

Suicide rates in Fortaleza increased 157% in ten years

Taxas de suicídio em Fortaleza cresceram 157% em 10 anos

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ABSTRACT

Objective: to analyze suicide rates between 2000-2009 in Fortaleza, Ceará, Brazil. **Methodology:** Data was obtained from Ceará's Institute of Forensic Medicine (PEFOCE). Estimated population by year was obtained from the Unified Health System (DATASUS). **Results:** A total of 1903 suicide cases were registered in Fortaleza, between 2000 and 2009. The distribution of methods was analyzed using the variables gender, age and year. Around 80% of the cases were male, corresponding to 4.3 male to female suicide rate. The most common suicide method was hanging, followed by poisoning, firearms, and jumping from heights. Among males, hanging was the most prevalent suicide method, followed by poisoning; while in females poisoning was the most prevalent method, followed by hanging. Almost half of all suicides in the study were by hanging. **Conclusions:** The classification of death as suicide is subject to interpretation of the coroner. Local published literature about this problem is sparse. Understanding suicide methods may provide support to more effective suicide prevention programs.

Keywords: Suicide. Public health. Vital statistics.

RESUMO

Objetivo: analisar as taxas de suicídio entre 2000-2009 em Fortaleza, Ceará, Brasil. **Metodologia:** Os dados foram obtidos na Perícia Forense do Estado do Ceará (PEFOCE). A população estimada por ano foi obtida no Sistema Único de Saúde (DATASUS). **Resultados:** Foram registrados 1903 casos de suicídio em Fortaleza, entre 2000 e 2009. A distribuição dos métodos foi analisada por meio das variáveis sexo, idade e ano. Cerca de 80% dos casos eram do sexo masculino, correspondendo a 4,3 suicídios masculinos para cada feminino. O método de suicídio mais comum foi enforcamento, seguido de envenenamento, arma de fogo e queda de altura. Entre os homens, o enforcamento foi o método de suicídio mais prevalente, seguido pelo envenenamento; enquanto nas mulheres, o envenenamento foi o método mais prevalente, seguido pelo enforcamento. Quase metade de todos os suicídios no estudo foram enforcamento. **Conclusões:** A classificação do óbito como suicídio está sujeita a interpretação do médico legista. A literatura publicada local sobre esse problema é esparsa. Compreender os métodos de suicídio pode fornecer apoio a programas mais eficazes de prevenção do suicídio.

Palavras-chave: Suicídio. Saúde pública. Estatísticas vitais.

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INTRODUCTION

Even though Brazil has low suicide rates, it has one of the highest count of suicides overall.¹ Between 1980-2006, a total of 158,952 suicides were registered. Rates increased from 4.4 to 5.7/100,000 inhabitants (a rise of 29.5%), being hanging and firearms the most common methods.²

Located in the northeast, Fortaleza is the 5th largest city in Brazil with 2,452,185 inhabitants.³ Between 1986-2006, suicide rates had an increase of 270% (2.7 to 7.3/100,000 inhabitants). Fortaleza went from 20th to 4th highest suicide rate among the 27 Brazilian capitals.²

Formulation of any prevention strategy must be based in reliable data that may detect changes in suicide patterns.⁴ There are few studies about how suicide methods have evolved in Fortaleza. This study aims to describe suicide methods in Fortaleza, between 2000-2009.

METHODS

Data were obtained from the Institute of Forensic Medicine of Ceará 2000-2009. All violent deaths were subjected to forensic investigations by a mandatory determination of state and coded by the International Classification of Diseases, Tenth Revision.⁵ This data was recently made available to the researchers' group. Population data was obtained from the Brazilian Institute of Geography.⁶

The variables method, gender, age and year of suicides were analyzed using multivariate and trend analyses. Methods were categorized into hanging, poisoning, firearms, jumping, stab wounds, burning and others. Ages between 14-65 years were divided into 5 groups. Ages above 64 years formed a single group. Age below 15 years and cases with incomplete information were excluded (n=72). All statistical analyses were performed using Statistical Package for the Social Sciences version 19.0.

