



## Sociodemographic factors associated with suicide mortality rates in Mexico, 2012-2016

Factores sociodemográficos asociados a la mortalidad por suicidios en México, 2012-2016

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### Resumen

**Introducción:** La mortalidad por suicidio se ha incrementado sostenida e ininterrumpidamente en México desde hace más de 40 años. **Objetivo:** El principal objetivo fue analizar los factores sociodemográficos asociados con la mortalidad por suicidio en México entre 2012 y 2016. **Materiales y métodos:** Se realizó un estudio de tipo observacional y transversal. Las bases de datos de defunciones se obtuvieron del Instituto Nacional de Estadística y Geografía en México para 2012-2016. Se ajustó un modelo de regresión logística binomial para analizar qué factores sociodemográficos se relacionan con la posibilidad de que las personas fallezcan por suicidio en México. **Resultados:** Las mujeres tuvieron una menor posibilidad de fallecer por suicidio y conforme aumenta la edad, las personas tienen menos posibilidad de suicidarse. Tener algún grado de escolaridad o realizar una actividad económica incrementó la posibilidad de fallecer por suicidio. **Conclusiones:** Se espera que este estudio aporte mayor evidencia que ayude a generar políticas de prevención, atención oportuna, y la disminución del impacto de esta causa de muerte en la sociedad.

**Palabras clave:** Suicidio; México; mortalidad; factores de riesgo. (Fuente: DeCS, Bireme).

### Abstract

**Introduction:** Mortality due to suicide has increased steadily and continuously in Mexico for more than 40 years. **Objective:** The main objective was to analyze the sociodemographic factors associated with suicide mortality rates in Mexico between 2012 and 2016. **Materials and methods:** An observational and cross-sectional study was conducted. Death databases were obtained from the National Institute of Statistics and Geography in Mexico for 2012-2016. A binomial logistic regression model was adjusted to analyze which sociodemographic factors are related to the possibility that people die of suicide in Mexico. **Results:** Women had a lower chance of dying from suicide, and as age increases, people are less likely to commit suicide. Having some level of schooling or performing an economic activity increased the possibility of death by suicide. **Conclusions:** This study is expected to provide more evidence to help generate prevention policies, timely care, and the reduction of the impact of suicide on society.

**Key words:** Suicide; Mexico; cause of death; risk factors. (Source: DeCS, Bireme).

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## Introduction

Suicide is one of the main public health problems that was positioned as the fifteenth cause of death worldwide in 2012. It accounted for almost half of all violent deaths in men and more than 70% of similar fatalities in women<sup>(1)</sup>. Suicide has resulted in almost one million victims and high social and economic costs<sup>(2)</sup>. Three out of four suicides take place in middle and low income countries, where early detection is difficult because of a lack of resources and services as well as insufficient treatments and support<sup>(1)</sup>. Latin America and the Caribbean have relatively low suicide rates (6.1 deaths per 100,000 inhabitants)<sup>(1)</sup>, but it has increased throughout these regions in the last 20 years<sup>(2)</sup>.

The suicide mortality rate in young populations experienced a nearly fivefold increase between 1970 and 2016, rising from 1.13 in 1970 to 5.2 in 2016, when there were 4.4 male suicides for every female death. Suicide is the third cause of death for people between the ages of 15 to 29 years of age in both genders, after homicides and motor vehicle accidents, and it constitutes one of the main causes of years of life lost due to premature death<sup>(3-5)</sup>.

The risk factors most commonly related to suicide in Mexico are consumption of alcohol and drugs, chronic pain and diseases, psychiatric disorders, experiencing negative events in life, among others<sup>(6)</sup>. Some sociodemographic factors such as sex, age, education level, marital status and employment situation have also been reported as being connected to a higher suicidal risk. Given this problematic situation and the lack of studies in this country, the objective of this research is to analyze sociodemographic factors that are associated with the suicide mortality in Mexico between 2012 and 2016.

## Materials and methods

An observational and cross-sectional study was conducted with death databases obtained from the National Institute of Statistics and Geography (from the Spanish: Instituto Nacional de Estadística y Geografía - INEGI) of Mexico, covering time period between 2012-2016. The definition of suicide used was the one described in International Classification of Diseases (ICD-10) (codes X60-X84; Y870)<sup>(7)</sup>.

