American Journal of Epidemiology

Vol. 182, No. 2
DOI: 10.1093/aje/kwv014
Advance Access publication:
June 28, 2015

Original Contribution

The Association Between Traumatic Brain Injury and Suicide: Are Kids at Risk?

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Initially submitted January 28, 2014; accepted for publication January 16, 2015.

Traumatic brain injury (TBI) in late adolescence and adulthood is associated with a higher risk of suicide; however, it is unknown whether this association is also present in people who sustained a TBI during childhood. The purpose of the present study was to determine whether experiencing a TBI during childhood is a risk factor for suicide later in life and to examine whether the risk of suicide differs by sex or injury severity. A cohort of 135,703 children aged 0–17 years was identified from the Quebec population-based physician reimbursement database in 1987, and follow-up was conducted until 2008. Of the children in this cohort, 21,047 had sustained a TBI. Using a survival analysis with time-dependent indicators of TBI, we found a higher risk of suicide for people who sustained a TBI during childhood (hazard ratio (HR) = 1.49, 95% confidence interval (CI): 1.04, 2.14), adolescence (HR = 1.57, 95% CI: 1.09, 2.26), and adulthood (HR = 2.53, 95% CI: 1.79, 3.59). When compared with less severe injuries, such as concussions and cranial fractures, more severe injuries, such as intracranial hemorrhages, were associated with a higher risk of suicide (HR = 2.18 vs. 2.77, respectively). Repeated injuries were associated with higher risks of suicide in all age groups.

adults; childhood; mental health; pediatrics; repeated injuries; suicide; traumatic brain injury; youth

Abbreviations: CI, confidence interval; HR, hazard ratio; ICD, *International Classification of Diseases*; IQR, interquartile range; SES, socioeconomic status; TBI, traumatic brain injury.

Sustaining a traumatic brain injury (TBI) during childhood can have devastating consequences on the motor (1, 2) and cognitive (1, 3) development and lead to myriad psychosocial and psychiatric sequelae (4–7). Among the latter are mood disorders, which have been found to have a prevalence ranging from 10% to 25% in pediatric populations (8, 9); irritability, which affects 30%–60% of children with a TBI (10, 11); and behavioral problems, such as attention deficit and hyperactivity disorder and conduct disorders, which have a prevalence of approximately 20%–50% (6, 12, 13).

Psychiatric and psychosocial problems are known risk factors for suicide, and preexisting psychiatric diagnoses have been associated with a higher mortality risk for people who have sustained a TBI (14–16). Repetitive TBIs have also been associated with a higher risk of suicide among military personnel and veterans (17). Other risk factors for suicide are male sex, social isolation, unemployment, and a history of suicide attempts (18–20). In the literature, age, socioeconomic status (SES), and sex have been associated with the risk of suicide, as has TBI (19, 21, 22). There is a higher risk of having a TBI during early childhood and late adolescence (23–25). Because males are twice as likely as females to sustain a TBI, especially during late childhood and adolescence (23, 26, 27), and because social isolation and unemployment are long-term consequences of TBI (7, 28, 29), studying the association between TBI and suicide is relevant.

In previous studies (30–33), investigators found an increased risk of death from suicide in adults, especially war veterans, who had sustained a TBI. In their seminal study, Teasdale and Engberg (32) reported an incidence of suicide that was 2.7–4.0 times higher (depending on the severity of injury) among persons who had a TBI than that in the general population. Moreover, although sustaining a TBI before the age of 21 years is associated with a lower risk of suicide than is experiencing a TBI at an older age (32), there has been no study to date in which the risk of suicide after a pediatric TBI has been clearly investigated. This is important because if children who sustain a TBI are indeed at risk of suicide, appropriate prevention and comprehensive treatment strategies (34) should be developed and implemented for that population.

In the present study, we examined the association between TBI and the risk of suicide deaths in a population-based cohort of children who were aged 0–17 years in 1987 and followed-up for 21 years. Our main hypothesis was that persons who sustained a TBI during childhood would have a higher lifetime risk of suicide than those who did not.

METHODS

Data sources

The cohort was assembled using information from 4 provincial administrative databases that include all residents of Quebec, Canada. Those 4 databases were the physician billing claims database from the Quebec Health Insurance Board (Régie de l'Assurance-Maladie du Québec), the hospital admission and discharge database (MEDECHO), the Quebec Institute of Statistics database, and the Quebec Coroner Database. These databases include the place of residence, age, and sex of persons who use health care service, as well as information on their medical visits (date, diagnosis, specialty of doctor seen, and medical procedures), hospitalizations (diagnosis, date of admission, interventions, intensive care unit stay, and date of discharge), and date and cause of death. A material deprivation index (expressed in quintiles) based on an algorithm using the postal code of residence (35, 36) was provided by the Régie de l'Assurance-Maladie du Québec and was used to characterize SES.

