

# The Effects of Gender on Adolescent Suicide in Ontario, Canada

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## Abstract

**Objective:** Identify patterns of suicide amongst male and female adolescents aged 11-18 years in Ontario. **Method:** All 370 adolescent suicides in Ontario between January 2000 and November 2006 were analyzed. Previous attempts, history of psychiatric treatment, location committed and method of suicide were assessed. Data was analyzed using 2-tailed t-tests and chi-square without Yates' correction. **Results:** Male adolescent suicide was twice as common as female suicide. Males were more likely to use violent methods ( $p=0.0352$ ) and females were more likely to have a history of a previous suicide attempt ( $p=0.0001$ ). **Conclusions:** While most of the data agree with previous studies in adult populations, the ratio of male to female suicides was much lower in our adolescent population.

**Key words:** suicide, adolescents, gender, Ontario

## Résumé

**Objectif:** Établir les schémas de suicide chez les adolescents et adolescentes âgés de 11 à 18 ans en Ontario. **Méthodologie:** Les 370 suicides d'adolescents survenus en Ontario entre janvier 2000 et novembre 2006 ont été analysés. Les tentatives préalables, les antécédents de traitements psychiatriques, le lieu du suicide et les méthodes utilisées ont été évalués. Les données ont été analysées au moyen de tests t à deux échantillons appariés et par chi carré sans correction de continuité de Yates. **Résultats:** Le suicide des adolescents est deux fois plus fréquent que celui des adolescentes. Les garçons utilisent davantage des méthodes plus violentes ( $p=0,0352$ ), tandis que les filles font plus souvent des tentatives préalables ( $p=0,0001$ ). **Conclusion:** Bien que la majorité des données concordent avec celles de la population adulte, le ratio garçons/filles était nettement inférieur dans la population adolescente que nous avons étudiée.

**Mots clés:** suicide, adolescents, sexe, Ontario

## Introduction and Background Information

In all Canadian provinces and territories, cause of death is classified into one of five categories: natural; accidental; suicide; homicide; and, undetermined. According to the Office of the Chief Coroner (2007), a natural death is one that can be explained by a disease or a known disease complication, while an accidental death is caused by an external force that occurs unexpectedly or without foresight.

Homicide, on the other hand, is not accidental. It is the result of the action of one human being against another.

MacNeil (2008) defines suicide as a cause of exclusion. All other possible causes of death must first be ruled out. Further, the death must result from an intentional act performed by a person who is aware of the probable consequences of his/her actions. For this reason, apparent suicides by children under 11 years of age are classified as 'undetermined'. Even though these deaths may appear to be intentional acts, it is believed that children under the age of 11 cannot fully

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comprehend the consequences of their actions, and for this reason their deaths are not considered to be suicides.

According to Statistics Canada (2008), suicides have taken the lives of over 20,000 Canadians, including 1500 children and teenagers aged 11-19 years, since January 2000. Langlois and Morrison (2002) showed that Canadians are seven times more likely to die from suicide than homicide, and between 1993 and 1998, suicide claimed more lives than motor vehicle accidents. Suicide affects individuals of all ages, and is the second leading cause of death in people aged 11-19 years.

Numerous studies have examined at-risk populations and identified risk factors and patterns of suicide. These studies have been validated across various populations in different countries. Blackmore et al. (2008) and Shoostary et al. (2008) showed the link between suicide and several host risk factors, including family violence, mental health problems, chronic illness, and substance abuse. However, there have been no published studies looking at these relationships in the general population of Ontario. Specifically, there has been no investigation of at-risk populations, risk factors, and patterns of suicide in adolescents aged 11-18 years in Ontario. General patterns and differences in suicide amongst males and females have been established in the literature, but do suicides committed by adolescents in Ontario fit these same patterns?

In their 2002 article "Suicide deaths and suicide attempts", Langlois and Morrison (2002) examined existing data on completed suicides in Canadians age ten or older, spanning the years 1979 and 1998.

