Suicidal Ideation among Canadian Youth: A Multivariate Analysis*

To be published in Archives of Suicide Research, vol. 12, pp. 1-13

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Abstract

Objective: A multivariate model was developed incorporating various socio-demographic, social-environmental, and social-psychological factors in an attempt to predict suicidal ideation among Canadian youth. The main research objective sought to determine what socially-based factors elevate or reduce suicidal ideation within this population.

Methods: Using data from the National Longitudinal Study of Children and Youth – Cycle 5 (2003), a cross-sectional sample of 1,032 was used to empirically identify various social determinants of suicidal ideation among youth between the ages of 12 and 15.

Results: Results reveal statistically significant correlations between suicide ideation and some lesser examined socially-based measures. In particular, ability to communicate feelings, negative attachment to parents/guardians, taunting/bullying or abuse, and presence of deviant peers were significant predictors of suicidal ideation. As expected, depression/anxiety, gender, and age were also correlated with thoughts of suicide.

Conclusions: Research findings should help foster a better understanding towards the social elements of suicide and provide insight into how suicide prevention strategies may be improved through an increased emphasis on substance use education, direct targeting of dysfunctional families and deviant peer groups, and exploring more avenues of self-expression for youth.

Keywords: Suicidal Ideation, Youth, NLSCY, Canada, Social Determinants

* Acknowledgement: Monetary support for this article was provided by a grant from the University of Manitoba Research Development Centre.
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Suicide and suicidal behaviour has long been regarded as a serious social problem. According to the World Health Organization (2000), globally there is one completed suicide every 40 seconds. In Canada, suicide is the second leading cause of unnatural deaths, accounting for 11.3 per 100,000 of accidental/adverse fatalities (Statistics Canada, 2006). Suicide is rare before the age of 12, while puberty marks the first significant rise in the rate of suicide (Jamison, 1999). Among youth, suicide is the third leading cause of all deaths in Canada (Canadian Institute of Child Health, 2000). Unlike most injury-risk behaviour for North American youth, rates of suicide have been increasing over the past decade (Zametkin, Atler, & Yemini, 2001). Given the severity of the problem, a substantial amount of research has attempted to identify which youth are more susceptible to suicidal ideation, in large part because thoughts of suicide are regarded as a precursor to suicide completion (Beck et al., 1999; Miller & Taylor, 2005). In brief, suicidal ideation refers to thoughts about suicide that include serious intent and/or a formulated plan, and is the central focus of the current article.

A large portion of the literature on youth suicidal ideation is linked to depression and feelings of hopelessness (Beck et al., 1993; Kandel et al., 1991; Rhodes, Bethell, & Bondy, 2006). Studies frequently suggest that the interaction of depression and hopelessness is the strongest predictor of suicide ideation and completion (Bonner & Rich, 1988; Chioqueta & Stiles, 2005; Harris & Barraclough, 1997; Reifman & Windle, 1995). The sustained focus on intra-personal contributors like depression and helplessness, however, has meant that the social (inter-personal) correlates of suicidal ideation are often overlooked and, consequently, are not adequately addressed (Kidd et al., 2006; Miller & Taylor, 2005). Gutierrez (2006, p. 130), for one, argues that
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depression is more than a disease of the mind, especially among young people who are less cognitively developed than adults. Feelings of sadness and loneliness (key elements of clinical depression) are often triggered through a series of external stressors, including marginalization, lack of attachment, anti-social behaviour, taunting/bullying or abuse, and substance use. In this regard, while there is useful clinical research illustrating the internal processes of suicidal individuals (depression, hopelessness), less attention has been paid to the social trajectories that may, in fact, help contextualize these intense inner states (Kral, 1994; Prinstein et al., 2000).

By recognizing that suicide prevention research contains gaps in understanding socially-based risk and protective factors through representative population surveys, the current paper investigates the social determinants of suicidal ideation among young people in Canada. In particular, we address the following two questions. First, what proportion of youth experience suicidal ideation? Second, what are the factors that may elevate or reduce suicidal ideation among children and youth?

