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# **Understanding care pathways and outcomes for people with sports and recreation-related traumatic brain injuries in Ontario**

## **Final Report**

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## **Executive Summary**

In Ontario, traumatic brain injury (TBI) is a major public health issue that affects tens of thousands of people annually and imparts high costs on the healthcare system. Beyond the acute physical impact of the injury, TBI has been associated with poor mental health outcomes.

Sports- and recreation-related TBI (SR-TBI) are injuries to the brain that occur in the context of organized and unorganized sports. Despite differences in the epidemiology of SR-TBI and TBI from all other causes, little is known about how SR-TBI and TBI from other causes differ in their subsequent patterns of health service use after injury and longer-term mental health outcomes.

To investigate potential differences in patterns of health service use and mental health-related outcomes after SR-TBI compared to TBI from all other causes, we conducted a retrospective cohort study where we identified all incident cases of SR-TBI and TBI from all other causes treated in hospital from 1 January 2010 to 31 December 2019 in Ontario, Canada. To account for health and socio-demographic differences at the time of injury, individuals with a SR-TBI were matched to ‘controls’ with TBI from other causes 1:1 on date of birth, sex, and date of injury. We compared the i) rates of inpatient and outpatient health service use and ii) help seeking for mental disorders, between SR-TBI and TBI from all other causes, over a four-year period after the initial injury during the study period by fitting Poisson regression models and Cox Proportional Hazards regression models, respectively, adjusting for differences in other socio-demographics, pre-existing medical comorbidities and mental disorders, self-harm and non-fatal overdose behaviour, and prior health service use patterns.

Over a ten-year period in Ontario, we found:

- SR-TBI accounted for over one-third of all cases of TBI.
- On average hospitals attended to approximately 46,000 incident cases of SR-TBI per year.
- Help seeking after both SR-TBI and TBI of all other causes peaked in the first thirty days after injury.

When comparing SR-TBI to TBI of all other causes across two years post-injury, we found:

- The relative rates of help seeking after SR-TBI varied over time such that:
  - The rate of all-cause hospitalizations was 14-24% lower for individuals with SR-TBI.

- The rate of all-cause emergency department (ED) visits was 2-6% lower for individuals with SR-TBI.
- The rate of all-cause general practitioner visits was 2-6% lower for individuals with SR-TBI.
- These lower rates of health service use after SR-TBI were more pronounced for mental health help seeking:
  - The rate of psychiatric hospitalizations was 23-28% lower among individuals with SR-TBI.
  - The rate of psychiatric ED visits was 12-23% lower among individuals with SR-TBI.
  - The rate of mental health-related general practitioner visits was 17-19% lower among individuals with SR-TBI.
  - The rate of outpatient psychiatrist visits was 5-8% lower after the initial 30-day period post-injury and there was no difference within the first 30 days among individuals with SR-TBI.

There were also key differences in the rates of mental health-related contacts with the health system after SR-TBI when compared to TBI from all other causes. Over a four-year period post-TBI, we found that individuals with SR-TBI were:

- 29% less likely to have contact with the healthcare system for substance use disorder
- 26% less likely to have contact with the healthcare system for overdose
- 24% less likely to have contact with the healthcare system for self-harm
- 10% less likely to have contact with the healthcare system for mental illness compared to those with TBI from all other causes.

Our findings indicate that SR-TBI is highly prevalent in Ontario. Given TBI's association with lasting psychiatric impacts and the unique context of sports and recreation activities, it may present distinct challenges to the healthcare system. Compared to individuals with TBI from all other causes, individuals discharged from hospital settings after a SR-TBI have lower rates of psychiatric service use, and are less likely to visit a healthcare provider for mental health-related conditions, which may suggest a lower care burden of subsequent mental disorder onset or conversely indicate barriers to accessing appropriate mental healthcare. Given the high incidence of SR-TBI and its

association with mental ill-health, programs targeting mental health needs post SR-TBI should be developed and rigorously evaluated in the context of the unique care needs of those who engage in sports and recreation activities in Ontario.

## 1.0 Background

Traumatic brain injury (TBI) encompasses a spectrum of injuries ranging from mild concussions to severe head trauma.<sup>1</sup> TBI is a major public health issue accounting for substantial fatal and non-fatal health burden worldwide.<sup>2</sup> In Ontario, TBI affects tens of thousands of people each year<sup>3,4</sup> and imparts high costs on the healthcare system.<sup>5,6</sup> TBI is commonly caused by blunt force trauma to the head which impacts brain structure and function, and can be associated with subsequent brain pathology, including cognitive deficits.<sup>7,8</sup> Mild TBIs (also termed concussions) account for approximately 90% of TBI cases.<sup>1</sup> Although most symptoms of mild TBI usually resolve within one week, between 10-15% of individuals who experience a mild TBI may experience post-concussive syndrome, which is defined by lingering symptomology for periods lasting longer than three months post-injury.<sup>1</sup> Research has shown that TBI of any severity can be associated with diverse longer-term mental health outcomes,<sup>9</sup> including mental illness,<sup>10-12</sup> cognitive impairment,<sup>9</sup> and suicidality.<sup>8</sup>

Sports- and recreation-related TBI (SR-TBI) are injuries to the brain that occur in the context of organized and unorganized sports, and include both group and solitary sports and recreational activities (e.g., biking; motor-cross; weight-lifting). Estimates of the incidence of SR-TBI vary, however the highest incidence rates of SR-TBI are observed among people engaged in contact sports (e.g., hockey, football, rugby).<sup>3,13</sup> Sex differences in SR-TBI have been identified. Whereas the incidence rate for SR-TBI in the general population is higher in males, evidence suggests that female athletes experience higher rates of TBI and greater severity of symptoms compared to male athletes.<sup>14-16</sup> Within Ontario, hospitalizations for SR-TBI are concentrated among youths and young adults under 30 years of age.<sup>3</sup> Findings from the Canadian Community Health Survey (CCHS), a large, ongoing representative national survey suggest that the incidence of self-reported SR-TBI has been rising since the year 2000, particularly among Canadians aged 19 years and younger.<sup>17</sup>

Consistent with TBI more broadly, prior research has found associations between SR-TBI and increased poor mental health outcomes such as depression,<sup>18,19</sup> suicidal behaviours,<sup>20</sup> and cognitive impairment.<sup>21</sup> However, few studies have compared the course of SR-TBI to TBI of all other causes,<sup>22,23</sup> even though there are several reasons to expect differences in care trajectories and mental health outcomes between people with SR-TBI and those with TBI from all other causes.

For example, while SR-TBI are concentrated among youth and young adults,<sup>3</sup> cases of TBI from other causes are primarily driven by high rates of falls in older adults.<sup>24</sup> Given the differences in the epidemiology of SR-TBI and TBI from other causes, and the fact that the onset of common mental illnesses occurs in youth and young adulthood,<sup>25</sup> these sports and recreation-related brain injury may yield a different risk profile for mental health outcomes after TBI than other mechanisms of injury. Furthermore, individuals who take part in sports may be at high risk for repeated brain injuries, which have been shown to be associated with chronic neuropathology<sup>26</sup> including dementia<sup>27</sup> and chronic traumatic encephalopathy.<sup>28</sup> Conversely, those who have experienced a SR-TBI are more likely to engage in protective health behaviours than the general population (e.g., better diet, more frequent exercise) and have fewer comorbidities, which have been hypothesized to be associated with shorter recovery post-injury among people with SR-TBI compared to TBI from other causes.<sup>1</sup> Likewise, treatment of a SR-TBI in organized sports settings can be rigorous, increasingly involving sustained medical encounters as required by return to play protocols<sup>24</sup> which may influence the course of clinical follow up post-injury.

To date, little is known about how SR-TBI and TBI from other causes differ in their influence on patterns of health service use after injury and longer-term mental health outcomes. Two studies have examined differences in mental health symptoms between SR-TBI and TBI from other causes.<sup>22,29</sup> One study, which compared mental illness symptomology among individuals recruited in hospital with SR-TBI and TBI from other causes using diagnostic screening tools for a period of up to six months post-injury and found fewer symptoms of mental illness for those with a SR-TBI compared to TBI from other causes.<sup>22</sup> Another study found no significant differences in symptoms of mental illness at three months using similar methodology.<sup>29</sup>

The findings of these previous studies are limited by several methodological constraints. First, these studies had relatively short follow-up periods (<6 months). This provides limited evidence on the longer-term mental health symptomology and health service use patterns after SR-TBI and its corresponding implications for health systems planning. Second, both studies reported high rates of loss to follow-up, which can impact the external validity of the estimates generated, particularly if the reason for drop out is related to TBI / mental illness symptomology, i.e., if those with worse symptoms did not return after recruitment. Third, both of these studies have relied on highly selected samples recruited directly from one or more hospital settings, which also might

impact the generalizability of the findings. Finally, these studies examined symptomology rather than service use for mental illness, and it is important to consider that mental health service usage might vary even if the underlying symptomology does not, which has implications for health systems resourcing post-injury. Given these limitations, population-level studies assessing the relationship between SR-TBI and subsequent health service use and mental health outcomes are warranted.

## **2.0 Objectives**

To effectively intervene on SR-TBI, further research is needed to investigate how SR-TBI and TBI from other causes may differ in their risk factors, health impacts, and course of care post-injury. If the occurrence and nature of SR-TBI differs from TBI from other causes, systems of support for the impacts of SR-TBI likely need to be tailored to the specific population that experience this mechanism of injury within the unique context of sports and recreation. This may be especially pertinent given the concentration of SR-TBI among youth and young adults, many of whom will have sustained a TBI during a period in which human brain development peaks.

Thus, the objectives of this project are to:

- 1) Ascertain a population-based cohort of people who experience SR-TBI in Ontario
- 2) Examine factors that are associated with SR-TBI
- 3) Compare health service use patterns after SR-TBI to that of TBI from all other causes
- 4) Ascertain and account for any pre-existing mental health problems among those who experience sports-related TBI
- 5) After accounting for pre-existing mental health issues, examine the association between sports-related TBI and subsequent mental health issues up to four years post injury.

## **3.0 Methods**

This study is a retrospective cohort study using routinely collected health administrative data in Ontario, Canada. Data for this study were acquired from ICES (formerly the Institute for Clinical Evaluative Sciences), an independent, non-profit research institute that holds in trust data on publicly administered health services within Ontario, and whose legal status under Ontario's health information privacy law allows it to collect and analyze health care and demographic data, without consent, for health system evaluation and improvement. The use of the data in this project is

authorized under section 45 of Ontario's Personal Health Information Protection Act (PHIPA) and does not require review by a Research Ethics Board.

### **Study population**

A cohort of individuals accessed hospital care for a TBI with a discharge date from 1 January 2010 to 31 December 2019 (herein the cohort accrual period) was identified from person-level, province-wide emergency department, non-psychiatric hospitalization, and trauma registry records using ICD-10 codes for TBI (ICD10 codes: S01.7-9, S02.0, S02.1, S02.7-2.9, S06.0-6.9, S07.1, S07.8-7.9, S09.09, S09.7-9.9, T02.0, T04.0, T06.0, T90.2, T90.5, T90.8-9) adapted from an algorithm previously validated in Ontario.<sup>5</sup> For individuals with multiple indications of TBI, we took the earliest incident case of TBI during the cohort accrual period as the index TBI date. See Table S1 for a detailed description of TBI-related ICD-10 codes.

After identifying the cohort, individuals were excluded if they: 1) Could not be linked to demographic records in the Registered Persons Database (RPDB), 2) Were missing data on sex, 3) Were 105 years of age or older or had missing data on age, 4) Were not an Ontario resident at the time of injury, 5) Were not eligible for Ontario Health Insurance Plan (OHIP) coverage at the time of injury, or 6) Had clear indications of erroneous data (e.g., date of death preceded the TBI; date of birth after index date).

### **Data sources**

Using person-level unique, encoded identifiers developed and analyzed by ICES, cohort data were deterministically linked, retrospectively and prospectively from their index TBI date, to emergency department, non-psychiatric and psychiatric hospitalization, trauma registry, outpatient physician visit, and demographic records from 1 April 1988 to 31 December 2023. We sourced socio-demographic data, including age, sex, neighborhood income quintiles, residence (identified via postal code) and dates of birth and death from the RPDB, a directory of all publicly insured persons in Ontario.

### **SR-TBI exposure ascertainment**

We identified SR-TBI using ICD-10 codes relating to injuries caused by or occurring while engaged in sports- or recreation-related activities by applying an algorithm used by the Public



Health Agency of Canada to identify SR-TBI.<sup>3</sup> As some sports activity codes are non-specific and do not distinguish between sporting and occupational activities (e.g., injuries on a fishing vessel), we introduced codes in a stepwise fashion from most specific to least specific to assess their influence on our SR-TBI exposure ascertainment. These steps were as follows: *Step 1*) Codes indicating an injury was acquired while engaged in sports (ICD-10: U990); *Step 2*) The presence of U990 in *Step 1*, or at least one code for sporting-specific injuries (ICD-10: V10-V19, V90.2-V90.9, V91.2-V91.9, V92.2-V92.9, V93.2-V93.9, V94.2-V94.9, V96, W02, W09, W16, W21, W22, W51, X50); and *Step 3*) Codes from either steps 1 or 2 present or at least one code for potential sporting or recreation injuries which may also be of a non-sporting nature (ICD-10: V80.2, V80.8, V80.9, V86, W67-W74, V97.2, V98). See Table S1 for a description of sports- and recreation-related ICD-10 codes.

### **Baseline measures**

Socio-demographic factors at time of injury included age, sex, neighbourhood income quintiles, Ontario health region, and community size (rural: <10,000 people; urban: 10,000+ people). To ascertain pre-existing mental disorder status, indications of mental illness (F01-F09, F20-F99) and substance use disorders (F10-F19) prior to the index TBI event were identified by the presence of lifetime hospitalization, emergency department visit, and/or outpatient physician visit with an ICD-10 code or equivalent for these conditions. ICD-10 codes were cross-walked using the WHO conversion table for ICD9-to-ICD10 diagnostic codes (see Table S3 in the appendix for a full list of codes).<sup>30</sup> Mental disorders were categorized by ICD-10 sub-chapter blocks (i.e., F0\*, F1\*, F2\*...F9\*). We required only one lifetime hospitalization, emergency department visit or outpatient psychiatrist visit as a positive indication of a mental disorder category. For general practitioner visits, we required two visits for the same category within a two-year period to reduce the risk of false positives. However, due to evidence that substance use disorder codes may be underutilized in outpatient settings,<sup>31</sup> we relaxed this restriction for substance use disorder conditions (i.e., those related to ICD-10 codes F10-F19), requiring only one general practitioner visit as a positive indication of substance use disorder. Individuals with indications for both a mental illness and substance use disorder prior to the index TBI were categorized as having a co-occurring mental illness and substance use disorder, herein referred to as dual diagnosis. History of psychiatric hospitalizations and emergency department visits for mental health reasons were

each categorized as, i) none, ii) more than one year prior to the index TBI, and iii) within the year prior to the injury. History of non-fatal overdose (ICD10: T36-T50; X40-X44; Y10-14) and deliberate self-harm (ICD 10: X60-X84, Y10-Y19, Y28) were identified where the principal diagnosis was not a mental disorder (as defined above) and were identified from emergency department and hospitalization records. Medical comorbidity was assessed using the Charlson Comorbidity Index,<sup>32</sup> which was derived from lifetime hospital records prior to discharge from the index TBI hospital contact. History of consistent primary care physician (PCP) and psychiatrist contact were each assessed using a validated algorithm.<sup>33</sup> A full description of the baseline variables, including data sources, is found in Table S2 in the appendix.

## **Outcomes**

Individuals were followed for up to four years post index (the end of the study period was 31 December 2023) to assess the influence of TBI subtype on interaction with the health care system post-injury. Individuals were censored if they, i) died or ii) lost eligibility for OHIP prior to the four-year study end date.

To ascertain changes to health service use post injury, we estimated piecewise rates of psychiatric and non-psychiatric service use for the periods 1 to 30 days, 31 to 90 days, 91 to 180 days, 181 to 365 days, and 366 to 730 days post-index date. Indicators included piecewise rates of i) all-cause hospitalization, ii) psychiatric hospitalizations, iii) all-cause emergency department visits, iv) emergency department visits for psychiatric reasons, v) outpatient psychiatrist visits, vi) all-cause general practitioner (GP) visits, and vii) GP visits for psychiatric reasons.

To assess differences in the timing of help seeking for psychiatric conditions, we examined individual health service episodes for four years post injury ascertaining their first indication for each of i) mental illness (any ICD10 F code, except for F10-F19), ii) substance use disorder (ICD10 codes F10-F19), iii) self-harm (ICD 10: X60-X84, Y10-Y19, Y28), and iv) overdose (ICD10 codes T36-T50; X40-X44; Y10-14). Data were drawn from the DAD, NACRS, OMHRS, and OHIP outpatient records. The initial date of contact was used to calculate the timing of each event. We examined all-cause mortality over the four-year follow-up window, with date of death determined by the RPDB. Definitions of the outcomes, including data sources, are found in Table S4 in the appendix.

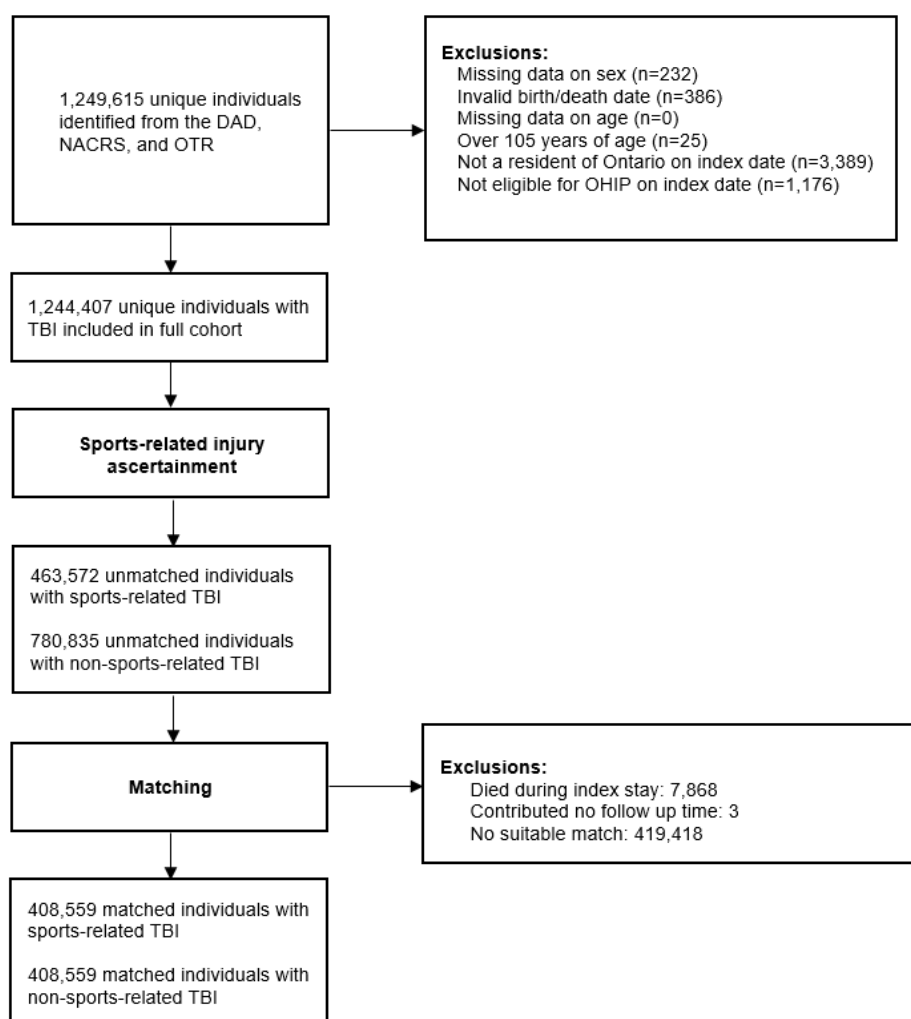
## **Statistical analyses**

Counts (proportions) and means ( $\pm$ standard deviation) were calculated for all baseline discrete and continuous variables, respectively. After ascertaining SR-TBI and TBI from other causes, baseline categorical and continuous variables were compared among the two groups using  $\chi^2$  tests and independent t-tests, respectively. Additionally, standardized differences were used to assess balance in baseline variables between the two groups, with scores of 0.10 or more indicative of potentially clinically meaningful differences.<sup>34</sup> Unadjusted relative risks and 95% confidence intervals comparing risks for SR-TBI compared to TBI from all other causes for the baseline variables were calculated using modified Poisson regression.<sup>35</sup> To account for health and socio-demographic differences at baseline, individuals with a SR-TBI were matched to controls with TBI from other causes 1:1 on date of birth ( $\pm 365$  days), sex, and date of injury ( $\pm 365$  days). Individuals who died during the index visit or otherwise contributed no follow up time were excluded prior to matching. To assess the influence of matching, we re-calculated the standardized differences,  $\chi^2$  tests, and t-tests for the matched cohort to re-compare covariate balance between the two groups on all baseline variables. Incidence rate ratios and 95% confidence intervals measuring the differences in piecewise rates of service use in the matched cohort were assessed across each of the time periods using Poisson regression, adjusting for baseline variables including neighbourhood income quintiles, rurality, Ontario health region, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and mental health/substance use indications at discharge. Differences among the two TBI groups in the timing of help seeking for mental illness, substance use disorder, self-harm and overdose, as well as all-cause death and thirty day outpatient follow up, were first plotted visually using Kaplan Meier Plots. Cox Proportional Hazards regression models were then fit to calculate hazard rate ratios and 95% confidence intervals to assess the magnitude of the differences in risk of accessing services for mental illness, substance use disorders, self-harm or overdose between the TBI types as well as risk of death and likelihood of follow-up with a general practitioner within thirty days of discharge for the index injury, adjusting for the baseline variables. We additionally fit non-parametric survival models to test the robustness of the hazard models to violations of the proportional hazards assumption. Finally, we performed subgroup analyses to examine the influence of socio-demographic factors on the rates and timing of service use. For the

subgroup analyses, we stratified the models for the matched cohort across age, sex, neighbourhood income quintiles, rurality, and Ontario health regions. All analyses were done using STATA 18 software.<sup>36</sup>

#### 4.0 Findings

We initially identified a total of 1,249,615 individuals with at least 1 TBI during the cohort accrual period. After applying exclusions (see Figure 1) the final cohort consisted of 1,244,407 (99.6%) individuals, of which 463,572 (37.3%) had a SR-TBI and 780,835 (62.7%) had a TBI from other causes. Identification of SR-TBI and TBI from other causes by year over the cohort accrual period are displayed in Table 1.



