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Suicides in the Young People of Geneva, Switzerland, From 1993 to 2002*

ABSTRACT: Suicides in Geneva in those less than 25 years old, from 1993 to 2002, were reviewed. Scenes investigations, autopsy findings, toxicology results, and psychiatric history (when available) were examined. There were 65 cases. The average annual suicide rate was 11/100,000. Seventy-seven percent were male, and 23% were female. The youngest was 12 years old and most of the victims were 18 years old and over (89%). For men, the use of firearms was the most common method (38%), followed by fall from height (16%) and drowning (10%). For women, fall from height was the most frequent (40%), followed by firearms and medication overdoses (20% each), hanging (13%), and drowning (7%). Toxicological analysis was performed in 41% of the cases and showed that alcohol was present in 26% and other drugs in 67% of these cases. The most common drugs present were benzodiazepines, cannabis, and cocaine.

KEYWORDS: forensic science, suicide, youth, adolescent

Suicide is one of the most common causes of death in young people. It has been reported that more than 15,000 young men and women committed suicide in 34 of the world's wealthiest countries in a 1-year period (1). In the United States, *c.* 1600 teenagers die by suicide each year and, in 2000, suicide was the third leading cause of death among 10–14 and 15–19 year olds (2,3). In Switzerland, in 2001, suicides represented the leading cause of death in males aged 15–44 years and the first cause of death among 15–19 year olds (4,5). Geneva is a relatively small state in Switzerland with a current population of *c.* 400,000. The suicide rate increased through the 1970s and remained level through the 1990s until now. Following an increase at the end of the 1960s, the adolescent suicide rate in Geneva has started to decrease in the mid-1980s (6). This is in contrast with most other European countries, New Zealand, and the United States where the suicide rate, especially in male adolescents, has continued to increase until the 1990s (3,7,8). The aim of this study was to observe whether the decreasing rate of adolescent suicide in Geneva is continuing in the 1990s and whether it also involves the young adult group less than 25 years old.

Methods

We reviewed, retrospectively, all cases of suicides among young people less than 25 years old in Geneva from January 1, 1993, to December 31, 2002. Only summary statements of psychiatric and clinical history were available and we had no clinical data for 70% of the cases. This lack of clinical data is due to the

Swiss legislation, which forbids the use of any personal data without the consent of the patient, even postmortem. Data collected included the victim's age and gender, date and place of the suicide, type of suicide, previous suicide attempts with psychiatric history when available, and toxicological findings.

Although the Geneva Department of Forensic Medicine conducts forensic examinations of all nonnatural deaths, police investigators make the final decision of whether an autopsy or only an external examination of the body will be performed, and whether or not a toxicological analysis is to be conducted. This decision is based on the appearance of the scene, on the circumstances of the death, and the wishes of the family.

Suicide Rates

The annual population for the age group less than 25 was based on the Annual Demographic Statistics report of Geneva (9). The age-specific formula used to calculate annual age-specific suicide rate/100,000 from 1993 to 2002 for suicides by youth aged less than 25 is

$$\text{Annual age-specific rate/100,000} = \frac{\text{Annual number of completed suicides} \times 100,000}{\text{Annual population for youth less than 25}}$$

To observe the trend of the suicide rate among adolescent (10–19 years) in Geneva for the last 30 years, we added our previous data to that of this study. To minimize random variation and avoid focusing on extremes of rate in certain years, the mean suicide rate/100,000 was calculated in 5-year periods.

Because the population of Geneva is relatively small, a slight deviation in number of suicides can greatly alter the rates. To compare more reliably the annual suicide rate of youths in Geneva with the comparable rates in Switzerland and other countries given by the WHO in 2002, we took the average annual rate from 1993 to 2002 in Geneva for youths aged 15–24 (Fig. 6).

