], and Lester [15] reports that the differences observed in national suicide rates are generally stable over time.

Moreover data from WHO suicide database show that there are small changes in national suicide rates in a period of some (5-10) years in the absence of great political or socioeconomic changes.

So it makes sense to consider the national data concerning a specific year also valid for a longer time period. This gives rise to a time overlapping in the data of the different countries which allows comparison.

To assess whether national suicide rates were associated with the country's alcohol consumption, we conducted a simple correlation analysis, using Excel, making no adjustment for age. No gender-specific data were available for alcohol consumption.

We used GIS [16] for visualising suicide and alcohol rates and delineated spatial differences on choroplet maps. Among the different classification methods that the ArcMap software allows (natural breaks, quantile, equal interval, defined interval, standard deviation, manual method) we choose standard deviation from the mean as class breaks.

With a mean worldwide per capita consumption rate of 6.64 litres a year, alcohol consumption
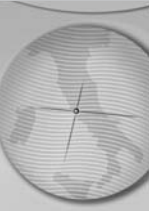
rates were classed as *low* when under 1 SD (standard deviation) of the mean (i.e. less than 2.63), *moderate-low* with a SD between -1 and -0.5 (i.e. 2.64 to 4.64 l), *moderate* between ± 0.5 SD (i.e. 4.64 to 8.64), *moderate-high* between 0.5 and 1 SD (i.e. 8.64 to 10.65), and *high* beyond 1 SD of the mean (i.e. more than 10.65 litres/year per capita).

The mean suicide rate worldwide is 17 ^{0}/0000 among men and 4.96 ^{0}/0000 among women.

Suicide rates were considered as *low* under 1 SD of the mean (i.e. under 2.38 ^{0}/0000 for men and under 0.84 ^{0}/0000 for women), *medium-low* between -1 and -0.5 SD (i.e. 2.38 to 9.69 for men and 0.84 to 2.90 for women), *medium* between ± 0.5 SD (i.e. 9.69 to 24.31 for men and 2.90 to 7.02 for women), *medium-high* between 0.5 and 1 SD (i.e. 24.31 to 31.62 for men and 7.02 to 9.08 for women), and *high* above 1 SD of the mean (i.e. more than 31.62 ^{0}/0000 for men and 9.08 ^{0}/0000 for women).

Results

Figure 1 shows that the 15 countries with the highest alcohol consumption are all in Europe (see Table 1). They belong to different European regions (Eastern, Northern, Central, and Mediterranean Europe), which have different [1] drinking patterns.

Other European countries where the alcohol consumption is only a little below 1 SD beyond the mean (with more than 10 litres/year per capita) include the Russian Federation, Finland, the United Kingdom and Belgium.

A moderate-high alcohol consumption was shown in 11 European countries (Switzerland, Russian Federation, Finland, United Kingdom, Belgium, Estonia, Netherlands, Latvia, Greece, Italy and Poland) as well as four extra-European countries, among which were Australia and New Zealand, where drinking patterns have been influenced by the British habits.

Only two of the Central and South America countries were found to be amongst the moderate-high consumers (Venezuela and Bahamas), while 16 fell within the moderate category.

This is also the case of Canada and the US, where there is an abundance of regulations concerning the sale and distribution of alcohol. In Europe, figures indicating a moderate consumption are reported in the Scandinavian countries (apart from Finland), which have strong anti alcohol movements.

Amongst the lowest consumers of alcohol in the world (see Table 1) there are three Central and one South American country. In the Middle East there is practically no alcohol consumption, since the majority of the population is Muslim. This is true of five Central Asian republics too. A distinctly low consumption was also noted in India and Sri Lanka.

