# Originals

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# Suicide mortality in Olot from 1936 until 2000

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Introduction. Suicide in Spain has increased in both genders and in different age groups.

It is important to evaluate the tendencies of this phenomenon. This study describes suicide mortality in a limited and homogeneous population, which offers the possibility of collecting detailed data over a long time period (1936-2000).

Methods. Suicide cases were extracted from data in regional archives and from autopsy reports in the Olot court registry office. The suicide rate per 100,000 inhabitants was calculated by analyzing the number of suicides and inhabitants in 5-year groups.

**Results.** Suicide occurred more frequently in males and in the over 65-year old population. The suicide rate fluctuated during the period studied. Among males, the peak was 14.92 during 1961-1965 and lowered to 8.68 in 1996-2000. The suicide rate in females was always lower than for men, except during 1946-1950 (7.71 vs. 3.09) and 1976-80 (5.7 vs. 4.9). The most common methods used were hanging (52%) and shooting (18%). There was no difference in the methods among females.

**Conclusions.** The demographic and methodological data reflect those obtained in similar studies. In the last 10 years of the study, Olot citizens did not have a higher risk of suicide than the population of the rest of Spain. This result should be interpreted considering the limits related to the methodology used in the data collection.

Key words: Suicide. Mortality.

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#### Mortalidad por suicidio en Olot desde 1936 hasta 2000

Introducción. En España el suicidio ha crecido en ambos sexos y en diferentes grupos de edad.

Es importante evaluar la tendencia de este fenómeno. Este estudio describe la mortalidad por suicidio en una población limitada y homogénea, que ofrece la posibilidad de obtener datos detallados acerca una larga temporada (1936-2000).

Método. Los casos han sido extraídos de los datos del archivo comarcal y de los informes de autopsias en los registros del juzgado de Olot. La tasa de suicidio por 100.000 habitantes ha sido calculada agrupando por quinquenios el número de suicidios y de habitantes.

Resultados. El suicidio ha sido más frecuente en hombres y en mayores de 65 años. La tasa de suicidio ha sido variable durante el período estudiado. En los varones el pico fue 14,92 en 1961-1965 y descendió hasta 8,64 en 1996-2000. Las mujeres tuvieron una tasa inferior a la de los hombres, excepto que en 1946-1950 (7,71 frente a 3,09) y 1976-1980 (5,7 frente a 4,9). Los métodos más utilizados en los hombres fueron el ahorcamiento (52%) y el disparo (18%). En las mujeres no hubo diferencias entre los varios métodos.

Conclusiones. Los datos demográficos y sobre los métodos de suicidio reflejan los de otros estudios similares. En los últimos 10 años del estudio, los habitantes de Olot no han tenido un riesgo de suicidio más alto que los del resto de España. Este resultado debe ser interpretado con límites relacionados a la metodología de trabajo utilizada.

Palabras clave: Suicidio. Mortalidad.

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## INTRODUCTION

In the industrialized societies, suicide is one of the first 10 causes of death in individuals from all ages and one of the first three causes of death in the ages of 15-35 years.<sup>1,2</sup> Several studies coincide that the magnitude of the problem is underestimated regarding its social, legal, economical implications and due to the difficulties that frequently arise on establishing the cause of the death.<sup>3</sup> This, above all in the past, has caused important limitations in the subsequent classification.<sup>4,5</sup>