Study population and design

We identified a cohort of 135,703 children aged 0–17 years who received medical services in the province of Quebec, Canada, during the 1987 calendar year. Four groups of children were defined based on *the International Classification of Diseases* (ICD)*, Ninth Revision* diagnostic codes: 1) all children who received care for a TBI diagnosis ($n = 7{,}894$); 2) all children who had had a probable TBI ($n = 47{,}537$); 3) all children who had medical visits for fractures or dislocations of the extremities, labeled as musculoskeletal injuries ($n = 24{,}841$); and 4) a random sample of children who sought care for any other reason ($n = 55{,}431$, which is equal to the sum of groups 1 and 2).

For each child in the cohort, the Régie de l'Assurance-Maladie du Québec provided data on all medical services received until the end of the 2008 calendar year, for a maximum follow-up period of 21 years. The ethics review board of the Centre de Recherche Interdisciplinaire en Réadaptation du Montréal Métropolitain approved this study, and permission to access the data was obtained from the provincial commission on protection of personal information.

Study variables

Outcome. The outcome variable was death by suicide as assessed using the coroner's database. In the coroner's database, suicide deaths were coded using an internal classification system based on the codes from the ICD, Ninth Revision, that had the prefix S until 2000, after which the ICD, Tenth Revision, was introduced.

Exposure variables. The main exposure variable was having had a TBI, which was defined by the following diagnoses: concussion, intracranial hemorrhage, and/or cranial fracture (ICD, Ninth Revision, codes 800–804 and 851–854). A list of pertinent diagnostic and procedure codes has been published previously (37).

Subjects were classified as exposed at the time of the first occurrence of one of the above diagnoses recorded in the Régie de l'Assurance-Maladie du Québec, the hospital admission and discharge database, or both, during the 21-year follow-up period. Subjects did not necessarily sustain a TBI in 1987 (the year in which our groups were defined); they might have had 1 or more in subsequent years. To address this, we created time-dependent cumulative variables that were updated to include the individual number of TBIs as they occurred in children, adolescents, and adults during the follow-up. On the basis of these variables, we constructed time-dependent indicators of the presence or absence of TBIs during follow-up. We replicated the process for both probable TBIs and musculoskeletal injuries.

It is not uncommon for children to have multiple TBIs (38). To differentiate a visit for a new TBI from a follow-up visit for a previously sustained TBI, we considered 3 "clear zones": 15 days after the initial diagnosis and 90 and 180 days after that. These intervals represented the minimum number of days between 2 consecutive visits for TBIs that would indicate 2 different episodes. TBIs that occurred on the day of suicide were identified but not counted as new episodes because they most likely represented the method chosen to commit suicide.

Time-dependent indicators were further developed to denote whether injuries were sustained during childhood (<12 years of age), adolescence (12–17 years of age), or adulthood (≥18 years of age). This allowed us to address whether the risk of suicide varied with the age at which the injury was sustained. The severity of the TBI was determined using an algorithm (32) that classified TBI in 3 categories: concussion, cranial fracture, and cerebral contusion/intracranial hemorrhage.

Confounders. The potential confounding variables that were included were sex, age in years at inclusion in the cohort, SES, probable TBI (based on both diagnostic and procedural codes, validated by Kostylova et al. (37)), and musculoskeletal injuries, as well as mental disorders that were diagnosed before a TBI. Mental disorders that occurred before the TBI were examined by using an algorithm based on ICD, Ninth Revision, codes 291–318 and ICD, Tenth Revision, codes F00–F99 (39, 40). We only considered mental health disorders that were diagnosed before the first TBI because those that occur after are considered to be in the causal pathway.

Given the 21-year follow-up period, some subjects were followed until they barely reached adulthood (21 years of age), whereas others were followed until the age of 38 years. Suicide risk varies with age (25, 41), resulting in potentially different risks of suicide in the cohort members. To verify whether the risk of suicide changed in relation to the age at study inclusion, we created 3 categories for age at inclusion in the cohort: younger than 6 years of age, 6–11 years of age, and 12 years of age or older.

