

Original Article

COMPLETED AND ATTEMPTED SUICIDE IN ILAM, IRAN
(1995 – 2002): INCIDENCE AND ASSOCIATED FACTORS

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Background: Understanding the epidemiology of suicide will increase awareness of suicide as a major public health problem. The epidemiology of suicide is described for the first time in Ilam, Iran. To describe the incidence of and factors associated with completed and attempted suicide in Ilam (western part of Iran), a longitudinal prospective case-register study was conducted from 1995 to 2002.

Methods: In the province of Ilam, Iran, all individual contacts concerning parasuicidal behavior were registered by the participating facilities. Demographic and case-related information were recorded. Two thousand five hundred twelve people committed suicide from the year 1995 to 2002. Cases were selected on the basis of information from the scene of crime, police inquest, office of welfare organization, autopsy findings, emergency medical services, mental health clinics and hospital records, Ilam Central Bureau of Statistics, and interview with the acquaintances of the victims and suicide attempted persons.

Results: The overall annual completed suicide rate (95% confidence interval [CI]) was 10.0 (8.5 to 11.5) and 26.4 (23.9 to 28.9) per 100,000 men and women. The attempted suicide rate was 41.8 (38.7 to 44.8) and 64.5 (60.7 to 68.4) per 100,000 men and women. More women than men completed (relative risk = 2.7 [95% CI: 2.2 to 3.2]) or attempted suicide (relative risk = 1.5 [95% CI: 1.4 to 1.7]). Suicide and attempted suicide rates were highest among 20 – 29 years old and decreased with increasing the age. Self-immolation was the most common method of suicide, while drug overdose was the predominant method of suicide attempt. Suicidal behavior was associated with a higher level of education. A higher completed and attempted suicide rate was found among the married people than those who never married.

Conclusion: The findings of this study highlight the need for further studies to identify population at high risk for suicide as the first step towards planning a well-organized approach to reduce the suicide rate.

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Keywords: Attempted suicide • completed suicide • epidemiology • Iran • parasuicide

Introduction

Suicide is devastating for individuals, families, and communities and is an important public health problem. It is one of the ten leading causes of death in the world.¹ Suicide is the third leading cause of death in youth, behind unintentional injury and homicide.

In the USA, more teenagers and young adults died from suicide than from cancer, heart disease, AIDS, birth defects, stroke, and chronic lung disease, combined, in 1999.² Suicide, with homicide, is the third leading cause of years of potential life lost in the USA³ and is also the leading cause of years of potential life lost in Canada.⁴ It carries a substantial economic burden.⁴ Suicide is a complex and tragic outcome of mental illness.⁵ It occurs on a continuum of severity that progresses from less serious and more prevalent behaviors through increasingly severe, less prevalent, and more lethal behaviors.^{6 – 9} At one end are behaviors such as casual ideation without specific plan. These behaviors may progress in

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some individuals through persistent and intense ideation that includes a planned and self-inflicted injury without an intention to die, and, for a very small proportion of persons at the other end of the continuum, to a suicide attempt with high lethality, and completion.^{6, 10, 11}

The incidence and pattern of suicide vary from nation to nation. The completed suicide rate varies from as low as 0.4/100,000 in Nigeria,¹² to as high as 22.7/100,000 in Geneva.¹³ Suicide rates differ by age, gender, race, socioeconomic, and marital status.^{7, 14} In most industrialized nations, suicide rate is more common in males than females and the rate increases with age. While much is known about the epidemiology of suicide in developed nations, and much remains to be clarified, approximately few researches have been undertaken in the developing nations, where the religious, cultural, and social values are different and play some role in this regard.¹⁵ To the best of our knowledge, no population-based study describing the epidemiology of suicide has been conducted in Iran. The rapid social transformation of the country in the presence of increasing rates of suicide in other industrialized nations raises the need to examine not only current rate but the possible changes that may occur over time.

The objectives of this longitudinal prospective case-register study were to estimate the incidence of completed and attempted suicide and its association with gender, marital status, and age among people in the western part of Iran.

Patients and Methods

Subjects

Our investigation was conducted in Ilam, situated in western Iran, with a population of almost half a million (487,886 in 1999 [males 249,275 and females 238,611]) and a high proportion of young people. Of the inhabitants, 42.9% belong to the > 20 years and 5% were aged 60 years or older in 1999. The study population included all residents of the Ilam Province aged 10 years and above, during the period from 1995 to 2002. The population structure and socioeconomic status of Ilam are similar to the rest of the country.