In regards to risk factors, gender, age and mental disorders make it possible to identify the group with the greatest exposures to suicide. Males in both Spain and in most of the countries<sup>6</sup> represent the largest portion of the cases. They use the most violent and definitive methods in which the onset constitutes a point of «no return», such as hanging, falls from an elevated site or using a firearm to shoot themselves. One notable exception is the case of China that accounted for 56% of the suicides of women that occurred worldwide in 1990. In that country, it is estimated that almost one fourth of the deaths among women between 15-45 years are caused by suicide.7 In relationship to age, most occur in the elderly, often in association with underlying organic diseases, incapacity or lack of social support. These factors could also act through the increase of the prevalence of depression.8 Among adolescents and young adults, suicide rates are lower, although recent analyses in this age cutoff have found a rapid increase.9,10 Psychiatric disorders such as depression, substance abuse and previous suicide attempts have been recognized as important risk factors in this age group while the nucleus of the family setting or work situation is still controversial.<sup>11,12</sup> In Europe, there are important geographic differences in suicide rates. In our continent,<sup>2</sup> two different types of countries can be differentiated: Nordic, with rates higher than 20 per 100,000 inhabitants in males and 9 in women and the Mediterranean countries whose rates are lower than 12 per 100,000 inhabitants among males and 5 in women.13 Although suicide rates in Spain are below the European average, there is evidence that it has been increasing over the last 20 years14 with differences inside the national territory.

Gross rates per 100,000 inhabitants in different regional communities have been calculated. The areas having the highest mean rates have been found to be Asturias,<sup>15</sup> Galicia<sup>10</sup> and Andalusia<sup>11</sup> compared to others such as Castilla-La Mancha<sup>16</sup> and Cantabria.<sup>17</sup> These studies have observed higher suicide rates in areas with lower income levels<sup>18,19</sup> and in the urban setting compared to the rural one. However, in the latter, the rates have been rapidly increasing in recent years.<sup>20</sup>

Differences have also been recorded in relationship to work occupation, there being greater risk for agriculture workers and manual workers compared to professional and management workers.<sup>21</sup>

In view of this variability, the WHO recommends performing local studies to analyze specific characteristics of each area in order to study the most adequate strategies possible to cope with the problem.  $^{\rm 13}$ 

This study describes suicide-induced mortality in a Catalonian town where the popular belief considers that they have a higher prevalence of mental disorders than in the rest of the region. The suicide rate could then be a valid indicator both to evaluate the existence of specific healthcare needs for a certain group of individuals of this zone and to inform on the supposedly greater presence of mental disorder.

#### METHOD

Deaths by suicide from the year 1936 to 1992 were identified from the data present in the regional archive registries. All of the deaths that occurred in the city of Olot, (Catalonia, Spain) including accidental ones (traffic accidents, homicides and suicides) are recorded in these books.

The death certificates used in these years had two parts: the first part was filled out by the doctor who certified the death (date, time, place and cause). When the cause was death by suicide, the method use (hanging, precipitation, drowning, firearm shooting or poisoning) was also indicated. The second part was filled out by a state worker responsible for the sociodemographic data (age, gender, civil status, place of birth and residents). These data were used to describe the social demographic characteristics of the cases considered. In some cases, it was not specified if death was by suicide or not, but this could be deduced from the diagnosis or autopsy report. Doubtful cases were not included in the elaboration of the data. Since it became obligatory to perform autopsies when there were accidental deaths (among them suicides) in the year 1992 and up to 2000, those deaths due to suicide were identified by investigating the autopsy reports present in the civil registries of the Olot Court of First Instances and Instruction. In the calculation of the suicide rates, expressed as number of deaths per 100,000 inhabitants, the estimations of the population of Olot elaborated in the same registry were used. Because the Olot population oscillated between 10,000 and 30,000 inhabitants during the study period, the number of suicides and number of inhabitations were grouped into 5-year periods instead of calculating the gross rate of suicide per 1,000,000 inhabitants/year per year, which would have produced very large oscillations in the index. The calculations have also been made with different 5-year groupings and no substantial differences were obtained regarding the data examined in the text.

The data base was analyzed using the SPSS 14.0 program. The Chi square test, Student's t test and Fisher's exact test were used for the statistical calculations. Differences with p < 0.05 were considered significant.