Review of the Literature

Adolescence, with its numerous transitions, is a time when thoughts of suicide may begin to surface, in large part because a constellation of risk factors begin to emerge (Miller & Taylor, 2005). In recent years, several empirical studies have examined various factors that may elevate or reduce suicidal propensities. Risk factors identified in youth include: past suicide attempts, depression/anxiety, feelings of hopelessness, substance use, abuse and neglect, suicide in the family or by a friend, negative life events, problems with anger and self-esteem, identity problems, family dysfunction, difficulties in problem solving,
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and negative attachments (Evans, Hawton, & Rodham, 2005; Hyde et al., 2005; Orbach, 1997, 2003). Although there are cases where a single traumatic event can trigger a suicide attempt, youth contemplating suicide usually give many warning signs, which are predictive of subsequent suicidality (Hyde et al., 2005). For the purpose of the current article, risk factors have been categorized into three groups: social psychological, social environmental, and socio-demographic. Each category will be discussed in turn.

Among social psychological factors, depression, anxiety, and hopelessness have been reliably associated with an increased probability of suicidal behaviour (Friedrich, Reams, Jacobs, 1982; Pfeffer, 2003). Self-report studies with youth have also found positive associations between suicidal ideation and emotional distress (Brent, 1995; Lester, 2000; Liu, 2004). For instance, intense emotional states, such as anger, resentment, and vengeance are reported to affect the prevalence of suicidal ideation among children and youth (Jacobsen et al., 1994; Pfeffer, 1986, 2003).

In terms of social-environmental factors, the literature suggests a strong association between suicidal behaviour and child abuse (Fergusson, Horwood & Lynskey, 1996; Santa Mina & Gallop, 1998) as well as schoolyard taunting/bullying (Kaltiala-Heino et al., 1999; Kim, Koh, & Leventhal, 2005). In addition, exposure to suicidal behaviour has been moderately correlated with suicidal ideation (Bearman & Moody, 2004; Crosby & Sacks, 2005; Hazell & Lewin, 1993). This body of literature suggests that knowledge of suicide among family or friends is significantly associated with an individual’s own suicidal behaviour (Orbach, 1997). For example, in one study of youth in Hong Kong, Wong and colleagues (2005) found that suicidal ideation increases for adolescents exposed to suicide attempts, but not necessarily completions. Prior
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research has also documented the influence deviant friends often have on the negative behaviour of children and youth (Liu, 2004; Kandel, Raveis, & Davies, 1991; Simons & Murphy, 1985). Finally, studies on youth suicide have identified substance use as a significant correlate of suicidal ideation (Kandel, Raveis & Davies, 1991; Metha et al., 1998; Prinstein et al., 2000; Reynolds and Mazza, 1994).

Moreover, social-environmental factors such as peer, school, and parental attachments are thought to act as protective measures against suicide (Kidd et al., 2006). Put another way, suicidal youths are more likely to exhibit weak attachments (DiFilippo & Overholser, 2000; Kandel, Raveis, & Davies, 1991; Perkins & Hartless, 2002). In particular, lack of parental attachment has been empirically shown to impact suicidal ideation (Adams et al., 1994) and completion (Brent et al., 1994). Peer attachment is thought to be paramount among youth, given that adolescence is generally a period of transition from parental authority to peer influence. With regard to suicidal ideation, both general population and clinical samples suggest that lack of peer support is connected to an increased likelihood of suicidal behaviour among youth (Lewinsohn, Rohde & Seeley, 1996; Perkins & Hartless, 2002; Prinstein et al., 2000). Specifically, low levels of friendship quality and social self-concept have been empirically linked to suicidal ideation (Lewinsohn, Rohde & Seeley, 1993; Prinstein et al., 2000). Similarly, the absence of a positive school environment is also significantly correlated with suicidality (Kidd et al., 2006; Perkins & Hartless, 2002).

In terms of socio-demographic predictors, girls consistently rate higher than boys in suicidal ideation (Kandel, Raveis, & Davies, 1991; Reinherz et al., 1995), but not completion (Bingham, 1994; Canadian Institute on Child Health, 2000). There is also
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evidence that suicidal ideation among young people increases with age (Beautrais, 2002). Little is known about the correlation between socio-economic status (SES) and suicidal ideation among youth (Gould & Kramer, 2001). In one study, however, Dubow and his colleagues (1989) found that low SES was significantly associated with both suicidal ideation and attempt. Finally, although previous research from the United States has found no significant differences between urban and rural breakdowns (Albers & Evans, 1994), no general population studies have been conducted in Canada to determine whether such divisions exist.