As for the distribution of suicide rates for males,

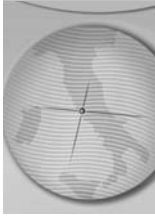Figure 1. Alcohol consumption rates (litres/per capita/year) by country.
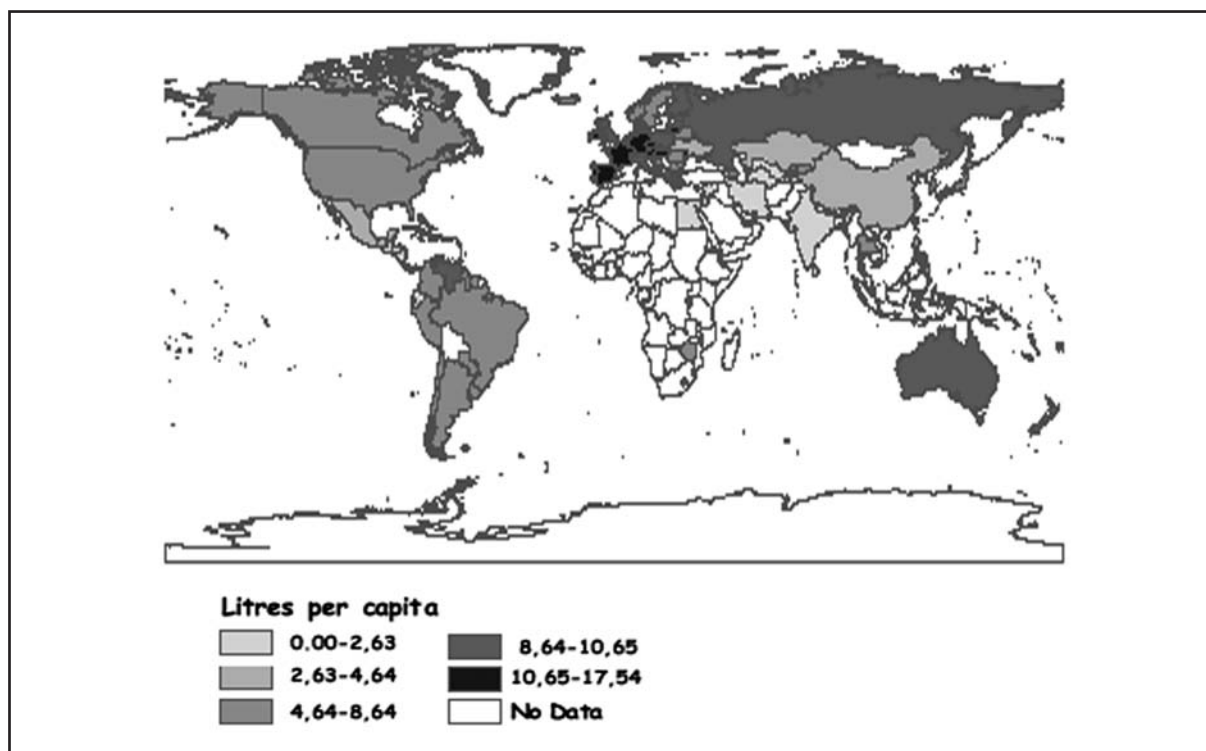
Figure 2 shows that eight of the Eastern European countries are amongst the worst affected by suicidal behaviour, together with Finland (see Table 2).

High suicide rates are reported for the Asian continent in particular the Russian Federation, Japan, South Korea, Sri Lanka and Kazakhstan.

On the other hand, the lowest suicide rates are reported in the Middle East, where people follow the Islamic religion (see Table 2). Four of the Central Asian republics, which also have Islamic traditions,   reveal low or medium-low rates.

The American continent does not appear to be severely affected by suicide. Medium or medium-low suicide rates were recorded in 23 of the 32 American countries; seven of the nine remaining countries show low suicide rates (see Table 2).

The situation is much the same for females. In Asia, in addition to the Russian Federation, Japan, Sri Lanka and Kazakhstan (as among men), there is also a high prevalence in China (the only country where women have higher suicide rates than men) and in India.

The outcome of our simple correlation analysis points to a significant positive association between per capita alcohol consumption and gender-specific suicide rates, taking all the 98 countries around the world for which data were available into account (see Table 3).

Figure 3 shows the scatter plot concerning males' suicide rates versus alcohol consumption.

