Appendix 1 (as supplied by the authors): Online Supplement

This supplement provides additional methodological details and an additional analysis of the primary study objective.

Participants

We chose the age range of 13 to 17 years because SH behaviours are common in adolescence (1) and a previous Canadian study (2) found that the mean age of onset of SH was 15.2 years.

Variables and Data Sources

Data on ED visits were obtained from the Canadian National Ambulatory Care Reporting System (NACRS) database from the Canadian Institute for Health Information (CIHI), using the International Classification of Diseases, 10th Revision (ICD-10) (3). The data were accessed through health administrative databases at ICES (Toronto, ON). NACRS records are produced by coders who abstract the documentation generated by ED clinicians (4).

Validity of Exposures and Outcomes

NACRS records are subject to several forms of error, including inaccurate or incomplete documentation of problems by physicians, and errors in coding and abstraction of data from clinical records. Gibson and her colleagues studied the quality of NACRS data by carrying out reabstractions of charts at several Ontario EDs, and found agreement rates for ICD-10 codes that ranged from 86-90% (4).

Concerning SH specifically, chart review studies indicate that some injuries and poisoning that are coded as having an undetermined cause are actually instances of intentional SH (5,6). Steele studied the validity of MH diagnostic codes abstracted from family practice records and found that the accuracy of the administrative data was 86.8% when compared with clinical data (7). The MH codes had high specificity, 97.0% to 99.5%, but lower sensitivity, 22.3% to 80.7%. Moreover, NACRS coders may record only the main diagnostic code that led to the ED visit; meaning that a mental health disorder or a self-injury might be omitted if another medical problem took precedence. This means that estimates of the prevalence of SH and MH diagnoses in the ED setting are likely biased downwards.

Overall mortality was determined by linking records to a database provided by Ontario Office of the Registrar General, where provincial vital statistics are collected. Suicides were determined using a method developed by ICES using ICD9 codes E950-E959 or ICD10 codes X60-84 (8). This method had 97% sensitivity for suicides between 2003 and 2012 and 95% sensitivity for 2013 onward.

Variable Definitions

Table A.1. Definitions of Covariates

Covariate	Definition	ICD-10 Codes
Mental Health and Substance Abuse Covariates		
Alcohol	Alcohol abuse	F10
Anxious-neurotic	Anxiety and neurotic disorders, reaction to severe stress, and adjustment disorders.	F40 F41 F42 F44 F45 F48 F930 F931 F932
Behavioural-emotional	Behavioural and emotional disorders	F90 F91 F92 F933 F938 F939 F94 F95 F98
Behavioural-physical	Behavioural syndromes associated with physiological disturbances	F51 F52 F53 F54 F55 F59
Bpd-manic	Bipolar Disorder or manic episode	F30 F31
Eating	Eating disorders	F50
Intellectual disability	Intellectual disability	F70 F71 F72 F73 F78 F79
Mood	Mood disorders other than bipolar/mania	F31 F30 F32 F33 F34 F38 F39
Organic	Organic mental disorders	F00 F01 F02 F03 F05 F06 F07 F09
Other mental health	Other mental health disorders	F99
Personality-behavioural	Disorders of personality and behaviour	F60 F61 F62 F63 F64 F65 F66 F68 F69
Psychological development	Disorders of psychological development	F8
Schizophrenia	Schizophrenia	F2

Covariate	Definition	ICD-10 Codes
Stress adjustment	Reaction to severe stress, and adjustment disorders	F43
Substance abuse	Substance abuse (non-alcohol)	F11 F12 F13 F14 F15 F16 F17 F18 F19
Suicidal ideation	Suicidal ideation	R45.8
Clinical Covariates		
Acne	Acne	L70
Asthma	Asthma	J45 J46
Bowel	Inflamed bowel	K50 K51 K90.0
Cancers	Cancers	C0 C1 C2 C3 C4 C5 C6 C7 C8 C90 C91 C92 C93 C94 C95 C96 C97
CF	Cystic fibrosis	E84
Concussion or traumatic brain injury	Concussion or traumatic brain injury	S06 S09
Diabetes	Diabetes mellitus	E10 E11 E12 E13 E14
Downs	Downs syndrome	Q90
Eczema	Eczema	L2 L30
Epilepsy	Epilepsy	G40 G41
Heart	Congenital heart disease	Q20 Q21 Q22 Q23 Q24
Inflammation	Inflammatory polyarthropathies	M05 M06 M07 M08 M09 M12 M13 M14
Migraine	Migraine	G43
Neuromuscular	Neuromuscular conditions	G71 G80 G81 G82 G83
Psoriasis	Psoriasis	L40
Sickle cell	Sickle cell anaemia	D57
Spina bifida	Spina bifida	Q05