**Figure 1.** Cohort derivation flowchart

**Table 1:** Number of unique cases of traumatic brain injuries identified, by year and TBI-type

Year	Sports-related TBI	TBI from all other causes	Total
2010	47,951	71,629	119,580
2011	49,505	73,178	122,683
2012	48,777	74,197	122,974
2013	47,418	75,727	123,145
2014	46,495	77,937	124,432
2015	47,044	77,074	124,118
2016	46,790	81,300	128,090
2017	45,552	81,490	127,042
2018	42,008	82,322	124,330
2019	42,032	85,981	128,013
<b>Total</b>	<b>463,572</b>	<b>780,835</b>	<b>1,244,407</b>

## 4.1 Unmatched comparisons

Baseline data at the index event for the SR-TBI and TBI from all other causes cohorts are found in Table 2. Compared to individuals with a non-SR-TBI, those with a SR-TBI were younger (mean: 25.1 vs. 37.5 years), more likely to be male (61.1% vs. 52.1%), reside in wealthier neighborhoods compared to poorer neighborhoods, and were less likely to have visited an emergency department for a mental illness or substance use disorder, both in their lifetime and in the year prior to the TBI. Scores on the Charlson Comorbidity Index suggested those with a SR-TBI had fewer medical comorbidities. Individuals with SR-TBI were less likely to reside in the Toronto region (15.3% vs. 20.3%). Those with a SR-TBI were more likely to have an indication for a previous TBI than those with TBI from all other causes (22.6% vs. 18.0%).

**Table 2.** Cohort characteristics by type of TBI (Unmatched comparison; n=1,244,407)

Measure	Sports-related TBI (n = 463,572)	TBI, all other causes (n = 780,835)	p-value	Standardized Difference	Risk Ratio <sup>1</sup> (95% CI)
<b>Socio-demographics</b>					
Sex			<0.001	0.18	
Female	180,248 (38.9%)	374,141 (47.9%)			Ref
Male	283,324 (61.1%)	406,694 (52.1%)			1.26 (1.26, 1.27)
Age (in years)			<0.001		
0-9	120,037 (25.9%)	203,494 (26.1%)		0.00	Ref
10-17	114,502 (24.7%)	62,066 (7.9%)		0.47	1.75 (1.74, 1.76)
18-24	54,957 (11.9%)	73,049 (9.4%)		0.08	1.16 (1.15, 1.17)
25-34	48,355 (10.4%)	69,452 (8.9%)		0.05	1.11 (1.11, 1.12)
35-44	35,703 (7.7%)	54,877 (7.0%)		0.03	1.06 (1.05, 1.07)
45-54	33,588 (7.2%)	65,126 (8.3%)		0.04	0.92 (0.91, 0.93)
55-64	24,105 (5.2%)	63,709 (8.2%)		0.12	0.74 (0.73, 0.75)
65-84	24,848 (5.4%)	128,182 (16.4%)		0.36	0.44 (0.43, 0.44)
85+	7,477 (1.6%)	60,880 (7.8%)		0.30	0.29 (0.29, 0.30)

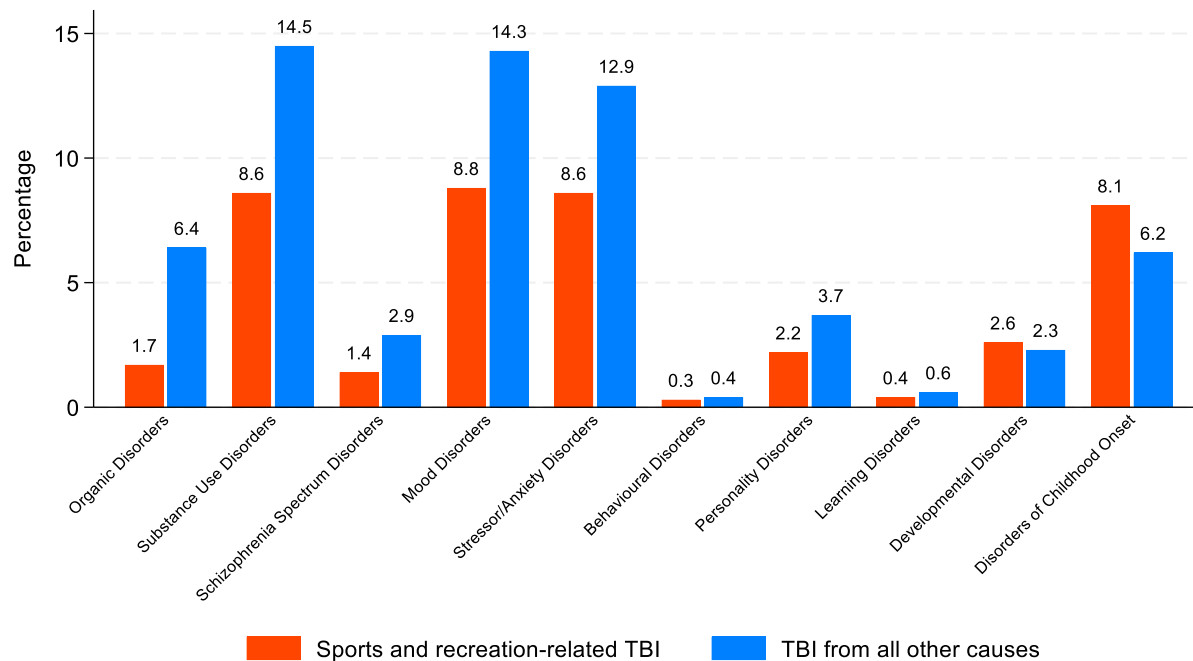
Mean(±SD)	25.11 (21.59)	37.50 (29.87)	<0.001	0.48	
Neighborhood income quintile			<0.001		
1 (lowest)	82,998 (17.9%)	178,592 (22.9%)		0.12	Ref
2	83,854 (18.1%)	159,544 (20.4%)		0.06	1.09 (1.08, 1.09)
3	90,634 (19.6%)	152,082 (19.5%)		0.00	1.18 (1.17, 1.19)
4	102,161 (22.0%)	146,670 (18.8%)		0.08	1.29 (1.28, 1.30)
5 (highest)	101,965 (22.0%)	140,221 (18.0%)		0.10	1.33 (1.32, 1.34)
Missing	1,960 (0.4%)	3,726 (0.5%)		0.01	1.09 (1.05, 1.13)
Community size			<0.001		
Urban (≥10,000)	402,275 (86.8%)	686,569 (87.9%)		0.03	Ref
Rural (<10,000)	59,896 (12.9%)	91,534 (11.7%)		0.04	1.07 (1.06, 1.08)
Missing	1,401 (0.3%)	2,732 (0.3%)		0.01	0.92 (0.88, 0.96)
Ontario health region			<0.001		
West	137,345 (29.6%)	231,926 (29.7%)		0.00	Ref
Central	116,431 (25.1%)	178,266 (22.8%)		0.05	1.07 (1.06, 1.07)
Toronto	70,976 (15.3%)	158,713 (20.3%)		0.13	0.83 (0.82, 0.84)
East	108,506 (23.4%)	154,102 (19.7%)		0.09	1.11 (1.10, 1.12)
Northeast	20,753 (4.5%)	38,264 (4.9%)		0.02	0.95 (0.93, 0.96)
Northwest	9,561 (2.1%)	19,564 (2.5%)		0.03	0.88 (0.87, 0.90)
Charlson comorbidity index			<0.001		
0	426,960 (92.1%)	635,008 (81.3%)		0.32	Ref
1	21,125 (4.6%)	59,485 (7.6%)		0.13	0.65 (0.64, 0.66)
2	7,388 (1.6%)	34,460 (4.4%)		0.17	0.44 (0.43, 0.45)
3+	8,099 (1.7%)	51,882 (6.6%)		0.25	0.34 (0.33, 0.34)
Past TBI exposure	104,568 (22.6%)	140,575 (18.0%)		0.11	1.19 (1.18, 1.19)
<b>Health service use</b>					
Past ED visit for mental health			<0.001		
None	423,140 (91.3%)	677,689 (86.8%)		0.14	Ref
>1 year one year prior to index TBI	11,272 (2.4%)	33,829 (4.3%)		0.11	0.65 (0.64, 0.66)
<= 1 year prior to index TBI	29,160 (6.3%)	69,317 (8.9%)		0.10	0.77 (0.76, 0.78)
Past hospitalization for mental health			<0.001		
None	450,232 (97.1%)	736,181 (94.3%)		0.14	Ref
>1 year one year prior to index TBI	3,432 (0.7%)	13,157 (1.7%)		0.09	0.55 (0.53, 0.56)
<= 1 year prior to index TBI	9,908 (2.1%)	31,497 (4.0%)		0.11	0.63 (0.62, 0.64)
History of consistent primary care	193,343 (41.7%)	357,143 (45.7%)	<0.001	0.08	0.90 (0.90, 0.91)
History of consistent psychiatrist care	31,301 (6.8%)	76,288 (9.8%)	<0.001	0.11	0.77 (0.76, 0.77)
<b>Lifetime mental health history</b>					
Any mental illness or substance use disorder (F00-F99)	120,441 (26.0%)	276,901 (35.5%)	<0.001	0.21	0.75 (0.74, 0.75)
Organic disorders (F00-F09)	7,722 (1.7%)	49,640 (6.4%)	<0.001	0.24	0.35 (0.34, 0.36)

Substance use disorders (F10-19)	39,734 (8.6%)	112,995 (14.5%)	<0.001	0.19	0.67 (0.66, 0.68)
Schizophrenia spectrum disorders (F20-29)	6,322 (1.4%)	22,464 (2.9%)	<0.001	0.11	0.58 (0.57, 0.60)
Mood disorders (F30-39)	40,926 (8.8%)	111,704 (14.3%)	<0.001	0.17	0.69 (0.69, 0.70)
Stressor/anxiety disorders (F40-48)	39,973 (8.6%)	100,665 (12.9%)	<0.001	0.14	0.74 (0.73, 0.75)
Behavioural disorders (F50-59)	1,476 (0.3%)	3,318 (0.4%)	<0.001	0.02	0.83 (0.79, 0.86)
Personality disorders (F60-69)	9,991 (2.2%)	28,746 (3.7%)	<0.001	0.09	0.69 (0.67, 0.70)
Learning disorders (F70-F79)	1,723 (0.4%)	4,503 (0.6%)	<0.001	0.03	0.74 (0.73, 0.75)
Developmental disorders (F80-F89)	12,202 (2.6%)	17,790 (2.3%)	<0.001	0.03	1.09 (1.08, 1.11)
Disorders of childhood onset (F90-F98)	37,683 (8.1%)	48,398 (6.2%)	<0.001	0.07	1.19 (1.18, 1.20)
Presence of dual diagnosis	22,131 (4.8%)	68,518 (8.8%)	<0.001	0.16	0.64 (0.63, 0.65)
History of self-harm	7,805 (1.7%)	21,802 (2.8%)	<0.001	0.07	0.70 (0.69, 0.72)
History of non-fatal overdose	14,527 (3.1%)	37,144 (4.8%)	<0.001	0.08	0.75 (0.74, 0.76)
Died during index event	962 (0.2%)	6,906 (0.9%)	<0.001	0.09	0.33 (0.31, 0.35)

CI: confidence interval; IQR: interquartile range; SD: standard deviation ; REF : reference category

<sup>1</sup>Risk ratio measuring the association between the baseline variable and likelihood of experiencing a SR-TBI, compared to TBI from other causes. Risk ratios greater than 1 indicate those with the baseline variable are more likely to experience a SRTBI while risk ratios less than 1 indicate individuals are more likely to experience a SR-TBI from a non-sports related cause.

Regarding mental illness/substance use disorders (see Figure 2), those with a SR-TBI were less likely than those with a SR-TBI from all other causes to have a previous presentation for organic disorders, substance use disorders, schizophrenia spectrum disorders, mood disorders, and anxiety and stressor-related disorders. Overall, those with a SR-TBI were less likely than those with a TBI from other causes to have a prior presentation for any mental illness or substance use disorder (26.0% vs. 35.5%) and less likely to have an indication of pre-existing dual diagnosis (i.e., presentations for both a mental illness and substance use disorder) compared to those with TBI from other causes (4.8% vs. 8.8%).



**Figure 2:** Percentage of unmatched cohort with 1+ lifetime indications for mental disorder by TBI type and ICD10 subchapter

## 4.2 Matched comparisons

After matching, the cohort included 408,559 individuals with a SR-TBI and 408,559 matched individuals with TBI from all other causes. The mean (standard deviation) age of the matched cohort was 26.6 ( $\pm 22.4$ ), while 59.4% were male (see Table 3). After matching, standardized differences suggested those with a SR-TBI were less likely to have any indication of a pre-existing mental illness or substance use disorder (26.9% vs. 33.3%) at the time of injury compared to those with TBI from other causes.

**Table 3.** Descriptive characteristics by TBI subtype (Matched comparisons; n=817,118)

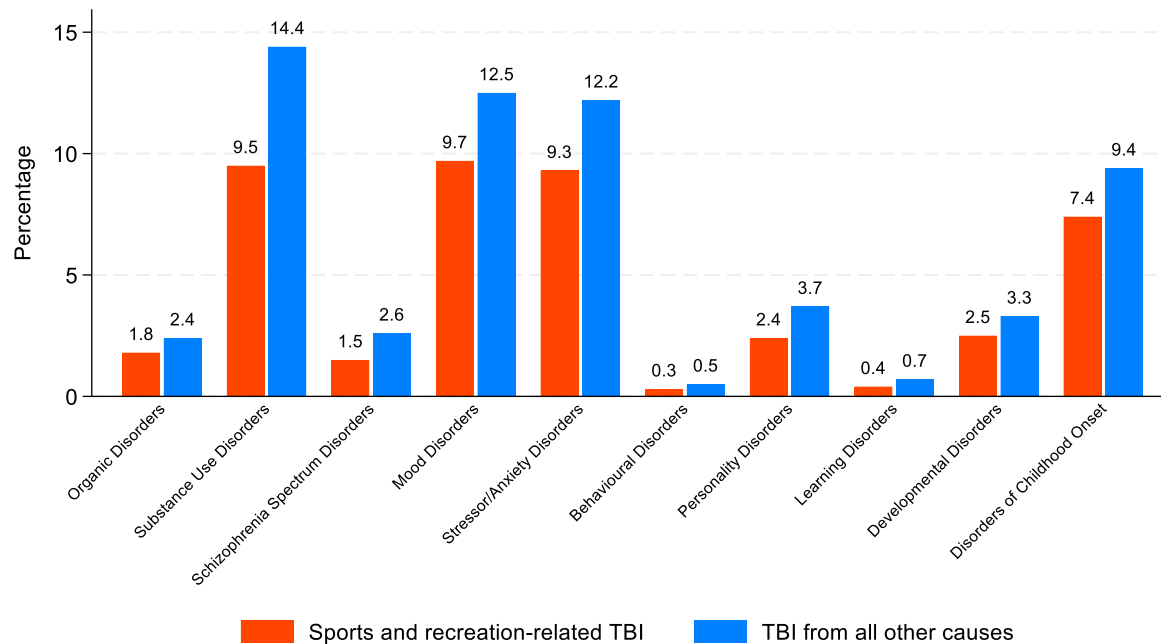
Measure	Sports-related TBI (n =408,559)	TBI from all other causes (n =408,559)	p-value	Standardized Difference
<b>Socio-demographics</b>				
Sex			1.00	0
Female	165,815 (40.6%)	165,815 (40.6%)		
Male	242,744 (59.4%)	242,744 (59.4%)		
Age (in years)			<0.001	
0-9	114,257 (28.0%)	115,135 (28.2%)		0.00
10-17	66,770 (16.3%)	61,989 (15.2%)		0.03
18-24	54,334 (13.3%)	58,218 (14.2%)		0.03
25-34	48,312 (11.8%)	48,323 (11.8%)		0.00
35-44	35,658 (8.7%)	35,652 (8.7%)		0.00
45-54	33,504 (8.2%)	33,497 (8.2%)		0.00



55-64	24,010 (5.9%)	24,025 (5.9%)		0.00
65-84	24,471 (6.0%)	24,484 (6.0%)		0.00
85+	7,243 (1.8%)	7,236 (1.8%)		0.00
Mean( $\pm$ SD)	26.62 (22.38)	26.63 (22.38)	0.84	0.00
Neighborhood income quintile			<0.001	
1 (lowest)	75,444 (18.5%)	92,181 (22.6%)		0.10
2	74,824 (18.3%)	81,594 (20.0%)		0.04
3	79,810 (19.5%)	80,126 (19.6%)		0.00
4	89,197 (21.8%)	77,892 (19.1%)		0.07
5 (highest)	87,519 (21.4%)	74,647 (18.3%)		0.08
Missing	1,765 (0.4%)	2,119 (0.5%)		0.01
Community size			<0.001	
Urban ( $\geq$ 10,000)	355,530 (87.0%)	357,610 (87.5%)		0.02
Rural (<10,000)	51,721 (12.7%)	49,329 (12.1%)		0.02
Missing	1,308 (0.3%)	1,620 (0.4%)		0.01
Ontario health region			<0.001	
West	120,014 (29.4%)	122,372 (30.0%)		0.01
Central	102,549 (25.1%)	95,771 (23.4%)		0.04
Toronto	64,808 (15.9%)	79,252 (19.4%)		0.09
East	94,985 (23.2%)	79,743 (19.5%)		0.09
Northeast	18,043 (4.4%)	20,219 (4.9%)		0.03
Northwest	8,160 (2.0%)	11,202 (2.7%)		0.05
Charlson comorbidity index			<0.001	
0	374,698 (91.7%)	366,326 (89.7%)		0.07
1	18,938 (4.6%)	22,635 (5.5%)		0.04
2	7,167 (1.8%)	8,611 (2.1%)		0.03
3+	7,756 (1.9%)	10,987 (2.7%)		0.05
Past TBI exposure	86,846 (21.3%)	86,949 (21.3%)	0.78	0.00
<b>Health service use</b>				
Past ED visit for mental health			<0.001	
None	370,353 (90.6%)	351,966 (86.1%)		0.14
>1 year one year prior to TBI	10,341 (2.5%)	19,753 (4.8%)		0.12
$\leq$ 1 year prior to TBI	27,865 (6.8%)	36,840 (9.0%)		0.08
Past hospitalization for mental health			<0.001	
None	395,880 (96.9%)	385,784 (94.4%)		0.12
>1 year one year prior to index TBI	3,131 (0.8%)	6,838 (1.7%)		0.08
$\leq$ 1 year prior to index TBI	9,548 (2.3%)	15,937 (3.9%)		0.09
History of consistent primary care	170,140 (41.6%)	168,258 (41.2%)		0.00

History of consistent psychiatrist care	29,501 (7.2%)	35,806 (8.8%)		0.06
<b><i>Lifetime mental health history</i></b>				
Any mental illness or substance use disorder (F00-F99)	109,810 (26.9%)	136,226 (33.3%)	<0.001	0.14
Organic disorders (F00-F09)	7,380 (1.8%)	9,639 (2.4%)	<0.001	0.04
Substance use disorders (F10-19)	38,978 (9.5%)	58,848 (14.4%)	<0.001	0.15
Schizophrenia spectrum disorders (F20-29)	6,185 (1.5%)	10,632 (2.6%)	<0.001	0.08
Mood disorders (F30-39)	39,727 (9.7%)	50,914 (12.5%)	<0.001	0.09
Stressor/anxiety disorders (F40-48)	37,998 (9.3%)	49,856 (12.2%)	<0.001	0.09
Behavioural disorders (F50-59)	1,381 (0.3%)	1,906 (0.5%)	<0.001	0.02
Personality disorders (F60-69)	9,762 (2.4%)	14,968 (3.7%)	<0.001	0.07
Learning disorders (F70-F79)	1,552 (0.4%)	2,685 (0.7%)	<0.001	0.04
Developmental disorders (F80-F89)	10,232 (2.5%)	13,368 (3.3%)	<0.001	0.04
Disorders of childhood onset (F90-F98)	30,240 (7.4%)	38,237 (9.4%)	<0.001	0.07
Presence of dual diagnosis	21,731 (5.3%)	35,874 (8.8%)	<0.001	0.14
History of self-harm	7,443 (1.8%)	13,394 (3.3%)	<0.001	0.09
History of non-fatal overdose	13,319 (3.3%)	20,358 (5.0%)	<0.001	0.09
IQR: interquartile range ; SD: standard deviation.				

For ICD-10 subchapter blocks (see Figure 3), after matching, differences between those with SR-TBI and TBI from other causes were observed for substance use disorders only (9.5% vs. 14.4%). Those with a SR-TBI were less likely to have indication for dual diagnosis (5.3% vs. 8.8%). Those with a SR-TBI were less likely to have any indication for a psychiatric hospitalization (3.1% vs 5.6%), as well as a past-year psychiatric ED visit (2.5% vs. 4.8%). Additionally, individuals with an SR-TBI were less likely to reside in the poorest neighbourhoods (18.5% vs 22.6%).