Two thousand five hundred twelve people committed suicide from 1995 to 2002. The subjects' vital status was determined.

Data sources

A longitudinal prospective case-register study

was conducted from 1995 to 2002 by the Ilam government. In the Province of Ilam, all individual contacts concerning parasuicidal behavior were registered by the participating facilities, i.e. hospitals, community mental health organizations, and emergency services. Mortality data were collected from the data files of the Ilam Bureau of Statistics (IBS). The IBS data included age, gender, date of death, and underlying cause of death based on death certificate. Suicide was classified according to ICD-9 code E950-E959.¹⁶ In Iran, a physician completes the death certificate, but when the causes of death are external, additional investigations are carried out by the district attorney and a forensic specialist to enhance diagnostic certainty. Morbidity data were collected from the scene of crime, police records, emergency medical services, hospital reports, office of welfare organization, forensic medicine reports, as well as family and community members. The patient's database included in-patients, outpatients, and day-patients at all hospitals providing care to Ilam residents. Demographic information obtained about persons who committed a suicidal act included age, gender, marital status, and education. Other pertinent information collected included the suicide method used, location of suicidal act, occupation, place of residence, and cause of suicide. The Iranian Central Bureau of Statistics (ICBS) regularly conducts population censuses, including in the year 1999, and also estimates the average annual population for the in between years based on several registries available in the country. The denominator population used was that calculated by the ICBS on the basis of 1999 census data.

Information had been collected about all service contacts for individuals on a cumulative basis. Patients' coverage was thought to have been virtually complete since no residents have been shown to have received any care outside Ilam during the study period. Data were collected by trained health workers who visited all relevant agencies and service points regularly.

Attempted suicide was defined as "a potentially self-injurious action with a nonfatal outcome for which there was evidence, either explicit or implicit, that the individual intended to kill himself/herself (the action may or may not result in injuries)".⁷ Completed suicides were defined as "the act of taking one's own life voluntarily and intentionally".

Statistical analysis

Suicide rate per 100,000 persons were calculated separately for completed and attempted suicides, and by gender and age groups. Average yearly rates were calculated for the 7 years combined, to increase stability and allow comparison across groups using relative risk (RR) with 95% confidence intervals (CI). Statistically significant confidence intervals are those that do not include 1.0. The rate for various subgroups were compared by Chi-square test or Fisher exact test. Ninety-five percent CI for mean and proportion differences were estimated by the confidence interval analysis software.¹⁷ All tests for statistical significance were two-tailed, with the level of significance at $\alpha < 0.05$.

Results

Subject characteristics

A total of 2,512 (926 [36.9%] males and 1586 [63.1%] females) cases of suicide occurred during the study period, from the year 1995 to 2002 (all suicide completions and attempts). There were 615 cases of completed suicides, 1807 cases of attempted suicides, and 90 cases unspecified. These 90 cases were excluded from the analysis. Differences in the distribution of several characteristics among males and females for completed and attempted suicide are shown in Table 1. For those who completed or attempted suicide, females were less likely to be never-married and more likely to be married or divorced/widows, and had a lower education than

Table 1. Comparison of selected characteristics between 174 men and 441 women, who completed suicide and 729 men and 1,078 women who attempted suicide, Ilam, Iran, 1995 – 2002.