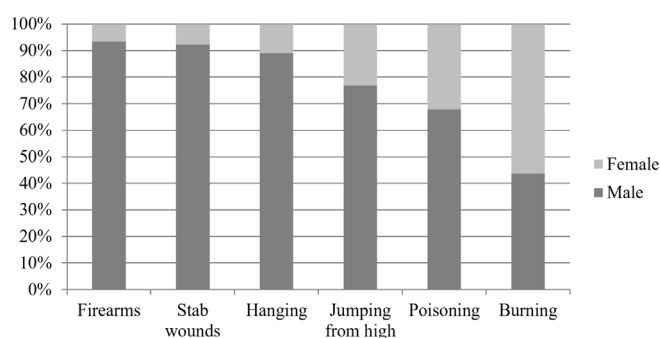
This study was approved by the Ethics Committee of the Federal University of Ceará/Labomar (Letter No.15/20; COMEPE Protocol No.20/10, 11.02.2010).

RESULTS

In the period between 2000 and 2009, a total of 1903 suicide cases were identified, being 81% male suicides. There were 4.3 male suicides (n=1546) for each female (n=357). The most common suicide method was hanging (48.5%), followed by poisoning (24.5%), firearms (9.4%) and jumping from heights (2.9%). Among males, the most prevalent methods were hanging (n=822, 53.2%) and poisoning (n=316, 20.4%). In contrast, female used more poisoning (n=50, 42.0%), following by hanging (n = 101, 28.3%).

Males preponderate around 90% in three suicide methods: firearms (93.3% of 179 cases), stab wounds (92.3% of 13 cases) and hanging (89.1% of 923 cases). The only method in which females outnumbered males was burning (56.3% of 18 cases). About a third (32.2%, n=150) of all poisonings occurred in females (Graphic 1).

Graphic 1. Proportion of gender in each suicide method in Fortaleza, Brazil, 2000-2009.



Note: data obtained from the Institute of Forensic Medicine of Ceará 2000-2009.

The most frequent methods in each age group according to sex are shown in Table 1. There was a significant change in suicide methods used by females within advancing age. Poisoning was the most prevalent method in groups below 55 years old. However, hanging was more common in the groups above 54 years.

Table 1. Proportion of gender in each suicide method in Fortaleza, Brazil, 2000-2009.

Gender	Age group	Hanging	Poisoning	Stab wounds	Firearms	Jumping from high	Burning	Others	Total
Male	15-24	53.9% (198)	17.4% (64)	1.1% (4)	13.1% (48)	4.1% (15)	0% (0)	10.4% (38)	100% (367)
	25-34	54.3% (236)	18.4% (80)	0.5% (2)	12.6% (55)	2.3% (10)	0.9% (4)	11.0% (48)	100% (435)
	35-44	52.0% (168)	27.9% (90)	0.3% (1)	6.50% (21)	2.8% (9)	0.6% (2)	9.9% (32)	100% (323)
	45-54	57.9% (103)	16.3% (29)	1.7% (3)	7.9% (14)	2.2% (4)	1.1% (11)	12.9% (23)	100% (178)
	55-64	45.2% (56)	25.8% (32)	0.8% (1)	12.9% (16)	1.6% (2)	4.0% (5)	9.7% (12)	100% (124)
	above 64	51.3% (63)	17.6% (21)	0.8% (1)	10.9% (13)	2.5% (3)	0.8% (1)	16.0% (19)	100% (119)

*(n)= Absolut number.

Continua.

Conclusão.

Table 1. Proportion of gender in each suicide method in Fortaleza, Brazil, 2000-2009.

Gender	Age group	Hanging	Poisoning	Stab wounds	Firearms	Jumping from high	Burning	Others	Total
Female	15-24	27.4% (26)	45.3% (43)	0% (0)	4.2% (4)	6.3% (6)	3.2% (3)	13.7% (13)	100% (95)
	25-34	21.8% (17)	50.0% (39)	0% (0)	2.6% (2)	0% (0)	10.3% (8)	15.4% (12)	100% (78)
	35-44	32.2% (27)	45.2% (38)	0% (0)	4.8% (4)	2.4% (2)W	4.8% (4)	10.7% (9)	100% (84)
	45-54	27.6% (16)	31.0% (18)	1.7% (1)	1.7% (1)	5.2% (3)	1.7% (1)	31.0% (18)	100% (58)
	55-64	37.5% (9)	33.3% (8)	0% (0)	4.2% (1)	8.3% (2)	0% (0)	16.7% (4)	100% (24)
	above 64	33.3% (6)	22.2% (4)	0% (0)	0% (0)	0% (0)	11.1% (2)	33.3% (6)	100% (18)

*(n)= Absolut number.