**Figure 3:** Percentage of matched cohort with 1+ lifetime indications for mental disorder, by TBI type and ICD10 subchapter

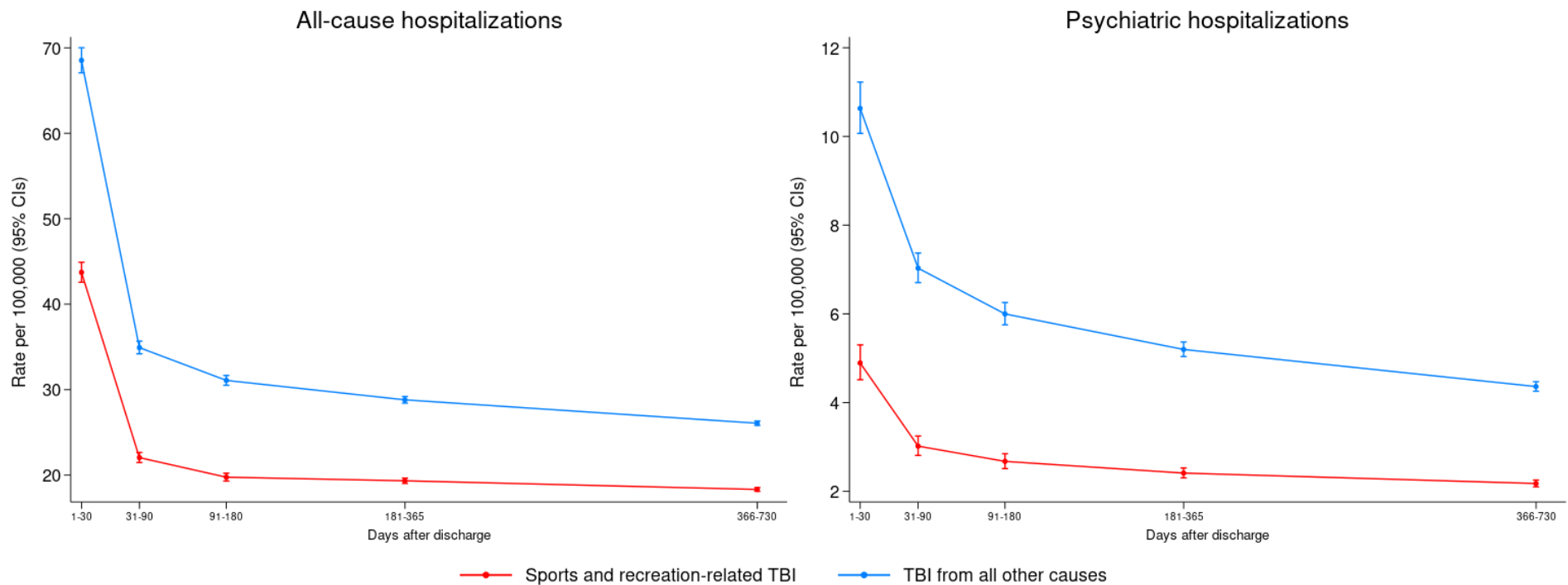
### 4.3 Rates of service use

As shown in Figure 4.1, the rates of all-cause and psychiatric hospitalization were highest for both SR-TBI and TBI from all other causes in the 30-day period following the index injury date, decreasing rapidly in the 31- to 90-day period before exhibiting a slower decline across the remaining study period. While this trend was apparent for both TBI groups, as shown in Table 4, incidence rate ratios (IRR) suggested that the piecewise rates of all-cause (adjusted IRRs range: 0.76-0.86; all  $p < 0.001$ ) and psychiatric hospitalization (adjusted IRRs range: 0.72-0.77; all  $p < 0.001$ ) were lower across all post-injury periods for those with a SR-TBI compared to TBI from all other causes, adjusting for baseline variables.

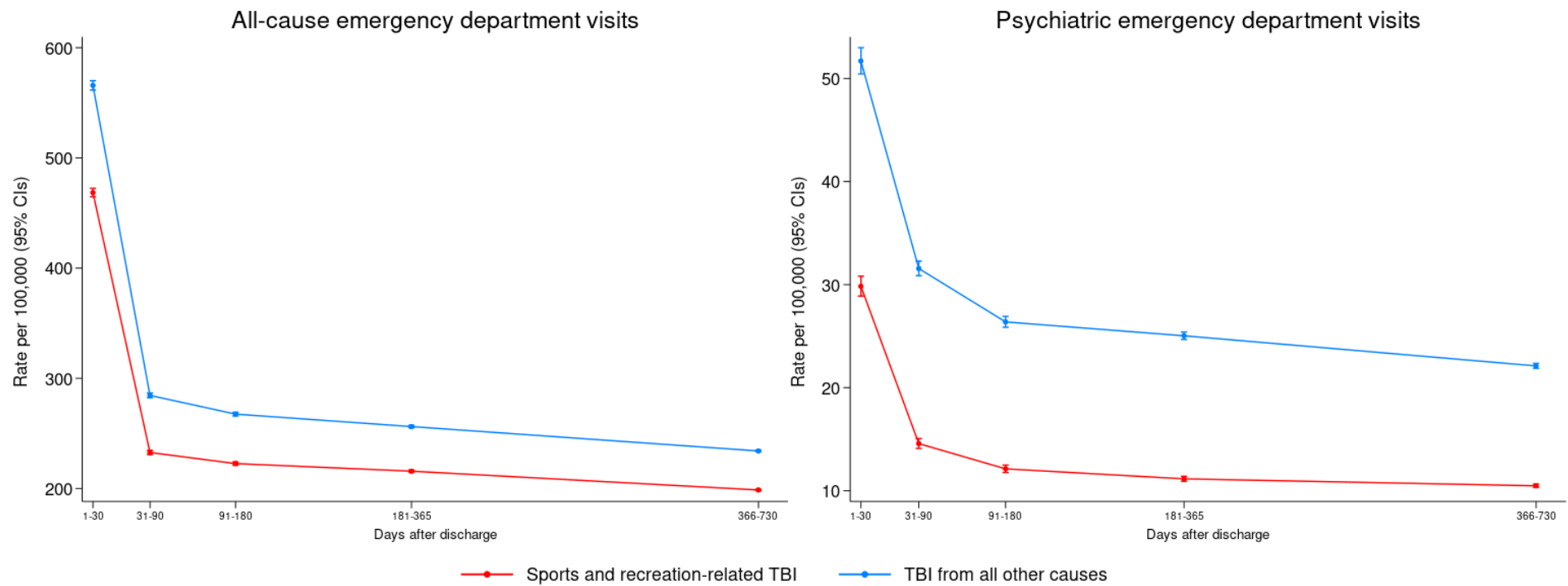
As displayed in Figure 4.2, similar trends in health service use were observed for all-cause and psychiatric ED visits for both SR-TBI and TBI from all other causes, with the highest rates observed in the 30-day period immediately after the index date, falling sharply in the 31- to 90-day period, before commencing a period of slower decline. As displayed in Table 4, the rates of all-cause ED visits (adjusted IRRs range: 0.94-0.98; all  $p < 0.001$ ) and psychiatric ED visits (adjusted IRRs range: 0.77-0.88; all  $p < 0.001$ ) were lower for those with a SR-TBI across all post-injury periods and this difference appeared to be particularly accentuated after the initial 30-day period.

As shown in Figure 4.3, the rates of all-cause and mental health-related outpatient general practitioner visits were also highest in the thirty-day period after the index date. As with hospitalizations and ED visits, the rates of outpatient visits declined sharply in the 31- to 90-day period. However, while the rates of all-cause visits continued to slowly decline thereafter, point estimates of the rates of mental-health related visits did not appear to decline further. As shown in Table 4, rates of all-cause general practitioner visits were lower across all post-injury periods (adjusted IRRs range: 0.94-0.97; all  $p < 0.001$ ) for those with a SR-TBI compared to TBI from all other causes. Similar differences were also observed for mental health-related general practitioner visits, however the reduction in the rates of mental health-related general practitioner visits for those with SR-TBI appeared to be greater in magnitude across all post-injury periods (adjusted IRRs range: 0.81-0.83;  $p < 0.001$ ).

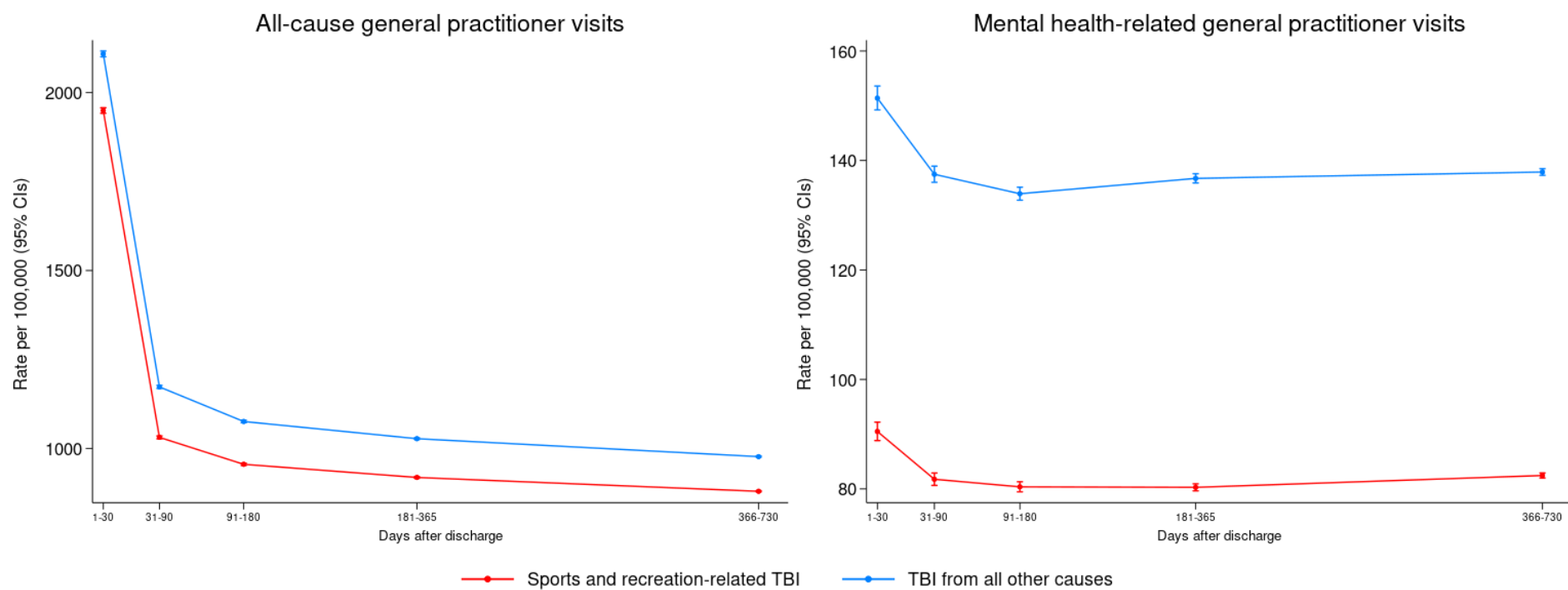
Lastly, as displayed in Figure 4.4, outpatient visits to psychiatrists appeared less impacted by time since the index date. A small reduction in rates was observed for those with a TBI from all other causes, while rates for those with a SR-TBI appeared similar across the observation window. When the rates of psychiatrist visits after SR-TBI and TBI from all other causes were compared, they did not differ in the initial thirty-day period (adjusted IRR = 0.97; 95%CI: 0.94-1.00;  $p = 0.070$ ) after adjusting for baseline variables. However, the rates of psychiatrist visits between the TBI groups differed after the 30-day period, with lower rates observed in those with a SR-TBI (adjusted IRRs range: 0.92-0.95;  $p < 0.001$ ) after controlling for baseline variables.



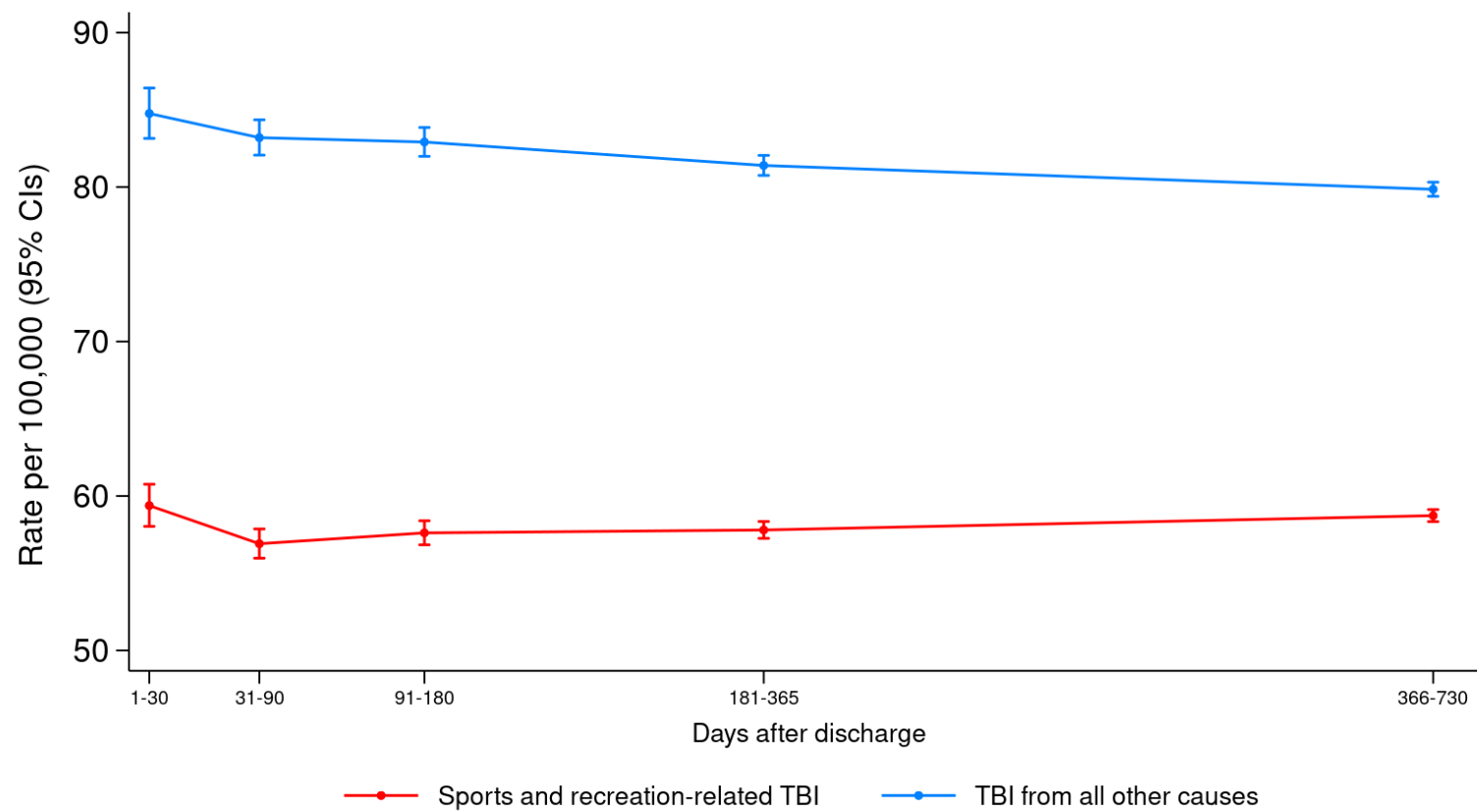
**Figure 4.1: Piecewise rates of all-cause and psychiatric hospitalizations, by TBI-type**



**Figure 4.2: Piecewise rates of all-cause and psychiatric emergency department visits, by TBI-type**



**Figure 4.3: Piecewise rates of all-cause and mental health-related general practitioner visits, by TBI-type**



**Figure 4.4: Piecewise rates of outpatient psychiatrist visits, by TBI-type**



**Table 4.** Association of TBI-type with rates of all-cause and psychiatric service use

Indicator	Days after index date	Rate per 100,000 (95% CI)		Unadjusted comparison		Adjusted comparison <sup>i</sup>	
		SR-TBI (n=408,559)	TBI from all other causes (n=408,559)	Incidence Rate Ratio <sup>ii</sup> (95% Cis)	p-value	Incidence Rate Ratio <sup>ii</sup> (95% Cis)	p-value
All-cause hospitalizations	1-30 days	43.72 (42.58, 44.91)	48.53 (67.08, 70.01)	0.64 (0.62, 0.66)	<0.001	0.76 (0.74, 0.79)	<0.001
	31-90 days	22.05 (21.47, 22.65)	34.92 (34.19, 35.67)	0.63 (0.61, 0.65)	<0.001	0.79 (0.77, 0.82)	<0.001
	91-180 days	19.76 (19.31, 20.22)	31.08 (30.51, 31.66)	0.64 (0.62, 0.65)	<0.001	0.80 (0.77, 0.82)	<0.001
	181-365 days	19.34 (19.03, 19.66)	28.81 (28.42, 29.20)	0.67 (0.66, 0.69)	<0.001	0.83 (0.82, 0.85)	<0.001
	366-730 days	18.33 (18.11, 18.54)	26.08 (25.82, 26.34)	0.70 (0.69, 0.71)	<0.001	0.86 (0.85, 0.88)	<0.001
Psychiatric hospitalizations	1-30 days	4.89 (4.52, 5.30)	10.63 (10.07, 11.23)	0.46 (0.42, 0.51)	<0.001	0.74 (0.67, 0.82)	<0.001
	31-90 days	3.02 (2.81, 3.24)	7.03 (6.71, 7.37)	0.43 (0.39, 0.47)	<0.001	0.72 (0.66, 0.79)	<0.001
	91-180 days	2.67 (2.51, 2.85)	6.00 (5.75, 6.26)	0.45 (0.41, 0.48)	<0.001	0.72 (0.67, 0.78)	<0.001
	181-365 days	2.41 (2.30, 2.53)	5.20 (5.04, 5.37)	0.46 (0.44, 0.49)	<0.001	0.75 (0.71, 0.79)	<0.001
	366-730 days	2.18 (2.10, 2.25)	4.36 (4.26, 4.47)	0.50 (0.48, 0.52)	<0.001	0.77 (0.74, 0.81)	<0.001
All-cause ED visits	1-30 days	468.51 (464.69, 472.35)	565.76 (561.56, 569.99)	0.83 (0.82, 0.84)	<0.001	0.94 (0.93, 0.95)	<0.001
	31-90 days	232.74 (230.84, 234.66)	284.51 (282.40, 286.63)	0.82 (0.81, 0.83)	<0.001	0.96 (0.95, 0.97)	<0.001
	91-180 days	222.65 (221.13, 224.19)	267.52 (265.85, 269.20)	0.83 (0.82, 0.84)	<0.001	0.97 (0.96, 0.98)	<0.001
	181-365 days	215.78 (214.72, 216.83)	256.23 (255.08, 257.38)	0.84 (0.84, 0.85)	<0.001	0.97 (0.97, 0.98)	<0.001
	366-730 days	198.72 (198.00, 199.44)	234.09 (233.30, 234.88)	0.85 (0.84, 0.85)	<0.001	0.98 (0.97, 0.98)	<0.001
Psychiatric ED visits	1-30 days	29.84 (28.89, 30.82)	51.70 (50.45, 52.99)	0.58 (0.55, 0.60)	<0.001	0.88 (0.85, 0.92)	<0.001
	31-90 days	14.58 (14.11, 15.06)	31.57 (30.87, 32.28)	0.46 (0.44, 0.48)	<0.001	0.79 (0.76, 0.83)	<0.001

	91-180 days	12.12 (11.77, 12.49)	26.38 (25.86, 26.92)	0.46 (0.44, 0.48)	<0.001	0.80 (0.77, 0.83)	<0.001
	181-365 days	11.16 (10.91, 11.40)	25.04 (24.68, 25.40)	0.45 (0.43, 0.46)	<0.001	0.77 (0.75, 0.79)	<0.001
	366-730 days	10.48 (10.31, 10.65)	22.11 (21.87, 22.36)	0.47 (0.46, 0.48)	<0.001	0.80 (0.78, 0.81)	<0.001
All-cause GP visits	1-30 days	1,949.57 (1,941.77, 1,957.41)	2,108.62 (2,100.50, 2,116.77)	0.92 (0.92, 0.93)	<0.001	0.96 (0.95, 0.96)	<0.001
	31-90 days	1,031.24 (1,027.22, 1,035.28)	1,173.06 (1,168.78, 1,117.37)	0.88 (0.87, .88)	<0.001	0.94 (0.94, 0.95)	<0.001
	91-180 days	955.53 (952.36, 958.70)	1,075.94 (1,072.58, 1,079.31)	0.89 (0.88, 0.89)	<0.001	0.95 (0.95, 0.96)	<0.001
	181-365 days	918.60 (916.44, 902.78)	1,027.59 (1,025.29, 1,029.89)	0.89 (0.89, 0.90)	<0.001	0.96 (0.96, 0.97)	<0.001
	366-730 days	879.71 (878.19, 881.23)	977.23 (975.62, 978.84)	0.90 (0.90, 0.90)	<0.001	0.97 (0.97, 0.97)	<0.001
Mental health- related GP visits	1-30 days	90.49 (88.82, 92.20)	151.40 (149.24, 153.60)	0.60 (0.58, 0.61)	<0.001	0.82 (0.80, 0.84)	<0.001
	31-90 days	81.76 (80.64, 82.90)	137.48 (136.02, 138.96)	0.59 (0.58, 0.61)	<0.001	0.83 (0.81, 0.84)	<0.001
	91-180 days	80.38 (79.46, 81.30)	133.92 (132.74, 135.12)	0.60 (0.59, 0.61)	<0.001	0.83 (0.82, 0.84)	<0.001
	181-365 days	80.28 (79.64, 80.92)	136.74 (135.90, 137.58)	0.59 (0.58, 0.59)	<0.001	0.81 (0.80, 0.82)	<0.001
	366-730 days	82.44 (81.98, 82.92)	137.89 (137.29, 138.50)	0.60 (0.59, 0.60)	<0.001	0.81 (0.81, 0.82)	<0.001
Outpatient psychiatrist visits	1-30 days	59.40 (58.03, 60.76)	84.77 (83.15, 86.41)	0.70 (0.68, 0.72)	<0.001	0.97 (0.94, 1.00)	0.070
	31-90 days	56.91 (55.97, 57.87)	83.20 (82.07, 84.36)	0.68 (0.67, 0.70)	<0.001	0.93 (0.91, 0.95)	<0.001
	91-180 days	57.61 (56.80, 58.39)	82.92 (81.99, 83.86)	0.69 (0.68, 0.71)	<0.001	0.93 (0.92, 0.95)	<0.001
	181-365 days	57.80 (57.26, 58.35)	81.40 (80.76, 82.05)	0.71 (0.70, 0.72)	<0.001	0.94 (0.93, 0.95)	<0.001
	366-730 days	58.73 (58.33, 59.12)	79.86 (79.40, 80.32)	0.74 (0.73, 0.74)	<0.001	0.95 (0.94, 0.96)	<0.001