Characteristics	Male No. (%)	Female No. (%)	Differences (95% CI)
Completed suicide			
Education			
Primary or below	61 (39.1)	234 (59.2)	-20.1 (-29.2 to -11.1)*
Secondary	89 (57.1)	157 (39.7)	17.3 (8.2 to 26.4)*
Matriculation or above	6 (3.8)	4 (1.0)	2.8 (-0.3 to 6.0)
Marital status			
Single	118 (69.0)	238 (54.6)	14.4 (6.1 to 22.8)*
Married	52 (30.4)	183 (42.0)	-11.6 (-19.9 to -3.2)*
Divorced/widowed	1 (0.6)	15 (3.4)	-2.8 (-4.9 to 0.8)*
Method of suicide			
Poisoning	22 (12.8)	29 (6.6)	6.2 (0.7 to 11.7)*
Drug overdose	16 (9.3)	14 (3.3)	6.0 (1.4 to 10.7)*
Hanging	29 (16.9)	14 (3.2)	13.7 (7.8 to 19.5)*
Firearm	20 (11.6)	6 (1.4)	10.3 (5.4 to 15.2)*
Sharp	0 (0.0)	0 (0.0)	—
Flame	72 (41.9)	361 (82.4)	-40.6 (-48.7 to -32.4)*
Others	13 (7.6)	14 (3.2)	4.4 (0.1 to 8.6)
Age (yr) (mean [SD])	29.4 (16.6)	25.6 (12.6)	3.8 (1.4 to 6.2)*
Attempted suicide			
Education			
Primary or below	158 (22.3)	429 (41.7)	-19.4 (-23.7 to -15.1)**
Secondary	521 (73.6)	577 (56.1)	17.5 (13.1 to 22.0)**
Matriculation or above	29 (4.1)	23 (2.2)	1.9 (1.1 to 3.6)*
Marital status			
Single	546 (75.2)	531 (49.5)	25.7 (21.4 to 30.1)**
Married	179 (24.7)	530 (49.4)	-24.7 (-29.1 to -20.4)**
Divorced/widowed	1 (0.1)	12 (1.1)	-1.0 (-1.7 to -0.3)*
Method of suicide			
Poisoning	173 (23.8)	253 (23.6)	0.2 (-3.8 to 4.2)
Drug overdose	428 (58.8)	612 (57.0)	1.8 (-2.8 to 6.5)
Hanging	9 (1.2)	5 (0.5)	0.8 (-0.1 to 1.7)
Firearm	12 (1.6)	2 (0.2)	1.5 (0.5 to 2.4)*
Sharp	9 (1.2)	4 (0.4)	0.9 (-0.02 to 1.8)
Flame	39 (5.4)	160 (14.9)	-9.5 (-12.2 to -6.9)*
Others	58 (8.0)	38 (3.5)	4.4 (2.2 to 6.7)**
Age (yr) (mean [SD])	24.3 (10.0)	24.2 (10.1)	0.1 (-0.8 to 1.1)

Total of each variable may vary because of missing values. CI = confidence interval; SD= standard deviation; * $P < 0.001$ for the difference in the mean and proportion of the variables between males and females; yr = year.

males. For completed suicides, the mean (SD) age was 29.4 (16.6) years for males and 25.6 (12.6) years for females ($P < 0.001$). For attempted suicides, the mean (SD) age was 24.3 (10.0) years for males and 24.2 (10.1) years for females. There was no significant gender difference in the mean age.

The most common method of completed suicide for both men and women was self-immolation, which was used by 41.9% of males and 82.4% of females. This was followed by hanging in males (16.9%) and poisoning in females (6.6%). The preference for self-immolation as a method of completed suicide was especially dominant in females. Firearms were used by 11.6% of males and only 1.4% of females.

The most common method used for attempted suicide was drug overdose, which was used by 58.8% of males and 57% of females. This was followed by poisoning (23.8% males, and 23.6% females) and self-immolation (5.4% of males and 14.9% of females). Firearms were used by 4.2% of completed and only 0.8% of attempted suicides.

Table 2 presents age-specific distribution of completed and attempted suicide by gender. Women were more likely to use attempted (59.6% vs. 40.4%; $P < 0.001$) or completed suicides (71.7% vs. 28.3%; $P < 0.001$). The age of predilection in men and women and completed and attempted suicides was 10 – 19 years, followed by 20 – 29 years and decreased with age in males and females. About 74% (1857) of the suicides occurred between the ages of 10 – 29 years. Only 3.2% (80) of cases were above 50 years. Of all suicidal acts, 615 (24.5%) resulted in death. The case fatality rate in all age groups, except 50 years and older, were higher in women than men and increased with age in both genders.

