Psychiatria Danubina, 2022; Vol. 34, No. 4, pp 715-718 https://doi.org/10.24869/psyd.2022.715 *Brief report*

TRENDS IN ADOLESCENT COMPLETED SUICIDE IN CROATIA FOR THE PERIOD OF 2000 TO 2020

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SUMMARY

***Background**: Croatia belongs to the countries with a medium mortality rate due to suicide in youths. Previous epidemiological reports indicated a decreasing trend of suicide rates in adolescents. However, recent trend analysis in youth suicide rates in Croatia are missing. This study aimed to describe recent trends in child and adolescent completed suicide in Croatia and to compare the rates and methods of suicide („means") across demographic groups.*

***Subjects and methods**: Data from the Croatian Committed Suicide Registry were used to calculate age-specific rates of suicide from 2000 to 2020 among 0 to 24 year olds, overall and by age, gender, and means of suicide.*

***Results**: The total average suicide rate for Croatian children and adolescents during the study period was 4.12 per 100,000. The male–female ratio was 4.1:1. The total youth suicide rate and male suicide rate significantly declined from 2000 to 2020; however, the decrease in female rates did not reach statistical significance. Nearly half of all suicides among Croatian youth of both gender occurred through hanging, whereas using firearms was the second-most common suicide method in males and jumping from a height in females.*

***Conclusions**: Suicide rates among children and adolescents in Croatia continue to decrease. High-risk groups include adolescents aged 20-24 years and male youth, so these data should be considered when designing prevention programmes for youth suicide.*

***Key words:** children - adolescents - suicide - rates - Croatia*

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INTRODUCTION

Suicide is the second leading cause of death among 10–24 years year olds worldwide (WHO 2014). From 1950 to 1990, the youth suicide rates increased by 300%, but in the past 20 years the rates have generally stabilized and declined (Wasserman et wl. 2005). The prevalence of adolescent suicidal behaviours varies across countries and within countries (Sedic et al. 2003, Kim et al. 2019).

Worldwide, over twice as many adolescent males complete suicide than females (WHO 2014). Higher completed suicide rates among males are linked to their greater propensity to have compounding risk factors for suicidality, such as higher levels of aggression/inclination towards violence and externalizing behaviors, the presence of co-morbid alcohol abuse disorders, their choice of more lethal suicide attempt methods (hanging and firearms) (Bridge et al. 2006). The ratio of attempted suicides to completed suicides among adolescents is estimated to be 100:1 to 200:1. The incidence of unsuccessful suicide attempts is higher among females because of using methods of lower lethality (self-cutting and medication overdose) than among males (Bridge et al. 2006). Firearms have traditionally been the leading suicide method among youth globally, followed by hanging/suffocation, and self-poisoning (Kõlves & de Leo 2017).

Risk factors for suicidal behaviors during adolescence include a history of depression, a previous suicide attempt, previous non-suicidal self injury, a family history of suicide and psychiatric disorders (especially depression and suicidal behavior), stressful and traumatic experiences, family disruption, and certain chronic or debilitating physical disorders (Hawton et al. 2012). Psychiatric disorder is present in up to 80-90% of adolescent suicide victims (Brigde et al. 2006). The most common psychiatric conditions in completed suicides are mood, anxiety, conduct, and substance abuse (alcohol and drug) disorders (De Hepcée et al. 2015, Bridge et al. 2006). Comorbidity of psychiatric disorders, particularly of mood, disruptive, and substance abuse disorders, significantly increases the risk for youth suicide (Bridge et al. 2006, Hawton et al. 2012). Globally, youth suicide remains a major public health concern.

The aim of this study was to describe recent trends in child and adolescent suicide in Croatia during the period from 2000 to 2020 and to compare the rates and methods ("means") of suicide across demographic groups.

SUBJECTS AND METHODS

All deaths from 2000 to 2020 among 0 to 24 year olds coded as suicides (X60-X84, Y87.0) according to the International Classification of Diseases, 10th Revisions (ICD-10, WHO 1992) from the Croatian Committed Sui-

cide Registry were included IN (Croatian Committed Suicide Registry, 2021). Data were available by age at death in years (0-24 years), gender, method of suicide death (via specific ICD codes). Overall, the suicide rates and the age and gender specific suicide rates per 100,000 persons were calculated for each year, using corresponding Croatian population data obtained from Croatian Bureau of Statistics (Croatian Bureau of Statistics 2021).

Statistical analysis

In order to assess time trends in the suicide rates, we calculated the Pearson correlation coefficient between yearly total, male, or female suicide rates and year of death, respectively. One-way analyses of variance (ANOVA) was calculated to compare the annual suicide rates of the three age groups (0–14, 15–19, and 20–24 years). Chi-squared tests were used to assess the associations between the suicide methods used and gender. One-sample Kolmogorov-Smirnov tests for uniform distribution were used to test for evenness (vs. unevenness) in the yearly distribution of suicides. We performed all statistical analyses with SPSS, version 20.