SES was assessed using the deprivation index, a population-based proxy derived from postal codes and census tract data. Values for this index were missing for 952 subjects (0.70% of the cohort) who moved out of the province during follow-up; these people were excluded from the cohort. We dichotomized the SES variable by regrouping the first, second, and third quintiles into a higher SES category, whereas the 2 lower quintiles became the lower SES category. We expected the risk to differ across SES levels and therefore stratified the SES variable so that each SES category would have its own baseline risk.

We included other injuries, such as musculoskeletal injuries and probable TBI, in the model. A probable TBI was an injury that was not positively identified as a TBI but that leaves a strong suspicion that one might have occurred because of the diagnosis, medical procedures, or tests involved. For example, a dislocation of the jaw combined with a head or brain scan would be categorized as a probable TBI. Musculoskeletal injuries that were included were those that required medical attention, such as fractures, dislocations, and severe soft tissue injuries. The inclusion of these other types of injuries can help control for certain premorbid characteristics that might be common causes of both TBIs and suicide, such as an impulsive/aggressive personality or a genetic predisposition to injury (19, 37).

Analysis

Descriptive statistics were measured to characterize our sample. We then used a Cox proportional hazards model with time-dependent covariates to analyze the survival time between injury and suicide. We used age as the time axis and defined time 0 as the age in years at enrollment in the study. Subjects who did not commit suicide were censored at the end of follow-up or at the time of death from other causes.

We modeled TBI as the main exposure variable in 4 different ways: 1) TBI at any age, 2) TBI by age group (children, adolescents, and adults), 3) TBI severity, and 4) repeated TBIs across age groups. Concussions and cranial fractures were grouped into a single low-severity category, and intracranial hemorrhages comprised the high-severity category.

For each model, we estimated the hazard ratio for suicide with 3 levels of adjustment: no adjustment, adjustment for demographic variables (age in years at injury, sex, and SES strata), and adjustment for demographic variables, other injuries (probable TBI, musculoskeletal injuries), and mental disorders diagnosed before the TBI. Finally, in order to determine whether the risk of suicide was higher for persons with a TBI and no mental health disorders, we conducted an analysis stratified by the presence of mental health disorders. The proportional hazards assumption was verified for each model.

Statistical analyses were conducted at the research data access center of the Institut de la Statistique du Québec. The statistical software used included SAS, version 9.2 (42), and R, version 2.14 (43).

RESULTS

After we excluded nonresidents, there were 134,629 subjects included in the analysis; the median age at inclusion was 8.42 years (interquartile range (IQR), 4.42, 12.42), and 76,791 (57.04%) participants were boys. In terms of SES, 41.11% of the cohort were in the 2 lower quintiles of population SES. During the follow-up period, there were 1,677 deaths, of which 482 were suicides (28.74%). The median age at death was 22.50 years (IQR, 18.67, 27.06). Most subjects who completed suicide (86.51%) were male, and 57.88% were in the lower SES category. The median age at baseline was 11.29 years (IQR, 7.42, 14.50), and the median follow-up period was 12.33 years (IQR, 8.50, 16.30).

Table 1. Incidence Rate per 1,000 Person-Years of First Traumatic Brain Injury, Mental Disorder Before First Traumatic Brain Injury, and Suicide in the Cohort, Quebec, Canada, 1987–2008

Variable	Incidence Rate per 1,000 Person-Years
First TBI	
All subjects	5.10
Children[a]	7.08
Adolescents[b]	5.80
Adults	4.08
Diagnosed mental disorders before first TBI	22.80
Suicide	
Survivors of TBI	0.30
All subjects	0.17

Abbreviation: TBI, traumatic brain injury.
[a] Subjects who were 0–11 years of age.
[b] Subjects who were 12–17 years of age.

During the study period, 21,047 (15.63%) members of the cohort had a total of 25,985 episodes of care related to TBIs, and most of these subjects (96.23%) sustained 1 or 2 TBIs each. Table 1 shows the incidence rates for the first TBI, mental disorders diagnosed before the first TBI, and suicide in this cohort.

Two-thirds of TBI survivors were male (14,170 males vs. 6,877 females); however, TBI severity was similar among males and females. First TBIs sustained during adulthood were generally more severe (76.08% of injuries were intracranial hemorrhages whereas 23.92% were concussions, cranial fractures, or cerebral contusions) than were first TBIs sustained in adolescence and childhood (63.25% and 67.71%, respectively, of more severe injuries).