In their article they highlight data from the World Health Organization demonstrating a male to female ratio of 4:1 for completed suicides in Canada. They also looked at data from the Canadian Vital Statistics Database, which also showed that the crude death rate from suicide for males is 22.6 in 1998 and 5.8 for females in 1998—a ratio of about 4:1. One question that has not been answered to date is whether the rate of completed suicides in the adolescent population in Ontario also occurs at a ratio of 4:1. In addition we sought to gain further insight into the following questions: i) are male adolescents in Ontario more likely to commit suicide at an earlier age than females?; and, ii) do female adolescents use less violent methods of suicide?

In an attempt to answer these questions, this study reviews all confirmed adolescent suicides committed in Ontario between January 2000 and November 2006, and calculates the incidence amongst genders within Ontario. Further, this study evaluates the differences in age at suicide, methods of suicide, and location of suicide between males and females. Several other factors are additionally analyzed and statistically significant correlations are discussed in detail.

## Method

### Research Design

In Ontario, a total of 370 adolescents aged 11 to 18 years committed suicide between January 2000 and November 2006. All 370 cases were investigated by the Office of the Chief Coroner (OCC) of Ontario, and all pertinent non-identifying data relevant to these cases was extracted by the OCC from its database and provided to the researchers via CD-ROM. The researchers categorized the data into two groups based on gender, the major determinant of health being evaluated in this study, and further subcategorized these groups on the basis of age at suicide, location of suicide, and method of suicide. All data was originally collected by the OCC, therefore the researchers did not personally review any patient charts. Ethics approval for this study was obtained from the Undergraduate Medicine Ethics Review Committee in the Faculty of Medicine at the University of Toronto, Toronto, Ontario.

The following four inclusion criteria were used to define the study population:

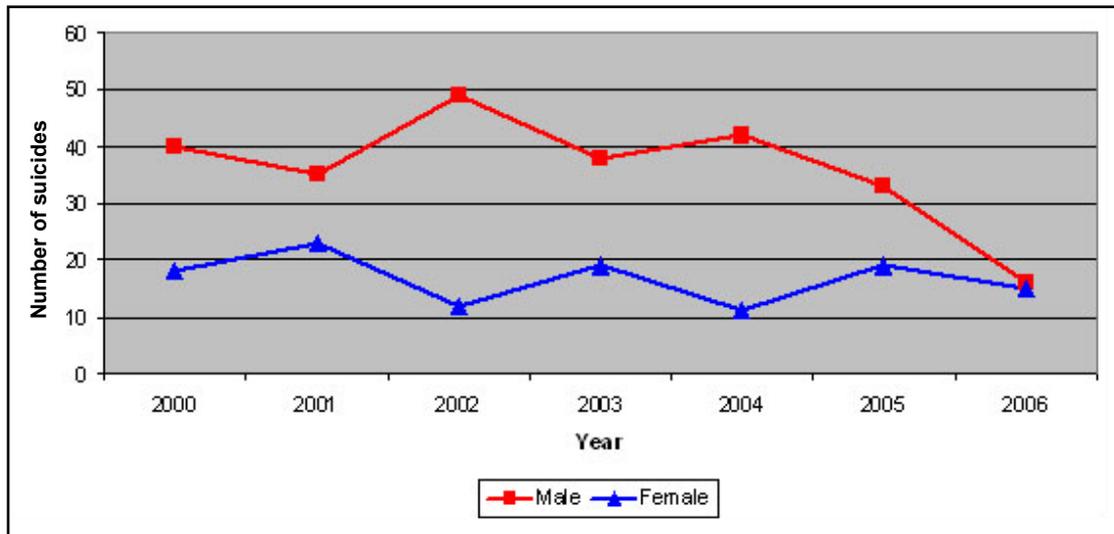
1. adolescent (aged 11-18);
2. resident of Ontario;
3. confirmed suicide committed in Ontario; and,
4. suicide committed between January 2000 and November 2006.

The data is complete from 2000 to 2005; however, several deaths from 2006 remain under investigation. Some may be suicides, but since this is yet to be verified, these unconfirmed deaths have been excluded from the study.