RESULTS

There were 1036 suicide deaths in Croatia in the age group 0–24 years between 2000 and 2020; 850 boys (82.0%) and 186 girls (18.0%). The annualized average overall suicide rate for Croatian youths was 3.97 per 100,000. Gender-specific rates amounted to 6.37 per 100,000 for males and 1.46 per 100,000 for females. The male-to-female ratio was 4.4:1.

The yearly suicide rate for the total population of youth *(r* (21) = -0.608, *p*=0.003) and the male suicide rate (*r* (21) = -0.523, *p*=0.015) decreased significantly over the 21-year period. Although the negative correlation between yearly suicide rate and year was seen for females as well, this time trend was not significant (*r* (21) = -0.403, *p*=0.70).

Completed suicide prevalence across age-groups

Figure 1 displays the rates of suicide deaths by age groups, 0–14 years, 15–19 years and 20-24 years, respectively, for each of the year analysed.

For children under 14 years of age (*n*=50), the calculated average suicide rate for the period 2000-2020 was 0.34 per 100,000, for adolescents aged 15-19 years (*n*=346) the suicide rate was 6.14 per 100,000, and for older adolescents aged 20-24 the suicide rate was 10.89 per 100,000.

The average total suicide rates (*F* (2, 62) = 253.81, *p*<0.001) differed significantly between the three age groups (0-14, 15-19 and 20-24 years). The highest suicide rates were in the age group 20-24 years, and the lowest in the age group 0-14 years.

Although the negative correlations between yearly suicide rate and year were seen for each age group (0-14, 15-19 and 20-24 years), the time trends were not statistically significant for children aged 0-14 years (*r* (21) = -0.216, *p*=0.346), but were significant for adolescents aged 15-19 and 20-24 years (*r* (21) = –0.445, *p*=0.043; *r* (21) = –0.493, *p*=0.23, respectively).

Differences in suicide methods

Table 1 presents the frequencey of methods (“means”) of completed suicide among Croatian children and adolescents, total and by gender from 2000 to 2020.

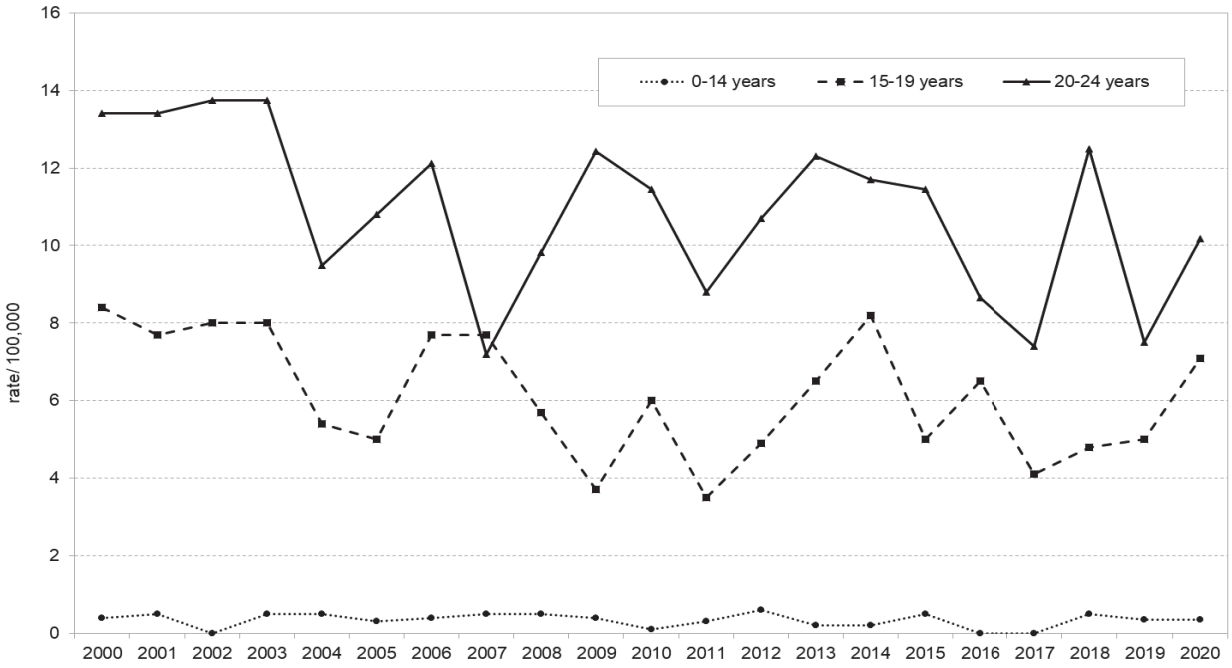

Figure 1. Suicide rates by age groups (0–14 years, 15–19 years and 20-24) per 100,000 of Croatian children and adolescents from 2000 to 2020

Table 1. Methods of completed suicide among Croatian children and adolescents, total and bygender from 2000 to 2020