Table 3 presents gender specific completed and attempted suicide rates by selected demographic characteristics. Overall 10.0 (95% CI: 8.5 to 11.5) per 100,000 men and 26.4 (95% CI: 23.9 to 28.9)

per 100,000 women were completed and 41.8 (95% CI: 38.7 to 44.8) per 100,000 men and 64.5 (9% CI: 60.7 to 68.4) per 100,000 women were attempted suicides. Females were about three times more likely to commit suicide (RR [95% CI] = 2.7 [2.2 to 3.2]). Also, females were about 50% more likely to attempt suicide (RR [95% CI] = 1.5 [1.4 to 1.7]). Marital status was significantly associated with attempted or completed suicide in both genders. Among men, those married were 2.8 (95% CI: 2.0 to 3.9) and among women, those married were 1.3 (95% CI: 1.1 to 1.6) times more likely to complete suicide than those never married. Among men, those married were 3.8 (95% CI: 3.2 to 4.5) times more likely to attempt suicide than those never married, while among women there was no difference. Suicidal behavior was associated with a higher level of education and it was especially dominant in the attempted suicides. The age differences in suicide rate were remarkable, with a clear pattern, and the completed and attempted suicide rates were the highest in males and females aged between 20 – 29 years.

Discussion

In this longitudinal prospective case-register study of 2512 completed and attempted suicides, we found an overall completed suicide rate of 10.0 per 100,000 men and 26.4 per 100,000 women per year during a seven-year study period. The attempted suicide rate was 41.8 per 100,000 men and 64.5 per 100,000 women. In this study it was found that women predominated in both completed and attempted suicide. Self-immolation was the most common method of suicide, while drug overdose was the predominant method of suicide attempt. Suicide and attempted suicide rates were highest among 20 – 29 years old and decreased with increasing the age. Suicide rates were higher among married than those never married. To the best of our knowledge, no other population-based

Table 2. Age distribution of completed and attempted suicide by gender.

Age (year)	Male No. (%)			Female No. (%)		
	Completed suicide	Attempted suicide	Case fatality rate (%)	Completed suicide	Attempted suicide	Case fatality rate (%)
10 – 19	63 (36.4)	309 (45.1)	16.9	204 (48.5)	467 (47.2)	30.4
20 – 29	62 (35.8)	274 (40.0)	18.5	123 (29.2)	355 (35.9)	25.7
30 – 39	22 (12.7)	60 (8.8)	26.8	51 (12.1)	106 (10.7)	32.5
40 – 49	7 (4.0)	25 (3.6)	21.9	22 (5.2)	38 (3.8)	36.7
50 – 59	7 (15.6)	6 (0.9)	53.8	11 (2.6)	13 (1.3)	45.8
≥ 60	12 (6.9)	11 (1.6)	52.2	10 (2.4)	10 (1.0)	50.0
Total	173 (100)	685 (100)	20.2	421 (100)	989 (100)	29.8

Table 3. Yearly average completed and attempted suicide rate of men and women according to selected characteristics per 100,000/year, 1995 to 2002.

Variables	Male			Female		
	Total No.	Suicide rate	Relative risk (95% CI)	Total No.	Suicide rate	Relative risk (95% CI)
Completed suicide						
Total	174	10.0	– (8.5 to 11.5)	441	26.4	– (23.9 to 28.9)
Age (yr)						
10 – 19	63	12.5	1.0	204	42.3	1.0
20 – 29	62	22.6	1.8 (1.3 to 2.6)**	123	42.9	1.0 (0.8 to 1.3)
30 – 39	22	12.3	1.0 (0.6 to 1.6)	51	29.1	0.7 (0.5 to 0.9)*
40 – 49	7	5.8	0.5 (0.2 to 1.0)	22	17.8	0.4 (0.3 to 0.7)*
50 – 59	7	11.2	0.9 (0.4 to 2.0)	11	19.2	0.5 (0.2 to 0.8)*
≥ 60	12	10.9	0.9 (0.5 to 1.6)	10	13.4	0.3 (0.2 to 0.6)*
Education						
Primary or below	61	12.0	1.0	234	33.1	1.0
Secondary	89	25.8	2.2 (1.6 to 3.0)**	157	54.9	1.7 (1.4 to 2.0)**
Matriculation or above	6	27.0	2.3 (1.0 to 5.2)	4	33.4	1.0 (0.4 to 2.7)
Marital status						
Never married	52	7.6	1.0	183	32.6	1.0
Married	118	21.3	2.8 (2.0 to 3.9)**	238	42.8	1.3 (1.1 to 1.6)*
Divorced/widowed	1	8.8	1.2 (0.2 to 8.4)	15	19.7	0.6 (0.4 to 1.0)
Attempted suicide						
Total	729	41.8	– (38.7 to 44.8)	1078	64.5	– (60.7 to 68.4)
Age (yr)						
10 – 19	309	61.4	1.0	467	96.9	1.0
20 – 29	274	99.9	1.6 (1.4 to 1.9)*	355	123.8	1.3 (1.1 to 1.5)*
30 – 39	60	33.4	0.5 (0.4 to 0.7)*	106	60.5	0.6 (0.5 to 0.8)*
40 – 49	25	20.7	0.3 (0.2 to 0.5)*	38	30.8	0.3 (0.2 to 0.4)*
50 – 59	6	9.6	0.2 (0.07 to 0.4)*	13	22.7	0.2 (0.1 to 0.4)*
≥ 60	11	10.0	0.2 (0.09, 0.3)	10	13.4	0.1 (0.07 to 0.3)*
Education						
Primary or below	158	31.0	1.0	429	60.7	1.0
Secondary	521	151.2	4.9 (4.1 to 5.8)**	577	201.6	3.3 (2.9 to 3.8)**
Matriculation or above	29	130.4	4.2 (2.8 to 6.2)**	23	192.1	3.2 (2.1 to 4.8)**
Marital status						
Never married	179	26.2	1.0	530	94.5	1.0
Married	546	98.7	3.8 (3.2 to 4.5)	531	95.6	1.0 (0.9 to 1.1)
Divorced/widowed	1	8.8	0.3 (0.05 to 2.4)**	12	15.7	0.2 (0.09 to 0.3)**