As this is a retrospective quantitative study, no measurement tools or research instruments were used (i.e. surveys, questionnaires, etc).

### Analysis

The independent variables analyzed were gender and age at suicide. The dependent variables included physical health, mental health, history of substance abuse, history of attempted suicide, history of physical abuse, method of suicide, and involvement of the Children's Aid Society (CAS) in the adolescent's care. Descriptive statistics described the mean and standard deviation of continuous data, which was statistically analyzed using a 2-tailed t-test. Contingency tables were plotted using categorical, non-continuous data, and statistical significance was evaluated using chi-square analysis without Yates' correction. Statistical analyses were performed using Minitab statistical software (Release 12; Minitab Inc., USA). All statistical tests were performed at a significance level of  $p < 0.05$ .

**Figure 1. Suicides per year based on gender**

The incidence of suicide each year has remained relatively consistent among males and females between the ages of 11 and 18 from January 2000 to November 2006. The downward trend in male suicides in 2006 (and perhaps 2005) may be due to incomplete data, as many deaths from 2006 are still under investigation and their causes have yet to be confirmed.

### Literature Review

Literature review was conducted using MedLINE. Key words included 'adolescent' and 'suicide'. All results were filtered using the quality filter, 'risk', and only articles dating as far back as 1990 were reviewed. This technique produced 91 articles, which were then manually screened for topic relevance.

## Results

### Demographics

This study reviewed a total of 370 confirmed adolescent suicides that occurred in Ontario between January 2000 and November 2006. Two hundred and fifty-three were males (68.4%) and 117 were females (31.6%) (Figure 1).

Individual age at death for the entire sample ranged from 11 to 18 years, with a mean of  $16.1 \pm 1.7$  years. On average, males tended to be older than females,  $16.3 \pm 1.6$  years versus  $15.6 \pm 1.8$  years, but there was no statistically significant difference between the two genders ( $p=0.1070$ ). Although males had a higher average age than females, they had a lower minimum age: individual age ranged from 11-18 years in males as opposed to 12-18 years in females (Figure 2).

The adolescent population of Ontario increased from 1,558,260 in 2001 to 1,651,560 in 2006. The adolescent suicide rate in 2001 was calculated to be approximately 1 per 27,000. Unfortunately, due to the fact that population information for Ontario is available only for the years 2001 and 2006 (since the Canadian census is performed every 5 years), and our data set from the OCC is incomplete for 2006, a suicide rate for 2006 could not be calculated, nor

could a comparison of suicide rates between 2001 and 2006 be made.

