

Undetermined Deaths: Are They Suicides?

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Aim. To investigate the characteristics of undetermined deaths by examining similarities and differences between undetermined deaths and other death categories, such as suicides, fatal traffic accidents, and remaining deaths.

Methods. The group of undetermined deaths was compared to other death categories with respect to sex, age, marital status, and month of death of the deceased. A total yearly number of 18.508 deaths in Slovenia in 2001 was analyzed.

Results. Significantly more men died in fatal traffic accidents and committed suicide than from undetermined causes. Persons dying in fatal traffic accidents and committing suicides were significantly younger than those dying from undetermined causes of death, whereas persons dying from remaining causes of death were older. The marital status profiles of persons dying from undetermined causes and those committing suicides were similar. Also, undetermined deaths and suicides were both more likely to occur in April and May.

Conclusion. Underestimation of actual number of suicides could be assumed, given the similarities with the group of undetermined deaths in both seasonality and marital status. As some differences were obtained between the two groups in sex and age, we may conclude that some cases of older women suicides are concealed within the undetermined deaths group.

Key words: accidents, traffic; cause of death; epidemiology; Slovenia; suicide

Although suicides are reported on the basis of death certificates issued by medical examiners, which allows international comparison, concealment and underestimation of the actual number of suicides can be expected most probably due to cases classified as undetermined causes of death, also called open verdict (1). Webster's Revised Unabridged Dictionary defines open verdict as "...finding the fact of a violent death without disclosing the cause" (2). According to the 10th revision of the International Classification of Diseases (ICD10), open verdicts are classified under R95-R99 diagnoses (R95 – sudden infant death syndrome, R96 – other sudden death, cause unknown, R98 – unattended death, R99 – other ill-defined and unspecified causes of mortality; ref. 3).

One way of investigating open verdicts is to compare the properties of suicides, fatal traffic accidents, and the remaining deaths (predominantly natural causes of death) with the properties of unexplained causes of death, among which suicides may be concealed. If the open verdicts are closer to the properties of natural deaths, there may be more natural deaths among the unexplained group of deaths. Similarly, if open verdicts in their main characteristics resemble suicides or fatal traffic accidents, we can conclude that there may be more suicides or traffic accidents among undetermined deaths.

Some deaths, classified as undetermined, can indeed belong to the suicide group. Bertolote and Fleischmann (4) suggested that underestimation of actual number of suicides could range from 20-100%. The study by Ohberg and Lonquist (5) similarly revealed that undetermined deaths resembled suicides and seemed to reduce the suicide rate by 10%. On the other hand, if all open verdicts are included in the suicide sample, a reverse phenomenon of an overestimation of suicide rate can occur.

When conducting suicide research it is of utmost importance that we understand characteristics of both suicides and undetermined deaths to determine whether they represent a single population or two. Linsley et al (6) reported many similarities between the two groups, although some differences were also found. The comparison revealed that within undetermined deaths, it is more likely to find younger women and alcohol consumers. Furthermore, significantly higher frequency of hanging and carbon monoxide (CO) poisoning was reported for the suicide group, whereas drowning and falling/jumping from high places occurred more frequently within the undetermined deaths group.

The main objective of our study was to compare the characteristics of group of undetermined causes of death with characteristics of suicides, fatal traffic acci-

dents, and remaining deaths to determine possible reasons for death in the undetermined group. As the study was mainly explorative in nature, no firm hypothesis was formulated, although we expected to find some similarities between undetermined deaths and suicides.

Material and Methods

The study was based on the records for all deaths among the residents of Slovenia in 2001. Statistics for all deaths were obtained from the Institute of Public Health of the Republic of Slovenia. Causes of death and external causes of death were classified according to the ICD10 (3). In the cases of uncertainty, suicides had to be proved by evidence. If there was any doubt about the intentions of the deceased, the case was not registered as suicide but as an accident or open verdict.

We analyzed a total of 18,508 deaths in Slovenia in 2001 and divided them into four death categories on the basis of the mortality data: 318 fatal traffic accidents, 581 suicides, 71 undetermined deaths, and 17,538 remaining deaths (predominantly natural deaths).