Of the subjects who sustained a TBI, irrespective of severity, 92 (80 men and 12 women) committed suicide during the study period. Of the 92 participants who completed suicide, 59 had sustained only intracranial hemorrhages, 26 had sustained only concussions, and the remaining 5 had sustained either cranial fractures, cerebral contusions, or repeated injuries of different severities.

The median time between the first (and in some cases the only) TBI and suicide was 7.39 years (IQR, 3.13, 12.11). For subjects who had multiple TBIs ($n = 18$), the median time between the last TBI and suicide was 7.01 years (IQR, 2.92, 11.94). Most people who completed suicide were either 6–11 years of age ($n = 43$) or 12–17 years of age ($n = 31$) at baseline. As we expected, the younger a participant was at cohort inclusion, the more time elapsed between a TBI and

Table 2. Multivariate Survival Models of Suicide After a Traumatic Brain Injury, Quebec, Canada, 1987–2008

Predictor	HR[a]	95% CI	*P* Value
TBI			
Yes	2.41	1.91, 3.02	<0.001
No	1.00	Referent	Referent
Probable TBI			
Yes	1.22	1.02, 1.47	0.032
No	1.00	Referent	Referent
Musculoskeletal injury			
Yes	1.48	1.23, 1.78	<0.001
No	1.00	Referent	Referent
Sex			
Male	4.82	3.69, 6.29	<0.001
Female	1.00	Referent	Referent
Age at inclusion, years			
0–5	1.00	Referent	Referent
6–11	1.96	1.50, 2.58	<0.001
12–17	2.69	2.01, 3.60	<0.001
Mental disorders before first TBI			
Yes	3.88	3.20, 4.71	<0.001
No	1.00	Referent	Referent

Abbreviations: CI, confidence interval; HR, hazard ratio; TBI, traumatic brain injury.

[a] Adjusted for demographic characteristics, mental disorders, and other injuries.

Table 3. Results From Multivariate Survival Models of Suicide by Age Group, Quebec, Canada, 1987–2008

Predictor	HR[a]	95% CI	*P* Value
Age at TBI, years			
<12	1.49	1.04, 2.14	0.032
12–17	1.57	1.09, 2.26	0.015
≥18	2.53	1.79, 3.59	<0.001
No TBI	1.00	Referent	Referent
Age at probable TBI, years			
<12	0.77	0.62, 0.95	0.016
12–17	1.19	0.96, 1.48	0.110
≥18	1.64	1.25, 2.15	<0.001
No probable TBI	1.00	Referent	Referent
Age at musculoskeletal injury, years			
<12	0.95	0.75, 1.21	0.680
12–17	1.17	0.96, 1.47	0.110
≥18	1.77	1.38, 2.27	<0.001
No musculoskeletal injury	1.00	Referent	Referent
Sex			
Male	4.69	3.59, 6.13	<0.001
Female	1.00	Referent	Referent
Mental health disorders before first TBI			
Yes	3.45	2.86, 4.17	<0.001
No	1.00	Referent	Referent

Abbreviations: CI, confidence interval; HR, hazard ratio; TBI, traumatic brain injury.

[a] Adjusted for demographic characteristics, mental disorders before first TBI, and other injuries.

suicide: Although the younger members of the cohort survived a median of 10 years after the first TBI, those in the older group (i.e., 12–17 years) survived between 5 and 8 years. When we controlled for demographic variables, other injuries, and mental disorders diagnosed before the first TBI, the adjusted hazard ratio for suicide after a TBI at any age was 2.41 (95% confidence interval (CI): 1.91, 3.02) (Table 2).

By dividing TBI survivors into 3 groups according to age at TBI (Table 3), we were able to show that the magnitude of the association between TBI and suicide is highest when a TBI is sustained during adulthood (hazard ratio (HR) = 2.53, 95% CI: 1.79, 3.59) as opposed to adolescence (HR = 1.57, 95% CI: 1.09, 2.26) or childhood (HR = 1.49, 95% CI: 1.04, 2.14). Having a history of mental disorders diagnosed before the TBI more than triples the risk of suicide (HR = 3.45, 95% CI: 2.86, 4.17). When compared with subjects who did not sustain a TBI, those in the higher category of TBI severity had a greater risk of suicide than did those in the lower-severity category (HR = 2.77, 95% CI: 2.01, 3.83 vs. HR = 2.18, 95% CI: 1.63, 2.91) (Table 4). Having sustained multiple TBIs increased the risk of suicide by 23% for children (95% CI: 0.98, 1.56) and 41%–61% for adolescents (95% CI: 1.12, 1.78) and adults (95% CI: 1.44, 1.80) (Table 5). Finally, males had a risk of suicide that was at least 4 times higher than females in the present cohort. The stratified analysis results indicate that among those who had mental health disorders prior to sustaining a TBI, the adjusted hazard ratio for suicide was 2.59 (95% CI: 1.70, 3.97). Among subjects with no mental health disorders prior to sustaining a TBI, the adjusted hazard ratio was 2.00 (95% CI: 1.52, 2.64).