Countries are identified by different symbols for the groups to which they belong. Much the same pattern emerged in the case of women.

Table 1. Countries by high (>1SD) and low (<1SD) alcohol consumption and suicide rates.

Countries with high Alcohol consumption	Alcohol consumption litres/per capita/year	Suicide_M $^0/_{0000}$	Suicide_F $^0/_{0000}$
LUXEMBOURG	17.54	21.9	7.4
CZECH REPUBLIC	16.21	25.9	5.7
IRELAND	14.45	16.3	3.2
REPUBLIC OF MOLDOVA	13.88	29.3	5.2
FRANCE	13.54	27.5	9.1
GERMANY	12.89	19.7	6.6
CROATIA	12.66	30.2	9.8
AUSTRIA	12.58	26.1	8.2
PORTUGAL	12.49	17.5	4.9
SLOVAKIA	12.41	23.6	3.6
LITHUANIA	12.32	70.1	14.0
SPAIN	12.25	12.6	3.9
DENMARK	11.93	19.2	8.1
HUNGARY	11.92	44.9	12.0
SWITZERLAND	11.53	23.7	11.3
Countries with low Alcohol consumption	**Alcohol consumption litres/per capita/year**	**Suicide_M $^0/_{0000}$**	**Suicide_F $^0/_{0000}$**
BAHRAIN	2.63	4.9	0.5
NICARAGUA	2.53	11.0	3.7
ALBANIA	2.51	4.7	3.3
GEORGIA	2.41	3.4	1.1
HONDURAS	2.28	0	0
ECUADOR	1.99	8.6	3.7
ISRAEL	1.99	10.4	2.1
GUATEMALA	1.64	3.4	0.9
UZBEKISTAN	1.52	8.1	3
ARMENIA	1.23	3.2	0.5
INDIA	0.82	12.2	9.1
TURKMENISTAN	0.77	13.8	3.5
SYRIAN ARAB REPUBLIC	0.62	0.2	0
TAJIKISTAN	0.41	2.9	2.3
SRI LANKA	0.18	44.6	16.8
JORDAN	0.11	0	0
EGYPT	0.10	0.1	0
IRAN	0	0.3	0.1
KUWAIT	0	2.5	1.4

Sources: WHO. Global Status Report on Alcohol 2004. [1]
WHO. Suicide statistics, online database, accessed in September 2008.

Figure 2. Suicide rates (°/oooo population/year) in the world by country – Males.
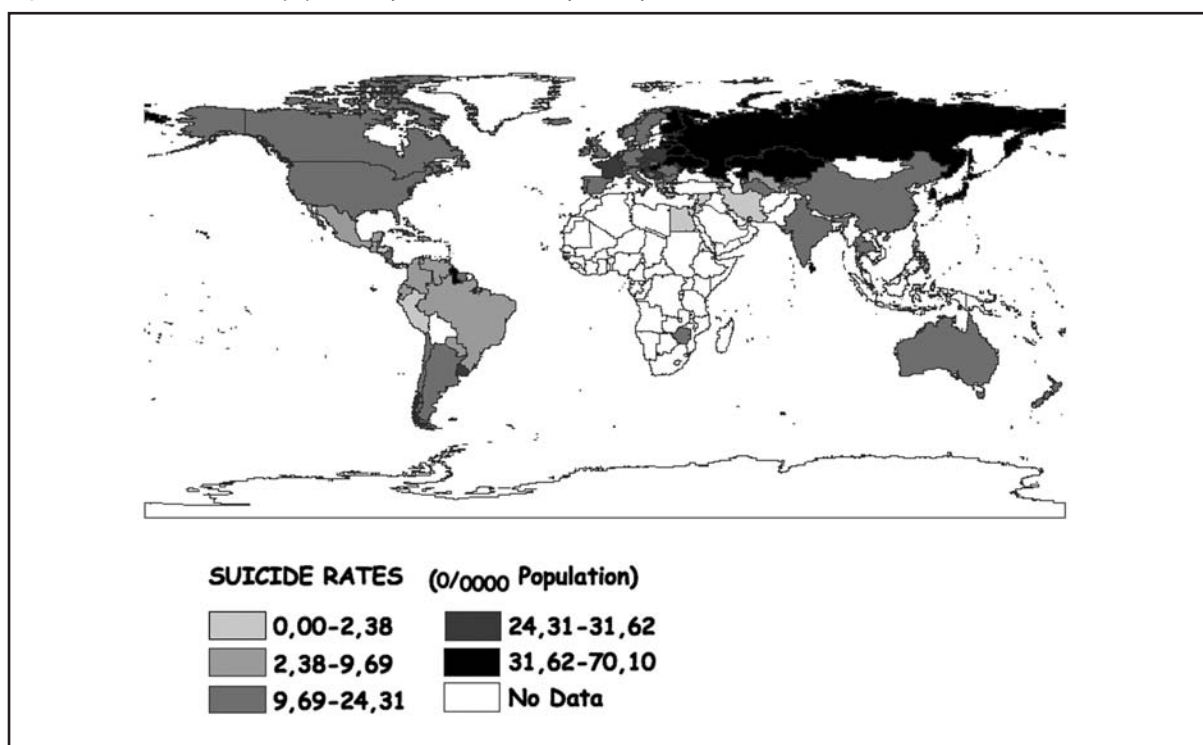