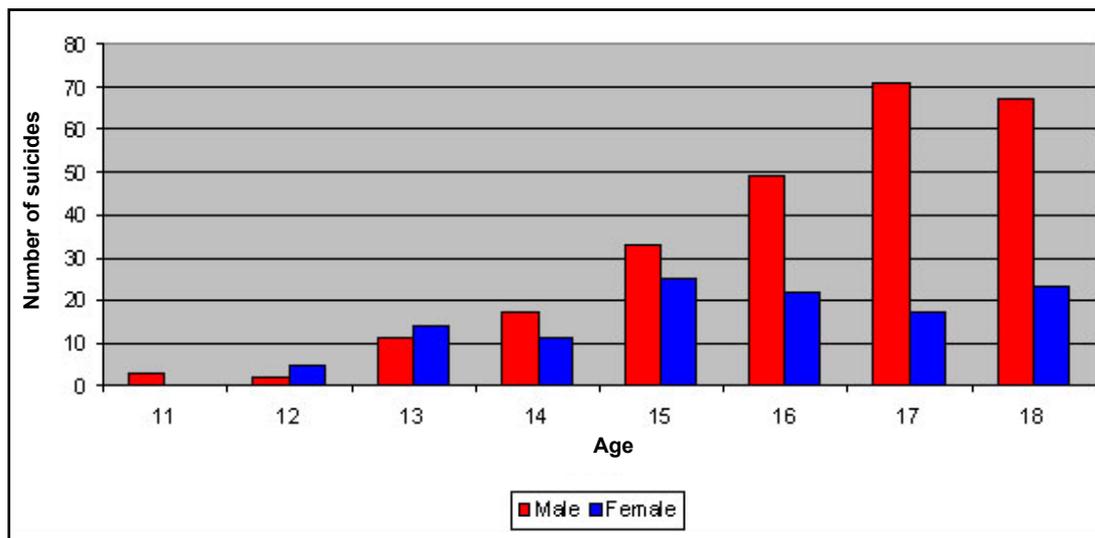
### Method of Suicide

Method of suicide was subdivided into violent and non-violent. Violent methods included shooting oneself with a shotgun or hand rifle, jumping from a significant height, drowning, purposeful collision as a pedestrian with a car or train, and asphyxia by hanging. Non-violent methods included asphyxia by carbon monoxide poisoning from inhalation of furnace fumes or vehicle exhaust, drug toxicity and alcohol toxicity. Violent methods of suicide were more common than non-violent methods, accounting for 91.9% ( $n = 340$ ) of all suicides, although females were twice as likely to use non-violent methods compared to males (9.4% ( $n = 11$ ) versus 4.0% ( $n = 10$ ), respectively) (Figure 3). Overall, males used violent methods of suicide significantly more frequently than females ( $p=0.0352$ ).

### Location of Suicide

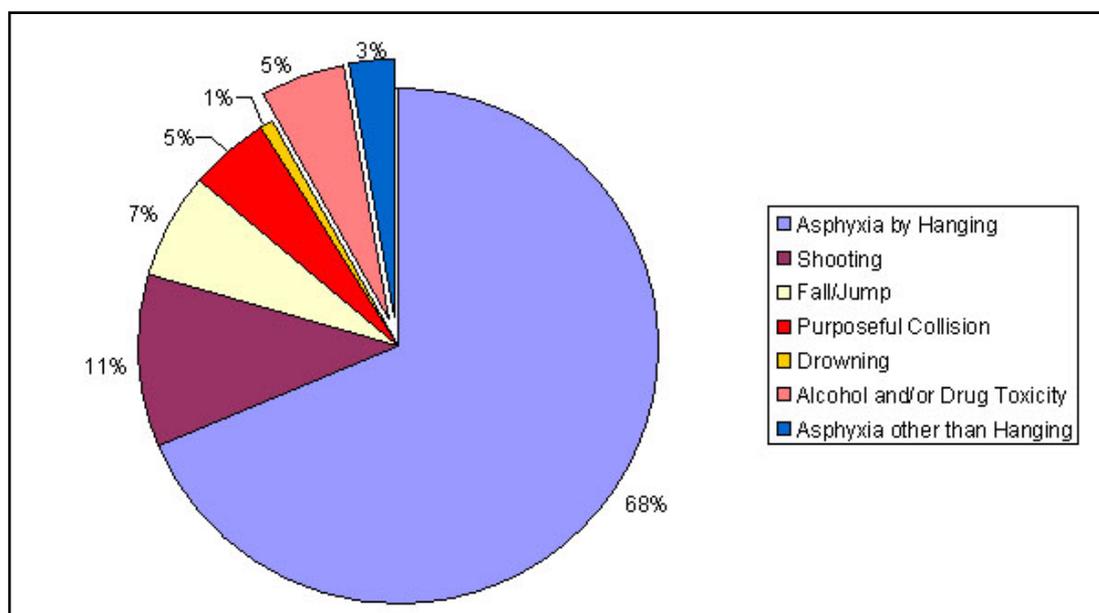
Location of suicide was analyzed in two different ways. First, it was subcategorized into residence (including inside or outside of the deceased's home or the home of a friend or relative), school, hospital, and urban (park, public area, parking lot) or rural (wooded areas, fields, forests) and outdoors. Of the males that committed suicide, 73% ( $n = 185$ ) did so in their residence while 27% ( $n = 68$ ) committed it elsewhere. Similarly, 72% ( $n = 84$ ) of females committed suicide in their residence while 28% ( $n = 33$ ) committed it elsewhere. No statistically significant difference was found between males and females when analyzed in this way ( $p=0.7898$ ). The most common non-residential place

**Figure 2. Age at suicide based on gender**



The prevalence of suicides is higher in males than in females. There is no significant difference in age at suicide amongst genders.