The variables tested were age, sex, marital status, and month of death. The undetermined death group was separately compared with other death categories. We tried to establish differences and similarities between the four groups in the sex ratio, age, and seasonal distributions and the marital status profile by using t-test for independent samples for age, and chi-square test for sex, marital status, and seasonality.

Results

The statistical analysis revealed significant differences between the group of undetermined deaths and other three categories of deaths.

Comparison of undetermined deaths with fatal traffic accidents and suicides revealed that significantly more men than women died in fatal traffic accidents (chi-square = 22.69; df = 1; p < 0.001) and due to suicide (chi-square = 18.10; df = 1; p < 0.001).

When we compared the age of victims in the open verdict group with that in the fatal traffic accident group, we found that persons in the latter group were significantly younger ($t_{387} = -7.90$; p < 0.001). Statistically significant differences regarding age were also observed between the group of undetermined deaths and suicides and remaining deaths. Persons committing suicides were significantly younger ($t_{650} = -4.74$; p < 0.001). On the other hand, persons dying predominantly from natural causes were older ($t_{17,607} = 5.84$; p < 0.001). However, similarities in age distribution between suicides and undetermined causes of death seemed to be the most obvious (Fig. 1). Most people dying from suicides and unexplained causes of death were aged between 20 and 30 years.

Regarding marital status, we found statistically significant differences between undetermined deaths and fatal traffic accidents, and between undetermined deaths and remaining deaths (Fig. 2). Significantly more singles and less widowed died due to fatal traffic accidents (chi-square = 36.48; df = 1; p < 0.001), and significantly more singles and less widowed were in the group of undetermined causes of death than in the group of remaining deaths (chi-square = 10.13; df = 1; p = 0.017).

According to seasonality, statistically significant differences were found only between undetermined

deaths and fatal traffic accidents (chi-square = 18.27; df = 1; p = 0.003). Traffic accidents prevailed in summer months, whereas undetermined deaths were more likely to occur in April and May (Fig. 3).

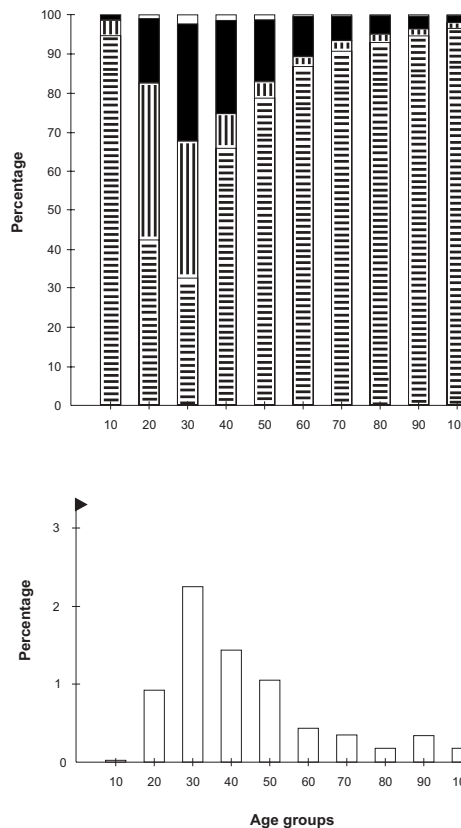


Figure 1. Shares of death categories across the age groups in Slovenia, 2001. **A.** All deaths. Bars with horizontal lines – other deaths; bars with vertical lines – fatal traffic accidents; closed bars – suicides; open bars – undetermined deaths. **B.** Details of undetermined deaths.

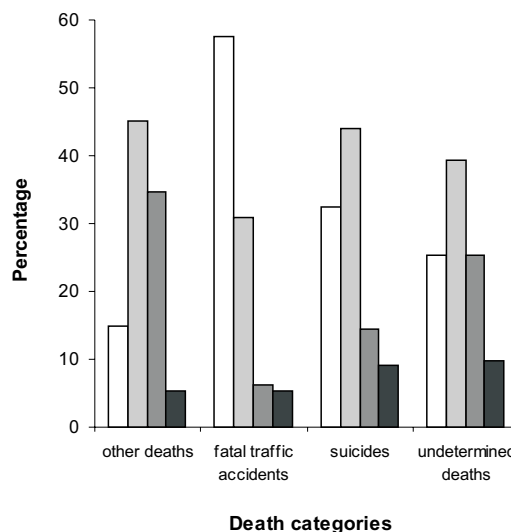


Figure 2. Marital status profiles of death categories in Slovenia, 2001. Open bars – singles; light gray bars – married; dark gray bars – widowed; closed bars – divorced.