**Table 2. Countries by high (>1SD) and low (<1SD) male suicide rate, female suicide rate and alcohol consumption.**

Countries with high male suicide rate	Suicide_M °/oooo	Suicide_F °/oooo	Alcohol consumption litres/per capita/year
LITHUANIA	70.1	14.0	12.32
BELARUS	63.3	10.3	8.12
RUSSIAN FEDERATION	61.6	10.7	10.58
KAZAKHSTAN	51.0	8.9	2.89
HUNGARY	44.9	12.0	11.92
SRI LANKA	44.6	16.8	0.18
UKRAINE	43.0	7.3	4.04
LATVIA	42.9	8.5	9.31
GUYANA	42.5	12.1	5.84
SLOVENIA	37.9	13.9	6.55
JAPAN	35.6	12.8	7.38
ESTONIA	35.5	7.3	9.85
REPUBLIC OF KOREA	32.5	15.0	7.71
FINLAND	31.7	9.4	10.43
Countries with low male suicide rate	**Suicide_M °/oooo**	**Suicide_F °/oooo**	**Alcohol consumption litres/per capita/year**
AZERBAIJAN	1.8	0.5	6.94
BARBADOS	1.4	0	6.7
PERU	1.1	0.6	4.68
JAMAICA	0.3	0	3.37
IRAN	0.3	0.1	0
SYRIAN ARAB REPUBLIC	0.2	0	0.62
EGYPT	0.1	0	0.1
SAINT KITTS AND NEVIS	0	0	7.62
HAITI	0	0	6.51
SAO TOME AND PRINCIPE	0	1.8	6.07
ANTIGUA AND BARBUDA	0	0	4.24
HONDURAS	0	0	2.28
JORDAN	0	0	0.11

Sources: WHO. Global Status Report on Alcohol 2004. [1]

WHO. Suicide statistics, online database, accessed in September 2008.

Table 3. Correlation coefficients for suicide and alcohol consumption.

	Correlation coefficient	P-value
All countries - Men	0.42	1.38593E-05
All countries - Women	0.34	0.000626
Ex-communist countries - Men	0.51	0.005263
Ex-communist countries - Women	0.47	0.012075