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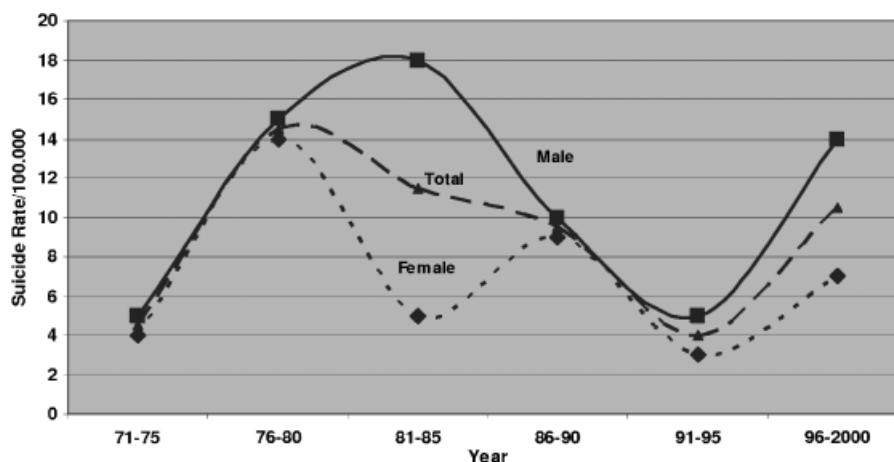


FIG. 1—Annual suicide rates in Geneva for adolescents 10–19 years old, 1971–2000.

Results

Suicide Rate

In the age group of 10–19 years old, from 1971 to 2000, the average annual suicide rate in Geneva was 9.1/100,000, ranging from 4.5 for the 5-year period 1991–1995 to 14.5 for 1976–1980. The average annual suicide rate was 7.0 for females and 11.2 for males. Following an increase in the male and female suicide rates in the 1970s, there was a decline in the suicide rate in the 1980s for females and in the 1990s for males (see Fig. 1).

From 1993 to 2002, the average annual suicide rate in the age group below 25 years old, was 11/100,000, ranging from two in 1996 to 19 in 2000 (see Fig. 2). The average annual suicide rate during this period was 6 for females and 17 for males. During this period, the overall rate per 100,000 slightly decreased (see in Fig. 3 where the suicide rate has been calculated for 5-year period).

Epidemiology

In the age group below 25 years old from 1993 to 2002, 65 suicides were investigated in Geneva. Seventy-seven percent of

the victims were males and 23% were females. The youngest was 12 years old; most of the victims were 18 years old and older (89%). The incidence of suicides for males is the highest between 20 and 22 years of age and is the highest for females between 18 and 20 years of age (see Fig. 4). Fifty-two percent of the victims were found at home and 45% in a public place. There was no clear pattern of seasonality, although we did observe an increase in the number of suicides at the beginning and end of the school year. Sundays and Mondays were the days with the highest number of suicides. For males, the use of firearms was the most common method used (38%), followed by fall from height (30%), hanging (16%), and drowning (10%). For females, fall from height was the most frequent (40%), followed by the use of firearms and medication overdose (20% each), hanging (13%), and drowning (7%) (see Fig. 5).

Clinical data (psychiatric history, previous suicide attempts) were available in 30% of the cases. Among the 18 victims with clinical data, 12 had known psychiatric histories, three had at least one previous suicide attempt, four had a preceding argument with a relative(s), three left a letter (suicide note), and one was at the beginning of her pregnancy. Among the psychiatric illnesses, four

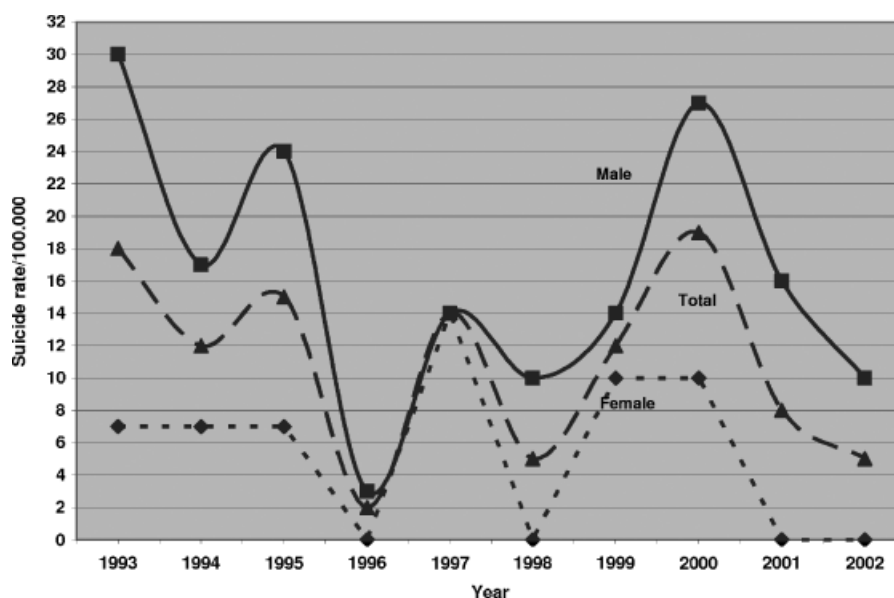


FIG. 2—Annual suicide rates in Geneva for young people less than 25 years, 1993–2002.