ED: emergency department; GP: general practitioner; CI: confidence interval  
Cohort matched on sex, date of birth ( $\pm 365$  days) and index date ( $\pm 365$  days)

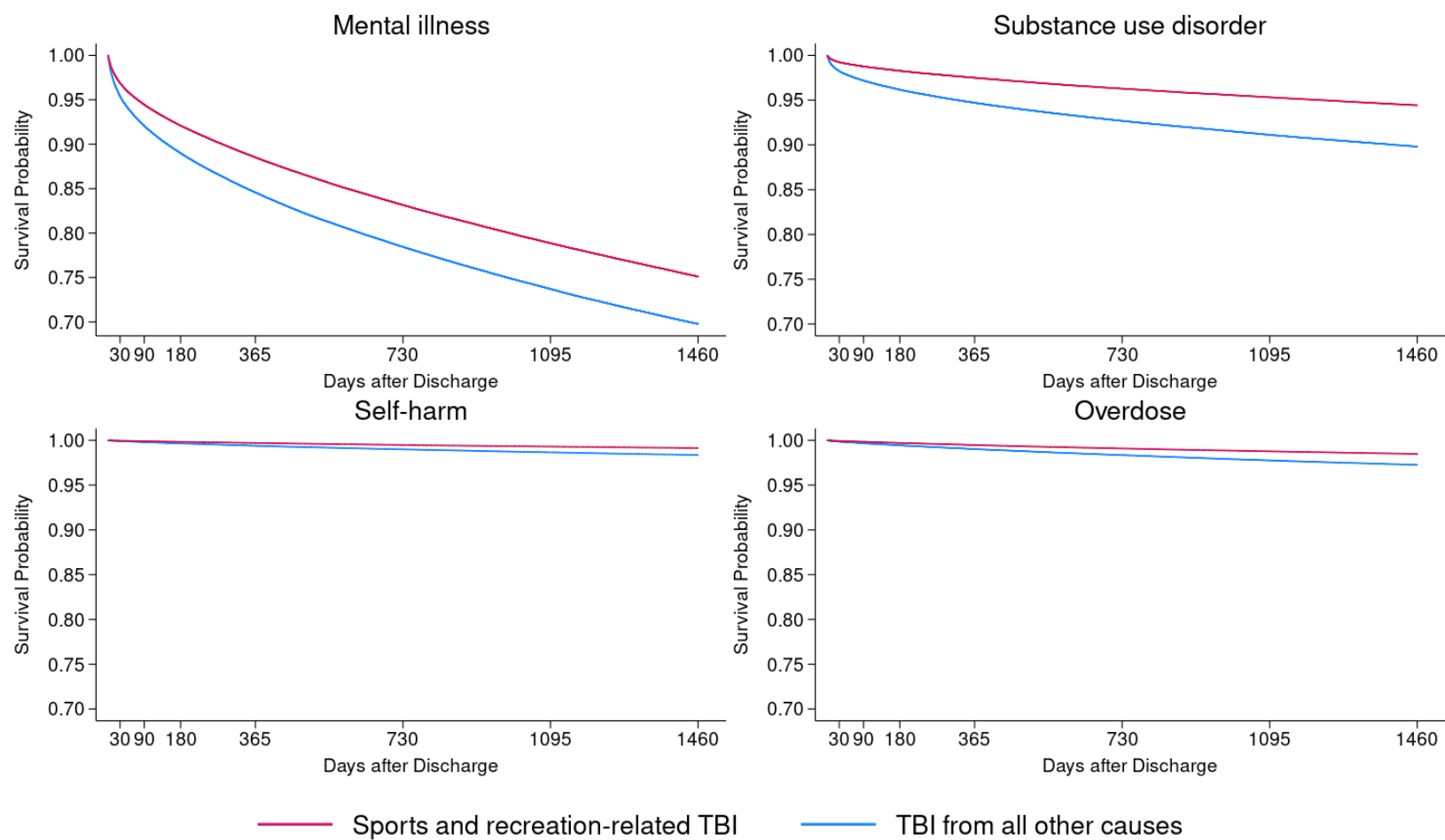
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<sup>i</sup>Adjusting for neighbourhood income quintiles, rurality, Ontario health region, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and history of mental health/substance use indications at baseline.

<sup>ii</sup>Comparing rate of outcomes for SR-TBI, compared to TBI from all other causes

#### **4.4 Timing and likelihood of service use**

Compared to those with a TBI from all other causes, those with a SR-TBI were less likely to have a contact for psychiatric reasons across the four-year study period after the index injury date. As shown in Table 5, compared to TBI from all other causes, the largest decrease in the rates of psychiatric-related health service contact for those with SR-TBI was for contact related to substance use disorder (adjusted hazard rate ratio (HR) = 0.71; 95%CI: 0.70-0.72), followed by overdose (adjusted HR = 0.74; 95%CI: 0.72-0.77), and self-harm (adjusted HR = 0.76; 95%CI: 0.72-0.79). Likelihood of contact for a mental illness was lower in those with a SR-TBI, though this difference was smaller in magnitude (adjusted HR = 0.90; 95%CI: 0.89- 0.90). In absolute terms, for both SR-TBI and TBI from all other causes the likelihood of contact across the four-year study period was highest for mental illness (24.6% vs. 29.8%, respectively), followed by substance use disorder (5.5% vs 10.0%), overdose (1.5% vs. 2.7%), and self-harm (0.8% vs 1.6%). As shown in Figure 5, likelihood of making contact for a mental illness or substance use disorder was highest in the first 30 days after discharge. Conversely, likelihood of making contact for self-harm or overdose appeared relatively steady across the four-year study period. Findings from the non-parametric survival analysis (not shown) were consistent with those of our primary Cox proportional hazards analyses.



**Figure 5: Time to first indication of psychiatric service use, by TBI-type and mental disorder category**

**Table 5.** Association of TBI-type with subsequent service use and all-cause mortality up to four years post-index date

	Proportion		Unadjusted comparison		Adjusted comparison <sup>i</sup>	
	Sports-related TBI (n =408,559)	TBI from all other causes (n =408,559)	Hazard Ratio <sup>ii</sup> (95% Cis)	p-value	Hazard Ratio <sup>ii</sup> (95% Cis)	p-value
Mental illness	100,389 (24.6%)	121,614 (29.8%)	0.79 (0.78, 0.79)	<0.001	0.90 (0.89, 0.90)	<0.001
Substance use disorder	22,381 (5.5%)	40,832 (10.0%)	0.53 (0.52, 0.54)	<0.001	0.71 (0.70, 0.72)	<0.001
Self-harm	3,461 (0.8%)	6,547 (1.6%)	0.52 (0.50, 0.55)	<0.001	0.76 (0.72, 0.79)	<0.001
Overdose	6,092 (1.5%)	10,919 (2.7%)	0.55 (0.53, 0.57)	<0.001	0.74 (0.72, 0.77)	<0.001
30-day outpatient follow up	43,218 (10.6%)	33,540 (8.2%)	1.30 (1.28, 1.32)	<0.001	1.25 (1.23, 1.27)	<0.001
All-cause mortality	10,805 (2.6%)	15,482 (3.8%)	0.69 (0.68, 0.71)	<0.001	0.84 (0.82, 0.86)	<0.001

CI: confidence interval.

Cohort matched on sex, date of birth ( $\pm 365$  days) and index date ( $\pm 365$  days)

<sup>i</sup>Adjusting for neighbourhood income quintiles, rurality, Ontario health region, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and history of mental health/substance use indications at baseline.

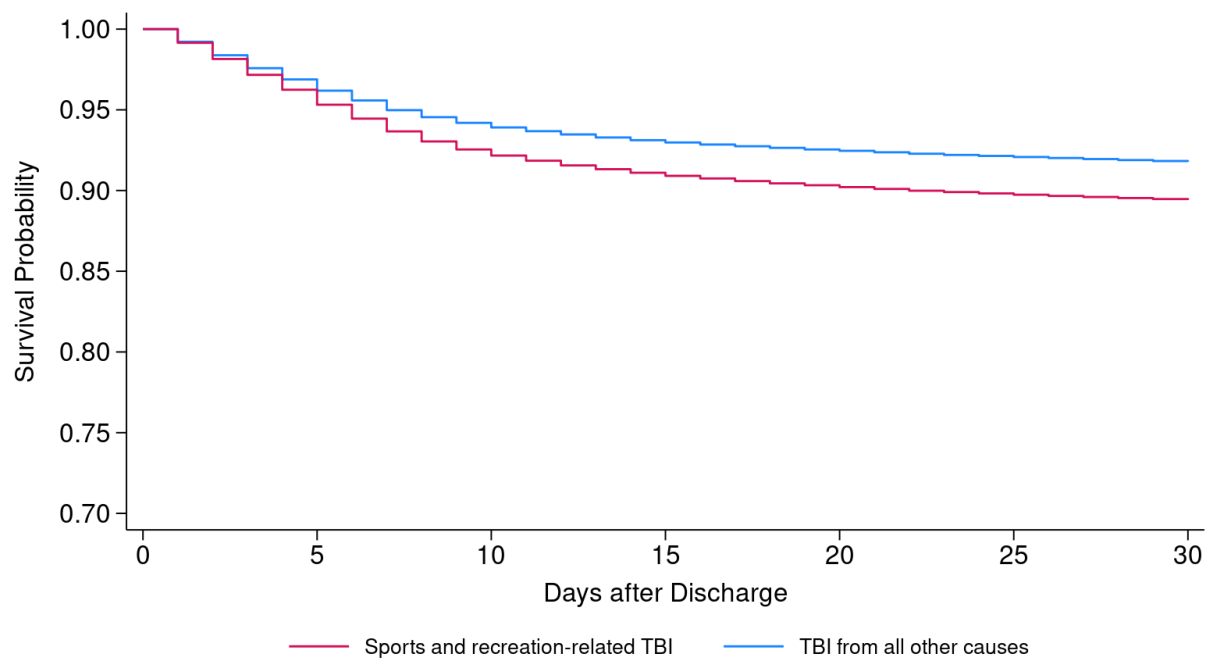
<sup>ii</sup>Risk of outcome for SR-TBI group, compared to TBI from all other causes

#### 4.5 30-day post injury period

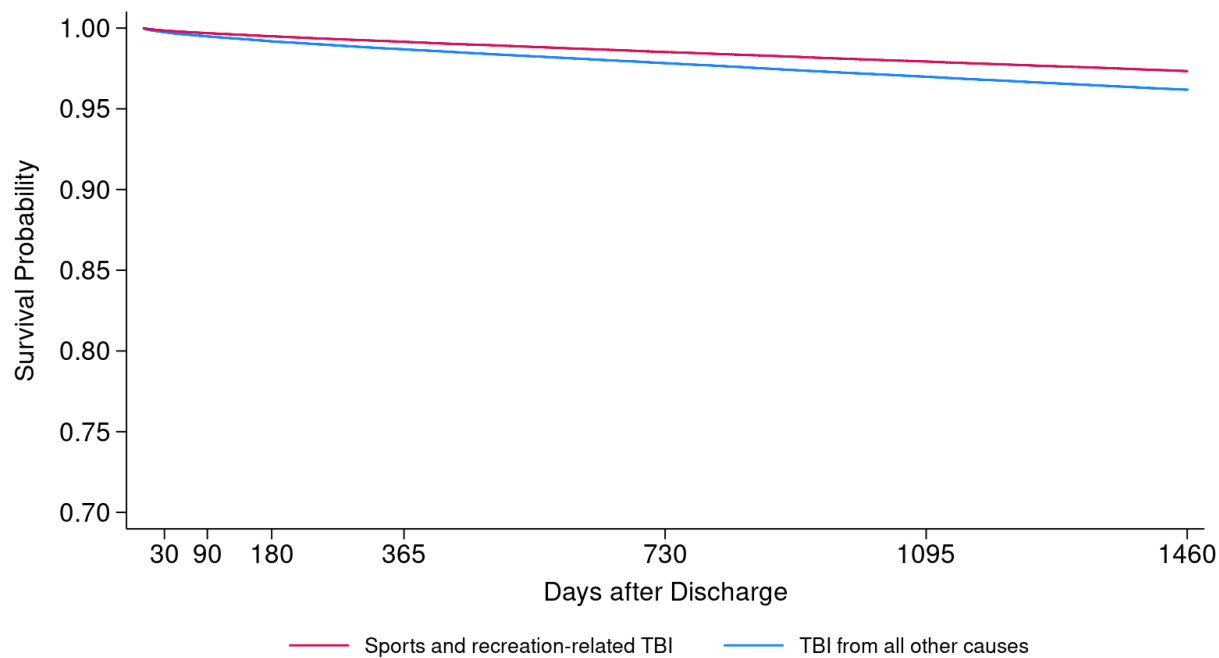
As shown in Table 5, those with a SR-TBI were more likely to have had an outpatient follow-up for TBI in the 30-day period after the index injury date compared to those with a TBI from all other causes (adjusted HR = 1.25; 95%CI: 1.23-1.27). In absolute terms, the likelihood of outpatient follow-up was relatively low for those with a SR-TBI and TBI from all other causes (10.6% and 8.2%, respectively). As shown in Figure 6, likelihood of follow-up was highest in the first ten days post-index injury date.

#### 4.6 All-cause mortality

As shown in Table 5, all-cause mortality was lower in those with a SR-TBI (adjusted HR = 0.84; 95%CI: 0.82-0.86). Although the risk of death was relatively low for both groups, with 2.6% of those with a SR-TBI and 3.8% of those with a TBI from all other causes dying across the four-year study period after the index injury. Moreover, for both groups risk of death appeared consistent across the four-year period (see Figure 7).



**Figure 6: Thirty-day outpatient follow-up for TBI, by TBI-type**



**Figure 7: All-cause mortality, by TBI-type**

## 4.7 Subgroup analyses

Findings from the subgroup analyses are shown in the appendix (see Tables S5-S14). The observed differences in the rates and timing of service use between those with an SR-TBI and a TBI from all other causes among levels of the socio-demographic indicators were largely consistent with that of our overall analysis. However, differences in rates of psychiatric help seeking by TBI-type were less pronounced or non-existent among the youngest (0-9 years old) and oldest age groups (65+ years old), with the former having the lowest absolute rates of help seeking for these challenges in the cohort.

## 5.0 Discussion

In this study, we examined the timing and burden of psychiatric and non-psychiatric service use for individuals discharged from acute care settings with a SR-TBI, compared to those discharged with a TBI from all other causes using a matched cohort design. Over a ten-year period, we found that SR-TBI accounts for over one-third of all hospital treated TBI in Ontario with hospitals attending to approximately 46,000 incident cases of SR-TBI per annum during this period. However, this annual rate peaked at 49,500 in 2011 and reduced to 42,000 in 2018 and 2019.

There were potentially meaningful baseline differences in the burden of mental illness among those presenting for SR-TBI compared to all other TBI cases, with evidence of a lower burden of pre-existing organic disorders, substance use disorders, schizophrenia spectrum disorders, mood disorders, and anxiety/stressor disorders for those who experienced SR-TBI. However, after matching on sex, date of birth, and year of injury, only the burden of substance use disorders remained lower for the SR-TBI group.

We observed that the highest rates of psychiatric and non-psychiatric service use were in the thirty-day period immediately after discharge from hospital for SR-TBI and TBI from all other causes, with substantial reductions in the rates of service use thereafter over a two-year study period. One exception to this was the rate of psychiatrist visits, which were sustained across the observation period. These trends were observed for both those discharged with a SR-TBI and those discharged with a TBI from all other causes. However, our findings did indicate that those with a SR-TBI accessed services at comparatively lower rates across the two-year period after discharge. While the absolute differences were small for all-cause visits, ranging from 2% to 6% fewer all-cause emergency department visits for the SR-TBI group, and likewise 3% to 6% fewer for outpatient care, more substantial differences in rates of service use were observed for psychiatric help seeking. For example, rates of psychiatric ED visits

were 12% to 20% lower for the SR-TBI group across the observation period, while outpatient visits to a primary care provider for mental health reasons were 17% to 19% lower. Differences in hospitalizations were more substantial, ranging between 14% and 24% lower rates of all-cause hospitalizations, and 23% and 28% lower rates of psychiatric hospitalizations for those with SR-TBI.

However, in absolute terms, likelihood of seeking care for psychiatric conditions was low for both groups. The most prominent reason for seeking help was mental illness, with 24.6% of the SR-TBI group and 29.6% of the TBI from all other causes group seeking care for these reasons over the four year study period after injury. Conversely, relatively few individuals sought care for harmful substance use, self-harm, and/or overdose.

Finally, we observed a 25% higher likelihood of thirty-day outpatient follow up for those with a SR-TBI, though in absolute terms, the cumulative likelihood of help seeking was low for both those with a SR-TBI (10.6%) as well as those with TBI from all other causes (8.2%).

### **5.1 Implications for Policy and Practice**

Previous research has identified rising rates of emergency department visits for all-cause TBI in Ontario.<sup>3</sup> We observed similar increases in the absolute numbers of cases of TBI from all other causes over our accrual period, which was largely drawn from ED settings in our study (~95% of cases), reflecting established trends from Canada.<sup>17,37</sup> However, this was due to rising rates of TBI from all other causes, and annual incident cases of SR-TBI did not increase over the accrual window. In fact, the incident cases appeared to drop in 2018 and 2019 from a peak in 2011. One potential explanation for these relatively static or potentially declining rates of SR-TBI presenting to acute care settings is that the identification and care for mild TBI is increasingly being handled in outpatient settings.<sup>17</sup> Unfortunately, outpatient data in Ontario do not capture mechanisms for injuries such that we are unable to ascertain if an injury is sports-related from outpatient records alone. As such, we were not able to use these records to identify cases in our study. Nevertheless, our study establishes a high burden of SR-TBI in hospital settings, with between 49,505 and 42,008 visits per year for SR-TBIs from 2010 to 2019.

Our case ascertainment algorithm was originally used by Fu and colleagues<sup>5</sup> to identify healthcare costs associated with TBI in Ontario using administrative data. In that study, the researchers identified sports-related injuries to be a significant burden of costs associated with TBI, estimating the total annual lifetime costs of TBI treated in emergency departments in Ontario to be \$945,000,000, of which



\$81,928,000 was attributable to sports-related injuries, with another \$31,155,000 attributable to bicycle-related injuries (all costs in 2009 CAD). However, due to our broader definition of sports-related injuries to include recreational activities, the burden of TBI attributable to sports activities was more than three times higher in our study (37% vs. 12%), which may have important implications for ascertaining SR-TBI burden and its associated costs. Additional research is needed to estimate the healthcare costs of SR-TBI using our broader definition of sports and recreation-related injuries, as well as to assess the influence of SR-TBI on psychiatric care costs post-injury.

Our study is one of the few studies to examine the burden of psychiatric care in Ontario after TBI, including SR-TBIs. A previous study<sup>4</sup> from Ontario identified pre-existing psychiatric disorders as a risk factor for outpatient specialist visits post all-cause TBI, including outpatient psychiatric care. Our study suggests that rates of outpatient psychiatrist visits were largely static in the two years post-injury, with only small relative differences observed between those with and without a SR-TBI after accounting for baseline differences in mental health status. The lack of change in rates of psychiatrist visits regardless of TBI-type is possibly influenced by well-known barriers accessing specialist care in such a short period, such as referral requirements and long wait times.<sup>38</sup> One potential interpretation of our findings is that the increased burden of psychiatric care in the 30 day post-injury period is being handled by a combination of primary care physicians and through emergency care settings, rather than by referral to specialist care. Research has suggested many Ontarians in need of psychiatric care first access services in emergency departments for conditions that could have been treated adequately in outpatient settings.<sup>39</sup> The heightened rates of emergency department use for psychiatric care in the thirty days after discharge may indicate that those recovering from a SR-TBI are experiencing challenges reaching appropriate outpatient and/or specialist care.

Taken together, our findings suggest that there is a lower rates of psychiatric service use after SR-TBI, compared to TBI from all other causes after accounting for differences in sex, age, and year of injury and adjusting for differences in other socio-demographics, pre-existing medical comorbidities and mental disorders, self-harm and non-fatal overdose behaviour, and prior health service use patterns. This finding reflects those of Ntikas and colleagues<sup>22</sup> who reported fewer anxiety and PTSD symptoms at three months, and fewer depression, anxiety and PTSD symptoms and six-month in those with SR-TBI compared to TBI from all other causes. Conversely, Beauchamp and colleagues<sup>29</sup> found no differences in psychiatric symptoms 90 days post-injury. In both studies, the authors attributed quick return to

physical activity among those with sports-related injuries as a possible protective factor against poor psychiatric outcomes. With regards to our findings, it is plausible that physical activity also moderates service access for psychiatric care post-injury such that participation in sports and related recreational activities confers a protective effect on subsequent psychiatric care needs due to fewer TBI symptoms post-injury. The protective effect of physical activity has been well studied, with research showing that physical activity moderates the risk of psychiatric health outcomes including depression<sup>40</sup> as well as later-in-life risk for dementia.<sup>41</sup> In youth, physical activity interventions may reduce the burden of depressive symptoms.<sup>42</sup> Moreover, physical activity may have longer term benefits years after a TBI. One study on cognitive functioning in adults age 50 to 90 showed poorer long-term outcomes among those with lifetime history of TBI from all other causes, compared to SR-TBI,<sup>43</sup> which the authors attributed to differences in physical activity between SR-TBI and TBI from all other causes.