**Figure 3. Method of suicide employed by both adolescent males and females, combined**



Violent methods of suicide were more common than non-violent methods. Asphyxia by hanging was the commonest method, followed by shooting oneself. Males were statistically more likely to use violent methods of suicide compared to females. Non-violent methods of suicide included asphyxia other than hanging and alcohol and/or drug abuse.

to commit suicide was in the rural (8.9%, n = 33) or urban (7.8%, n = 29) outdoors. Three patients (0.8%) committed suicide in the psychiatric ward of a hospital.

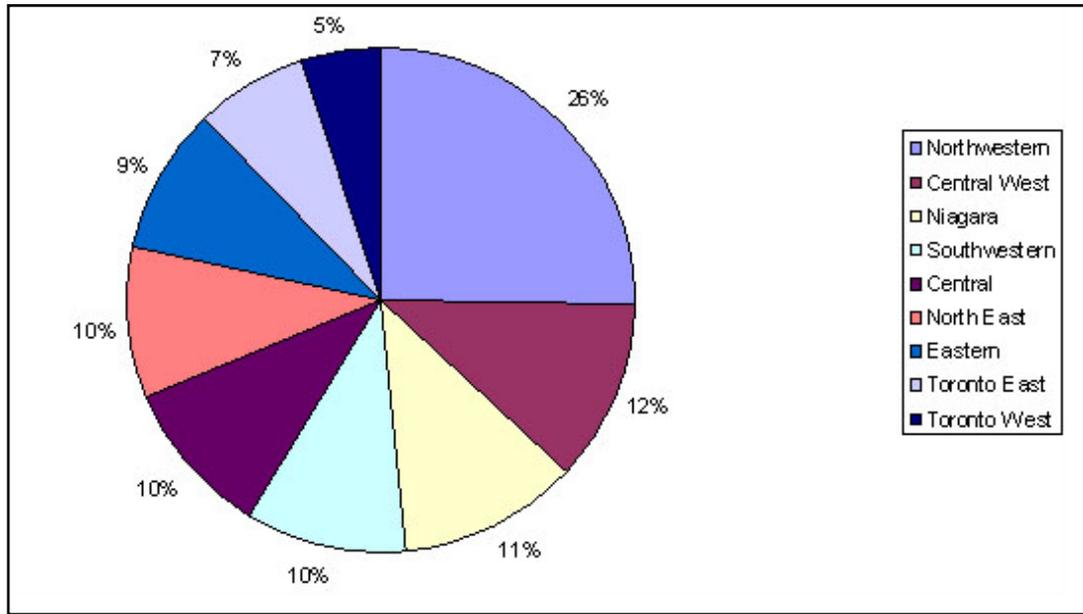
The second method of analysis included a geographical breakdown of the data according to regions within Ontario (Figure 4). Although there were no statistically significant differences in the rates of suicide between males and females in different geographical areas, there was a significantly

higher number of total suicides in Northwestern Ontario compared to the rest of the province (p=0.0001).

**Involvement of Other Factors**

Many adolescents had involvement of multiple risk factors, some of which may have contributed to their suicide (Table 1). However, only one showed a statistically significant difference amongst males and females. A history of previous suicide attempt(s) was more common in females

**Figure 4. Geographical distribution of adolescent suicides in Ontario**



Between January 2000 and November 2006, a significant number of suicides were committed by adolescents from Northwestern Ontario compared to all other parts of Ontario. The reason for this remains unclear. It is thought that the increase is related to the dense population of First Nations people.

than males, occurring at a frequency of 35.0% (n = 41) versus 11.9% (n = 30), respectively (p=0.0001).