In sensitivity analyses, we considered different clear zones to define separate episodes of TBI. Results did not differ significantly, and therefore we only report results for the 90-day clear zone.

DISCUSSION

In the present cohort, we found that children, adolescents, and adults who sustained a TBI had a higher risk of suicide in the future than did those who did not sustain a TBI. These results are consistent with those reported by Teasdale and Engberg (32), Brenner et al. (30), and Harrison-Felix et al. (44).

The increase in risk was not as high for persons who sustained a TBI in childhood or adolescence as it was for those who sustained a TBI in adulthood, and there appears to be an increasing tendency toward suicide after a TBI from childhood (HR = 1.49) to adolescence (HR = 1.57) to adulthood (HR = 2.53). Not surprisingly, those who had mental health disorders prior to their first TBI had a higher risk of suicide. Nevertheless, subjects who did not have a mental health

Table 4. Results From Multivariate Survival Models of Suicide According to Severity of Traumatic Brain Injury, Quebec, Canada, 1987–2008

Predictor	HR[a]	95% CI	*P* Value
TBI severity			
High	2.77	2.01, 3.83	<0.001
Low	2.18	1.63, 2.91	<0.001
No TBI	1.00	Referent	Referent
Probable TBI			
Yes	1.24	1.03, 1.49	0.0250
No	1.00	Referent	Referent
Musculoskeletal injury			
Yes	1.50	1.25, 1.81	<0.001
No	1.00	Referent	Referent
Sex			
Male	4.82	3.69, 6.28	<0.001
Female	1.00	Referent	Referent
Age at inclusion, years			
0–5	1.00	Referent	Referent
6–11	1.96	1.25, 2.15	<0.001
12–17	2.69	1.49, 2.64	<0.001
Mental disorders before first TBI			
Yes	3.85	3.18, 4.68	<0.001
No	1.00	Referent	Referent

Abbreviations: CI, confidence interval; HR, hazard ratio; TBI, traumatic brain injury.
[a] Adjusted for demographic characteristics and other injuries.

Table 5. Results From Multivariate Survival Models of Suicide in Subjects With Repeated Traumatic Brain Injuries in Different Age Groups, Quebec, Canada, 1987–2008

Predictor	HR[a]	95% CI	*P* Value
Age group with repeated TBIs, years			
<12	1.23	0.98, 1.56	0.074
12–17	1.41	1.12, 1.78	<0.010
≥18	1.61	1.44, 1.80	<0.001
No TBI	1.00	Referent	Referent
Probable TBI			
Yes	1.12	0.93, 1.36	0.240
No	1.00	Referent	Referent
Musculoskeletal injury			
Yes	1.44	1.21, 1.74	<0.001
No	1.00	Referent	Referent
Sex			
Male	4.96	3.79, 6.47	<0.001
Female	1.00	Referent	Referent
Mental disorders before first TBI			
Yes	3.28	2.73, 3.95	<0.001
No	1.00	Referent	Referent

Abbreviations: CI, confidence interval; HR, hazard ratio; TBI, traumatic brain injury.
[a] Adjusted for demographic characteristics and other injuries.

disorder before sustaining a TBI also had an elevated risk of suicide when compared with those who did not have a TBI.

Although sustaining a TBI at a younger age is associated with worse outcomes in terms of learning abilities and long-term psychosocial functioning (3, 7, 45), younger children may adapt better to their condition than their older peers (24, 46). Recovery from a TBI seems to depend on many factors, including injury features and environmental influences (47).

When considering the influence of age at the time of injury, it is worth noting that the predictive value of a TBI on suicide may not be constant in time. Simpson and Tate (48) maintained that the risk of suicide for people who have sustained a TBI remains elevated for several decades. However, there have been few studies in which TBI survivors were followed over such a long period. It has been reported that on average, TBI survivors commit suicide between 3 and 8 years after their injury (32, 49). Our own results suggest a delay of 5–10 years between injury and suicide, depending on age group.