However, the interpretation that involvement in physical activity is a primary factor behind the lower rates of psychiatric service use seen in sports-related injuries is limited by our methodology. Exposure status was determined by injury type, and individuals who incurred a TBI from an activity unrelated to sports (e.g., a car accident or fall), may nevertheless be highly engaged with the positive health factors associated with sports involvement, such as frequent physical activity. Unfortunately, information on factors such as physical activity is not captured in administrative data, and it is unknown the degree to which our findings are influenced by the inability to control for potential confounds related to personal health behaviours such as diet and exercise. Moreover, due to data limitations, we were not able to assess either injury severity or mental health symptomology, and the influence of these factors on rates and timing of psychiatric service use post-injury is unknown.

There are potential psychosocial factors that could explain the lower rates of post-TBI service use among those involved in sports. In their review of help seeking for mental illness among athletes, Cosh and colleagues<sup>44</sup> identified several unique barriers that athletes may encounter in regards to psychiatric help seeking, including stigma, lack of awareness or literacy around mental illness, confidentiality concerns and negative views of health services. For some athletes, their self-identities may be rooted in concepts of strength and toughness which can dissuade help seeking for psychiatric challenges due to a fear of appearing weak. Relatedly, some athletes involved in organized sports may fear that being identified with having a mental disorder may lead to them being passed over on the field in favour of other athletes, such that seeking help is avoided. Moreover, athletes may not be aware of the symptoms

associated with mental disorders, instead associating their symptoms with fatigue rather than an underlying disorder, while some athletes may perceive their symptoms as being not serious enough to warrant seeking formal help.

Another alternative explanation for lower rates of psychiatric service use in individuals with a SR-TBI is that these individuals may be accessing services outside of the public healthcare system at a greater rate. Thus, even if these individuals seek care for the TBI in hospital, it is possible that psychiatric services accessed afterwards is handled through private care pathways including therapists and other services paid either out of pocket or by private insurance plans. Additionally, in organized sports and other team-based settings, private caregivers may be rostered and paid for by sports organization, which would not be captured in administrative data. Understanding whether the reduced rates of health service use after SR-TBI is due to factors that improve resilience and recovery or is an indication of a lack of appropriate TBI aftercare among sports athletes is a critical area for further investigation.

## **5.2 Limitations**

Our findings are limited by several factors. Foremost, health administrative data only captures encounters with the public healthcare system, and we were unable to assess the influence of receipt of non-public healthcare (e.g., therapies covered by private insurance or paid out of pocket). Additionally, this means that those who did not seek help after their TBI were not included in our study. A related limitation is that we were unable to ascertain whether TBIs treated in outpatient settings were sports and recreation-related, as the databases that include these encounters do not have information on the activities that were associated with the TBIs. Thus, we opted to control for outpatient visits for TBI, rather than include them in our sampling frame for identifying cases. Moreover, we did not account for injury severity or severity of mental health symptomology as this information is not reliably captured across the data sources. Likewise, several personal health behaviours that may influence recovery post-injury were not accounted for due to data limitations, including levels of physical activity.

## **5.3 Recommendations**

We make the following recommendations based upon our findings:

- The highest period of need for psychiatric care for those treated in acute care settings for any TBI is in the thirty days after discharge. However, this heightened burden of need seems to be handled by general practitioners and in emergency departments, rather than in specialist settings.

Specialist referrals at discharge, including to bridging services, may help streamline access to specialist psychiatric care during this transient period of increased risk.

- Education for general practitioners on the psychiatric impacts of TBI may be beneficial for individuals who seek care through that pathway.
- Programming to address stigma and challenge attitudes associating seeking care with weakness may encourage athletes to seek help when experiencing poor mental health post-injury.
- Help seeking for psychiatric care after TBI appears lower in those with a SR-TBI, even after accounting for existing psychiatric care needs, age, and medical comorbidities. Care pathways for those involved in sports may need to be tailored to the unique psychosocial factors and culture that sports athletes experience. It is not possible to establish that the lower relative rate of psychiatric service access in those with SR-TBI stems from a real gap in access or from factors inherent to sports athletes that are associated with increased resilience and improved TBI recovery. Nonetheless, our findings suggest that proactive screening at discharge from acute care, and early follow up in outpatient settings to gauge ongoing specialist psychiatric care need is warranted.
- Interventions for SR-TBI in organized sporting settings, including return-to-play rules, should include routine assessment of psychiatric care need. Added requirements for the assessment of psychiatric service use needs during recovery and prior to return-to-play should occur in the roll out of interventions stemming from Rowan's Law. Organized sports among school aged youth are a critical site for needs assessment given the high burden of SR-TBI among this age group.
- For SR-TBIs acquired in unorganized sports as well as recreational activities, there may be fewer formal sites to engage in interventions after discharge from acute care settings post-injury. This group may especially benefit from needs assessment occurring in hospital immediately prior to discharge.

## 5.4 Future research

Additional research is warranted to expand upon our findings. Data triangulation approaches, where survey data are linked to health administrative records offer one possible solution to the data limitations inherent in administrative data. For instance, the recurring Canadian Community Health Survey routinely collects self-report data on brain injuries as well as socio-demographic factors not routinely collected in administrative data (e.g., education; house hold income; physical activity). These data are

routinely linked to health administrative data, and future research drawing on these complimentary data sources may help investigate the influence of these factors on psychiatric service use post-injury.

Future research is needed to assess the influence of government mandated interventions on rates of service use for SR-TBI, as well as subsequent psychiatric service use patterns among those who have been discharged for these injuries. Difference-in-difference models, which measure changes in ecological trends creditable to public health interventions at the population level are one suggestion for assessing the influence of government interventions on rates of service use. Such data may help assess the impact of suites of interventions launched as part of Rowan's Law.

Research has shown that subsequent SR-TBIs may have an additional effect on the risk for poor cognitive and psychiatric outcomes.<sup>45</sup> Advanced causal models such as the self-controlled case series,<sup>46</sup> which allows researchers to compare distinct risk periods within individuals (e.g., comparing risk prior to first TBI, after first TBI, after second TBI), may be useful for understanding how psychiatric service use changes as individuals experience additional TBIs. Additionally, longitudinal research examining how sociodemographic factors, psychiatric and non-psychiatric comorbidities, and the clinical course of care post discharge (e.g., timely outpatient follow-up) is needed to understand how these factors might influence risk for subsequent SR-TBIs after discharge. Such data may be useful for identifying sites for intervention to help prevent the occurrence of subsequent injuries.

## **6.0 Conclusion**

Sports and recreation-related TBI is a highly prevalent and costly challenge to the healthcare system in Ontario which may be associated with lasting psychiatric impacts. Compared to individuals with TBI from all other causes, individuals discharged from hospital settings after a sports and/or recreation-related TBI have lower rates of psychiatric service use, and are less likely to visit a healthcare provider for common mental disorders after injury which may suggest a lower care burden of subsequent mental disorder onset or indicate barriers to accessing appropriate mental healthcare for those with SR-TBI. Given the high incidence of SR-TBI and the established association with mental ill-health, programs targeting mental health needs post SR-TBI should be developed and rigorously evaluated in the context of the unique care needs of this population, including their younger age, unique psychosocial barriers, personal affinity towards wellness, and sports and physical activity participation.

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## 8.0 Appendix

**Table S1.** Codes used for cohort creation and stratification

<b>Construct</b>		<b>ICD10 Code (NACRS, DAD, OTR)</b>
<b>Traumatic brain injury<sup>i</sup></b>		
i)	Open wound of head	S01.7-S01.9
ii)	Fracture of skull and facial bones	S02.0, S02.1, S02.7-S02.9
iii)	Intracranial injuries	S06.0-S06.9
iv)	Crushing injury of head	S07.1, S07.8, S07.9
v)	Unspecified injury of head	S09.7-S09.9
vi)	Injuries involving head with neck	T02.0, T04.0, T06.0
vii)	Sequelae of injuries of head	T90.2, T90.5, T90.8-T90.9
<b>Sports-related injury indicators<sup>ii</sup></b>		
i)	Sports activity code	U990
ii)	Specific sports and recreation-related injury codes	V10-V19, V90.2-V90.9, V91.2-V91.9, V92.2-V92.9, V93.2-V93.9, V94.2-V94.9, V96, W02, W09, W16, W21, W22, W51, X50
iii)	Non-specific sports and recreation-related injury codes	V80.2, V80.8, V80.9, V86, W67-W74, V97.2, V98

<sup>i</sup>TBI codes from Fu et al.<sup>5</sup>

<sup>ii</sup>Sports and recreation activity codes from the Public Health agency of Canada.<sup>3</sup>

**Table S2.** Baseline variable definitions

<b>Variable</b>	<b>Source</b>	<b>Definition/Codes</b>
Sex	RPDB	Administrative sex, male or female.
Age	RPDB	Age in years.
Neighbourhood Income Quintiles	Census	Quintiles of neighbourhood income derived from Canadian Census dissemination areas, mapped to the participant's postal code.
Rurality	RPDB	Based on size of community derived from the Canadian Census mapped to the participant's postal code, where urban is community size of 10,000+ and rural is community size less than 10,000.
Ontario Health Region	RPDB	Ontario health regions defined from postal code data.
Charlson Comorbidity Index Score	DAD	An index of 17 medical conditions. Higher scores indicate greater burden of medical conditions.
Pre-existing TBI	OHIP, DAD, NACRS	An emergency department visit or hospitalization for TBI (codes as in table S1) before the start of the accrual period (i.e., < January 1 <sup>st</sup> , 2010) or an outpatient visit for TBI before the index date (codes 803, 850, 854).
Mental health hospitalizations	DAD, OMHRS	Any hospitalization in the OMHRS, or DAD hospitalization for mental illness or substance use disorder. See table S3 for full list of codes.
Emergency department visits for mental health reasons	NACRS	Any emergency department visit for a mental illness of substance use disorder. See table S3 for a full list of codes.
History of consistent primary care provider/psychiatrist use	OHIP	Where 50% or more lifetime visits to a general practitioner/psychiatrist were with the same care provider. Measured separately for primary care providers (i.e., general practitioners) and psychiatrists.
History of intentional self-injury	DAD, NACRS	A hospitalization or emergency department visit for self-injury, where the primary reason for visit was not mental health related.
Non-fatal overdose	NACRS, DAD, OHIP, OMHRS	A visit for a substance use overdose, regardless of intent, where the individual survived the event.
Prior Mental Health History	NACRS, DAD, OHIP, OMHRS	Any mental illness or substance use disorder, i.e., ICD10 code = F or equivalent ICD 9 and OHIP diagnostic code. Additionally stratified by ICD10 subchapter (E.g., F0*, F1*, F2*). See table S3 for full list of codes.
Presence of Dual Disorders	NACRS, DAD, OHIP, OMHRS	Lifetime presence of both a mental illness (Any ICD10 F code, except F10-19) and a substance use disorder (ICD10 code F10-F19). See table S3 for full list of codes.

**Table S3.** Diagnostic Code Crosswalk for Mental Illness and Substance Use Disorder Codes<sup>1</sup>

<b>Mental Disorder Category</b>	<b>ICD-10 Codes (DAD [2002 onwards], NACRS [2002 onwards], OMHRS [2019 onwards])</b>	<b>ICD-9 Codes (DAD [pre-2002], NACRS [pre-2002], OMHRS [pre-2019])</b>	<b>Outpatient diagnostic codes (OHIP)</b>
Any mental disorder	All F codes, including F99 (mental illness, not otherwise specified), as well as OMHRS admissions without a discharge diagnosis	All codes below, plus OMHRS admissions without a discharge diagnosis	All codes below, plus 307 <sup>2</sup>
Organic disorders	F00-F09	290.0, 290.1, 290.2, 290.3, 290.4, 290.8, 290.9, 293.0, 293.1, 293.8, 293.9, 294.0, 294.1, 294.8, 294.9, 310	290
Substance use disorders	F10-F19	291.0, 291.1, 291.2, 291.3, 291.4, 291.5, 291.8, 291.9, 292.0, 292.1, 292.2, 292.8, 292.9, 294.0, 303, 304 305.0	291, 292, 303, 304, 305
Schizophrenia spectrum disorders	F20-F29	295, 296.6, 296.8, 297, 298.2, 298.3, 298.4, 298.8, 298.9	295, 297, 298
Mood disorders	F30-F39	296.0, 296.1, 296.2, 296.3, 296.4, 296.5, 296.6, 296.8, 296.9, 298.0, 298.1, 300.4, 301.1, 311, 313.2	296, 311
Stressor/Anxiety disorders	F40-F48	300, 306, 307.8, 308, 309	306, 309
Behavioural disorders	F50-F59	302.7, 302.8, 302.9, 307.1, 307.4, 307.5, 316	N/A
Personality disorders	F60-F69	301, 302.1, 302.2, 302.3, 302.4, 302.5, 302.6, 302.8, 302.9, 312.2, V40.2, V40.3, V40.9, V61.1	301, 302
Learning disorders	F70-F79	317, 318.0, 318.1, 318.2, 319	319
Developmental disorders	F80-F89	299.0, 299.1, 299.8, 299.9, 315.0, 315.1, 315.2, 315.3, 315.4, 315.5, 315.8, 315.9,	299, 315
Disorders of childhood onset	F90-F98	307.0, 307.2, 307.3, 307.6, 307.7, 307.9, 309.2, 309.8, 312.0, 312.1, 312.3, 312.8, 312.9, 313.0, 313.2, 313.3,	313, 314

313.8, 313.9, 314.0, 314.1,  
314.2, 314.8, 314.9

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<sup>1</sup>Adapted from the WHO conversion table for ICD9-to-ICD10 diagnostic codes.<sup>30</sup>

<sup>2</sup>OHIP billing code 307 is used to record a variety of disorders, including habit spasms, tics, stuttering, tension headaches, anorexia nervosa, and sleep disorders.

**Table S4.** Outcome variable definitions

<b>Variable</b>	<b>Source</b>	<b>Definition/Codes</b>
<b>Piecewise rates of service use</b>		
All-cause hospitalization	DAD, OMHRS	A hospitalization episode for any cause. Date taken at admission.
Psychiatric hospitalization	DAD, OMHRS	Any hospitalization episode in OMHRS, or any DAD hospitalization episode where the main reason for the stay was an ICD-10 F code. Date taken at admission.
All-cause ED visit	NACRS	A visit to emergency department not resulting in admission to hospital. Date taken at admission.
Psychiatric ED visit	NACRS	A visit to emergency department not resulting in admission to hospital where the main diagnosis was an ICD-10 F code. Date taken at admission.
All-cause GP visit	OHIP	An outpatient visit to a general practitioner for any reason. Only one visit per physician per day was counted.
Mental health-related GP visit	OHIP	An outpatient visit to a general practitioner for a mental illness/substance use disorder. Only one visit per physician per day was counted. See table S3 for a full list of codes.
Psychiatrist visit	OHIP	Any visit to a psychiatrist in an outpatient setting. Only one visit per physician per day was counted.
<b>Time to event outcomes</b>		
Mental Illness	DAD, OMHRS, NACRS, OHIP	Any hospitalization, emergency department visit, or outpatient visit where the primary diagnosis was ICD-10 F00-F09, F20-F99, or equivalent. See table S3 for a full list of codes. Date taken at admission.
Substance use disorder	DAD, OMHRS, NACRS, OHIP	Any hospitalization, emergency department visit, or outpatient visit where the primary diagnosis was ICD-10 F10-F19, or equivalent. See table S3 for a full list of codes. Date taken at admission.
Self-harm	DAD, NACRS	Any hospitalization or emergency department visit where any of ICD-10 codes X60-X84; Y10-Y19; Y28 were present, and the main diagnosis was not mental-health related (i.e., an ICD-10 F code). Date taken at admission.
Overdose	DAD, NACRS, OMHRS	Any hospitalization or emergency department visit where any of ICD-10 codes T36-T50; X40-X44; Y10-Y14 or ICD-9 codes 960-979; E850-E858; E950.0-E950.5; E980.0-E980.5 were present. Date taken at admission.
30 day outpatient follow up	OHIP	An outpatient visit to a general practitioner where the reason for the visit was a TBI (OHIP diagnosis codes 803, 850, 854) in the 30 days immediately after discharge
All-cause mortality	RPDB	Administrative date of death

**Table S5.** Association of TBI-type with rates of all-cause and psychiatric service use, by sex

Indicator	Strata	Days after index date	Rate per 100,000 (95% CI)		Unadjusted comparison		Adjusted comparison <sup>i</sup>	
			SR-TBI	TBI from all other causes	Incidence Rate Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value	Incidence Rate Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value
All-cause hospitalizations	Females	1-30 days	42.58 (40.80, 44.43)	63.39 (61.21, 65.64)	0.67 (0.64, 0.71)	<0.001	0.78 (0.74, 0.82)	<0.001
		31-90 days	24.65 (23.69, 25.64)	36.40 (35.23, 37.60)	0.68 (0.64, 0.71)	<0.001	0.81 (0.77, 0.85)	<0.001
		91-180 days	23.26 (22.50, 24.05)	34.11 (33.18, 35.06)	0.68 (0.65, 0.71)	<0.001	0.81 (0.78, 0.85)	<0.001
		181-365 days	24.20 (23.66, 24.76)	33.48 (32.84, 34.14)	0.72 (0.70, 0.74)	<0.001	0.85 (0.83, 0.88)	<0.001
		366-730 days	23.48 (23.09, 23.87)	31.25 (30.80, 31.70)	0.75 (0.74, 0.77)	<0.001	0.87 (0.85, 0.89)	<0.001
	Males	1-30 days	44.51 (43.00, 46.07)	72.04 (70.12, 74.02)	0.62 (0.59, 0.65)	<0.001	0.75 (0.72, 0.79)	<0.001
		31-90 days	20.28 (19.56, 21.02)	33.92 (32.98, 34.88)	0.60 (0.57, 0.63)	<0.001	0.79 (0.75, 0.83)	<0.001
		91-180 days	17.37 (16.82, 17.93)	29.02 (28.31, 29.74)	0.60 (0.57, 0.62)	<0.001	0.79 (0.76, 0.82)	<0.001
		181-365 days	16.02 (15.65, 16.39)	25.61 (25.14, 26.09)	0.63 (0.61, 0.64)	<0.001	0.81 (0.79, 0.84)	<0.001
		366-730 days	14.81 (14.56, 15.07)	22.54 (22.22, 22.85)	0.66 (0.64, 0.67)	<0.001	0.85 (0.83, 0.87)	<0.001
Psychiatric hospitalizations	Females	1-30 days	5.33 (4.73, 6.01)	10.69 (9.82, 11.64)	0.50 (0.43, 0.58)	<0.001	0.73 (0.63, 0.85)	<0.001
		31-90 days	3.29 (2.95, 3.66)	7.11 (6.61, 7.66)	0.46 (0.41, 0.53)	<0.001	0.70 (0.61, 0.80)	<0.001
		91-180 days	3.20 (2.93, 3.50)	6.35 (5.95, 6.77)	0.50 (0.45, 0.56)	<0.001	0.75 (0.67, 0.84)	<0.001
		181-365 days	2.91 (2.72, 3.10)	5.70 (5.44, 5.97)	0.51 (0.47, 0.55)	<0.001	0.73 (0.68, 0.80)	<0.001
		366-730 days	2.67 (2.55, 2.81)	4.78 (4.60, 4.96)	0.56 (0.53, 0.60)	<0.001	0.78 (0.74, 0.83)	<0.001
	Males	1-30 days	4.59 (4.12, 5.11)	10.59 (9.87, 11.37)	0.43 (0.38, 0.49)	<0.001	0.75 (0.66, 0.86)	<0.001
		31-90 days	2.84 (2.58, 3.12)	6.97 (6.56, 7.42)	0.41 (0.36, 0.46)	<0.001	0.75 (0.66, 0.84)	<0.001
		91-180 days	2.31 (2.12, 2.53)	5.76 (5.45, 6.09)	0.40 (0.36, 0.45)	<0.001	0.71 (0.64, 0.79)	<0.001
		181-365 days	2.07 (1.94, 2.21)	4.86 (4.66, 5.07)	0.43 (0.40, 0.46)	<0.001	0.76 (0.70, 0.83)	<0.001

		366-730 days	1.84 (1.75, 1.93)	4.08 (3.95, 4.22)	0.45 (0.42, 0.48)	<0.001	0.77 (0.72, 0.82)	<0.001
All-cause ED visits	Females	1-30 days	486.50 (480.41, 492.67)	563.11 (556.55, 569.75)	0.86 (0.85, 0.88)	<0.001	0.95 (0.93, 0.96)	<0.001
		31-90 days	263.46 (260.28, 266.67)	302.88 (299.47, 306.33)	0.87 (0.86, 0.88)	<0.001	0.99 (0.97, 1.00)	0.112
		91-180 days	255.06 (252.51, 257.65)	290.30 (287.57, 293.06)	0.88 (0.87, 0.89)	<0.001	0.99 (0.98, 1.00)	0.176
		181-365 days	246.96 (245.20, 248.74)	280.32 (278.44, 282.21)	0.88 (0.87, 0.89)	<0.001	0.99 (0.98, 1.00)	0.006
		366-730 days	228.50 (227.29, 229.72)	255.37 (254.09, 256.67)	0.89 (0.89, 0.90)	<0.001	1.00 (0.99, 1.01)	0.646
	Males	1-30 days	456.21 (451.33, 461.15)	567.57 (562.11, 573.07)	0.80 (0.79, 0.82)	<0.001	0.93 (0.92, 0.95)	<0.001
		31-90 days	211.76 (209.41, 214.14)	271.95 (269.28, 274.65)	0.78 (0.77, 0.79)	<0.001	0.94 (0.93, 0.96)	<0.001
		91-180 days	200.52 (198.64, 202.41)	251.94 (249.84, 254.07)	0.80 (0.79, 0.81)	<0.001	0.95 (0.94, 0.96)	<0.001
		181-365 days	194.48 (193.19, 195.78)	239.75 (238.31, 241.20)	0.81 (0.80, 0.82)	<0.001	0.96 (0.95, 0.97)	<0.001
		366-730 days	178.42 (177.53, 179.31)	219.53 (218.54, 220.52)	0.81 (0.81, 0.82)	<0.001	0.96 (0.95, 0.97)	<0.001
Psychiatric ED visits	Females	1-30 days	34.41 (32.82, 36.08)	49.26 (47.34, 51.25)	0.70 (0.66, 0.74)	<0.001	0.92 (0.87, 0.99)	0.015
		31-90 days	15.74 (14.97, 16.54)	26.86 (25.86, 27.90)	0.59 (0.55, 0.62)	<0.001	0.87 (0.81, 0.92)	<0.001
		91-180 days	12.30 (11.75, 12.88)	23.83 (23.06, 24.63)	0.52 (0.49, 0.55)	<0.001	0.78 (0.74, 0.83)	<0.001
		181-365 days	11.66 (11.29, 12.05)	22.20 (21.67, 22.73)	0.53 (0.50, 0.55)	<0.001	0.79 (0.75, 0.82)	<0.001
		366-730 days	11.18 (10.91, 11.45)	19.46 (19.10, 19.82)	0.57 (0.56, 0.59)	<0.001	0.85 (0.82, 0.87)	<0.001
	Males	1-30 days	26.72 (25.56, 27.94)	53.38 (51.72, 55.08)	0.50 (0.47, 0.53)	<0.001	0.86 (0.81, 0.91)	<0.001
		31-90 days	13.78 (13.19, 14.40)	34.78 (33.83, 35.75)	0.40 (0.38, 0.42)	<0.001	0.76 (0.72, 0.80)	<0.001
		91-180 days	12.00 (11.55, 12.47)	28.13 (27.43, 28.85)	0.43 (0.41, 0.45)	<0.001	0.83 (0.79, 0.87)	<0.001