The most common factor present in both males and females was a history of past or present psychiatric treatment, found in 17.9% (n = 66) of cases.

Alcohol and drug involvement was more common in males than in females. Alcohol and drugs were involved in 11.1% (n = 28) and 4.7% (n = 12) of male cases, and in 9.4% (n = 11) and 4.3% (n = 5) of female cases, respectively. It should be noted that information regarding substance abuse was gathered from family members and therefore may be underrepresented. The families of females were more likely to have been receiving assistance from the Children’s Aid Society (CAS). While CAS was involved in only 8.3% (n = 21) of male suicide families, it was involved in 14.5% (n = 17) of female suicide families (p=0.0664). A history of abuse or neglect, and a history of chronic mental or physical illness, was also more common in females than in males (Table 1).

Approximately half (n = 159) of the individuals had no involvement of known or identifiable risk factors.

## Discussion

Since the 1950s, numerous studies have sought to identify the risk factors for suicide and to ascertain the reasons that drive individuals to take their own lives. Belfer (2008) has compared suicide between countries, while Clayer and Czechowicz (1991) have compared suicide amongst different ethnic populations. Attempts have been made by

Hawton and Harriss (2008) to differentiate the risk factors for suicide between genders and the causes thereof, while Everett-Jones and Lollar (2008) have assessed individuals affected by mental or physical conditions. Countless risk factors have been identified, and a tremendous amount of research outcomes have been used to implement preventative programs.

As with all preventable causes of death, suicide is of grave concern. From 1950 to 1995, the Canadian population doubled, yet according to the Centers for Disease Control and Prevention (2001) the total number of deaths by suicide increased threefold, from 1,067 in 1950 to 3,970 in 1995. Information from Statistics Canada (2008) shows that in the new millennium suicide rates have remained relatively constant, and have in fact demonstrated a decline since the

**Table 1. Adolescent suicide risk factors based on gender**

Risk factor	Males %	Females %
Alcohol involvement	11.1	9.4
Drug involvement	4.7	4.3
History of physical abuse	-	0.6
Psychiatric treatment	17.0	19.7
Previous suicide attempt	11.9	35.0
CAS involvement	8.3	14.5

The prevalence of these risk factors was associated with approximately the same number of males and females, except for a history of previous suicide attempts, which was significantly more common in females.

CAS = Children’s Aid Society

1990s. There were 3,606 suicides in Canada in 2000 and 3,613 suicides in 2004.

Gender has frequently been reported as a significant risk factor for suicide. The National Institute for Mental Health (NIMH) (2010) in the United States has reported that males die by suicide almost four times greater compared to females, and Statistics Canada (2008) reported a male-to-female suicide ratio of 3:1 and this ratio was consistent from 2003 to 2007. While there are statistics, by age group, on the rate of completed suicides as well as suicide attempts in both males and females in the adolescent range, this data is in aggregate form, reflecting national crude rates, and includes pre-adolescents (age 10) as well as young adults (age 19).

We found an adolescent male to female suicide ratio of approximately 2:1 in Ontario and there are a few points worth noting at this juncture. First is that this ratio differs from the national Canadian ratio of 4:1. Second, there are a number of possible explanations for this:

- i. males in Ontario are less successful in completing suicide;
- ii. males in Ontario attempt suicide less than males in other parts of the country; or,
- iii. that in Ontario more females are successfully completing suicide compared to other provinces.

Due to a paucity of studies investigating suicidal behaviour and outcomes specifically in the province of Ontario, it is not possible to claim with any certainty, why the gender difference exists. In our view, this warrants further investigation.

Numerous hypotheses, some backed by hard data, and other less so, have been proposed to explicate gender differences in completed suicides and suicidal behaviours. Some of the risk factors are endogenous, or biologically intrinsic, such as the propensity of males to be more aggressive and impulsive, arguably an effect of testosterone among other things, and that men choose means of higher lethality—e.g. firearms. Another risk factor is the use of substances, and Murphy (1998) showed that a history of alcohol or substance abuse occurs less frequently in women than in men. Murphy also highlighted that women tend to be less impulsive and have larger social support networks, both of which are salient protective factors against completed suicide.