Figure 3. Scatter plot: number of suicide versus Alcohol consumption (litres/per capita/year) in men.
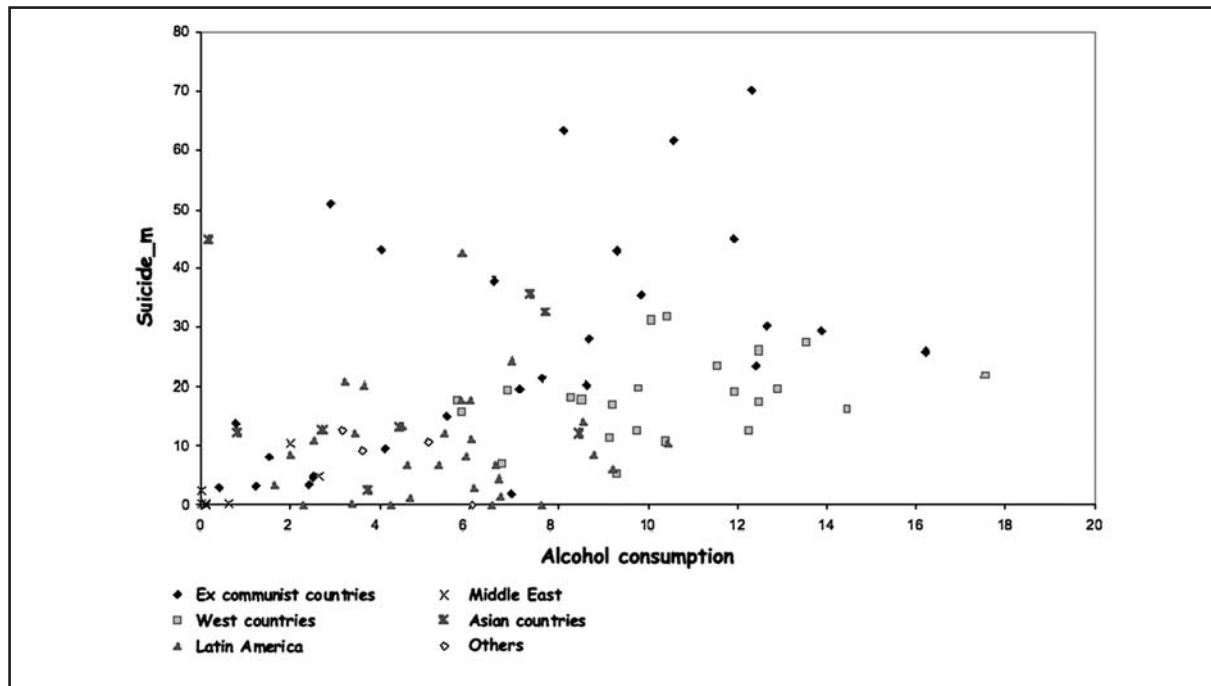
In summary, ten of the 19 European ex-communist countries and 16 of the 23 Western countries have high or moderate-high alcohol consumption rates that coincide with high to medium suicide rates. Conversely, the Middle East revealed low rates of both alcohol consumption and suicide. In Central and South America, alcohol consumption was restricted to values from moderate to low (with the exception of Bahamas, Venezuela and Saint Lucia), and the same applies to the rates of suicide in these countries.

In some Asian countries (Japan, South Korea, Sri Lanka, and in particular for women in China and India), a limited (low to moderate) alcohol consumption coincided with high suicide rates, especially in the case of women.

When considering the group of ex-communist countries alone, the correlation coefficient between alcohol consumption and suicide rates was higher and statistically significant for both men (0.51) and women (0.47).

Discussion

National suicide rates were found to be statistically associated with country level rates of alcohol consumption. The highest correlation coefficient was found in the ex-communist countries, also documented by Pridemore [17], who suggested that alcohol consumption played an important part in these countries, even if it is not the only issue affecting suicide rates.

There were no countries where high or moderate-high alcohol consumption coincided with a low or medium-low suicide rate.

In cases where a country has a low alcohol consumption rate and high rate of suicide, and a consequently weak association between the two, the suicide rate may be related to factors other than alcohol abuse, given the multi-factorial nature of suicide determinants.