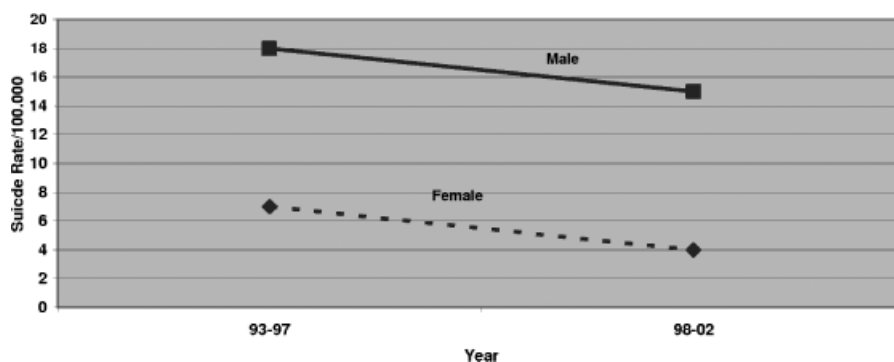


FIG. 3—Suicide rates for each period of 5 years in Geneva, young people less than 25 years, 1993–2002.

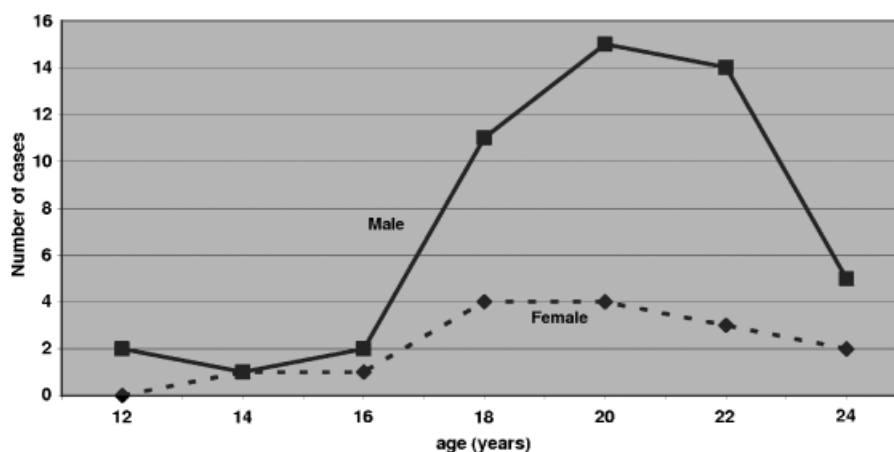


FIG. 4—Distribution of suicides in Geneva for young people less than 25 years according to their age and sex.

were diagnosed with depression and one with psychosis. For the other victims, the chart mentioned only a psychiatric disease or a previous hospitalization in a psychiatric ward. For example: a 23-year-old woman who jumped from height had a previous admission in a psychiatric hospital; or a 22-year-old man who hanged himself from a tree after he escaped from a psychiatric ward; or a 24-year-old man who jumped from the roof of his building was positive for cocaine, ecstasy, and cannabis, and had been dis-

charged from a psychiatric hospital 3 days back; or a 24-year-old man who jumped from the stairway of his parents' building had committed several suicide attempts in the past and was discharged from the psychiatric hospital one month before this fatal event.

Toxicological testing for drugs and alcohol was performed in 41% of all deaths. Blood tested positive for drugs in 67% of the cases, for only alcohol in 26%, and for drugs plus alcohol in 15%. The most common drugs found were benzodiazepines, cannabis,