Sample

Data for the current study were derived from the National Longitudinal Survey of Children and Youth (NLSCY) Cycle 5, conducted in 2002/03 by Statistics Canada in partnership with Social Development Canada. The original sample consisted of 2,806 youth between the ages of 12 and 15. However, due to the low variability of the variable (“suicidal thoughts in the last year,” n=225), respondents who reported suicidal ideation were over-sampled. Consequently, a random sample of 807 cases were drawn for youth who did not report any suicidal ideation in the last year, resulting in a final sample of 1,032 cases with 22% variability on the dependent variable. The data were weighted using the standardized NLSCY weight distribution measure in order to achieve unbiased results. The specific codes and computations of the criterion and predictor variables are discussed in turn.

Measures
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The criterion variable is suicidal ideation \((1=\text{yes}, \; 0=\text{no})\), which was measured by the following question: “In the past 12 months, did you *seriously* consider attempting suicide (emphasis in original)?” Next, a series of measures were computed in order to help predict suicidal ideation among youth. For the purposes of the present analysis, predictor variables were divided into three groups: social-environmental, social-psychological, and socio-demographic.

In terms of social-environmental factors, 4 peer attachment variables\(^3\) were entered into a factor analysis, which indicated a single-factor solution. As such, a unidimensional measure was constructed \((\alpha=0.85)\) where higher values represent greater peer attachment. Six variables\(^4\) addressing school attachment also confirmed a single-factor solution through factor analysis \((\alpha=.75)\). The NLSCY questionnaire includes 20 statements that measure children’s attachment to their parents. Factor analysis reveals three dimensions of parental attachment: parental positive stimuli \((\alpha =0.92)\), parental negative stimuli \((\alpha =0.80)\), and parental involvement/supervision \((\alpha =0.60)\). Finally, to measure the possible negative influence of friends on suicidal ideation, a deviant peers index was computed \((\alpha =0.85)\), which addresses the extent to which close friends engage in deviant activities, such as: smoking, marijuana, alcohol, and other drug use as well as stealing, assaultive behaviour, and vandalism.

A series of social-environmental dummy variables were also included in the analysis. The first variable addresses whether respondents have been verbally threatened (i.e. taunted) or physically abused at school (i.e. bullied) or elsewhere (for example, abused at home) in the past twelve months \((1=\text{yes}, \; 0=\text{no})\). Second, a dummy variable \((1=\text{yes}, \; 0=\text{no})\) was derived based on the respondents’ answers to the questions “has
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anyone in your school committed suicide?” or “has anyone that you have personally known committed suicide?” Third, substance use was measured by a dummy variable computed based on two variables that ask respondents how often in the past twelve months they have been drunk or used marijuana (1=yes, 0=no).

The NLSCY contains several social-psychological measures. To assess the level of stress management among youth, four composite measures were formed based on factor analysis results of 13 items. The four emotional quotient/stress management latent dimensions include: ability to communicate feelings (\( \alpha =0.84 \)), trouble-shooting skills (\( \alpha =0.74 \)), the level of anger and impulsivity (\( \alpha =0.70 \)), and capacity to be caring and empathetic (\( \alpha =0.57 \)). Also included in the NLSCY is a comprehensive list of cognitive variables. Factor analysis suggests a three-factor solution: vengefulness (\( \alpha =0.79 \)), depression/ anxiety (\( \alpha =0.80 \)), and having some form of attention deficit (\( \alpha =0.79 \)).

Finally, for a comprehensive exploration of socio-demographic factors on suicidal ideation, the following variables were included in the model: gender (1=male, 0=female), age (12-15 years), household income, highest level of education attained by parent(s), and place of residence according to regional distributions. We use dummy measures of provincial locale (Quebec, Ontario, the Prairie Provinces, and British Columbia, with the Maritime provinces acting as the reference category) as well as urban/rural breakdowns (1=urban, 0=rural). Means and standard deviations among the study variables are presented in Table 1.

<TABLE 1 ABOUT HERE>

Analytic Procedure
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Given the dichotomous nature of the suicidal ideation measure, logistic regression was employed using SPSS. Multivariate logistic regression is a standard statistical technique for a two-value (dichotomous) dependent variable (Tabachnick & Fidell, 2007). Logistic regression constructs an estimate of the strength of several measures as a way to determine whether the odds of success (no suicidal ideation) or failure (suicidal ideation) can be significantly predicted. Following the analyses reported in the previous section, because the NLSCY contains many complex scales, composite measures were computed after a series of factor analyses (principal components with varimax rotation) were performed (Pett, Lackey, & Sullivan, 2003).