Covariate	Definition	ICD-10 Codes
Self-Harm History		
Self-injury	Self-injury	X7 X80 X81 X82 X83 X84
Self-poisoning	Self-poisoning	X6

Note. Some clinical covariates were also identified by a series of non-ICD-10 codes that are unique to Ontario databases (definitions are available from the corresponding author).

Propensity-Score Matching Algorithm

The propensity score (PSCORE) was the logit transform of the estimated probability that the youth's ED presentation would include SH. We hard-matched youths with SH ED visits with controls on age, sex, and rural residence, and matched them on the PSCORE using the GREEDY algorithm. As described by Austin (9):

> In greedy matching, a treated subject is first selected at random. The untreated subject whose propensity score is closest to that of this randomly selected treated subject is chosen for matching to this treated subject. This process is then repeated until untreated subjects have been matched to all treated subjects or until one has exhausted the list of treated subjects for whom a matched untreated subject can be found. This process is called greedy because at each step in the process, the nearest untreated subject is selected for matching to the given treated subject, even if that untreated subject would better serve as a match for a subsequent treated subject.

Potential matches were rejected if the difference between the PSCORE of the self-harming youth and the potential match was greater than $0.2 \times SD$(PSCORE). The 1:2 matching strategy produced 10,731 controls. The number of matched controls is less than twice the number of matched adolescents with SH visits because we could find only one control for 591 (10.1%) of adolescents with SH visits. To document differences on covariations, we calculated the standardised mean differences (*D*) between the matched group of youths with SH visits and youths who did not have an SH visit.

Inverse Probability Weighting Analysis

As a sensitivity check on the propensity-matched comparisons, we compared adolescents with SH ED visits and those with ED visits without SH using an Inverse Probability Weighting Analysis (IPWA) (10). Instead of using matching to compare treatment and control, IPWA calculates weighted means for

each group using all the members in each group and compares those means. The weights are based on the propensity scores, so that individuals with a higher probability of belonging to the group are more heavily weighted in the calculation of the mean. Table A.2 presents analyses that parallel those reported in Table 2 and the results are similar.

Table A.2. Association of Self-Harm and Outcomes: Inverse Probability Weighting Analysis

	Youths with 0 SH Visits (N = 397,973)	Youths with ≥ 1 SH Visits (N = 5,832)	Conditional Logistic Regression	
Outcome	*Count (%)*	*Count (%)*	*OR (95% CI)*	*P*
Readmissions to ED or hospital for SH	7,252 (1.8%)	1,718 (29.5%)	7.67 (7.22 – 8.15)	< 0.001
Suicides	199 (0.1%)	43 (0.7%)	7.26 (5.07 – 10.40)	< 0.001
Overall mortality	937 (0.2%)	61 (1.0%)	3.27 (2.47 – 4.33)	< 0.001
	Mean ± SD	*Mean ± SD*	*t*	*P*
Cummulative 5-year health care costs ($)	9,270.85 ± 32,829.08	31,697.65 ± 64,011.36	86.66	< 0.001

Note. For the cost data, the standardized mean difference D is calculated as the difference between the average 5-year costs for youths with ≥ 1 SH visit minus the average costs for those with 0 SH visits, divided by $33,593, which was the standard deviation of 5-year costs among the 403,805 youths with ED visits who were eligible to be matched. The t statistic is the comparison of the average log-transformed costs, with statistical significance P.

Time-to-Event and Cost Analyses

We used stratified Cox proportional hazards regression to compare youths with SH visits to controls on the time from the index visit to a hospitalization for SH or ED visit for SH. The proportionality assumption was assessed by visual inspection of the Schoenfeld residuals (11). Five-year cumulative health-care costs were log-transformed and compared using paired t-tests.

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