Note: data obtained from the Institute of Forensic Medicine of Ceará 2000-2009.

The relationship of gender and age in suicide cases is shown on Table 2. The male to female ratio (M:F) tended to increase with age. The M:F ratio was 3.9 (367:95) in the range between 15 and 24 years old and 6.6 (119:18) in the age group above 64 years.

Over the years, suicide rates had a trend to grow (Graphic 2). Between 2000-2009, suicide rates have increased by 154% in Fortaleza (4.9 to 7.7/100,000 inhabitants). The rise was

even higher among female than male suicide rates, 140% and 337%, respectively.

The suicide method distribution by year is shown in Graphic 3. Throughout the time, suicide by hanging and poisoning tended to increase; meanwhile it was observed a downward trend in firearm suicide. There was a stable pattern of suicide cases due to stab wounds, burning and jumping from high.

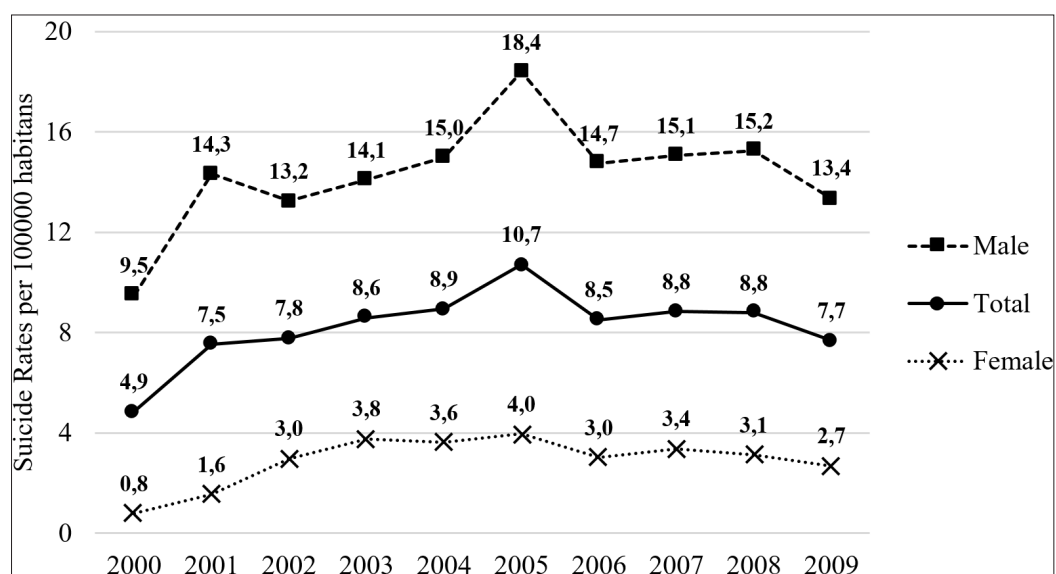
Table 2. Suicide cases by sex and age group in Fortaleza, Brazil, 2000-2009.

	15 to 24 years old	25 to 34 years old	35 to 44 years old	45 to 54 years old	55 to 64 years old	above 64 years old	Total
Male	367	435	323	178	124	119	1546
Female	95	78	84	58	24	18	357
M:F*	3.9	5.6	3.8	3.1	5.2	6.6	4.3

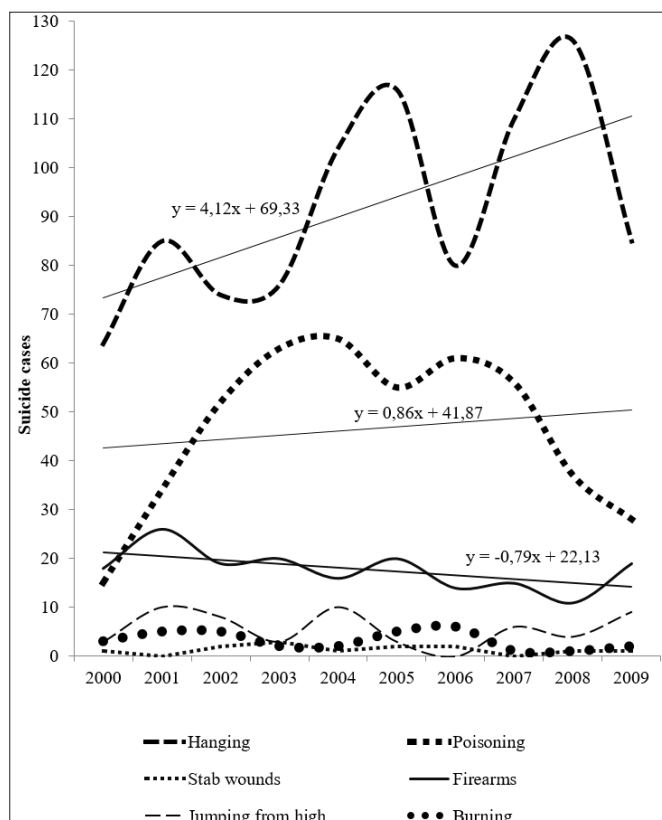
* ratio of male-to-female (M:F).