In regards to suicide attempts, the Centers for Disease Control and Prevention (2001) in the United States showed that females are three times more likely to attempt suicide than males. Cutright and Fernquist (2000) showed that females have a propensity to choose means of lower lethality, such as excessive pill ingestion (a form of poisoning) or alcohol intoxication. In addition, Kuo, Gallo and Tien (2001) showed that younger females have higher incidences of suicidal ideation than their male counterparts. What drives the higher rate of suicidal ideation in females is unclear, but the

higher incidence of suicidal thinking may be one factor, in addition to factors delineated above, and other factors that have not been elucidated yet.

Several risk factors for suicide have been characterized (Table 1). Although we were unable to identify many statistically significant differences between males and females, there are numerous reports in the literature of a higher prevalence of certain risk factors in one gender compared to the other. For example, Molnar, Berkman, and Buka (2001) reported that women are more likely to experience domestic or physical abuse, both of which are associated with increased risk of suicide. Nelson et al. (2002) found childhood sexual abuse, another risk factor for suicide, to be three times more common in women. The American Psychiatric Association borderline personality disorder guidelines (2001) show that borderline personality disorder is more common in women, and that the disorder carries an independent risk for suicide. The chronic and repetitive nature of suicidal and parasuicidal gestures in this specific population is well known and this factor on its own could account for at least some of the higher incidence of suicide attempts in women.

Hawgood and De Leo (2008), as well as Bethell and Rhodes (2008), have shown that psychiatric illnesses in general, such as schizophrenia, depression, and anxiety disorders, all confer an increased risk of suicide. In a study by Henriksen et al. (1993), 93 out of 100 individuals who committed suicide were found to be mentally ill. Similarly, Robins et al. (Robins, Murphy, Wilkinson, Gassner, & Kayes, 1959) reported a 98% prevalence of psychiatric illness in his cohort of 134 suicide cases. In a study by Pinninti et al. (Pinninti, Steer, Rissmiller, Nelson, & Beck, 2002), 10-15% of patients with schizophrenia were reported to have committed suicide, while 50% were reported to have attempted suicide and 80% had thought about it. Compared to the above studies, psychiatric illnesses appeared not as prevalent in our population, as defined by a history of past or present psychiatric treatment. Only 17.8% of individuals had such a history. This lower prevalence may or may not reflect a limitation in study method—i.e. use of coroner's reports as compared to psychological autopsy, which is more rigorous. That is to say that a portion of patients in the study may have had undiagnosed and untreated psychiatric illness.

## Conclusions

We have demonstrated that adolescent males commit suicide more frequently than adolescent females, in the ratio of 2:1 (M:F). The most common shared risk factor for suicide across gender was a history of psychiatric treatment but this was present in only 18% (n=66) of 370 suicides. Therefore, the factors influencing suicidal thinking and behaviour in adolescent males and females are varied, divergent, and extend beyond mental illness. Given that we know there are statistically salient differences in the risk factors affecting adolescent males versus females (e.g. greater substance use

and use of more lethal means by males, and more suicidal ideation and suicide attempts with females), these differences should be targets of intervention in programs and treatments designed for the adolescent population. More research is needed to identify why these differences exist and how they can be modified. Future studies also need to address whether the 2:1 (M:F) ratio in adolescents reflects more or less suicidal behaviour in teen females and males, respectively, as compared to the adult population or whether another factor is driving this difference. Among the most pertinent unanswered question is why teenage females contemplate suicide more than teenage males.

In closing, we would like to draw attention to limitations of this study. The sample size was relatively small and there is a lack of generalizability. The study period was not very long and there was a lack of sufficient follow up data and analysis of the risk factors that could separate males and females. Further research is needed on this issue so that there can be more data available so that more of an impact can be made. The investigators hope that future studies will address these and other issues.

## Acknowledgements / Conflicts of Interest

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