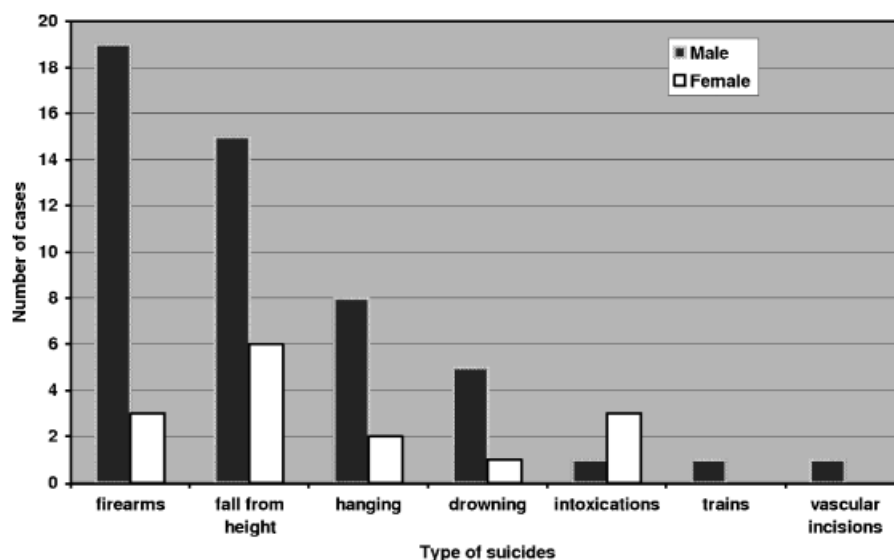


FIG. 5—Mean of suicides among young people aged less than 25 years in Geneva from 1993 to 2003.

TABLE 1—Summary of the drug findings among victims who had toxicological and blood alcohol testing ($N = 27$).

Drugs	Number of Cases With or Without Drugs (Total of Deaths With Toxicological Testing)	Percent of Cases Positive or Negative for the Drugs (%)
Without drugs	10 (27)	37
Cannabis	5 (27)	18
Cannabis + benzodiazepines	2 (27)	7
Morphine + cocaine	2 (27)	7
Methadone	1 (27)	4
Methadone + cannabis + benzodiazepines	1 (27)	4
Benzodiazepines	1 (27)	4
Ecstasy + cannabis	1 (27)	4
Cannabis + cocaine	1 (27)	4
Antidepressants + benzodiazepines	1 (27)	4
Antidepressants + antipsychotics	1 (27)	4
Chloroquine	1 (27)	4
Therapeutic morphine	1 (27)	4

and cocaine (see Table 1). Toxicological testing for only alcohol was performed in another 9% of all deaths. Among those victims tested only for blood alcohol, 76% had a concentration of 0 g/dL, 18% below 0.1 g/dL, and 6% above 1 g/dL.

Discussion

Epidemiology

Epidemiological data in certain countries have shown that adolescent or youth suicide rates, mostly in males, kept increasing during the 1990s or started to decline slowly since 1992. In Geneva, we have observed a decrease of adolescent suicide rates since the mid-1980s and a stabilization of the rate since the 1990s (3,7,8). A decrease in the suicide rate among those less than 25 years was also observed during the 1990s. The most probable explanation for this decrease is the very active role played for the last few years by the suicide prevention program aimed at young people in Geneva (10).

The average annual suicide rate in Geneva for youths aged 15–24 years is slightly higher than the rate for the rest of Switzerland (see Fig. 6). One explanation could be that suicides are more frequent in urban areas in Switzerland, although in other countries, like Australia, males aged 15–24 years have a higher suicide rate

in nonmetropolitan areas (11). Geneva is also an international city with a high percentage of migrant population, which can lack social and family ties. The number of suicides among females is low, the male-to-female ratio of suicides being 3.4 in our study, which is similar to the rates in Switzerland and other countries (4,12–14). Males tend to use more violent methods such as firearms and fall from height compared with females. The use of more lethal methods by males among youth has been reported in previous studies and may be an explanation for why their suicide rate is higher (12–15), because the more violent the act the better the chance of a successful outcome. It has also been reported that women, especially in the younger age group, have a higher rate of suicide attempts than men (16). Because medication overdoses cause death over a relatively prolonged period, a window of time exists where the victim may be discovered and brought to a health care system, which could prevent the suicide.

Our study has shown that the older teen years is the most prevalent time for suicides among youths; this has been reported in previous studies (17). In our study, the incidence of suicide among men peaks between 20 and 22 years old compared with 18–20 years old for women. These findings compare favorably with a recent study that showed in Europe, the highest number of suicide attempts is between 15 and 24 years old in women and between 25 and 34 in men (16).