Note: Total of each variable may vary because of missing values; CI = confidence interval; * $P < 0.05$; ** $P < 0.001$ for the difference in the incidence of suicide between variables.

attempted and completed suicide rate among Iranian people has been reported. Incidence rates in various studies from around the world show considerable variation depending on the social, cultural, and religious values. In the USA, the age adjusted completed suicide rate in 1998 was 10.4 per 100,000.¹ Suicide rates vary widely from state to state. In 1998, age adjusted rates ranged from 6.4/100,000 in New Jersey to 21.2/100,000 in Nevada and 22.1/100,000 in Alaska.¹ In Australia the attempted suicide rates were 85 per 100,000 for men and 203/100,000 for women.¹⁸ Another study from Israel found an incidence of completed suicide of 12.6 per 100,000.¹⁹ One study from Taiwan found a completed suicide rate of 12.5 per 100,000 people.²⁰ Slightly lower rates in our study could have been due to the differences in urbanization and industrial development, leading to

an increased detachment of the individual from his social milieu resulting in a weakening of the individual's identification with the social group which controls and defines his action. Yet another important reason could be the role of religion, specially the belief in the world hereafter, which prevents the feeling of hopelessness, a feeling that has been described as an important predisposing factor for suicide.²¹

The gender ratio in this study is different to the accepted view of male dominance.^{14, 21} We found a gender effect, with women committing suicide more often than men, like in China.²² This finding was clear in all age groups for both completed and attempted suicide. In Iran, women status is greatly undervalued. The ratio of male to female suicide rates in the US was 4.3 in 1998.¹ The overall age-adjusted rate for men was 17.2/100,000, ranging

from rates near 0 in boys aged between 5 – 9 years to 57.8/100,000 in men 85 years and older.²³ The comparable rates for women were much lower. The overall age-adjusted rate for women was 4.0/100,000, with a range near 0 in girls aged between 5 – 9 years, to 7.0/100,000 in women aged between 45 – 54 years. The studies on attempted suicide or parasuicide in western societies have shown that women engage far more in suicidal acts (including suicide ideation and parasuicide) than men.²⁴

In this study, 74% of the suicides occurred between the ages of 10 – 29 years and the suicide rate decreased with advancing age. This finding goes against the concept of increasing rate of suicide with advancing age in the literature,^{14, 21} and as revealed by studies in Ireland,²⁵ USA,²⁶ Italy,²⁷ Singapore,²⁸ Japan,²⁹ and Spain.³⁰ But, is closer to the age of predilection reported in other less-developed nations like Nigeria,¹² Malaysia,¹⁵ India,³¹ Jordan,³² and Pakistan.³³ In this study, the reason for suicide at an early age could be social pressures of growing up accompanied by marital and domestic issues in females (aged 10 – 19 years) and the economic pressures and failure to achieve life goals in cases of males (age 20 – 29 years), in their early years of economically-independent existence. In this study, only 3.2% of cases were above fifty years. The reason for this could be the family system in which elders are taken care of and usually relax and enjoy their advancing years with their family and grandchildren. In addition, the increased inclination towards religion with advancing age, has been usually noted in our setup. Attempted suicide rates have consistently been found to be higher in younger than older age groups.^{18, 22, 34 – 40}