Official death numbers registered between 2012-2016 were analyzed. A bivariate descriptive analysis

was performed in order to identify deaths due to suicide and associated sociodemographic factors, using contingency tables and Ji-Square independence test. The studied variable was whether the cause of death was suicide and the sociodemographic characteristics analyzed were: gender, age, education level, employment as well as union situation. A binomial logistic regression model (BLRM) was adjusted to analyze which of those sociodemographic factors are associated with the possibility that people have died because of suicide in Mexico. The year was used as control variable. The interactions between age and sex as well as between sex and activity level were included. Standardized coefficients were calculated in order to determine which independent variables had either the greatest or the least effect on death by suicide. Cases of suicide with incomplete records in any of the variables under study were excluded from the analysis (14.1% of the total registered suicides). The excluded cases had a lower percentage of economic activities, were not typically in job unions, and had low education levels. A 5% significance level was applied and calculations were made using a STATA V. 14.1 program.

## Ethical considerations

The source of information was death certificates registered and published by the INEGI under the statistical project MEX-INEGI.40.202.06-EVM. This data collection approach guarantees the confidentiality of the studied subjects and prevents ethical conflicts.

## Results

Between 2012 and 2016, 30,591 suicides were registered in Mexico, of which 81% were men. Over 81% of these suicides occurred in people that were younger than 50 years of age (Table 1). More than half of the female cases of suicide occurred before they reached the age of 30 years, while 8.2% of male suicides occurred at the age of 65 years or older. In terms of education level, the highest suicide incidence occurred in people with primary or secondary education. There was no difference in the suicide incidence according to the marital status. For the employment variable, an opposite behavior in men and women was observed and for this reason an interaction between sex and employment variables was carried out. With regard to suicidal methods, hanging was the most common, followed by poisoning in women and firearms in men. It was found that there is a statistically significant

relationship between all studied variables and suicide.

The BLRM showed there is a lower possibility that women die by suicide (Table 2). The age at which suicides occur varies according to gender, but a decrease was observed as the age increases and this trend is more evident in women. Having some level of education increased the chance of dying by suicide. The general trend indicates that having a job increases the possibility of suicide. However, this condition varies according to gender as women showed an inverse relationship. In 2014 and 2015,

there was a greater propensity to die by suicide compared to 2012 in Mexico. The variables that had the greatest effect on death by suicide were (see standardized coefficients): 65 years of age and older, 65 years of age and older for women, and ages between 50 and 64 years (all of them decreased the possibility of death by suicide). In contrast, the variables that had a lower effect on suicide mortality were: the year 2015, employed women, and the year 2014. Finally, the variables that caused an increase in the odds ratio for suicide were: having primary as well as secondary education levels and being employed.

**Table 1.** Sociodemographic characteristics of deaths caused by suicide in México analyzed by gender between 2012 and 2016

Characteristics	Men n=21,373 (81.4%)	Women n=4,906 (18.6%)	Total n=26,279
<b>Age (years)*</b>			
15 - 29	41.3	52.0	43.3
30 - 49	37.9	34.0	37.2
50 - 64	12.6	10.7	12.2
65 +	8.2	3.3	7.3
<b>Education level*</b>			
No schooling	19.8	13.5	18.6
Primary	29.5	23.5	28.4
Secondary	32.7	37.1	33.6
Undergraduate education or higher	18.0	25.9	19.5
<b>Unionized*</b>			
No	49.3	52.4	49.9
Yes	50.7	47.6	50.1
<b>Employment*</b>			
No	20.3	70.1	29.6
Yes	79.7	29.9	70.4
<b>Suicide methods*</b>			
Poisoning	6.1	20.4	8.8
Hanging	80.7	70.9	78.8
Drowning	0.2	0.6	0.3
Firearm	10.2	3.9	9.0
Cutting	1.1	0.9	1.1
Burning	0.2	0.3	0.2
Jumping from height	0.9	1.7	1.0
Others	0.7	1.3	0.8