		181-365 days	10.81 (10.51, 11.12)	26.98 (26.50, 27.47)	0.40 (0.39, 0.41)	<0.001	0.77 (0.75, 0.80)	<0.001
		366-730 days	10.00 (9.79, 10.21)	23.93 (23.61, 24.26)	0.42 (0.41, 0.43)	<0.001	0.77 (0.75, 0.79)	<0.001
All-cause GP visits	Females	1-30 days	2196.11 (2183.12, 2209.17)	2315.36 (2302.02, 2328.78)	0.95 (0.94, 0.96)	<0.001	0.97 (0.96, 0.98)	<0.001
		31-90 days	1272.95 (1265.95, 1279.99)	1368.65 (1361.39, 1375.95)	0.93 (0.92, 0.94)	<0.001	0.97 (0.96, 0.98)	<0.001
		91-180 days	1182.35 (1176.83, 1187.90)	1266.32 (1260.60, 1272.06)	0.93 (0.93, 0.94)	<0.001	0.98 (0.97, 0.98)	<0.001
		181-365 days	1142.10 (1138.31, 1145.91)	1220.54 (1216.61, 1224.48)	0.94 (0.93, 0.94)	<0.001	0.98 (0.98, 0.99)	<0.001
		366-730 days	1108.17 (1105.49, 1110.85)	1173.61 (1170.85, 1176.38)	0.94 (0.94, 0.95)	<0.001	0.99 (0.99, 0.99)	<0.001
	Males	1-30 days	1781.16 (1771.49, 1790.88)	1967.32 (1957.15, 1977.54)	0.91 (0.90, 0.91)	<0.001	0.95 (0.94, 0.96)	<0.001
		31-90 days	866.15 (861.38, 870.95)	1039.35 (1034.12, 1044.62)	0.83 (0.83, 0.84)	<0.001	0.92 (0.91, 0.92)	<0.001
		91-180 days	800.63 (796.87, 804.40)	945.77 (941.68, 949.87)	0.85 (0.84, 0.85)	<0.001	0.93 (0.93, 0.94)	<0.001
		181-365 days	765.98 (763.41, 768.56)	895.55 (892.77, 898.35)	0.86 (0.85, 0.86)	<0.001	0.95 (0.94, 0.95)	<0.001
		366-730 days	723.91 (722.13, 725.70)	842.82 (840.88, 844.76)	0.86 (0.86, 0.86)	<0.001	0.95 (0.95, 0.95)	<0.001
Mental health-related GP visits	Females	1-30 days	98.98 (96.25, 101.78)	136.38 (133.17, 139.66)	0.73 (0.70, 0.75)	<0.001	0.90 (0.87, 0.93)	<0.001
		31-90 days	86.74 (84.93, 88.59)	125.11 (122.93, 127.34)	0.69 (0.67, 0.71)	<0.001	0.86 (0.84, 0.89)	<0.001
		91-180 days	84.40 (82.94, 85.89)	121.53 (119.77, 123.32)	0.69 (0.68, 0.71)	<0.001	0.86 (0.84, 0.88)	<0.001
		181-365 days	84.46 (83.43, 85.50)	125.80 (124.55, 127.07)	0.67 (0.66, 0.68)	<0.001	0.83 (0.82, 0.85)	<0.001
		366-730 days	88.17 (87.42, 88.93)	127.63 (126.72, 128.54)	0.69 (0.68, 0.70)	<0.001	0.85 (0.84, 0.86)	<0.001
	Males	1-30 days	84.70 (82.61, 86.84)	161.67 (158.77, 164.62)	0.52 (0.51, 0.54)	<0.001	0.78 (0.75, 0.80)	<0.001

		31-90 days	78.36 (76.93, 79.81)	145.93 (143.98, 147.91)	0.54 (0.52, 0.55)	<0.001	0.81 (0.79, 0.83)	<0.001
		91-180 days	77.63 (76.47, 78.81)	142.40 (140.82, 144.00)	0.55 (0.54, 0.56)	<0.001	0.81 (0.80, 0.83)	<0.001
		181-365 days	77.43 (76.62, 78.25)	144.22 (143.11, 145.34)	0.54 (0.53, 0.54)	<0.001	0.79 (0.78, 0.80)	<0.001
		366-730 days	78.54 (77.96, 79.14)	144.92 (144.12, 145.72)	0.54 (0.54, 0.55)	<0.001	0.79 (0.79, 0.80)	<0.001
Psychiatrist visits	Females	1-30 days	75.82 (73.44, 78.28)	94.29 (91.62, 97.02)	0.80 (0.77, 0.84)	<0.001	1.02 (0.97, 1.06)	0.466
		31-90 days	73.77 (72.10, 75.48)	94.76 (92.86, 96.70)	0.78 (0.76, 0.80)	<0.001	0.97 (0.94, 1.00)	0.047
		91-180 days	75.57 (74.19, 76.99)	96.19 (94.62, 97.78)	0.79 (0.77, 0.81)	<0.001	0.97 (0.95, 0.99)	0.015
		181-365 days	76.19 (75.21, 77.18)	96.16 (95.06, 97.27)	0.79 (0.78, 0.81)	<0.001	0.96 (0.94, 0.98)	<0.001
		366-730 days	78.57 (77.86, 79.28)	94.97 (94.19, 95.76)	0.83 (0.82, 0.84)	<0.001	0.99 (0.98, 1.00)	0.065
	Males	1-30 days	48.15 (46.58, 49.77)	78.26 (76.26, 80.32)	0.62 (0.59, 0.64)	<0.001	0.93 (0.89, 0.97)	0.001
		31-90 days	45.40 (44.32, 46.51)	75.30 (73.90, 76.73)	0.60 (0.58, 0.62)	<0.001	0.89 (0.86, 0.92)	<0.001
		91-180 days	45.35 (44.46, 46.25)	73.84 (72.71, 75.00)	0.61 (0.60, 0.63)	<0.001	0.89 (0.87, 0.92)	<0.001
		181-365 days	45.24 (44.62, 45.87)	71.30 (70.52, 72.09)	0.63 (0.62, 0.65)	<0.001	0.91 (0.90, 0.93)	<0.001
		366-730 days	45.20 (44.76, 45.65)	69.52 (68.96, 70.07)	0.65 (0.64, 0.66)	<0.001	0.91 (0.90, 0.92)	<0.001

ED: emergency department; GP: general practitioner; CI: confidence interval

<sup>i</sup>Adjusting for age, neighbourhood income quintiles, rurality, Ontario health region, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and history of mental health/substance use indications at baseline.

<sup>ii</sup>Comparing rates of outcomes for SR-TBI, compared to TBI from all other causes.  
Refer to Figures S1-S7,

**Table S6.** Association of TBI-type with rates of all-cause and psychiatric service use, by neighbourhood income quintile

Indicator	Strata	Days after index date	Rate per 100,000 (95% CI)		Unadjusted comparison		Adjusted comparison <sup>i</sup>	
			SR-TBI	TBI from all other causes	Incidence Rate Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value	Incidence Rate Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value
All-cause hospitalizations	Quintile 1 (lowest)	1-30 days	55.47 (52.49, 58.63)	82.60 (79.27, 86.06)	0.67 (0.63, 0.72)	<0.001	0.79 (0.73, 0.84)	<0.001
		31-90 days	29.62 (28.07, 31.25)	45.21 (43.47, 47.02)	0.66 (0.61, 0.70)	<0.001	0.80 (0.75, 0.86)	<0.001
		91-180 days	27.52 (26.29, 28.80)	40.76 (39.40, 42.16)	0.68 (0.64, 0.71)	<0.001	0.83 (0.78, 0.88)	<0.001
		181-365 days	25.83 (25.00, 26.70)	37.40 (36.49, 38.34)	0.69 (0.66, 0.72)	<0.001	0.84 (0.80, 0.87)	<0.001
		366-730 days	24.22 (23.64, 24.82)	34.55 (33.91, 35.19)	0.70 (0.68, 0.72)	<0.001	0.84 (0.82, 0.87)	<0.001
	Quintile 2	1-30 days	45.31 (42.61, 48.19)	73.61 (70.29, 77.10)	0.62 (0.57, 0.66)	<0.001	0.72 (0.66, 0.78)	<0.001
		31-90 days	23.66 (22.28, 25.13)	38.11 (36.41, 39.88)	0.62 (0.58, 0.67)	<0.001	0.76 (0.71, 0.82)	<0.001
		91-180 days	21.82 (20.73, 22.97)	32.54 (31.25, 33.87)	0.67 (0.63, 0.72)	<0.001	0.82 (0.77, 0.88)	<0.001
		181-365 days	20.88 (20.13, 21.66)	31.57 (30.68, 32.48)	0.66 (0.63, 0.69)	<0.001	0.80 (0.76, 0.84)	<0.001
		366-730 days	19.68 (19.15, 20.21)	28.16 (27.56, 28.78)	0.70 (0.67, 0.72)	<0.001	0.84 (0.81, 0.87)	<0.001
	Quintile 3	1-30 days	43.90 (41.32, 46.63)	64.42 (61.28, 67.71)	0.68 (0.63, 0.74)	<0.001	0.80 (0.74, 0.86)	<0.001
		31-90 days	21.32 (20.05, 22.67)	31.35 (29.80, 32.98)	0.68 (0.63, 0.74)	<0.001	0.83 (0.77, 0.90)	<0.001
		91-180 days	18.82 (17.84, 19.85)	29.10 (27.88, 30.38)	0.65 (0.60, 0.69)	<0.001	0.79 (0.74, 0.85)	<0.001
		181-365 days	18.65 (17.97, 19.37)	25.94 (25.13, 26.78)	0.72 (0.68, 0.76)	<0.001	0.87 (0.83, 0.91)	<0.001
		366-730 days	17.26 (16.79, 17.75)	24.07 (23.51, 24.64)	0.72 (0.69, 0.74)	<0.001	0.86 (0.83, 0.89)	<0.001

	Quintile 4	1-30 days	39.24 (36.93, 41.69)	60.86 (57.77, 64.11)	0.64 (0.60, 0.70)	<0.001	0.75 (0.69, 0.81)	<0.001
		31-90 days	19.95 (18.79, 21.18)	29.37 (27.85, 30.97)	0.68 (0.63, 0.74)	<0.001	0.83 (0.77, 0.90)	<0.001
		91-180 days	16.81 (15.94, 17.74)	26.59 (25.41, 27.83)	0.63 (0.59, 0.68)	<0.001	0.77 (0.72, 0.83)	<0.001
		181-365 days	17.17 (16.54, 17.81)	24.12 (23.32, 24.94)	0.71 (0.68, 0.75)	<0.001	0.87 (0.83, 0.92)	<0.001
		366-730 days	16.37 (15.93, 16.82)	21.50 (20.96, 22.05)	0.76 (0.73, 0.79)	<0.001	0.91 (0.87, 0.94)	<0.001
	Quintile 5 (highest)	1-30 days	36.25 (34.01, 38.62)	56.57 (53.54, 59.78)	0.64 (0.59, 0.70)	<0.001	0.77 (0.71, 0.84)	<0.001
		31-90 days	16.97 (15.89, 18.12)	27.88 (26.38, 29.48)	0.61 (0.56, 0.66)	<0.001	0.76 (0.70, 0.83)	<0.001
		91-180 days	14.99 (14.16, 15.88)	23.91 (22.77, 25.11)	0.63 (0.58, 0.68)	<0.001	0.78 (0.72, 0.84)	<0.001
		181-365 days	15.20 (14.61, 15.82)	22.86 (22.07, 23.67)	0.67 (0.63, 0.70)	<0.001	0.82 (0.77, 0.86)	<0.001
		366-730 days	14.98 (14.56, 15.42)	19.90 (19.37, 20.44)	0.75 (0.72, 0.78)	<0.001	0.91 (0.88, 0.95)	<0.001
Psychiatric hospitalizations	Quintile 1 (lowest)	1-30 days	7.74 (6.68, 8.98)	13.69 (12.38, 15.15)	0.57 (0.47, 0.68)	<0.001	0.84 (0.70, 1.01)	0.063
		31-90 days	4.83 (4.23, 5.52)	10.27 (9.45, 11.15)	0.47 (0.40, 0.55)	<0.001	0.73 (0.62, 0.86)	<0.001
		91-180 days	4.34 (3.87, 4.87)	8.68 (8.06, 9.34)	0.50 (0.44, 0.57)	<0.001	0.75 (0.66, 0.87)	<0.001
		181-365 days	3.51 (3.21, 3.83)	7.42 (7.02, 7.84)	0.47 (0.43, 0.52)	<0.001	0.72 (0.64, 0.80)	<0.001
		366-730 days	3.13 (2.92, 3.35)	6.14 (5.88, 6.42)	0.51 (0.47, 0.55)	<0.001	0.75 (0.69, 0.81)	<0.001
	Quintile 2	1-30 days	5.04 (4.19, 6.06)	10.23 (9.04, 11.58)	0.49 (0.39, 0.62)	<0.001	0.75 (0.60, 0.94)	0.012
		31-90 days	3.13 (2.65, 3.69)	7.70 (6.95, 8.51)	0.41 (0.33, 0.49)	<0.001	0.64 (0.53, 0.79)	<0.001
		91-180 days	3.06 (2.67, 3.51)	6.02 (5.48, 6.61)	0.51 (0.43, 0.60)	<0.001	0.79 (0.66, 0.93)	0.005
		181-365 days	2.65 (2.39, 2.94)	5.80 (5.42, 6.20)	0.46 (0.40, 0.52)	<0.001	0.70 (0.62, 0.79)	<0.001
		366-730 days	2.41 (2.23, 2.60)	4.65 (4.41, 4.90)	0.52 (0.47, 0.57)	<0.001	0.77 (0.70, 0.85)	<0.001

All-cause ED visits	Quintile 3	1-30 days	4.43 (3.66, 5.36)	10.21 (9.01, 11.57)	0.43 (0.35, 0.55)	<0.001	0.67 (0.53, 0.84)	0.001
		31-90 days	2.68 (2.25, 3.19)	5.93 (5.28, 6.66)	0.45 (0.37, 0.56)	<0.001	0.71 (0.57, 0.88)	0.002
		91-180 days	2.21 (1.89, 2.59)	5.52 (5.00, 6.09)	0.40 (0.33, 0.48)	<0.001	0.61 (0.51, 0.74)	<0.001
		181-365 days	2.09 (1.87, 2.33)	4.22 (3.90, 4.56)	0.49 (0.43, 0.57)	<0.001	0.74 (0.65, 0.85)	<0.001
		366-730 days	1.85 (1.70, 2.02)	3.90 (3.67, 4.13)	0.48 (0.43, 0.53)	<0.001	0.69 (0.62, 0.77)	<0.001
	Quintile 4	1-30 days	3.59 (2.94, 4.39)	8.23 (7.14, 9.48)	0.44 (0.34, 0.56)	<0.001	0.69 (0.54, 0.89)	0.004
		31-90 days	2.72 (2.31, 3.20)	4.64 (4.06, 5.30)	0.59 (0.47, 0.72)	<0.001	1.01 (0.82, 1.26)	0.900
		91-180 days	1.83 (1.55, 2.15)	4.78 (4.30, 5.33)	0.38 (0.31, 0.46)	<0.001	0.62 (0.51, 0.76)	<0.001
		181-365 days	1.97 (1.77, 2.20)	4.10 (3.78, 4.44)	0.48 (0.42, 0.55)	<0.001	0.79 (0.69, 0.91)	0.001
		366-730 days	1.83 (1.69, 1.98)	3.25 (3.05, 3.47)	0.56 (0.51, 0.62)	<0.001	0.88 (0.79, 0.97)	0.015
	Quintile 5 (highest)	1-30 days	3.89 (3.20, 4.72)	9.53 (8.33, 10.89)	0.41 (0.32, 0.52)	<0.001	*	*
		31-90 days	2.02 (1.67, 2.45)	5.72 (5.06, 6.46)	0.35 (0.28, 0.44)	<0.001	0.63 (0.50, 0.79)	<0.001
		91-180 days	1.98 (1.69, 2.31)	4.12 (3.66, 4.64)	0.48 (0.39, 0.58)	<0.001	0.80 (0.65, 0.98)	0.031
		181-365 days	1.97 (1.76, 2.20)	3.78 (3.47, 4.12)	0.52 (0.45, 0.60)	<0.001	0.87 (0.75, 1.00)	0.058
		366-730 days	1.78 (1.64, 1.94)	3.29 (3.08, 3.52)	0.54 (0.49, 0.60)	<0.001	0.85 (0.76, 0.95)	0.003
All-cause ED visits	Quintile 1 (lowest)	1-30 days	618.97 (608.80, 629.31)	723.32 (713.36, 733.43)	0.86 (0.84, 0.87)	<0.001	0.96 (0.94, 0.98)	<0.001
		31-90 days	327.21 (321.97, 332.53)	380.17 (375.06, 385.36)	0.86 (0.84, 0.88)	<0.001	0.99 (0.97, 1.02)	0.601
		91-180 days	309.06 (304.89, 313.28)	356.20 (352.14, 360.31)	0.87 (0.85, 0.88)	<0.001	0.99 (0.97, 1.01)	0.405
		181-365 days	292.31 (289.47, 295.18)	340.59 (337.81, 343.39)	0.86 (0.85, 0.87)	<0.001	0.98 (0.97, 0.99)	0.002
		366-730 days	265.97 (264.03, 267.93)	306.53 (304.63, 308.43)	0.87 (0.86, 0.88)	<0.001	0.99 (0.98, 0.99)	0.002
	Quintile 2	1-30 days	507.35 (498.11, 516.76)	591.99 (582.42, 601.71)	0.86 (0.84, 0.88)	<0.001	0.94 (0.92, 0.96)	<0.001
		31-90 days	253.19 (248.57, 257.89)	299.90 (295.08, 304.80)	0.84 (0.82, 0.87)	<0.001	0.96 (0.94, 0.98)	0.001
		91-180 days	241.81 (238.12, 245.57)	282.05 (278.22, 285.93)	0.86 (0.84, 0.88)	<0.001	0.97 (0.95, 0.99)	0.001

		181-365 days	236.13 (233.57, 238.72)	268.99 (266.36, 271.64)	0.88 (0.87, 0.89)	<0.001	0.98 (0.97, 1.00)	0.013
		366-730 days	216.15 (214.40, 217.92)	247.74 (245.93, 249.55)	0.87 (0.86, 0.88)	<0.001	0.97 (0.96, 0.98)	<0.001
Quintile 3	1-30 days		455.97 (447.49, 464.61)	536.67 (527.48, 546.01)	0.85 (0.83, 0.87)	<0.001	0.93 (0.91, 0.96)	<0.001
	31-90 days		221.02 (216.85, 225.28)	264.46 (259.90, 269.11)	0.84 (0.81, 0.86)	<0.001	0.95 (0.92, 0.97)	<0.001
	91-180 days		211.88 (208.54, 215.29)	248.14 (244.51, 251.81)	0.85 (0.84, 0.87)	<0.001	0.95 (0.93, 0.97)	<0.001
	181-365 days		207.75 (205.42, 210.10)	240.38 (237.88, 242.90)	0.86 (0.85, 0.88)	<0.001	0.96 (0.95, 0.97)	<0.001
	366-730 days		191.67 (190.07, 193.28)	220.09 (218.38, 221.82)	0.87 (0.86, 0.88)	<0.001	0.97 (0.96, 0.98)	<0.001
Quintile 4	1-30 days		406.67 (399.10, 414.39)	486.30 (477.44, 495.33)	0.84 (0.81, 0.86)	<0.001	0.92 (0.89, 0.94)	<0.001
	31-90 days		199.68 (195.93, 203.51)	238.28 (233.89, 242.76)	0.84 (0.82, 0.86)	<0.001	0.95 (0.92, 0.98)	<0.001
	91-180 days		193.67 (190.64, 196.74)	225.66 (222.16, 229.22)	0.86 (0.84, 0.88)	<0.001	0.97 (0.94, 0.99)	0.003
	181-365 days		186.90 (184.82, 189.01)	216.57 (214.17, 219.01)	0.86 (0.85, 0.88)	<0.001	0.97 (0.95, 0.98)	<0.001
	366-730 days		174.52 (173.08, 175.98)	197.44 (195.80, 199.10)	0.88 (0.87, 0.89)	<0.001	0.98 (0.97, 1.00)	0.012
Quintile 5 (highest)	1-30 days		373.50 (366.18, 380.97)	445.79 (437.12, 454.62)	0.84 (0.81, 0.86)	<0.001	0.93 (0.90, 0.96)	<0.001
	31-90 days		174.86 (171.32, 178.48)	212.94 (208.70, 217.27)	0.82 (0.80, 0.85)	<0.001	0.94 (0.91, 0.97)	<0.001
	91-180 days		169.03 (166.18, 171.93)	201.42 (198.04, 204.85)	0.84 (0.82, 0.86)	<0.001	0.95 (0.93, 0.98)	<0.001
	181-365 days		166.37 (164.38, 168.37)	191.59 (189.28, 193.92)	0.87 (0.85, 0.88)	<0.001	0.97 (0.96, 0.99)	0.001
	366-730 days		154.43 (153.06, 155.81)	179.11 (177.51, 180.73)	0.86 (0.85, 0.87)	<0.001	0.97 (0.96, 0.98)	<0.001
Psychiatric ED visits	Quintile 1 (lowest)	1-30 days	48.35 (45.57, 51.30)	76.80 (73.60, 80.14)	0.63 (0.59, 0.68)	<0.001	0.96 (0.89, 1.03)	0.276