Suicide method (ICD-10 code)	Males (%) (N=850)	Females (%) (N=186)	Total (%) (N=1036)
Poisoning (X60-X69)	51 (6.0)	14 (7.5)	65 (6.3)
Hanging (X70)	448 (52.7)	86 (46,2)	534 (51.5)
Drowning (X71)	11 (1.3)	7 (3.8)	18 (1.7)
Firearms (X72-X75)	176 (20.7)	14 (7.5)	190 (18.3)
Sharp objects (X78)	7 (0.8)	4 (2.2)	11 (1.1)
Jumping from a height (X80)	90 (10.6)	35 (18.8)	125 (12.1)
Jumping and lying before a moving object (X81)	38 (4.5)	22 (11.8)	60 (5.8)
Other (X76, X82-X84)	29 (3.4)	4 (2.2)	33 (3.2)

The suicide methods varied significantly between gender (χ^2 (7, N=1036) = 45,42, p<0.001). The most frequently used method of suicide among Croatian children and adolescents for both males and females was hanging, making up nearly half of all cases (Table 1). In males, hanging was followed by firearms and jumping from a great height. In females, hanging was followed by jumping from a height, jumping and lying before a moving object and poisoning.

DISCUSSION

Overall, nationwide data showed that the suicide rates among children and adolescents in Croatia decreased during the period 2000 and 2020. Although the total youth suicide rate and male suicide rate declined significantly, the decrease in female rates did not reach statistical significance. This trend in Croatia corresponds to a similar decreasing trend observed in other countries (Wasserman et al. 2005, Värnik 2012). The implementation of a national suicide prevention plan (Prevention programme for child and youth suicide for the period 2011-2013) which included multisectoral preventive activities may have contributed to the decrease in youth suicide rates in Croatia.

The average total suicide rate for Croatian youth of 3.97/100,000 is similar to the average suicide rate for same age group of 2.53/100,000 for EU countries (Eurostat 2022). Socioeconomic factors with political instability and economic insecurity in the past two decades, but also mental health care factors with underdeveloped mental health services and facilities for children and adolescents may have contributed to the youth suicide rate in Croatia (Signorini et al. 2017). Further study is warranted to examine the sociodemographic and clinical determinants of youth suicide in Croatia.

The rates of suicides in our study varied according to age; the highest suicide rates were in the age group 20-24 years. It is widely recognized that incidence of completed suicide increases with chronological progression through adolescence, reaching the peak in older adolescents before stabilizing in early adulthood and maintaining this level until the sixth decade (Hawton et al. 2012). Factors that heighten risk for suicide among older adolescents include high prevalence of mental health disorders, increased substance and alcohol abuse and higher preponderance of exposure to social deprivation and stressful life events (Bridge et al. 2006, Kim et al. 2019).

We found an overall gender ratio for male to female suicide deaths of 4.4:1. Although the decrease in male suicide rate was observed in Croatia between 2000 and 2020, the large male to female suicide ratio indicates that male adolescents are a vulnerable group and suicide prevention strategies should take this data in account. Females have a greater preponderance to nonsuicidal self-injury, suicidal ideation and attempts, but tend to use less lethal suicide methods (medication overdose and self-cutting) as compared to males (hanging and firearms) (Hawton et al. 2012).

Finally, concerning the methods involved in youth suicide in Croatia, hanging was the most frequent suicide method among both males and females. Hanging is also a common method of youth suicide in other countries and has replaced firearms and self-poisoning as the most common method of youth suicide (Kõlves & de Leo 2017). Firearms were the second leading method of suicide among boys in Croatia. The reduction in the proportion of firearm suicides in youth may be related to the more stringent firearm legislation which has been implemented in Croatia after the Homeland War 1991-1995.

The frequent use of "jumping from a height" and "jumping and lying before a moving object" were more favored by female adolescents. The use of these suicidal methods could possibly be due the non-availability of other methods, such as firearms. Therefore, restricting access to hotspots, fast driving roads and railways (i. e., installation of barriers) is effective in diminishing suicides by jumping.

Although high-quality, national-level data were obtained, there are a number of limitations in our analysis. First, data for this study were collected from the death certificate, so we could not investigate other important factors not included such as diagnosed mental disorders, sociodemographic, familial and economic factors, or precipitating factors for suicide. Second, misclassification of suicide as accidental or other unnatural death (Palmer 2015) is another limitation of studies based on death certificate data. However, authors of previous studies on this topic have generally concluded that the degree of misclassification is not sufficiently substantial to alter major trends and patterns (Mohler & Earls 2001).

CONCLUSIONS

Suicide rates among youths in Croatia continue to decrease. High-risk groups include adolescents aged 20-24 years and male youth. The movement toward means of suicide that are less feasible to restrict, such as hanging and jumping from a height was observed. This trend analysis cannot confirm direct causal mechanisms of heightened suicide risk, but nevertheless can be helpful in identifying patterns which suggest opportunities to develop suicide prevention strategies specifically addressing high risk cohorts and their mental health needs. Universal mental health promotion and suicide prevention strategies at multiple levels, including that of the individual, family, school, employer, media and community are needed (Wasserman et al. 2015, Wyman 2014).

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Contribution of individual authors:

Vlatka Boričević Maršanić: study design, first draft.
Maja Silobrčić Radić: study design, data collection.
Mia Flander Tadić: first draft, statistical analysis.
All authors approval of the final version.

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