**Results**

A test of the full model containing all predictor measures against a constant-only model was statistically significant with a $\chi^2$ of 314.16, $p<.001$ (df=25), indicating that the independent variables, as a group, reliably differentiate between youth with suicidal thoughts and those with no reported suicidal ideation. Classification was more impressive for non-suicidal youth with a 94.1% successful prediction rate compared to respondents experiencing thoughts of suicide (49.7%). The overall prediction success rate was strong at 84.8%.

The multivariate model of suicidal ideation and its predictor measures are shown in Table 2. Regression estimates indicate the amount of change in the log odds of suicidal ideation with a standardized unit change (either an increase or decrease) in the predictor variable while controlling for all of the other measures in the model. As shown, use of drugs and/or alcohol is significantly related to subsequent suicidal ideation. The positive
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coefficient suggests that substance use increases the log odds of suicidal ideation among young people. Specifically, with one standardized unit increase in substance use, the log odds of suicidal thoughts occurring increases by $b=1.445$ (odds of 4.242), while holding all other independent variables constant. Put another way, youth who use drugs and/or alcohol are 4.2 times more likely to have thoughts of suicide compared to adolescents who do not use these substances.

In terms of social-psychological measures, only one of the three cognitive constructs was a significant predictor of suicidal ideation. In particular, youth who experience depression and/or anxiety have a greater logged odds ($b=.361$) of having suicidal thoughts. In this regard, depressed or anxious youth are 1.4 times more likely to have thoughts of suicide compared to adolescents without these symptoms. The only significant emotional quotient/stress management measure was ‘ability to communicate feelings’ ($b=-.151$). Here, youth who have difficulties describing their feelings are more likely to report occurrences of suicidal ideation.

Of the five attachment constructs measuring social-environmental factors, only the ‘negative stimuli from parents’ index was significant ($b=.068$). Positive attachment with parents, friends, or school had no significant effect as protective measures against suicidal ideation. Moreover, youth who have been verbally threatened or physically abused at school or elsewhere in the past twelve months are 1.6 times more likely to have suicidal thoughts ($b=.492$) compared to adolescents who are not taunted/bullied or abused. The deviant peers index was also statistically significant ($b=.140$), meaning that the odds of suicidal ideation increases for young people who associate with troubled
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cohorts. Finally, contrary to ‘contagion effect’ theories, knowing someone who has died by suicide is not a significant predictor to someone’s own suicidal ideation.

In terms of socio-demographic measures, gender and age were the only significant predictors of suicidal ideation. In particular, compared to males, females were more likely to report having thoughts of suicide. The onset of puberty also appears to be a factor in suicidal ideation as younger adolescents were more likely to report having thoughts of suicide compared to the older youth sampled. Neither household income nor parent’s education had significant effects on suicidal ideation. There were also no significant differences in terms of urban/rural splits or geographical location.

Discussion

This study is among the first to provide empirical support, using Canadian data, for models of suicidal ideation that include socio-demographic, social-environmental, and social–psychological risk and protective factors within a general population sample of children and youth. Suicidal ideation is a complex phenomenon that includes mild cognitions of death to specific plans in regards to ending one’s life. Prevalence of suicidal ideation in normative population studies among children and youth indicate that approximately 20.5% of adolescents in the United States seriously consider attempting suicide, 15.7% develop a plan to end their life, 7.7% attempt suicide, and 2.6% require emergency medical attention due to their attempt (Centers for Disease Control, 1998; see also, Miller & Dexter, 2005 for similar results).

Compared to American population studies, the current project using NLSCY data has a prevalence rate that is substantially lower at 8%. One possible explanation for such
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a divergence lies in the difference in age demographics. Data collected from the Centers for Disease Control, for instance, are based on high school students from grades 9-12. In contrast, our sample encompasses youth from grades 7-10. The fact that suicidal ideation generally increases with age (Beautrais, 2002) may account for some differences in these alternate estimates.