It is only for both genders in Sri Lanka, and for women in India, that suicide rates are high, despite low alcohol consumption rates. A number of different factors, such as easy access to pesticides in the rural population, economic difficulties, civil war, and the Tamil suicide bombers in the case of Sri Lanka [18], and social issues relating to marriage and dowries in the case of Indian women [19, 20], probably play a part in triggering suicide in these countries.
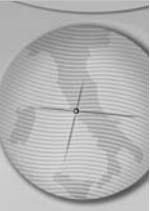
Other countries have high suicide rates correlating with alcohol consumptions ranging from medium-low to medium-high. A variety of factors besides alcohol abuse naturally have a role in explaining these situations, as discussed elsewhere in the literature. In Japan, for instance, suicide carries a positive moral connotation [21], there was an economic downturn in the late 1990s, the population is very elderly, the country has one of the world's lowest levels of religiosity (the more religious countries tend to have lower suicide rates [22]).

The economic crisis in South Korea [23] and the ready availability of pesticides and rat poison among women in rural China [24] are other reasons that have been suggested in order to explain suicide rates in these countries.

In some of the ex-communist countries, such as Ukraine, Slovenia and Belarus, socioeconomic changes have led to an increase in the rate of suicide [25], together with a widespread atheism or abandoning of religious practices [26], and in Kazakhstan such specific factors such as nuclear explosions and suicide bombers [27] may well have been involved.

In Suriname, the Hindustani cultural rigidity, the availability of pesticides and economic problems are all factors that may potentially impact on the rate of suicide. [28]

In Finland, widespread depression together with alcohol abuse [29], low serotonin levels due to the shortage of natural light during the winter season [30], and population differences in genetic risk factors (the Finno-Ugrian suicide hypothesis) [29] have been associated with the country's high suicide level.

In the discussion on differences between countries' suicide rates, it is generally agreed that a significant proportion of cross-national variations can be explained by a combination of religious, culture, economic and sociological variables. [12, 31] The weight of any given suicide determinant is clearly more difficult to explain.

In recent years, the relationship between suicide rates and alcohol consumption figures has been investigated in several studies, as reviewed by Sher. [32]

This association was analyzed in 13 Western countries [33] and the suicide rates were found positively associated with per capita alcohol consumption in 10/13 cases.

Suicide rates have also been associated with alcohol consumption levels in the former USSR and Finland [34, 35], and Mäkinen [36] found that a set of variables, which included alcohol consumption along with economic changes, social

stress, political changes and social disorganization, explain the changes in the Eastern European countries' suicide rates over the last 15 years.

Portugal has quite a low suicide rate, in spite of its high alcohol consumption. [37] But in this and similar cases caution is needed because of underreporting estimates in official data of suicide. After correction for misclassifications, owing to very high rates of undermined causes, the Portuguese suicide rate increased spectacularly. [38, 39]

In Hungary, the suicide rate dropped remarkably by more than 30% between 1984 and 1998, despite a 25% increase in alcohol dependence and a six fold increase in the unemployment rate. [40]

Ramsted [41] studied European countries and found a significant positive relationship between per capita alcohol consumption and gender- and age-specific suicide rates that was much more evident in northern Europe and much less so in southern Europe.

Sher [32] concluded that the inconsistent results of epidemiological studies indicate that multiple socio-cultural and environmental factors influence suicide rates, and that studies conducted in one nation are not always applicable to other nations.

Simple correlation analysis suggests that, at the country level, higher alcohol consumption is associated with higher suicide rates, as reported in the majority of previous papers. [33-36, 41]

This study is the first to have considered all the 98 countries around the world for which data are available, revealing quite a strong association between the two, and identifying some notable mismatches.

Where alcohol consumption is high, there is an impact on suicide rates. Where it is low, this seems to have a protective effect, unless other determinants of suicide have acquired a major role.

In order to better understand suicide behaviour, the cultural, political and socioeconomic conditions of individual countries also have to be taken into account.

Currently available figures provide only an approximate measure of both suicide and alcohol consumption rates, which are generally underestimated and refer to different years in different countries. The reliability of cross-national comparisons is also negatively influenced by variations in the political, cultural and religious scenario. In addition, no age-specific suicide rates were calculated and no gender-specific alcohol consumption rates were available.