	31-90 days	26.78 (25.31, 28.33)	49.48 (47.66, 51.37)	0.54 (0.51, 0.58)	<0.001	0.87 (0.81, 0.94)	<0.001
	91-180 days	22.34 (21.24, 23.50)	42.45 (41.06, 43.88)	0.53 (0.50, 0.56)	<0.001	0.85 (0.80, 0.91)	<0.001
	181-365 days	19.41 (18.68, 20.15)	41.31 (40.35, 42.29)	0.47 (0.45, 0.49)	<0.001	0.77 (0.74, 0.81)	<0.001
	366-730 days	17.87 (17.37, 18.38)	35.68 (35.04, 36.33)	0.50 (0.48, 0.52)	<0.001	0.79 (0.77, 0.82)	<0.001
Quintile 2	1-30 days	29.26 (27.10, 31.58)	54.67 (51.81, 57.68)	0.54 (0.49, 0.59)	<0.001	0.77 (0.70, 0.85)	<0.001
	31-90 days	15.42 (14.31, 16.61)	33.26 (31.68, 34.92)	0.46 (0.42, 0.51)	<0.001	0.75 (0.69, 0.82)	<0.001
	91-180 days	13.03 (12.19, 13.92)	26.81 (25.65, 28.03)	0.49 (0.45, 0.53)	<0.001	0.81 (0.75, 0.88)	<0.001
	181-365 days	12.61 (12.03, 13.22)	25.47 (24.67, 26.29)	0.50 (0.47, 0.52)	<0.001	0.82 (0.77, 0.86)	<0.001
	366-730 days	11.60 (11.20, 12.02)	22.47 (21.94, 23.03)	0.52 (0.49, 0.54)	<0.001	0.81 (0.78, 0.85)	<0.001
Quintile 3	1-30 days	26.67 (24.68, 28.82)	43.83 (41.26, 46.56)	0.61 (0.55, 0.67)	<0.001	0.87 (0.79, 0.96)	0.008
	31-90 days	12.11 (11.16, 13.13)	27.24 (25.80, 28.75)	0.44 (0.40, 0.49)	<0.001	0.73 (0.66, 0.80)	<0.001
	91-180 days	10.09 (9.38, 10.86)	22.20 (21.13, 23.32)	0.45 (0.42, 0.50)	<0.001	0.74 (0.67, 0.81)	<0.001
	181-365 days	8.97 (8.50, 9.47)	21.71 (20.97, 22.48)	0.41 (0.39, 0.44)	<0.001	0.67 (0.63, 0.71)	<0.001
	366-730 days	9.06 (8.72, 9.42)	19.55 (19.04, 20.07)	0.46 (0.44, 0.49)	<0.001	0.75 (0.71, 0.78)	<0.001
Quintile 4	1-30 days	22.26 (20.54, 24.12)	36.51 (34.14, 39.05)	0.61 (0.55, 0.68)	<0.001	0.86 (0.78, 0.96)	0.007
	31-90 days	10.70 (9.85, 11.61)	21.20 (19.92, 22.57)	0.50 (0.46, 0.56)	<0.001	0.83 (0.74, 0.92)	<0.001
	91-180 days	8.61 (7.99, 9.28)	18.42 (17.44, 19.45)	0.47 (0.43, 0.51)	<0.001	0.79 (0.71, 0.86)	<0.001
	181-365 days	7.78 (7.36, 8.22)	16.86 (16.20, 17.55)	0.46 (0.43, 0.49)	<0.001	0.77 (0.72, 0.82)	<0.001

		366-730 days	7.38 (7.09, 7.68)	14.22 (13.78, 14.67)	0.52 (0.49, 0.55)	<0.001	0.84 (0.79, 0.88)	<0.001
All-cause GP visits	Quintile 5 (highest)	1-30 days	23.59 (21.80, 25.53)	36.98 (34.55, 39.59)	0.64 (0.57, 0.71)	<0.001	0.94 (0.84, 1.04)	0.230
		31-90 days	9.07 (8.29, 9.92)	19.73 (18.46, 21.07)	0.46 (0.41, 0.51)	<0.001	0.78 (0.70, 0.88)	<0.001
		91-180 days	7.20 (6.63, 7.82)	15.91 (14.98, 16.89)	0.45 (0.41, 0.50)	<0.001	0.78 (0.70, 0.87)	<0.001
		181-365 days	7.62 (7.21, 8.06)	14.49 (13.86, 15.14)	0.53 (0.49, 0.56)	<0.001	0.88 (0.82, 0.95)	0.001
		366-730 days	7.13 (6.85, 7.44)	14.42 (13.97, 14.88)	0.49 (0.47, 0.52)	<0.001	0.84 (0.79, 0.88)	<0.001
All-cause GP visits	Quintile 1 (lowest)	1-30 days	1934.38 (1916.33, 1952.59)	2121.03 (2103.92, 2138.28)	0.91 (0.90, 0.92)	<0.001	0.96 (0.95, 0.97)	<0.001
		31-90 days	1120.68 (1110.95, 1130.49)	1268.67 (1259.30, 1278.12)	0.88 (0.87, 0.89)	<0.001	0.96 (0.95, 0.97)	<0.001
		91-180 days	1052.55 (1044.84, 1060.32)	1177.00 (1169.61, 1184.44)	0.89 (0.89, 0.90)	<0.001	0.97 (0.96, 0.98)	<0.001
		181-365 days	1011.41 (1006.11, 1016.73)	1138.57 (1133.47, 1143.69)	0.89 (0.88, 0.89)	<0.001	0.97 (0.96, 0.98)	<0.001
		366-730 days	964.95 (961.25, 968.67)	1078.48 (1074.92, 1082.05)	0.89 (0.89, 0.90)	<0.001	0.98 (0.97, 0.98)	<0.001
	Quintile 2	1-30 days	1953.89 (1935.68, 1972.27)	2122.31 (2104.13, 2140.66)	0.92 (0.91, 0.93)	<0.001	0.96 (0.95, 0.98)	<0.001
		31-90 days	1060.07 (1050.57, 1069.65)	1206.55 (1196.83, 1216.34)	0.88 (0.87, 0.89)	<0.001	0.95 (0.94, 0.96)	<0.001
		91-180 days	985.20 (977.71, 992.75)	1095.18 (1087.61, 1102.81)	0.90 (0.89, 0.91)	<0.001	0.97 (0.96, 0.98)	<0.001
		181-365 days	946.85 (941.71, 952.02)	1051.26 (1046.06, 1056.48)	0.90 (0.89, 0.91)	<0.001	0.97 (0.97, 0.98)	<0.001
		366-730 days	908.35 (904.75, 911.97)	1008.98 (1005.33, 1012.64)	0.90 (0.90, 0.91)	<0.001	0.98 (0.97, 0.98)	<0.001
	Quintile 3	1-30 days	1958.41 (1940.75, 1976.22)	2136.99 (2118.58, 2155.57)	0.92 (0.91, 0.93)	<0.001	0.95 (0.94, 0.96)	<0.001
		31-90 days	1029.11 (1020.06, 1038.25)	1168.61 (1158.97, 1178.34)	0.88 (0.87, 0.89)	<0.001	0.94 (0.93, 0.95)	<0.001



		91-180 days	961.80 (954.63, 969.01)	1079.44 (1071.86, 1087.08)	0.89 (0.88, 0.90)	<0.001	0.95 (0.94, 0.96)	<0.001
		181-365 days	916.20 (911.31, 921.12)	1024.91 (1019.74, 1030.11)	0.89 (0.89, 0.90)	<0.001	0.96 (0.95, 0.96)	<0.001
		366-730 days	880.48 (877.05, 883.92)	968.66 (965.06, 972.28)	0.91 (0.90, 0.91)	<0.001	0.97 (0.97, 0.98)	<0.001
Quintile 4	1-30 days		1970.83 (1954.07, 1987.73)	2116.30 (2097.71, 2135.05)	0.93 (0.92, 0.94)	<0.001	0.95 (0.93, 0.96)	<0.001
	31-90 days		1007.25 (998.77, 1015.79)	1129.36 (1119.75, 1139.06)	0.89 (0.88, 0.90)	<0.001	0.93 (0.92, 0.94)	<0.001
	91-180 days		930.89 (924.22, 937.60)	1034.00 (1026.47, 1041.58)	0.90 (0.89, 0.91)	<0.001	0.94 (0.93, 0.95)	<0.001
	181-365 days		897.29 (892.71, 901.89)	979.97 (974.85, 985.13)	0.92 (0.91, 0.92)	<0.001	0.95 (0.95, 0.96)	<0.001
	366-730 days		859.98 (856.77, 863.19)	931.89 (928.32, 935.49)	0.92 (0.92, 0.93)	<0.001	0.96 (0.96, 0.97)	<0.001
Quintile 5 (highest)	1-30 days		1932.04 (1915.29, 1948.93)	2028.27 (2009.69, 2047.02)	0.95 (0.94, 0.96)	<0.001	0.97 (0.96, 0.99)	<0.001
	31-90 days		955.90 (947.56, 964.31)	1062.35 (1052.83, 1071.96)	0.90 (0.89, 0.91)	<0.001	0.95 (0.93, 0.96)	<0.001
	91-180 days		867.52 (861.02, 874.06)	964.41 (956.98, 971.89)	0.90 (0.89, 0.91)	<0.001	0.95 (0.94, 0.96)	<0.001
	181-365 days		839.35 (834.89, 843.85)	912.32 (907.27, 917.41)	0.92 (0.91, 0.93)	<0.001	0.97 (0.96, 0.98)	<0.001
	366-730 days		802.00 (798.88, 805.14)	871.37 (867.83, 874.92)	0.92 (0.92, 0.93)	<0.001	0.97 (0.97, 0.98)	<0.001
Mental health-related GP visits	Quintile 1 (lowest)	1-30 days	135.77 (131.05, 140.65)	213.12 (207.74, 218.63)	0.64 (0.61, 0.67)	<0.001	0.85 (0.81, 0.88)	<0.001
		31-90 days	125.52 (122.29, 128.83)	199.86 (196.16, 203.63)	0.63 (0.61, 0.65)	<0.001	0.84 (0.81, 0.86)	<0.001
		91-180 days	124.15 (121.52, 126.84)	197.12 (194.11, 200.18)	0.63 (0.61, 0.65)	<0.001	0.83 (0.81, 0.86)	<0.001
		181-365 days	125.79 (123.93, 127.68)	205.35 (203.19, 207.53)	0.61 (0.60, 0.62)	<0.001	0.81 (0.79, 0.82)	<0.001
		366-730 days	128.08 (126.73, 129.44)	203.07 (201.53, 204.62)	0.63 (0.62, 0.64)	<0.001	0.83 (0.82, 0.84)	<0.001

Quintile 2	1-30 days	103.11 (98.99, 107.40)	159.47 (154.54, 164.55)	0.65 (0.61, 0.68)	<0.001	0.87 (0.82, 0.91)	<0.001
	31-90 days	93.27 (90.48, 96.14)	145.24 (141.90, 148.67)	0.64 (0.62, 0.67)	<0.001	0.86 (0.83, 0.90)	<0.001
	91-180 days	89.73 (87.49, 92.03)	140.98 (138.28, 143.74)	0.64 (0.62, 0.66)	<0.001	0.86 (0.83, 0.89)	<0.001
	181-365 days	88.85 (87.28, 90.44)	139.78 (137.89, 141.69)	0.64 (0.62, 0.65)	<0.001	0.85 (0.83, 0.87)	<0.001
	366-730 days	92.30 (91.16, 93.46)	145.79 (144.41, 147.19)	0.63 (0.62, 0.64)	<0.001	0.84 (0.82, 0.85)	<0.001
Quintile 3	1-30 days	86.24 (82.60, 90.05)	136.50 (131.90, 141.25)	0.63 (0.60, 0.67)	<0.001	0.83 (0.78, 0.88)	<0.001
	31-90 days	77.37 (74.91, 79.90)	122.90 (119.79, 126.08)	0.63 (0.60, 0.66)	<0.001	0.84 (0.81, 0.88)	<0.001
	91-180 days	74.76 (72.78, 76.80)	119.60 (117.10, 122.16)	0.63 (0.60, 0.65)	<0.001	0.83 (0.80, 0.86)	<0.001
	181-365 days	75.21 (73.82, 76.63)	123.26 (121.48, 125.07)	0.61 (0.60, 0.62)	<0.001	0.81 (0.79, 0.83)	<0.001
	366-730 days	75.39 (74.39, 76.40)	120.81 (119.54, 122.09)	0.62 (0.61, 0.63)	<0.001	0.82 (0.80, 0.83)	<0.001
Quintile 4	1-30 days	70.66 (67.54, 73.92)	116.66 (112.36, 121.12)	0.61 (0.57, 0.64)	<0.001	0.79 (0.75, 0.84)	<0.001
	31-90 days	61.85 (59.78, 64.00)	105.75 (102.83, 108.74)	0.58 (0.56, 0.61)	<0.001	0.78 (0.74, 0.81)	<0.001
	91-180 days	62.10 (60.40, 63.86)	101.48 (99.14, 103.87)	0.61 (0.59, 0.63)	<0.001	0.80 (0.78, 0.83)	<0.001
	181-365 days	62.38 (61.18, 63.60)	103.42 (101.76, 105.10)	0.60 (0.59, 0.62)	<0.001	0.79 (0.77, 0.81)	<0.001
	366-730 days	64.78 (63.91, 65.67)	104.51 (103.32, 105.72)	0.62 (0.61, 0.63)	<0.001	0.79 (0.78, 0.81)	<0.001
Quintile 5 (highest)	1-30 days	62.66 (59.70, 65.76)	112.30 (107.99, 116.78)	0.56 (0.52, 0.59)	<0.001	0.76 (0.72, 0.81)	<0.001
	31-90 days	56.26 (54.27, 58.33)	96.38 (93.55, 99.31)	0.58 (0.56, 0.61)	<0.001	0.81 (0.78, 0.85)	<0.001
	91-180 days	56.52 (54.88, 58.21)	92.89 (90.60, 95.23)	0.61 (0.59, 0.63)	<0.001	0.84 (0.80, 0.87)	<0.001

Psychiatrist visits		181-365 days	55.06 (53.92, 56.22)	93.10 (91.49, 94.73)	0.59 (0.58, 0.61)	<0.001	0.80 (0.78, 0.82)	<0.001
		366-730 days	57.50 (56.67, 58.34)	97.61 (96.43, 98.80)	0.59 (0.58, 0.60)	<0.001	0.78 (0.77, 0.80)	<0.001
	Quintile 1 (lowest)	1-30 days	74.89 (71.41, 78.55)	105.92 (102.15, 109.83)	0.71 (0.67, 0.75)	<0.001	0.95 (0.89, 1.01)	0.091
		31-90 days	70.61 (68.20, 73.10)	101.63 (99.00, 104.33)	0.69 (0.67, 0.73)	<0.001	0.93 (0.89, 0.97)	0.001
		91-180 days	70.13 (68.16, 72.15)	101.63 (99.47, 103.83)	0.69 (0.67, 0.72)	<0.001	0.91 (0.88, 0.94)	<0.001
		181-365 days	70.53 (69.14, 71.95)	100.36 (98.86, 101.89)	0.70 (0.69, 0.72)	<0.001	0.91 (0.89, 0.93)	<0.001
		366-730 days	71.75 (70.75, 72.77)	98.41 (97.34, 99.49)	0.73 (0.72, 0.74)	<0.001	0.94 (0.92, 0.96)	<0.001
	Quintile 2	1-30 days	62.08 (58.90, 65.43)	83.72 (80.17, 87.43)	0.74 (0.69, 0.79)	<0.001	1.00 (0.94, 1.08)	0.888
		31-90 days	61.05 (58.80, 63.38)	86.29 (83.72, 88.94)	0.71 (0.67, 0.74)	<0.001	0.93 (0.89, 0.98)	0.003
		91-180 days	59.12 (57.31, 60.99)	85.10 (83.01, 87.24)	0.69 (0.67, 0.72)	<0.001	0.91 (0.87, 0.94)	<0.001
		181-365 days	59.94 (58.66, 61.25)	82.92 (81.47, 84.40)	0.72 (0.70, 0.74)	<0.001	0.93 (0.91, 0.96)	<0.001
		366-730 days	60.09 (59.17, 61.03)	80.71 (79.68, 81.75)	0.74 (0.73, 0.76)	<0.001	0.94 (0.92, 0.96)	<0.001
	Quintile 3	1-30 days	53.93 (51.06, 56.95)	69.12 (65.88, 72.53)	0.78 (0.73, 0.84)	<0.001	1.05 (0.98, 1.14)	0.156
		31-90 days	50.98 (48.99, 53.04)	69.36 (67.04, 71.76)	0.73 (0.70, 0.77)	<0.001	0.97 (0.92, 1.02)	0.243
		91-180 days	51.97 (50.32, 53.67)	69.28 (67.38, 71.24)	0.75 (0.72, 0.78)	<0.001	0.99 (0.95, 1.03)	0.644
		181-365 days	51.41 (50.26, 52.58)	67.84 (66.52, 69.19)	0.76 (0.74, 0.78)	<0.001	0.98 (0.95, 1.01)	0.246
		366-730 days	52.98 (52.14, 53.83)	68.61 (67.66, 69.58)	0.77 (0.76, 0.79)	<0.001	0.98 (0.96, 1.00)	0.052
	Quintile 4	1-30 days	49.49 (46.89, 52.23)	69.81 (66.51, 73.29)	0.71 (0.66, 0.76)	<0.001	0.97 (0.90, 1.04)	0.394

	31-90 days	46.60 (44.81, 48.47)	68.21 (65.88, 70.63)	0.68 (0.65, 0.72)	<0.001	0.91 (0.86, 0.96)	0.001
	91-180 days	47.76 (46.27, 49.30)	66.96 (65.06, 68.91)	0.71 (0.68, 0.74)	<0.001	0.93 (0.89, 0.97)	0.002
	181-365 days	49.37 (48.30, 50.46)	66.71 (65.38, 68.07)	0.74 (0.72, 0.76)	<0.001	0.96 (0.93, 0.99)	0.011
	366-730 days	50.31 (49.53, 51.09)	65.19 (64.25, 66.14)	0.77 (0.76, 0.79)	<0.001	0.97 (0.95, 1.00)	0.017
Quintile 5 (highest)	1-30 days	56.79 (53.98, 59.75)	88.10 (84.30, 92.08)	0.64 (0.60, 0.69)	<0.001	0.88 (0.82, 0.95)	<0.001
	31-90 days	56.24 (54.25, 58.31)	84.30 (81.65, 87.04)	0.67 (0.64, 0.70)	<0.001	0.89 (0.85, 0.94)	<0.001
	91-180 days	59.03 (57.36, 60.76)	85.08 (82.89, 87.32)	0.69 (0.67, 0.72)	<0.001	0.91 (0.88, 0.95)	<0.001
	181-365 days	58.45 (57.28, 59.65)	83.56 (82.04, 85.11)	0.70 (0.68, 0.72)	<0.001	0.91 (0.88, 0.93)	<0.001
	366-730 days	59.68 (58.83, 60.54)	80.89 (79.82, 81.98)	0.74 (0.72, 0.75)	<0.001	0.93 (0.91, 0.95)	<0.001

ED: emergency department; GP: general practitioner; CI: confidence interval.

<sup>i</sup>Adjusting for age, sex, rurality, Ontario health region, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and history of mental health/substance use indications at baseline.

<sup>ii</sup>Comparing rates of outcomes for SR-TBI, compared to TBI from all other causes.

\*Model was not fit due to data sparsity/convergence issues.

Refer to Figures S8-S14.