\* Significance of the Ji-Square independence test,  $p < 0.001$

Source: Vital statistics of mortality from the INEGI, 2012-2016

**Table 2.** Results of the binomial logistic regression model of death by suicide in México, 2012-2016

Characteristics	$\beta$	Odds Ratio	95 % IC	P - value	Standardized coefficients
<b>Gender</b>					
Male+	-	-	-	-	-
Female	-0.152	0.859	[0.81, 0.91]	p<0.0001	-0.076
<b>Age (years)</b>					
15 - 29 +	-	-	-	-	-
30 - 49	-0.869	0.420	[0.41, 0.43]	p<0.0001	-0.295
50 - 64	-2.220	0.109	[0.10, 0.11]	p<0.0001	-0.898
65 +	-3.455	0.032	[0.03, 0.03]	p<0.0001	-1.690
<b>Gender * Age (years)</b>					
Male * 15 - 29 +	-	-	-	-	-
Female * 30 - 49	-0.665	0.514	[0.48, 0.55]	p<0.0001	-0.134
Female * 50 - 64	-1.089	0.337	[0.30, 0.37]	p<0.0001	-0.306
Female * $\geq$ 65	-2.187	0.112	[0.09, 0.13]	p<0.0001	-1.007
<b>Education level</b>					
No schooling+	-	-	-	-	-
Primary	0.330	1.391	[1.34, 1.44]	p<0.0001	0.139
Secondary	0.402	1.495	[1.44, 1.55]	p<0.0001	0.132
Undergraduate education or higher	0.171	1.186	[1.14, 1.24]	p<0.0001	0.058
<b>Unionized</b>					
No+	-	-	-	-	-
Yes	-0.006	0.994	[0.97, 1.02]	0.646	-0.003
<b>Employment</b>					
No+	-	-	-	-	-
Yes	0.133	1.142	[1.10, 1.18]	p<0.0001	0.066
<b>Employment * Gender</b>					
Men * Unemployed+	-	-	-	-	-
Female * Employed	0.206	1.229	[1.14, 1.32]	p<0.0001	0.041
<b>Year</b>					
2012+	-	-	-	-	-
2013	0.015	1.015	[0.97, 1.06]	0.471	0.006
2014	0.104	1.109	[1.07, 1.15]	p<0.0001	0.042
2015	0.088	1.092	[1.05, 1.14]	p<0.0001	0.036
2016	0.009	1.009	[0.97, 1.05]	0.660	0.004
Constant	-2.905	0.055	[0.05, 0.06]	p<0.0001	-

Percentage of correctly classified cases

99.01%

Hosmer-Lemeshow goodness of fit test

6.810

0.078

+ Reference category

## Discussion

Our results confirm that suicide mortality is higher in men<sup>(8)</sup>. This difference regarding suicidal behavior, i.e., a more prominent non-fatal suicidal trend in women compared to male mortality, has been described as the gender paradox<sup>(9)</sup>. A possible explanation for this difference is that, in general, men use more lethal methods that result in completed suicides<sup>(10)</sup> such as hanging and firearms, while women choose hanging and poisoning, the latter being a less lethal method<sup>(11,12)</sup>.

Age is another important factor that affects suicide as it carries a greater burden of the disease due to the increased number of years lost due to premature death<sup>(5)</sup>. We observed that having some level of education increased the possibility of death by suicide. However, the evidence supporting this relationship is still inconsistent as shown by Xavier, *et al.*, who found an inverse association between education and suicides<sup>(13)</sup>. Likewise, other studies have reported that a higher suicidal risk is associated with low educational achievements<sup>(14,15)</sup>. Having a job

increased the possibility of death by suicide, especially in women. This relationship has been analyzed by other studies, and they found that unemployment and underemployment have a more direct relationship to suicide<sup>(16,17)</sup>.

It is important to highlight some limitations of this study. We worked with vital statistics of mortality, which do not have information about mental health of patients and/or other suicide risk factors previously mentioned<sup>(6)</sup>. Furthermore, errors associated with the quality and coverage of vital mortality statistics in Latin America and the Caribbean have been reported<sup>(18)</sup>, which may cause underreporting of this event. Even though it is considered that the registered information allows reliable estimates in Mexico<sup>(19)</sup>, it was not possible to identify the economic activity of the deceased people. Finally, this type of cross-sectional information makes it difficult to analyze possible causal factors of completed suicides as it only allows one to establish associations with these variables.

This study has the advantage of using only one source of information and a novel approach to a little explored phenomenon, despite its data richness and temporality. The results focused on the factors associated with completed suicides, given that it is a preventable phenomenon that has a high disease burden<sup>(5)</sup>.

### Conclusions

This study is expected to contribute with enough evidence to generate prevention and health care policies that diminish the impact of this event on the society.

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### Conflict of interests

None declared by the authors.

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