As suicide is such a multi-factorial phenomenon, a multivariate analysis on suicide determinants (e.g.

divorce, religion, unemployment, depression) is needed. [42] In a previous study [13], we analyzed the relationship between unemployment and suicide at the country level. We are now aiming to continue using multivariate analyses to examine the rates of divorce, unemployment, alcohol consumption, the HDI (Human Development Index) [43] and HPI (Happy Planet Index) [44] indexes.

Conclusions

Our findings show that alcohol abuse substantially influences suicidal behaviour, although numerous other factors contribute to determining the suicide rates in any given country.

Nowadays, with the global economic crisis affecting the whole world, greater attention should be paid to the link between economic problems (notably unemployment), depression and alcohol abuse. In combination, these three determinants could cause a rise in suicide rates worldwide.
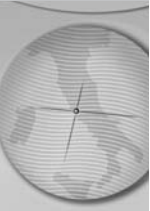
Governments everywhere should give equal priority to combating the causes of both economic and psychological depression, and to adopting schemes to contain alcohol abuse.

Every effort should be made to prevent alcohol abuse, primarily through public health education measures. Alcohol is too cheap, too readily available, and too well tolerated socially in many countries.

A global health policy is needed to effectively mitigate suicide rates. Global statistical analyses may provide the foundations for the design of a health policy framework for dealing with suicide.

References

1) WHO. Global Status Report on Alcohol, 2004.
2) Dinh-Zarr T, Goss C, Heitman E et al. Interventions for preventing injuries in problem drinkers [review]. Cochrane Database Syst Rev. 2004;(3):CD001857.
3) Conner KR, Duberstein PR. Predisposing and precipitating factors for suicide among alcoholics: empirical review and conceptual integration. Alcohol Clin Exp Res 2004;28(5 Suppl):6S-17S.
4) Sher L. Alcohol use and suicide rates. Med Hypotheses 2005;65:1010-2.
5) Bilban M, Skibin L. Presence of alcohol in suicide victims. Forensic Science International 2005;147S:S9-S12.
6) Bertolote JM, Fleischmann A. Suicide and psychiatric diagnosis: a worldwide perspective. World Psychiatry 2002;1:181-5.
7) Schneider B. Substance Use Disorders and Risk for Completed Suicide. Archives of Suicide Research 2009; 13(4):303-16.
8) Pearce N. The ecological fallacy strikes back. J Epidemiol Community Health 2000,54(May): 326-7.
9) Morgenstern H. Uses of ecologic analysis in epidemiological research. Am J Public Health 1982;72:1336-44.
10) Freedman DA. The ecological fallacy. In: Lewis-Beck M, Bryman A, Liao TF (eds). Encyclopedia of Social Science Research Methods. Sage Publications, 2004;1:293.
11) MacRae K. Commentary: Socioeconomic deprivation and health and the ecological fallacy. BMJ 1994;309:1478-9.
12) Neumayer E. Socioeconomic factors and suicide rates at large-unit aggregate levels: a comment. Urban Studies 2003;40(13):2769-76.
13) Inelmen E, Inelmen EM, Pintore G et al. Highlighting work-based health disorders as predictors of suicide: a world perspective. In: De Santis G. Salute e lavoro. IX International Seminar on Medical Geography, Dec 13-15 2007 Rome. Perugia: Rux, 2009:423-44.
14) Liu K. Suicide Rates in the World: 1950-2004, Suicide Life Threat Behav. 2009 ; 39(2): 204-13.
15) Lester D. Cross-cultural perspective on Suicide. In: Bryant CD ed. Handbook of Death & Dying. Thousand Oaks, CA.: Sage Publications, 2003; 1:351-6.
16) Schweikart J, La Torre F, Mannocci A. The Geographical Information System. Ital J Pub Health 2008;5,4:241-4.
17) Pridemore WA. Heavy drinking and suicide mortality in Russia. In: The Annual Meeting of the American Sociological Association, 2005-08-12; Philadelphia. Available from: http://www.allacademic.com/meta/p18517_index.html. [Accessed on February 11, 2009].
18) Eddleston M, Rezvi Sheriff MH, Hawton K. Deliberate self harm in Sri Lanka: an overlooked tragedy in the developing world. BMJ 1998;317:133-5.
19) Vijaykumar L. Suicide and its prevention: the urgent need in India. Indian J Psychiatry 2007; 49:81-4.
20) Aaron R, Joseph A, Abraham S et al. Suicides in young people in rural southern India. The Lancet 2004;363(9415):1117-8.
21) Young J. Morals, suicide, and psychiatry: a view from Japan. Bioethics 2002;16:412-24.
22) Pelham B, Nyiri Z. In more religious countries, lower suicide rates. Gallup, 2008 July 3. Available from: www.gallup.com/poll/108625/More-Religious-Countries-Lower-Suicide-Rates.aspx. [Accessed on March 5, 2009].
23) Seo C. Economic crisis and suicide rates in South Korea [poster]. In: The Annual Meeting of the American Sociological Association, Aug 11 2006; Montreal. Available from: [Accessed on March 16, 2009].
24) Yip P S F, Liu KY. The ecological fallacy and the gender ratio of suicide in China. Br J Psych 2006;189:465-6.
25) Levi F, La Vecchia C, Saraceno B. Global suicide rates. Eur J Pub Health 2003;13:97-8.
26) Bertolote JM, Fleischmann A. A global perspective in the epidemiology of suicide. Suicidologi 2002;7(2):6-8.
27) Charny I W. Fighting suicide bombing: a worldwide campaign for life. Greenwood Publishing Group, 2007.
28) Graafsma T, Kerkhof A, Gibson D et al. Suicide using pesticides in Nickerie, Suriname. Crisis 2006; 27(2):77-81.
29) Koskinen S, Aromaa A, Huttunen J et al. Health in Finland. National Public Health Institute, KTL National Research and Development Centre for Welfare and Health STAKES, Ministry of Social Affairs and Health, Helsinki, 2006.
30) Hakko H, Räsänen P, Tiihonen J, Seasonal variation in suicide occurrence in Finland. Acta Psychiatr Scand 1998;98(2):92-7.