Note: data obtained from the Institute of Forensic Medicine of Ceará 2000-2009.

Graphic 2. Suicide rates by year in Fortaleza, Brazil, 2000-2009.



Note: data obtained from the Institute of Forensic Medicine of Ceará 2000-2009.

Graphic 3. Suicide methods by year in Fortaleza, Brazil, 2000-2009.

Note: data obtained from the Institute of Forensic Medicine of Ceará 2000-2009.

DISCUSSION

Almost half of all suicides occurred in Fortaleza between 2000-2009 were by hanging, which mirrors the general trend in most countries in the world. Studies show hanging as main suicide method when no other major method is available. The proportion of hanging typically decrease as either pesticide suicide or firearm suicide increases.⁴ In addition, in Fortaleza, there is a significant use of hammocks to rest or sleep. This cultural factor may increase suicide by hanging due to the easy availability of ropes.

The second most prevalent method was poisoning as well as many countries.⁷⁻⁹ In Fortaleza, the high proportion of suicides by poisoning could had been caused by ingestion of carbamate and organophosphate as suggested in a preliminary report of the biggest emergency hospital of Fortaleza, that 80% of deaths observed in that hospital by suicide were associated with self-poisoning by pesticides.¹⁰ This phenomenon may be influenced by the easy access to these substances at the local market, which are usually sold as rat poison in urban and as pesticides in rural areas. Despite the Federal Law n^o. 7802/89, which regulates the sale and use of these products,¹¹ unfortunately, there is no effective control over these substances. Brazilian regulatory agencies still suffer from institutional fragilities such as shortage of dedicated staff and funding.¹²

Since 2008, Brazil is one of the largest pesticide markets in the world, with 19% of the total market share. While in the

world, pesticide market grew by 93% during the last 10 years, the Brazilian market increased by 190%. According to the Department of Health Surveillance (ANVISA), approximately half of all pesticides registered in Brazil do not reach farmers.¹³

The problem of irregular and clandestine use of pesticides reaches other regions in Brazil.^{14,15} Intoxication is the leading cause of hospitalization in Brazil due to suicide attempts and pesticides account for 46.7% of total deaths of suicide by exogenous intoxication in a time period between 1998 and 2009.¹⁶ In South India, poisoning by pesticides was the most prevalent method (53%) also may be the result of ease of access to pesticides.¹⁷ In Sri Lanka, where pesticides are the leading method of suicide, after the government banned several of the most highly toxic pesticides, the suicide rate fell by half.¹⁸

In Fortaleza, among males, hanging was the most prevalent method followed by poisoning in all age groups, while in South India, in males, poisoning was prevalent in the age group 15-74 years, and hanging was more prevalent above 74 years.¹⁷ In this city, female suicide methods vary with age. Poisoning predominated in women aged up to 54 years, while hanging was more prevalent in elder women (55 and over). A similar result was observed in South India, where poisoning was prevalent in females in the age group 0-74 years, and hanging was prevalent above 74 years.¹⁷

In Europe and Korea, hanging was the most prevalent method in both genders.^{7,8} A review of the World Health Organization (WHO) mortality database showed that violent and highly lethal methods, such as suicide by firearm and hanging, are more frequent among men, while women tend to choose poisoning, which is less violent and lethal.⁴