### RESULTS

It can be seen in Table 1 that most of the suicides occur in men: 68.1%. The age group for both genders in which the most suicides are found is between 66-75 years: 21.1% among men and 27.9% among women. The proportion of cases among those under 30 years and over 65 years is greater among women than men (12% vs. 4% y 46% vs. 40%). These differences do not reach statistically significant values (Fisher's exact test, p = 0.145). It was not possible to know the subject's age in an impor-

Table 1	Characteristics of the sample				
Gender	Men	Women			
N (%)	109 (68.1%)	51 (31.9%)			
Age (years)					
Mean $\pm$ SD	57.7 ± 16.2	57.7 ± 16.2 58.2 ± 18.4			
Min-Max	19-91	23-92			
Cases-age groups (%)					
15-25 years	0.9%	4%			
26-35 years	6.3%	12%			
36-45 years	14.7%	4%			
46-55 years	16.6%	9.9%			
56-65 years	10%	13.8%			
66-75 years	21.1%	27.9%			
>76 years	11.8%	12%			
Age unknown	18.3%	17%			
Season of year, N (%)					
Winter	27 (30%)	8 (19%)			
Spring	21 (24%)	20 (48%)			
Summer	19 (21%)	5 (12%)			
Autumn	22 (25%)	9 (21%)			
Civil status, N (%)					
Married	55 (50.4%)	14 (27.4%)			
Widow(er)s	6 (5.6%)	12 (23.6%)			
Single	17 (15.6%)	10 (19.6%)			
Unknown	31 (28.4%)	15 (29.4%)			



Figure 1

Suicide by season and gender.

tant number of cases (18.3% of the men and 17% of the women).

There are no significant differences in mean age of suicide between men and women (t-test, p > 0.05). The highest percentage of cases among men is found in winter (30%), and among women in spring (48%). As can be observed in figure 1, women commit significantly more suicides than men in spring (Chi square test, p = 0.043). The other differences are not statistically significant (p > 0.005). In many cases, it has not been possible to know the civil status. Most of the suicides, for men as well as women, occur among married subjects (50.4% and 27.4%, respectively).

Table 2 and figure 2 show the suicide rate per 100,000 inhabitants by gender in Olot over a 64-year period. In the period considered, the suicide rate for men was always superior to that of women, except in the five-year periods of 1946-1950 and 1976-1980. The highest value among men was 14.9 in 1961-1965, and the lowest 2.87 in 1951-1955. Among women, the highest value was 7.78 in 1956-1960 and the lowest 0.89 in the period 1971-1976.

It can be seen in figure 2 how the suicide rate of women oscillated more of less within similar values over the years and then has been maintained around 4/100,000 in the last 20 years. On the contrary, that of the men had a peak between the years between 1956-1970 and then successively decreased and has been maintained around the values of the onset of the century in recent years.

In Figure 3, the proportion of the suicidal methods used in men and women is shown. That used most in men is hanging 52%, followed by use of firearm (gunshot) 18%, submersion 15%, precipitation 12%, poisoning with different harmful substances 2% and injury by cut 2%.

Table 2	Suicides by quinquen gender	Suicides by quinquennium and gender		
Five-year period	ls Men	Women		
1936- 1940	8.55	6.84		
1941- 1945	3.05	1.52		
1946- 1950	3.09	7.71		
1951- 1955	2.87	1.44		
1956- 1960	12.97	7.78		
1961- 1965	14.92	2.29		
1966- 1970	12.91	4.96		
1971- 1975	8.03	0.89		
1976- 1980	4.89	5.7		
1981- 1985	9.34	4.67		
1986- 1990	7.66	2.3		
1991- 1995	9.59	3.69		
1996- 2000	8.64	3.6		



No method has been more clearly used than others in women. The two methods used most have been hanging, in 29%, and drowning (submersion), in 25%, followed by precipitation, poisoning with different harmful substances and injury by cut, respectively 24%, 20% and 2%. No case of suicide by firearm has been found.

In a statistically significant way, men used hanging more frequently than women (Fisher's exact test p = 0.01) and gunshot (Fisher's exact test p < 0.001). On the other hand, women used poisoning with harmful substances more than men (Fisher's exact test p < 0.001).



Figure 3Suicide methods by gender.