Self-immolation, drug overdose, and poisoning were the three most common methods of suicide. Self-immolation was the most common method of completed suicide, particularly among women, because of the ease of availability of flame. This is in agreement with some other studies conducted in different nations.^{13, 15, 39, 31, 33, 41} In the US, across all age groups, a firearm is the most common mechanism used by both men and women to commit suicide, followed by hanging and self-inflicted poisoning. Mechanisms used by suicide attempters are distinct from the most common mechanisms used by suicide completers, although overdose or poisoning is also a frequent mechanism of completed suicide. Like this study, the most common mechanism reported in all

studies of suicide attempters is self-poisoning, accounting for over 70% of all attempts.^{34 – 36} Beautrais et al³⁶ reported that carbon monoxide poisoning and cutting or stabbing ranked behind ingestion in their adult sample. In industrialized nations, the drugs that people commonly take in overdose, including analgesics, tranquillizers, and antidepressant are relatively nontoxic. The estimated case fatality for overdose in England, for example, is around 0.5%.⁴² Most individuals who self-harm do not intent to die. Studies carried out in industrialized nations have found that only 2% go on to commit suicide in the subsequent 12 months.³⁷ In developing nations the situation is quite different.³⁸ The substances most commonly used for self-poisoning are agricultural pesticides.^{22, 38} Overall case fatality ranges from 10% to 20%.³⁹

Much higher suicide rates have been found for married persons than those never married. This finding is against the hypothesis that marriage is protective against suicide, as found by Durkheim in 1897 and as reported in more recent works.^{40, 43, 44} Previous studies in western societies have shown that married persons experience lower suicide rates than singles. People never married and those divorced, separated, and widowed have the highest suicide rates.^{40, 43, 44} One of the most prominent explanations given in previous studies to account for the observed differentials in the risk of suicide by marital status is that marriage provides social and emotional stability, whereas divorce, separation, singlehood, and widowhood do not.⁴³ Accordingly, marriage offers the best protection against suicide, because it provides social and community integration, and reduces social isolation.²⁴ Unfortunately, the data used here do not allow for an empirical test of these speculations. Further research would be useful to examine which factors might play a role in the suicides of those married persons in our society.

Performing this study on the epidemiology of completed and attempted suicide, benefited from the availability of suicide information over a long period of time in order to overcome the problem of stability of rates arising from the yearly fluctuations due to a relatively small number of events. The actual denominator figures generated by the ICBS allowed the calculation of significant statistical tests, beyond the mere comparison of rates. The prospective nature of the study enhances the validity of these findings, because risk factors were assessed of the same time suicide occurred.

Although this study had several findings relevant to the understanding of epidemiology of suicide in an Iranian community, it has some limitations. Our study, like all the studies dealing with mortality data, is subject to possible biases. Worldwide, the reliability of suicide reporting is questionable and the validity of suicide as a construct is dubious. Clinicians are aware that suicidal acts are associated with degrees of ambivalence. The lack of adequate registration of cause of death in mortality statistics can actually determine an underestimation of the suicide number.⁴⁵ Some deaths, which are considered as suicide equivalent, such as that by drug overdose, are not recorded as suicide, but often as “undetermined”, and euthanasia is somewhere tolerated. Unfortunately, official data are unavailable or unreliable. However, no study in Iran has validated the existence of either differential or nondifferential misclassification in this regards. Despite the above limitations, the findings of this study further add to our understanding of epidemiology of suicide in Iran. Nevertheless, this study provides new data from Iran, a nonwestern culture, which has been under-represented in previous studies.

The findings of this report highlight the need for further studies, which could identify subpopulations at high risk for suicide. On the one hand, societal trends such as lifestyle, as well as media exposure to violence and suicidal event, are the first steps toward planning well-organized interventional programs to reduce suicide rates.

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