The second purpose of this study was to test various risk and protective factors on suicidal ideation among youth between the ages of 12 and 15. Results from the logistic regression support much of the existing work on suicide ideation, but extends the research in a few important ways. First, previous studies have highlighted emotional distress as an important predictor of suicidal behaviour (Liu, 2004). Our emotional distress indicators, however, offer a more comprehensive assessment of its relationship with suicidal ideation because we included four measures of the latent trait. Interestingly, the only significant construct was ‘ability to communicate feelings.’ Obviously, an inability to communicate feelings is not the only risk factor for suicidal ideation, but this research suggests that it should be added to the list. Moreover, the fact that the only two significant social-psychological main effects were ability to communicate and depression/anxiety is worth noting. One plausible explanation for an increased presence of suicidal ideation among this group is that feelings of depression and/or anxiety are further exacerbated by an inability to communicate feelings of hopelessness. In this regard, more attention should be paid to the ability of young people to communicate feelings in addition to the presence of depression and/or anxiety, especially in terms of how they interact with each other.
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Second, findings from the present study reveal several lesser known social-environmental measures found to be significant. Similar to other studies (Kaltiala-Heino, 1999; Kim, Koh, & Leventhal, 2005; Perkins & Hartless, 2002), the current research found a significant correlation between bullying and/or abuse and suicide ideation. In terms of the former, our findings provide further evidence of the detrimental impact of bullying among children and youth. In the case of child abuse, findings from the logistic regression model are consistent with previous research on suicide ideation (Evans, Hawton, & Rodham, 2004; Fergusson, Lynskey, & Horwood, 1996; Santa Mina & Gallop, 1998). What remains unknown, however, is whether it is bullying or child abuse that is absorbing the bulk of the variance since the data did not separate verbal and physical abuse at home or school. Future research would benefit from a more comprehensive measure that separates the two types of harm. Nevertheless, the significant relationship does suggest that young people who are the objects of violence should be the targets of suicide monitoring and/or the focus of prevention programs.

Third, another finding that emerges from the study is the importance of parental attachment. However, unlike previous studies of suicide ideation that found positive parental attachment (DeJong, 1992; DiFilippo & Overholser, 2000) as well as parental involvement (Perkins & Hartless, 2002) to be significant predictors, our model did not. Interestingly, negative parental attachment accounted for significant variation in suicidal ideation among youth. To this end, our finding highlights the significance of risk factors over protective ones. This is contrary to research which illustrates the importance of protective factors in youth suicidal ideation (Gutierrez, 2006; Gutierrez, Osman, Kopper, & Barrios, 2000). Particularly within the family, it seems to be the presence of negative
stimuli or attachment, rather than protective factors such as positive attachment or parental involvement, that significantly predicts suicidal ideation. In this regard, it may be that negative, unstable, and/or violent households contribute to feelings of depression and hopelessness, traits frequently found among suicidal adolescents. Further research would be useful in examining this link in more detail.

The final significant social-environmental risk factor was the presence of deviant friends. While many studies have found significant correlations between delinquency and suicidal behaviour (Kandel, Raveis, & Davies, 1991; Liu, 2004), our research took a slightly different approach by examining the existence of deviant peers among young people who experience suicidal ideation. Such an approach is similar to Prinstein and his colleagues’ (2000) study that examined, among other covariates, the relationship between deviant peers and suicidal ideation. Given the well-known saying in criminological literature – ‘birds of a feather flock together’ (Glueck & Glueck, 1950; see also, Agnew, 1991; Short & Strodtbeck, 1965; Thornberry, 1987), it is not unreasonable to assume that young people who associate with deviant peers exhibit similar behaviour.

Despite these lesser known socially-based measures, it is important to remember that depressive symptoms and substance abuse were the strongest predictors of suicidal ideation. Both findings are well documented in suicidology literature (see, for example, Hallfors et al., 2004; Rossow, 2005). Nevertheless, the profile of a youth experiencing suicidal ideation seems to include socially-based measures that possibly compound on one another. Results suggest that significant portions of at-risk youth are either being bullied by peers or abused/threatened at home. These depressed/anxious adolescents experience negative attachments/relations with parents, but have little verbal ability to
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express their feelings. Consequently, they tend to engage in alcohol and/or drug use and find solace among deviant peers, possibly the only group where they find acceptance.