31) Huang WC. Religion, culture, economic and sociological correlates of suicide rates: a cross-national analysis. Applied Economics Letters 1996; 3(12):779-82(4).

32) Sher L. Alcohol consumption and suicide. Q J Med 2006; 99:57-61.

33) Lester D. Alcoholism, substance abuse, and suicide. In: Maris RW, Berman AL, Silverman MM, editors. Comprehensive Textbook of Suicidology. New York: The Guilford Press, 2000:357-75.

34) Nemtsov A. Suicides and alcohol consumption. Drug Alcohol Depend 2003; 71:161-8.

35) Pirkola SP, Suominen K, Isometsa ET. Suicide in alcohol-dependent individuals. Epidemiology and management. CNS Drugs 2004; 18:423-36.

36) Mäkinen I H. Eastern European transition and suicide mortality. Soc Sci Med 2000; 51(9):1405-20.

37) Skog OJ, Teixeira Z, Barrias J et al. Alcohol and suicide - the Portuguese experience. Addiction 1995; 90:1053-61.

38) Ferreira de Castro E, Pimenta F, Martins I. The truth about suicide in Portugal. Acta Psychiatr Scand 2009; 80(4):334-9.

39) Andriessen K. Do we need to be cautious in evaluating suicide statistics? Eur J Pub Health 2006; 16(4):445.

40) Rihmer Z, Belsö N, Kalmár S. Antidepressants and suicide prevention in Hungary. Acta Psychiatr Scand 2001; 88:238.

41) Ramsted M. Alcohol and suicide in 14 European countries. Addiction 2001; 96(1 Suppl):S59-S75.

42) Inelmen EM, Sergi G, Pintore G et al. An uncommon case of failed suicide in a 94-year-old woman: 'masked' depression or rational decision? Aging Clin Exp Res 2008;20(4):381-3.

43) United Nations Development Programme. Human Development Record. New York: Oxford University Press, 2003.

44) New Economics Foundation. Happy Planet Report 2006. Available from: http://www.happyplanetindex.org [Accessed on March 19, 2009].