Firearms were the third most used suicide method in Fortaleza. Suicide by firearms had a downward trend. This fact may be associated with restricting access implemented by the Disarmament Statute (Federal Law n. 10.826 of 22th December 2003).¹⁸ This law prohibits carrying weapons by civilians, except for cases where there is proven need. The permission is allowed only for members of the armed forces, police, intelligence agents, tax auditors and private security agents. The availability of firearms is associated with higher rates of suicide with mounting evidence suggesting that restricting access to firearms may be an effective strategy for suicide prevention.^{19,20} Many countries have witnessed significant falls in suicide rates that have paralleled gun law reforms.²¹⁻²³

One limitation of this study is the possible bias in the underreporting of death by suicide. This may have resulted in underestimation of certain suicide methods since death from overdose and drowning are more likely to be coded as undetermined deaths instead of suicide.²⁴ The classification of death as suicide or undetermined death is subject to the interpretation of the coroner. This can affect the reliability of official suicide statistics. Furthermore, changes at social and religious acceptability of suicide may lead to biased trend estimates.²⁵

The diagnosis of a mental disorder, one of the most important risk factors for suicide, as well as other indicators of demographic and clinical facts that could be associated to suicidal behavior were not evaluated because the report Institute of Forensic Medicine of Ceará did not register these variables.

The preference of the suicide method is complex. The use of a method depends on the availability and accessibility of ways to commit suicide. Epidemiological evidence suggests that means restriction do not reduce only method-specific but also overall suicide rates, being an important assistance on

suicide prevention.²⁶⁻²⁸ In this sample, it was not possible to evaluate whether the restriction of firearms had an impact on the overall suicide rates in Fortaleza.

In conclusion, although suicide is an important public health issue, the local published literature about this problem is sparse. Therefore, understanding suicide methods may provide support to more effective public suicide prevention programs. There is a clear need to improve data registry of suicide, including demographic and clinical data as a way to develop more effective strategies.