Method of Suicides

A gender difference exists for the methods used for suicide. The most common method used by males is firearms, but females preferentially used fall from height. Medication overdoses were the second method of choice for females but were not favored by males. This repartition is in concordance with our previous studies, which showed that in Geneva, at all ages, more women than men commit suicide by falling from height and medication overdose (18). Firearms are in the vast majority used by males (6,18). The use of firearms by men can be explained by the fact that, in Switzerland, men have compulsory military service and must keep a rifle or a gun at home after their first training, when they are 19–20 years old. In fact, from the eighteen men who used a firearm, only three were younger than 19 years. Police observations have shown that most of them do not use their own weapons but those of their relatives or friends. Another factor could be the very permissive laws to obtain a firearm in Switzerland (anyone can sell his own weapon to someone else). Indeed, it has been shown that

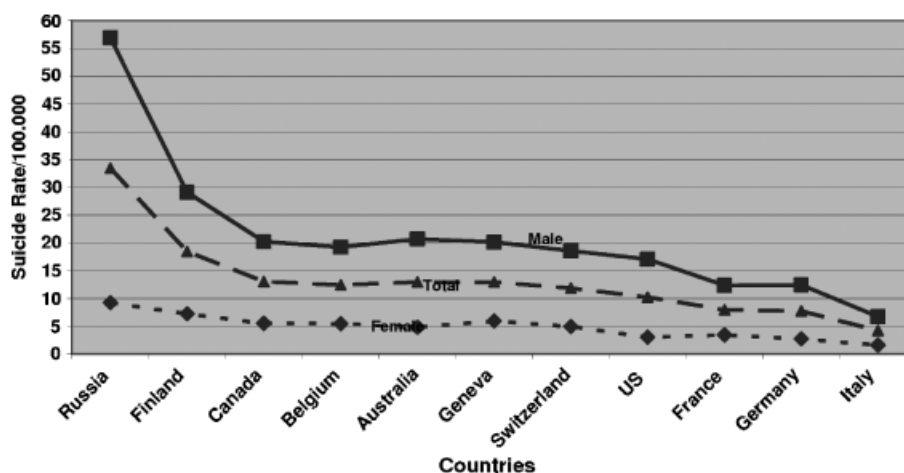


FIG. 6—Suicide rates, young ages 15–24, 2000 (WHO Report, 2000).

in different European countries such as France, Italy, or Austria, the greater the availability of guns, the lower the suicides rates by other methods (19). The high rate of suicides by firearms among males in our study may therefore be explained by the availability of such weapons in Geneva. This finding has been observed in other studies, where males may be more inclined to use a more lethal method of suicide such as firearms (12,20–22).

Psychiatric Illness and Toxicology

Past medical history was lacking in 70% of the victims and, even when present, was too often very succinct. Nevertheless, of the victims for whom clinical data were available, 60% were known to have some psychiatric history. It has been shown that more than 90% of youths who commit suicide have at least one major psychiatric disorder, and that mental disorder has the strongest associations with suicide (23–26).

Based on the medical history, 17% of the victims in our study were known to have made a prior suicide attempt. It has been reported that between one quarter to one-third of youth suicide victims have made a prior suicide attempt (3). This may be an underestimate of the true incidence of prior suicides attempt as we have found in Geneva that most suicide attempters have not reported to hospital and therefore do not have a medical chart (10).

Toxicology results show a high percentage of drug or alcohol use in suicide victims. This was an incidental finding in the traumatic suicides. This has been described as a significant risk factor to commit suicide, especially among older adolescent male victims, probably due to the disinheriting effect of these substances (27). The most frequent finding was cannabis (18%), cannabis+benzodiazepines (7%), and cocaine+morphine (7%).

Limitations of the Study

This study has a few limitations. Caution is needed in the interpretation of rates (per 100,000) due to the relatively small population of Geneva. A small number of cases either unreported or misreported can greatly alter the rates and lead to erroneous conclusions.

Although the total number of victims was 65, only 51% ($n = 31$) of the bodies were autopsied and only 41% ($n = 27$) had toxicological testing. This limits the interpretation of the importance of the drug use, which is known to be a significant risk factor for suicides. Only 30% of the victims had known past medical histories. As it has been reported that more than 90% of youth suicides have at least one psychiatric diagnosis, we have a considerable disadvantage in generating data for this field. In Geneva, an effort should be made to collect more clinical data during medico-legal investigations as this information could be helpful to clinicians who work in suicide prevention programs. Data collected from “psychological autopsy” studies suggest that between half and three-quarters of suicides could be avoided were it possible to have completely effective treatment, or prevention, of mental disorders (28).

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