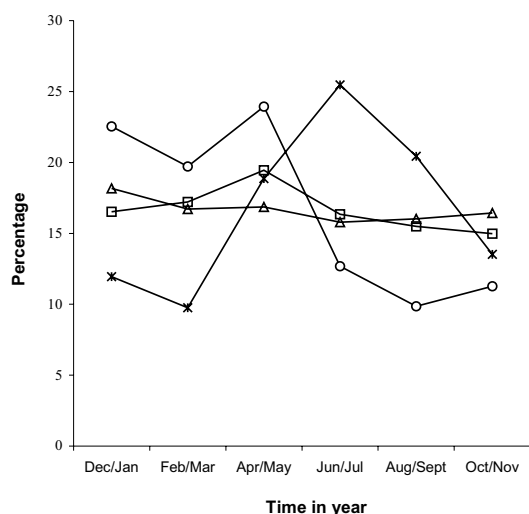


Figure 3. Seasonality of death in Slovenia, 2001. Triangle – other deaths; asterisk – fatal traffic accidents; squares – suicides; circles – undetermined deaths.

Discussion

Our study showed that persons in the group of undetermined causes of death died at younger age than those who died from natural causes, but at older age than victims of fatal traffic accidents and suicides. The share of undetermined deaths increased towards the age of 20 and decreased afterwards towards the age of 90, similarly to the share of suicide deaths. The share of deaths due to traffic accidents reached the peak in the teen years. Consequently, other causes of deaths, predominantly natural deaths, had the lowest share in the teenage group and those in their twenties. When analyzed according to the marital status profile, undetermined deaths were similar to suicides. With respect to the seasonality, undetermined deaths were not only similar to suicides, which were most frequently committed in the months of April and May, but even more pronounced. On the other hand, mortality due to deaths of natural causes remained the same year-round, whereas traffic accident mortality showed rather large variation, reaching its peak in summer months.

These differences between undetermined causes of death and fatal traffic accidents indicate that cases of fatal traffic accidents were not hidden within the group of undetermined deaths. On the other hand, underestimation of the actual number of suicides could be assumed, given the similarities with the undetermined causes of death in seasonality and marital status. Studies from other countries offered similar suggestions (4,5).

Some authors reported differences between suicides and undetermined deaths in the sex ratio, with female cases found more frequently in the group of undetermined deaths (6). The similar difference between the two groups was also found in our study, although women in the group of undetermined deaths in our study tended to die at older age. On the basis of these data, we can speculate that some cases of sui-

cide among older women in Slovenia are concealed within the undetermined death group, ie, that our female suicide rates are actually higher than it seems. This finding is even more disturbing given the fact that Slovenia has one of the highest female suicide rates in the world (7). However, further comparisons of suicides and undetermined deaths are needed before a more solid conclusion could be reached.

One of the major weaknesses of the present study is categorization of deaths, because some death groups were rather roughly formed. For example, the fatal traffic accidents consisted of all traffic accidents, irrespective of whether the victim himself or herself caused it or was an accident victim. The former subgroup might have been more similar to suicides and, accordingly, to the undetermined deaths group. Also, the so-called natural deaths group consisted of all remaining deaths that could have had little in common. Finally, if more variables were available in our statistical data set, the assumption about similarities between suicides and undetermined deaths would be tested more reliably and validly.

In conclusion, the group of undetermined deaths in Slovenia may conceal suicides, especially female suicides. Given the extent of suicide problem in Slovenia in general, and similarities between the group of undetermined deaths and suicides with respect to seasonality and age, further studies are needed to discern more clearly between these two groups of deaths.

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