This study provides good preliminary support for an association between socially-based risk factors and suicidal ideation. Findings have important public health implications, especially since it is well documented that ideation is a strong predictor of actual suicide attempts (Beck et al., 1999) and other long-term problems (Reinherz, 1995). This research will help foster a better understanding towards the social elements of suicide and provide insight into how suicide prevention strategies may be improved. At the level of suicide prevention, according to our evidence, strategies should include: a continued emphasis on substance use/abuse education; targeting dysfunctional families and deviant peer groups; greater resources towards mental health literacy – including stigma reduction; further recognition of the social impact of both taunting/bullying and abuse; and exploring more avenues of self-expression for youth. If adolescents with the greatest risk of engaging in suicidal behaviour can be identified prior to an attempt or completion, incidence of suicide-related deaths may be significantly reduced. Moreover, successful interventions for at-risk youth should also improve their overall quality of life (Gutierrez, 2006).

Despite the potential contributions of this study, further general population and clinical sample research is needed within the Canadian context. Future longitudinal studies should be undertaken to determine the developmental pathways from ideation to attempt among Canadian youth. Because suicidal ideation is a fluid construct (Gutierrez, 2006), cross-sectional data is unable to examine suicidal trajectories over time. As such, factors that may influence someone’s suicidal ideation may significantly change from one
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moment to the next, making precise predictions regarding future behaviour extremely
difficult.

In addition, the interaction between known risk factors such as depression and
gender or substance use and parental attachment should be explored. Prospective research
could also use the NLSCY to examine the long-term effects of earlier suicidal ideation.
Moreover, although some youth with suicidal ideation attempt suicide, others do not. An
exploration of these differences would be a significant contribution to suicide prevention
research. Finally, more sophisticated indices of suicidal ideation should be conducted on
Canadian youth. One such measure is the ‘Suicidal Ideation Questionnaire (SIQ)’
(Reynolds, 1987, 1988), which was developed in order to identify individuals who
exhibit thoughts of death. The NLSCY does not include the SIQ index, but future data
sources addressing suicidal behaviour would benefit from including a more
comprehensive measure. Using one question to measure suicidal ideation is a substantial
limitation of the present study.

Concluding Remarks

Adolescence is a tumultuous time for most youth. The very nature of adolescence as a
life-stage involves substantial cognitive, biological, and social changes. Youth must deal
with the biological changes associated with puberty while, at the same time, work though
social and psychological changes such as developing new roles with parents, managing
peer relationships, and establishing one’s own self-identity. Given such trials and
tribulations, it is not surprising that adolescent’s who are not part of supportive networks
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and who lack the ability to communicate their feelings may feel depressed and/or may turn to drugs or alcohol as a means of handling their social and emotional problems.

In sum, this study provides a comprehensive assessment of various risk factors that increase the likelihood of suicidality among Canadian youth. Further identification and empirical testing is required in order to advance inclusive suicide prevention strategies for youth. In this regard, the current research should help foster a better understanding toward the social elements of suicide in terms of socio-demographic, social-environmental, and social–psychological factors that propel many youth into suicidal ideation.
### Table 1: Means and Standard Deviations

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### Table 2: Logistic Regression Results

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<td>Negative Stimuli</td>
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<tr>
<td>Ability to communicate feelings</td>
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<td>.860</td>
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Pseudo $R^2$

- Cox & Snell $R^2$  .301
- Nagelkerke $R^2$   .468

Total N  1,032
Suicidal Ideation among Canadian Youth

References


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ENDNOTES

1 The leading cause of adverse fatalities is ‘non-transport accidents’ accounting for 15.7 per 100,000 deaths. Examples of non-transport accidents include: falls, drowning, and fire-related deaths. ‘Transport accidents’ occur at a rate of 9.7 per 100,000.

2 Initially, the targeted population was 12 to 19 year olds; however, due to the limited coverage of certain variables, only respondents aged between 12 and 15 years who answered the question on suicide ideation were selected.

3 Items include: ‘I have many friends,’ ‘I get along easily with others my age,’ ‘Others my age want me to be their friend,’ and ‘Most others my age like me.’

4 School attachment is measured by how important it is for children to: ‘learn new things,’ ‘take part in student council or other similar groups,’ ‘participate in extra-curricular activities,’ ‘get good grades,’ ‘always show up for class on time,’ and ‘express your opinion in class.’

5 This result should be interpreted with caution since a significant positive relationship was found between age and suicidal ideation at the bi-variate level. Moreover, previous research has generally found that suicidal ideation increases with age among children and youth (Beautrais, 2002).