REFERÊNCIAS

1. World Health Organization. Suicide rates, age standardized – estimates by country [Internet]. [place unknown]: WHO: 2015 [cited 2017 April 13]. Available from: <http://apps.who.int/gho/data/node.main.MHSUICIDEASDR?lang=en>
2. Lovisi GM, Santos SA, Legay L, Abelha L, Valencia E. [Epidemiological analysis of suicide in Brazil from 1980 to 2006]. *Rev Bras Psiquiatr.* 2009;31(Suppl 2):S86-94. Article in Portuguese.
3. Data on cities of the immediate and intermediate geographical regions of Brazil Brazilian Institute of Geography. 2017 [cited 2018 October 20]. Available from: <https://cidades.ibge.gov.br/brasil/ce/fortaleza/panorama>
4. Ajdacic-Gross V, Weiss MG, Ring M, Hepp U, Bopp M, Gutzwiller F, et al. Methods of suicide: international suicide patterns derived from the WHO mortality database. *Bull World Health Organ.* 2008;86(9):726-32.
5. World Health Organization. International statistical classification of diseases, injuries, and causes of death. Geneva: World Health Organization; 1992 [cited 2018 October 20]. Available from: <https://icd.who.int/browse10/2016/en>
6. Ministério da saúde. DATASUS. Resident population per year [Internet]. Brasília: Ministério da Saúde; [cited 2013 Jan 15]. Available from: <http://tabnet.datasus.gov.br/cgi/tabcgi.exe?ibge/cnv/popce.def>
7. Värnik A, Kõlves K, van der Feltz-Cornelis CM, Marusic A, Oskarsson H, Palmer A, et al. Suicide methods in Europe: a gender-specific analysis of countries participating in the “European Alliance Against Depression”. *J Epidemiol Community Health.* 2008;62(6):545-51.
8. Im JS, Choi SH, Hong D, Seo HJ, Park S, Hong JP. Proximal risk factors and suicide methods among suicide completers from national suicide mortality data 2004-2006 in Korea. *Compr Psychiatry.* 2011;52(3):231-7.
9. Kinyanda E, Wamala D, Musisi S, Hjelmeland H. Suicide in urban Kampala, Uganda: a preliminary exploration. *Afr Health Sci.* 2011;11(2):219-27.
10. Regadas RP, Veras TN, Lins EB, Cavalcante LO, Aguiar JC, Braga MD. Tentativa de suicídio por auto-envenenamento: um estudo retrospectivo de 446 casos. *Pesqui Méd Fortaleza.* 2000;3(1-4):50-3.
11. Brasil. Lei nº 7.808, de 11 de julho de 1989. Dispõe sobre a pesquisa, a experimentação, a produção, a embalagem e rotulagem, o transporte, o armazenamento, a comercialização, a propaganda comercial, a utilização, a importação, a exportação, o destino final dos resíduos e embalagens, o registro, a classificação, o controle, a inspeção e a fiscalização de agrotóxicos, seus componentes e afins, e dá outras providências. Brasília: [publisher unknown]; 1989 [cited 2018 October 20]. Available from: http://www.planalto.gov.br/ccivil_03/leis/17802.htm
12. Pelaez V, da Silva LR, Araujo EB. Regulation of pesticides: a comparative analysis. *Sci Public Policy.* 2013;40(5):644-56.
13. Carneiro FF, Augusto LG, Rigotto RM, Friedrich K, Búrigo AC. Dossiê ABRASCO: um alerta sobre os impactos dos agrotóxicos na saúde [Internet]. Rio de Janeiro: Escola Politécnica de Saúde Joaquim Venâncio; 2015 [cited 2018 October 20]. Co-published by Expressão Popular (São Paulo). Available from: <https://www.arca.fiocruz.br/bitstream/icict/26221/2/Livro%20EPSJV%20013036.pdf>
14. Meyer A, Koifman S, Koifman RJ, Moreira JC, Chrisman JR, Abreu-Villaca Y. Mood disorders hospitalizations, suicide attempts, and suicide mortality among agricultural workers and residents in an area with intensive use of pesticides in Brazil. *J Toxicol Environ Health A.* 2010;73(13-14):866-77.
15. Faria NM, Fassa AG, Meucci RD. Association between pesticide exposure and suicide rates in Brazil. *Neurotoxicology.* 2014;45:355-62.
16. Santos SA, Legay LF, Lovisi GM. Substâncias tóxicas e tentativas e suicídios: considerações sobre acesso e medidas restritivas. *Cad Saúde Coletiva.* 2013;21(1):53-61.
17. Gajalakshmi V, Peto R. Suicide rates in rural Tamil Nadu, South India: verbal autopsy of 39 000 deaths in 1997-98. *Int J Epidemiol.* 2007;36(1):203-7.
18. Brasil. Lei nº 10.826, de 22 de dezembro de 2003. Dispõe sobre registro, posse e comercialização de armas de fogo e munição, sobre o Sistema Nacional de Armas – Sinarm, define crimes e dá outras providências [Internet]. Brasília: [publisher unknown]; 2003. Available from: http://www.planalto.gov.br/ccivil_03/LEIS/2003/L10.826.htm
19. Florentine JB, Crane C. Suicide prevention by limiting access to methods: a review of theory and practice. *Soc Sci Med.* 2010;70(10):1626-32.
20. Rodriguez Andres A, Hempstead K. Gun control and suicide: the impact of state firearm regulations in the United States, 1995-2004. *Health Policy.* 2011;101(1):95-103.

21. Nordentoft M. Prevention of suicide and attempted suicide in Denmark. *Epidemiological studies of suicide and intervention studies in selected risk groups.* *Dan Med Bull.* 2007;54(4):306-69.
22. Rosenbaum JE. Gun utopias? Firearm access and ownership in Israel and Switzerland. *J Public Health Policy.* 2012;33(1):46-58.
23. Chapman S, Alpers P, Agho K, Jones M. Australia's 1996 gun law reforms: faster falls in firearm deaths, firearm suicides, and a decade without mass shootings. *Inj Prev.* 2006;12(6):365-72.
24. Platt S, Backett S, Kreitman N. Social construction or causal ascription: distinguishing suicide from undetermined deaths. *Soc Psychiatry Psychiatr Epidemiol.* 1988;23(4):217-21.
25. Castro EF, Pimenta F, Martins I. The truth about suicide in Portugal. *Acta Psychiatr Scand.* 1989;80(4):334-9.
26. Chen YY, Kwok CL, Yip PS, Wu KC. A test of the substitution hypothesis: an analysis of urban and rural trends in solid/liquid poisoning suicides in Taiwan. *Soc Sci Med.* 2013;96:45-51.
27. Mann JJ, Apter A, Bertolote J, Beautrais A, Currier D, Haas A, et al. Suicide prevention strategies: a systematic review. *JAMA.* 2005;294(16):2064-74.
28. Bertolote JM, Fleischmann A, Eddleston M, Gunnell D. Deaths from pesticide poisoning: a global response. *Br J Psychiatry.* 2006;189:201-3.

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