Although brain plasticity might play a role in the apparent relative resilience of younger brains, it has been shown in recent studies (4–6) that developing brains might in fact be more vulnerable and more likely to present long-term sequelae. Therefore, social and environmental factors should also be considered. For instance, several factors might mitigate the influence of injury (particularly for children), such as potentially better access to mental health services for children and adolescents with a TBI than for adults, as well as the support of people like parent caregivers and institutions like school systems. These factors may help alleviate the influence of a TBI, but they may also only postpone suicidal tendencies until an age at which limitations and issues of the transition to adulthood become more burdensome for young people (50). In the present study, because of the range of ages at which people entered the cohort, the participants were in their early 20s to well into their 30s at the maximum follow-up. In Quebec, as elsewhere (51), suicide before the age of 14 is rare, and its prevalence increases with age, peaking between 35–49 years of age (41). This being the case, it could be that time spent in the "at-risk" age group for TBI survivors was not sufficient to fully observe the consequences of the injury in the case of the younger subjects.

In contrast, adults have less access to a range of publicly funded services, such as special education, than do children and adolescents (52, 53). Further, people who sustain a TBI during adulthood might have less access to mental health services and tend to be more severely injured in the first place, likely because of the mechanism of injury among these persons (e.g., motor vehicle crashes) (53, 54).

Sustaining repeated injuries was associated with a higher risk of suicide, particularly for adolescents and adults, in whom the risk was 41% and 61% higher, respectively. This finding corroborates the association between repeated injuries, particularly sports-related injuries, and dementia, psychiatric disorders, and suicide that has been reported in recent literature (55–57).

Males who sustained a TBI were at a much higher risk for suicide than females. This finding corroborates the data from the literature on suicide in the general population (41, 58, 59), in children, adolescents, and young adults (60, 61), and in the population with TBIs (49). Road traffic accidents and other head trauma sustained in adults might be related to behavioral problems such as substance abuse and personality disorders, both of which are important risk factors for suicide (62). These findings imply that prevention strategies might need to better target males who could be at risk and persons with more severe TBIs, especially if other risk factors such as mental disorders or substance abuse were present before the TBI occurred.

The present study is not without limitations. Children between the ages of 0 and 17 years were included in the cohort, but we did not have information on their previous medical histories. Some of them could have sought care for previous TBIs and/or mental disorders. This risk of misclassification would therefore affect the status of children who were older at inclusion more than their younger counterparts, which could possibly lead us to underestimate the risk of suicide for children with a TBI.

Other possible misclassification errors may have occurred, most notably in the cause of death. In cases in which they lacked good evidence that the person had intended to die by suicide, coroners may have concluded that the death was accidental (e.g., in the case of a drug overdose) or of undetermined cause. To the best of our knowledge, there has been no study in which the validity of the Quebec coroner's database has been specifically addressed. However, in the course of a case-control study in which they compared youth suicides with accidental road traffic deaths in Quebec in the early 1990s, Lesage et al. (63), in collaboration with Quebec's Chief Coroner's office, did not find any misclassification after their in-depth, hours-long interviews with relatives.

Finally, these results are based on physicians' billing data and not on medical records. Our previous work indicated physicians' billing data provide a valid source for identification of childhood TBIs (37). Although Colantonio et al. (64, 65) and Chen and Colantonio (66) have used physicians' billing data in epidemiologic studies of adult TBIs, the validity of these data in identifying adult TBIs remains unknown.

The risk of suicide is elevated in persons who sustain a TBI, whether it occurs during childhood, adolescence, or adulthood. These findings underscore the importance of suicide prevention strategies aimed at both children and adults who have sustained a TBI. Prevention strategies may include periodic screening for mental health issues among persons who have suffered a TBI, as well as the use of multifaceted and comprehensive treatment approaches. Particular attention should be paid to males, persons who sustained severe injuries, and those who have sustained repeated TBIs. The delay between a TBI and suicide highlights the importance of monitoring patients who have been discharged from medical or rehabilitation services and ensuring that they can easily access care later if needed.

ACKNOWLEDGMENTS

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This work was supported by the Canadian Institutes of Health Research (grant 84479). Y.F.R. received a study grant from the Réseau Québécois de Recherche sur le Suicide. B.R.S. and D.E.F. received a senior research award from the Fonds de Recherche Québec-Santé.

Conflict of interest: none declared.

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