In figure 4, the gross rate of suicide was calculated according to the method used. Over the years, hanging has been used most, with a peak in the 5-year period of 1956-1960. It has also been observed how in recent years, after a decrease, there was a tendency for its use to increase. Use of firearm peaked in the 5-year period of 1961-1965 and then there was a tendency for its use to decrease. Poisoning with harmful substances has remained stable over the years.

No significant differences appeared in the suicide method used by men and women aged < 30 years and between 31 and 65 years. There were significant differences in the suicide method used in the population aged > 65 years (Fisher's exact test p < 0.001) as can be seen in table III. Hanging (64% vs. 20%) and gunshot (11% vs. 0%) on both shows most by men while women use precipitation (30% vs. 11%), submersion (30% vs. 14%) and poisoning (15% vs. 0%) more than men. No significant differences in the sui-

Table 3	Suicide methods in the over 65 year old population		
Over 65 years	Men	Women	P value
Hanging	64%	20%	0.001*
Submersion	14%	30%	
Precipitation	11%	30%	
Firearm shot	11%	0%	
Poisoning	0%	15%	
Injury	0%	5%	
*Fisher's exact test			

cide method used among those under 30 years of age and the elderly over 65 years were found.

#### DISCUSSION

This study includes suicide cases that occurred in a town of Catalonia, Olot, over a 64-year period beginning in 1936. It has been observed that during this century. Most of the suicides in Olot have occurred in men over 65 years of age, married persons, during the winter and by hanging.

The fact that most were married probably depends on the fact that this group was more numerous then that of the widow(er)s and single persons who, even though they represent a lower absolute number, represent a more relevant percentage of cases. This fact is consistent with other studies that state that marriage, limiting aloneness, maybe a protective factor against suicide.22 Our data show greater suicidal acts among women during Spring. There are other studies that coincide in stating that there is a significant seasonal variation in the number of suicides, with a peak in springtime followed by a decrease at the end of the year.8 This seasonality could be correlated with the variations of climate factors, hours of light, yearly peaks of the depressive episodes and circannual rhythms of serotonin.23 The suicide rate in men underwent several changes during the time period observed. Some of these variations may be related, with the adequate precaution, to historic and social events. The gross rates of mortality per 100,000 inhabitants in men oscillate from a minimum of 3.05 in the post-war (1941-1945) to a maximum one of 14.92 during the years of industrialization of the region (1961-1965). It subsequently lowered until becoming established at about 8.6 in 1996-2000. This development is also observed in another study with an extensive prospective.24

The suicide rate in women in the 5-year periods of 1946-1950 and 1976-80 surprisingly exceeds that of men. This finding could indicate both the existence in Olot of special risk factors for women or protection factors for the men as well as doubts about the work methodology. Comparing the results with the national crude rate per 100,000 inhabitants in 1995-1999 (9.6 for men, 2.8 for women) or in 1990-1994 (9.0 for men, 2.6 for women),<sup>14</sup> it was observed that more suicides than in the rest of Spain were not verified among the male inhabitants of Olot in recent years although we could observe the contrary among the women. Among those under 30 years, women have committed more suicides compared to men and it has been observed how the predominance of male suicide decreases as their age increases. These differences are not statistically significant so that they have a very relative value. However, the limitations due to the sample size and large proportion of incomplete data should be taken into account. When these evaluations are considered, the need for possible programs and interventions related with suicide prevention in Olot that would specifically consider characteristics of the female gender is seen.

However, it is difficult to compare the national data or those of other regions with those of Olot due to the different work methodologies used.

It has been demonstrated previously that the national registries of mortality in the case of suicide are unreliable because many are not registered as such due to different problems (family reluctance, etc.).<sup>4,5</sup>

Even with these limitations, our results can be compared with those obtained in different regions having shorter studies. The gross suicide rates in Andalusia in 1991-95 (16.86; SD = 1.2 in men, 4.39; SD = 0.24 in women) are superior to those of Olot in the same period.<sup>11</sup>

In Galicia, the mean gross rate in 1992-98 is superior to that of 1991-00 in Olot (16.34; SD = 10.2 men and 7.72; SD = 8.4).<sup>10</sup> In general, it can be stated that the suicide rate in Olot is not higher than in other communities.

Historically, there has been a substantial difference in the suicide rates according to the geographic areas and the period studied. Social and cultural rules play an important role in the registry of the deaths. Research suggests that the deaths may be undervalued by 10%-50%.<sup>25</sup> It has been proposed that a more standardized approach in both the registry as well as in the classification and description of the suicide cases would permit reliable comparisons between several realities.<sup>26</sup>

In our study, it has been observed that the most frequent suicide methods in men are by hanging and firearm. This reflects the results obtained in other studies regarding countries of our geographic and cultural setting.<sup>16</sup>

There is some controversy on whether handing is the method used most due to it relative facility of access or if its predominance derives from greater facilities in registering these deaths as suicide.<sup>11</sup> Hanging and firearms have been used more by men than by women, who, on the contrary, use poisoning more. It should be taken into account that there was a violent civil war during the study period in Catalonia and that the availability of firearms was relatively easy, above all in La Garrotxa, route used to pass the firearms from France to the capital. These results confirm those that suggest that men use more violent methods than women.<sup>27</sup>

An explanation of this phenomenon in addition to the different accessibility to the different methods could be that there is greater suicidal intentionality, aggressivity, knowledge about violent methods and less concern for body disfiguration among males.<sup>28</sup> When the suicide rates according to the method used are observed, hanging has always been the one used the most. In addition, an increase is

also observed, this coinciding with less use of firearm shot. This phenomenon has been described in other contexts,<sup>29</sup> and may be justified by an increase of the policy reducing the availability of firearms and by greater social stigmatization of the use of firearms regarding hanging. This information, together with greater concern towards a possible increase of suicides among the young people,<sup>4</sup> induces greater research among age groups to discover if there are different suicide conduct patterns in Olot according to age or gender.<sup>24</sup> Gross rate by age could not be calculated due to the lack of exact demographic data. We have not found any statistically significant difference when analyzing the possible differences in the suicide method between the young and the elderly. On the contrary, it was observed that women use different suicide methods in comparison with men in the over 65-year group in comparison with that seen in the general population. Other studies show that there has been a greater increase in precipitation among women than in men among the elderly over the century.24 Others suggest that poisoning with harmful substances being the method used most in general by women, a progressively lower lethality of the substances available has induced an increase in the registry of suicides completed with other more lethal methods.30,32

Our work method has limitations regarding data collection, above all in relationship with the first years considered. In this case, although the mortality data by suicide has not been identified through the code established by the International Classification of Diseases (ICD-IX), those regarding limited dimensions of the population studied, efforts made over the years to maintain the quality of the mortality court registry of Olot and the facility of access to those emerging from information make it possible to obtain good reliability of the data obtained.<sup>16</sup> However, there are cases with incomplete variables, especially those regarding psychiatric disease that might have been suffered by those with death by suicide. Mental disorders are highly prevalent in suicide victims<sup>33</sup> and in those who make serious attempts but survived them, and can be accessible to systematized interviews.<sup>34-36</sup> This shows us the limits that make suicide a difficult subject to study in spite of the efforts to collect valid data. In any event, it is correct to think that the real values would be superior to those detected, thus increasing mortality and the magnitude of the problem.

#### CONCLUSIONS

It should be mentioned that there were moments related to the particular of this locality in which suicide was much more frequent. Most of the epidemiological investigations on this subject do not consider such a wide time perspective. On the contrary, information of this type makes it possible to formulate hypotheses on the presence of protective factors or risk factors for specific subgroups over the years. Our study does not make it possible to draw conclusions on the level of mental disorder in Olot or to make valid comparisons with other studies. However, the suicide rate used as a measure of the health status of a population somehow allows us to evaluate both the dimensions of this behavior as well as the quality of the services offered to prevent this terrible outcome.<sup>13</sup>

Investigating on a local level makes it possible to perform a detailed revision of the death registries, with greater accuracy of the data and detection of historic, cultural and local elements that may determine more specific interventions in order to contain this alarming phenomenon.

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