**Table S7.** Association of TBI-type with rates of all-cause and psychiatric service use, by rurality

Indicator	Strata	Days after index date	Rate per 100,000 (95% CI)		Unadjusted comparison		Adjusted comparison <sup>i</sup>	
			SR-TBI	TBI from all other causes	Incidence Rate Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value	Incidence Rate Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value
All-cause hospitalizations	Urban	1-30 days	43.23 (42.00, 44.49)	67.12 (65.59, 68.69)	0.64 (0.62, 0.67)	<0.001	0.77 (0.74, 0.80)	<0.001
		31-90 days	22.17 (21.55, 22.81)	34.74 (33.96, 35.54)	0.64 (0.62, 0.66)	<0.001	0.80 (0.77, 0.83)	<0.001
		91-180 days	19.56 (19.08, 20.05)	30.80 (30.19, 31.41)	0.64 (0.62, 0.66)	<0.001	0.80 (0.77, 0.82)	<0.001
		181-365 days	19.22 (18.89, 19.56)	28.57 (28.16, 28.98)	0.67 (0.66, 0.69)	<0.001	0.84 (0.82, 0.85)	<0.001
		366-730 days	18.13 (17.89, 18.36)	25.75 (25.47, 26.03)	0.70 (0.69, 0.72)	<0.001	0.86 (0.85, 0.88)	<0.001
	Rural	1-30 days	46.39 (43.12, 49.90)	77.13 (72.78, 81.74)	0.60 (0.55, 0.66)	<0.001	0.71 (0.64, 0.78)	<0.001
		31-90 days	21.29 (19.73, 22.98)	35.89 (33.79, 38.12)	0.59 (0.54, 0.65)	<0.001	0.75 (0.68, 0.83)	<0.001
		91-180 days	20.92 (19.64, 22.28)	32.81 (31.16, 34.55)	0.64 (0.59, 0.69)	<0.001	0.78 (0.72, 0.85)	<0.001
		181-365 days	20.01 (19.13, 20.93)	30.27 (29.16, 31.43)	0.66 (0.62, 0.70)	<0.001	0.81 (0.76, 0.86)	<0.001
		366-730 days	19.54 (18.92, 20.19)	28.08 (27.31, 28.88)	0.70 (0.67, 0.73)	<0.001	0.84 (0.81, 0.88)	<0.001
Psychiatric hospitalizations	Urban	1-30 days	4.72 (4.33, 5.15)	10.43 (9.83, 11.06)	0.45 (0.41, 0.50)	<0.001	0.73 (0.65, 0.81)	<0.001
		31-90 days	2.93 (2.71, 3.17)	6.96 (6.62, 7.33)	0.42 (0.38, 0.46)	<0.001	0.71 (0.64, 0.78)	<0.001
		91-180 days	2.57 (2.40, 2.75)	5.87 (5.61, 6.14)	0.44 (0.40, 0.48)	<0.001	0.71 (0.65, 0.77)	<0.001
		181-365 days	2.39 (2.28, 2.52)	5.13 (4.96, 5.31)	0.47 (0.44, 0.50)	<0.001	0.75 (0.70, 0.80)	<0.001
		366-730 days	2.12 (2.04, 2.20)	4.29 (4.18, 4.41)	0.49 (0.47, 0.52)	<0.001	0.76 (0.73, 0.80)	<0.001
	Rural	1-30 days	5.74 (4.66, 7.07)	11.31 (9.72, 13.16)	0.51 (0.39, 0.66)	<0.001	0.79 (0.61, 1.03)	0.083
		31-90 days	3.62 (3.01, 4.36)	7.00 (6.10, 8.02)	0.52 (0.41, 0.65)	<0.001	0.86 (0.67, 1.08)	0.195
		91-180 days	3.17 (2.70, 3.73)	6.38 (5.68, 7.18)	0.50 (0.41, 0.61)	<0.001	0.79 (0.64, 0.97)	0.025
		181-365 days	2.37 (2.08, 2.70)	5.45 (4.98, 5.95)	0.44 (0.37, 0.51)	<0.001	0.70 (0.60, 0.82)	<0.001

All-cause ED visits	Urban	366-730 days	2.50 (2.28, 2.74)	4.66 (4.35, 4.99)	0.54 (0.48, 0.60)	<0.001	0.82 (0.73, 0.92)	0.001
		1-30 days	434.64 (430.70, 438.62)	529.16 (524.82, 533.53)	0.82 (0.81, 0.83)	<0.001	0.94 (0.93, 0.95)	<0.001
		31-90 days	215.86 (213.90, 217.84)	266.39 (264.21, 268.59)	0.81 (0.80, 0.82)	<0.001	0.96 (0.95, 0.98)	<0.001
		91-180 days	205.18 (203.62, 206.76)	249.98 (248.25, 251.72)	0.82 (0.81, 0.83)	<0.001	0.96 (0.95, 0.97)	<0.001
		181-365 days	198.87 (197.79, 199.96)	239.65 (238.47, 240.84)	0.83 (0.82, 0.84)	<0.001	0.97 (0.96, 0.97)	<0.001
		366-730 days	183.09 (182.34, 183.83)	218.86 (218.05, 219.68)	0.84 (0.83, 0.84)	<0.001	0.97 (0.97, 0.98)	<0.001
	Rural	1-30 days	694.58 (681.59, 707.83)	823.14 (808.64, 837.91)	0.84 (0.82, 0.87)	<0.001	0.93 (0.90, 0.95)	<0.001
		31-90 days	346.00 (339.50, 352.61)	410.75 (403.49, 418.13)	0.84 (0.82, 0.86)	<0.001	0.95 (0.92, 0.97)	<0.001
		91-180 days	340.79 (335.52, 346.15)	388.80 (383.02, 394.67)	0.88 (0.86, 0.90)	<0.001	0.98 (0.96, 1.00)	0.042
		181-365 days	329.93 (326.29, 333.60)	370.98 (367.02, 374.98)	0.89 (0.88, 0.90)	<0.001	0.99 (0.98, 1.01)	0.334
		366-730 days	304.50 (302.00, 307.02)	339.73 (337.02, 342.47)	0.90 (0.89, 0.91)	<0.001	1.00 (0.99, 1.01)	0.930
Psychiatric ED visits	Urban	1-30 days	28.88 (27.87, 29.92)	50.84 (49.51, 52.21)	0.57 (0.54, 0.59)	<0.001	0.88 (0.84, 0.92)	<0.001
		31-90 days	14.33 (13.83, 14.85)	31.36 (30.62, 32.12)	0.46 (0.44, 0.48)	<0.001	0.79 (0.75, 0.82)	<0.001
		91-180 days	11.89 (11.52, 12.27)	26.06 (25.51, 26.63)	0.46 (0.44, 0.47)	<0.001	0.80 (0.77, 0.83)	<0.001
		181-365 days	10.96 (10.71, 11.22)	24.85 (24.47, 25.24)	0.44 (0.43, 0.45)	<0.001	0.76 (0.74, 0.79)	<0.001
		366-730 days	10.24 (10.07, 10.42)	21.88 (21.62, 22.14)	0.47 (0.46, 0.48)	<0.001	0.79 (0.77, 0.81)	<0.001
	Rural	1-30 days	35.42 (32.58, 38.51)	53.09 (49.50, 56.94)	0.67 (0.60, 0.74)	<0.001	0.95 (0.85, 1.06)	0.333
		31-90 days	15.77 (14.43, 17.23)	30.32 (28.40, 32.38)	0.52 (0.47, 0.58)	<0.001	0.85 (0.76, 0.95)	0.005
		91-180 days	12.95 (11.96, 14.03)	25.13 (23.69, 26.65)	0.52 (0.47, 0.57)	<0.001	0.85 (0.77, 0.94)	0.002

All-cause GP visits	Urban	181-365 days	11.70 (11.03, 12.41)	23.75 (22.76, 24.78)	0.49 (0.46, 0.53)	<0.001	0.83 (0.77, 0.89)	<0.001
		366-730 days	11.65 (11.17, 12.15)	22.37 (21.68, 23.08)	0.52 (0.49, 0.55)	<0.001	0.84 (0.80, 0.89)	<0.001
		1-30 days	2047.37 (2038.79, 2055.98)	2198.76 (2189.90, 2207.66)	0.93 (0.93, 0.94)	<0.001	0.96 (0.96, 0.97)	<0.001
		31-90 days	1084.99 (1080.58, 1089.43)	1221.88 (1217.20, 1226.57)	0.89 (0.88, 0.89)	<0.001	0.95 (0.94, 0.95)	<0.001
		91-180 days	1005.36 (1001.88, 1008.85)	1123.28 (1119.61, 1126.97)	0.90 (0.89, 0.90)	<0.001	0.96 (0.96, 0.96)	<0.001
		181-365 days	966.40 (964.01, 968.79)	1073.10 (1070.59, 1075.62)	0.90 (0.90, 0.90)	<0.001	0.97 (0.96, 0.97)	<0.001
		366-730 days	924.82 (923.15, 926.49)	1020.18 (1018.43, 1021.94)	0.91 (0.90, 0.91)	<0.001	0.97 (0.97, 0.98)	<0.001
	Rural	1-30 days	1264.39 (1246.81, 1282.22)	1409.28 (1390.26, 1428.56)	0.90 (0.88, 0.91)	<0.001	0.92 (0.91, 0.94)	<0.001
		31-90 days	653.77 (644.82, 662.84)	798.03 (787.89, 808.30)	0.82 (0.80, 0.83)	<0.001	0.88 (0.86, 0.89)	<0.001
		91-180 days	607.18 (600.12, 614.31)	716.26 (708.39, 724.21)	0.85 (0.83, 0.86)	<0.001	0.91 (0.89, 0.92)	<0.001
		181-365 days	585.10 (580.25, 589.98)	681.93 (676.56, 687.35)	0.86 (0.85, 0.87)	<0.001	0.92 (0.91, 0.93)	<0.001
		366-730 days	566.38 (562.97, 569.81)	653.84 (650.08, 657.63)	0.87 (0.86, 0.87)	<0.001	0.94 (0.93, 0.94)	<0.001
Mental-health related GP visits	Urban	1-30 days	93.32 (91.50, 95.17)	155.29 (152.95, 157.67)	0.60 (0.59, 0.62)	<0.001	0.82 (0.80, 0.85)	<0.001
		31-90 days	84.78 (83.56, 86.03)	140.68 (139.10, 142.28)	0.60 (0.59, 0.61)	<0.001	0.83 (0.82, 0.85)	<0.001
		91-180 days	83.19 (82.19, 84.19)	137.51 (136.23, 138.80)	0.60 (0.60, 0.61)	<0.001	0.84 (0.82, 0.85)	<0.001
		181-365 days	83.35 (82.65, 84.05)	139.25 (138.35, 140.16)	0.60 (0.59, 0.60)	<0.001	0.82 (0.81, 0.83)	<0.001
		366-730 days	85.29 (84.79, 85.80)	140.13 (139.48, 140.78)	0.61 (0.60, 0.61)	<0.001	0.83 (0.82, 0.83)	<0.001
	Rural	1-30 days	68.00 (64.02, 72.23)	116.94 (111.56, 122.59)	0.58 (0.54, 0.63)	<0.001	0.79 (0.73, 0.86)	<0.001

		31-90 days	58.26 (55.63, 61.01)	108.83 (105.13, 112.67)	0.54 (0.51, 0.57)	<0.001	0.75 (0.71, 0.79)	<0.001
		91-180 days	59.04 (56.86, 61.29)	102.13 (99.19, 105.16)	0.58 (0.55, 0.61)	<0.001	0.79 (0.75, 0.82)	<0.001
		181-365 days	57.03 (55.53, 58.57)	109.57 (107.43, 111.75)	0.52 (0.50, 0.54)	<0.001	0.71 (0.68, 0.73)	<0.001
		366-730 days	60.04 (58.93, 61.16)	114.09 (112.52, 115.68)	0.53 (0.51, 0.54)	<0.001	0.70 (0.69, 0.72)	<0.001
Psychiatrist visits	Urban	1-30 days	63.90 (62.40, 65.44)	89.41 (87.63, 91.22)	0.71 (0.69, 0.74)	<0.001	0.99 (0.95, 1.02)	0.367
		31-90 days	61.36 (60.32, 62.42)	88.54 (87.29, 89.81)	0.69 (0.68, 0.71)	<0.001	0.94 (0.91, 0.96)	<0.001
		91-180 days	62.08 (61.22, 62.95)	87.93 (86.91, 88.97)	0.71 (0.69, 0.72)	<0.001	0.94 (0.93, 0.96)	<0.001
		181-365 days	62.17 (61.57, 62.78)	86.59 (85.88, 87.31)	0.72 (0.71, 0.73)	<0.001	0.94 (0.93, 0.96)	<0.001
		366-730 days	63.11 (62.68, 63.55)	84.84 (84.34, 85.35)	0.74 (0.74, 0.75)	<0.001	0.96 (0.95, 0.97)	<0.001
	Rural	1-30 days	24.39 (22.05, 26.97)	41.17 (38.02, 44.58)	0.59 (0.52, 0.67)	<0.001	0.81 (0.71, 0.92)	0.001
		31-90 days	23.72 (22.06, 25.50)	36.54 (34.42, 38.79)	0.65 (0.59, 0.71)	<0.001	0.85 (0.78, 0.94)	0.001
		91-180 days	23.72 (22.36, 25.17)	38.58 (36.79, 40.46)	0.61 (0.57, 0.66)	<0.001	0.79 (0.73, 0.85)	<0.001
		181-365 days	25.83 (24.83, 26.87)	39.01 (37.74, 40.32)	0.66 (0.63, 0.70)	<0.001	0.85 (0.80, 0.89)	<0.001
		366-730 days	26.74 (26.01, 27.49)	39.57 (38.65, 40.51)	0.68 (0.65, 0.70)	<0.001	0.85 (0.82, 0.89)	<0.001

ED: emergency department; GP: general practitioner; CI: confidence interval.

<sup>i</sup>Adjusting for age, sex, neighbourhood income quintiles, Ontario health region, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and history of mental health/substance use indications at baseline.

<sup>ii</sup>Comparing rates of outcomes for SR-TBI, compared to TBI from all other causes.  
Refer to Figures S15-S21.



**Table S8.** Association of TBI-type with rates of all-cause and psychiatric service use, by Ontario health region

Indicator	Strata	Days after index date	Rate per 100,000 (95% CI)		Unadjusted comparison		Adjusted comparison <sup>i</sup>	
			SR-TBI	TBI from all other causes	Incidence Rate Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value	Incidence Rate Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value
All-cause hospitalizations	West	1-30 days	45.74 (43.58, 48.00)	67.86 (65.24, 70.58)	0.67 (0.63, 0.72)	<0.001	0.77 (0.72, 0.82)	<0.001
		31-90 days	23.97 (22.87, 25.13)	36.05 (34.70, 37.45)	0.66 (0.63, 0.71)	<0.001	0.78 (0.74, 0.83)	<0.001
		91-180 days	20.78 (19.94, 21.66)	31.55 (30.52, 32.62)	0.66 (0.62, 0.69)	<0.001	0.78 (0.74, 0.82)	<0.001
		181-365 days	20.77 (20.18, 21.38)	29.33 (28.62, 30.05)	0.71 (0.68, 0.74)	<0.001	0.83 (0.80, 0.87)	<0.001
		366-730 days	19.09 (18.68, 19.51)	25.98 (25.51, 26.47)	0.73 (0.71, 0.76)	<0.001	0.86 (0.83, 0.88)	<0.001
	Central	1-30 days	38.75 (36.61, 41.01)	59.61 (56.85, 62.50)	0.65 (0.60, 0.70)	<0.001	0.75 (0.69, 0.81)	<0.001
		31-90 days	20.02 (18.93, 21.17)	28.81 (27.45, 30.23)	0.69 (0.65, 0.75)	<0.001	0.85 (0.79, 0.91)	<0.001
		91-180 days	17.60 (16.76, 18.48)	25.27 (24.23, 26.36)	0.70 (0.65, 0.74)	<0.001	0.84 (0.78, 0.89)	<0.001
		181-365 days	17.35 (16.77, 17.96)	23.64 (22.93, 24.37)	0.73 (0.70, 0.77)	<0.001	0.89 (0.85, 0.93)	<0.001
		366-730 days	16.61 (16.20, 17.03)	22.00 (21.51, 22.50)	0.75 (0.73, 0.78)	<0.001	0.90 (0.87, 0.93)	<0.001
	Toronto	1-30 days	43.33 (40.50, 46.36)	73.29 (69.93, 76.82)	0.59 (0.54, 0.64)	<0.001	0.74 (0.68, 0.80)	<0.001
		31-90 days	20.94 (19.54, 22.43)	36.60 (34.92, 38.37)	0.57 (0.53, 0.62)	<0.001	0.77 (0.71, 0.84)	<0.001
		91-180 days	18.37 (17.30, 19.51)	32.82 (31.51, 34.18)	0.56 (0.52, 0.60)	<0.001	0.74 (0.69, 0.80)	<0.001
		181-365 days	18.74 (17.98, 19.54)	30.27 (29.38, 31.18)	0.62 (0.59, 0.65)	<0.001	0.81 (0.77, 0.85)	<0.001
		366-730 days	17.45 (16.92, 18.00)	27.23 (26.63, 27.85)	0.64 (0.62, 0.67)	<0.001	0.83 (0.79, 0.86)	<0.001

Psychiatric hospitalizations	East	1-30 days	45.93 (43.50, 48.49)	67.84 (64.62, 71.23)	0.68 (0.63, 0.73)	<0.001	0.79 (0.73, 0.85)	<0.001
		31-90 days	21.71 (20.53, 22.96)	33.44 (31.84, 35.12)	0.65 (0.60, 0.70)	<0.001	0.79 (0.73, 0.85)	<0.001
		91-180 days	20.39 (19.46, 21.38)	29.63 (28.39, 30.92)	0.69 (0.65, 0.73)	<0.001	0.84 (0.79, 0.89)	<0.001
		181-365 days	19.20 (18.56, 19.87)	27.56 (26.72, 28.42)	0.70 (0.67, 0.73)	<0.001	0.83 (0.80, 0.87)	<0.001
		366-730 days	18.51 (18.06, 18.97)	24.62 (24.05, 25.20)	0.75 (0.73, 0.78)	<0.001	0.89 (0.86, 0.92)	<0.001
	Northeast	1-30 days	47.32 (41.86, 53.48)	87.00 (79.88, 94.75)	0.54 (0.47, 0.63)	<0.001	0.71 (0.61, 0.83)	<0.001
		31-90 days	24.70 (21.91, 27.85)	47.91 (44.17, 51.98)	0.52 (0.45, 0.60)	<0.001	0.75 (0.64, 0.87)	<0.001
		91-180 days	24.53 (22.23, 27.06)	44.68 (41.70, 47.87)	0.55 (0.49, 0.62)	<0.001	0.78 (0.69, 0.88)	<0.001
		181-365 days	23.44 (21.85, 25.15)	39.32 (37.35, 41.40)	0.60 (0.55, 0.65)	<0.001	0.80 (0.73, 0.88)	<0.001
		366-730 days	23.00 (21.86, 24.20)	37.44 (36.05, 38.88)	0.61 (0.58, 0.65)	<0.001	0.81 (0.76, 0.87)	<0.001
	Northwest	1-30 days	46.18 (38.40, 55.53)	89.99 (80.39, 100.73)	0.51 (0.41, 0.64)	<0.001	0.71 (0.57, 0.89)	0.003
		31-90 days	26.18 (22.02, 31.14)	50.16 (45.07, 55.82)	0.52 (0.43, 0.64)	<0.001	0.77 (0.62, 0.94)	0.013
		91-180 days	25.00 (21.63, 28.90)	49.22 (45.06, 53.76)	0.51 (0.43, 0.60)	<0.001	0.72 (0.61, 0.86)	<0.001
		181-365 days	20.54 (18.37, 22.97)	47.02 (44.14, 50.08)	0.44 (0.38, 0.50)	<0.001	0.62 (0.55, 0.71)	<0.001
		366-730 days	23.17 (21.49, 24.98)	43.78 (41.78, 45.88)	0.53 (0.48, 0.58)	<0.001	0.74 (0.68, 0.81)	<0.001
	West	1-30 days	5.06 (4.38, 5.85)	10.56 (9.56, 11.67)	0.48 (0.40, 0.57)	<0.001	0.69 (0.58, 0.83)	<0.001
		31-90 days	3.25 (2.85, 3.69)	6.65 (6.08, 7.27)	0.49 (0.42, 0.57)	<0.001	0.73 (0.62, 0.85)	<0.001
		91-180 days	2.84 (2.54, 3.18)	5.94 (5.50, 6.42)	0.48 (0.42, 0.55)	<0.001	0.70 (0.61, 0.80)	<0.001
		181-365 days	2.47 (2.27, 2.69)	5.14 (4.85, 5.45)	0.48 (0.43, 0.53)	<0.001	0.69 (0.63, 0.77)	<0.001
		366-730 days	2.11 (1.97, 2.25)	4.36 (4.16, 4.56)	0.48 (0.45, 0.52)	<0.001	0.67 (0.62, 0.73)	<0.001

Central	1-30 days	3.51 (2.91, 4.24)	8.71 (7.70, 9.86)	0.40 (0.32, 0.51)	<0.001	0.63 (0.50, 0.79)	<0.001
	31-90 days	2.02 (1.69, 2.41)	5.43 (4.86, 6.07)	0.37 (0.30, 0.46)	<0.001	0.61 (0.49, 0.75)	<0.001
	91-180 days	1.75 (1.50, 2.04)	4.36 (3.94, 4.82)	0.40 (0.33, 0.48)	<0.001	0.63 (0.52, 0.76)	<0.001
	181-365 days	1.90 (1.72, 2.11)	4.01 (3.72, 4.32)	0.47 (0.42, 0.54)	<0.001	0.74 (0.65, 0.84)	<0.001
	366-730 days	1.71 (1.58, 1.85)	3.41 (3.22, 3.61)	0.50 (0.46, 0.55)	<0.001	0.76 (0.68, 0.83)	<0.001
Toronto	1-30 days	5.20 (4.28, 6.32)	10.57 (9.34, 11.96)	0.49 (0.39, 0.62)	<0.001	0.87 (0.68, 1.10)	0.233
	31-90 days	3.30 (2.78, 3.92)	8.05 (7.28, 8.90)	0.41 (0.34, 0.50)	<0.001	0.71 (0.58, 0.87)	0.001
	91-180 days	2.34 (1.98, 2.77)	6.33 (5.77, 6.95)	0.37 (0.31, 0.45)	<0.001	0.62 (0.51, 0.76)	<0.001
	181-365 days	2.43 (2.17, 2.73)	5.80 (5.42, 6.20)	0.42 (0.37, 0.48)	<0.001	0.71 (0.62, 0.81)	<0.001
	366-730 days	2.37 (2.18, 2.58)	4.60 (4.36, 4.86)	0.51 (0.47, 0.57)	<0.001	0.83 (0.75, 0.92)	0.001
East	1-30 days	4.74 (4.01, 5.62)	9.80 (8.62, 11.14)	0.48 (0.39, 0.60)	<0.001	0.76 (0.61, 0.94)	0.013
	31-90 days	2.80 (2.40, 3.27)	5.73 (5.09, 6.46)	0.49 (0.40, 0.59)	<0.001	0.75 (0.62, 0.92)	0.005
	91-180 days	3.06 (2.71, 3.46)	5.17 (4.67, 5.73)	0.59 (0.50, 0.69)	<0.001	0.94 (0.80, 1.11)	0.466
	181-365 days	2.37 (2.15, 2.61)	4.28 (3.96, 4.63)	0.55 (0.49, 0.63)	<0.001	0.86 (0.76, 0.98)	0.020
	366-730 days	2.12 (1.97, 2.28)	3.42 (3.21, 3.64)	0.62 (0.56, 0.68)	<0.001	0.92 (0.83, 1.01)	0.089
Northeast	1-30 days	9.61 (7.32, 12.61)	20.14 (16.87, 24.05)	0.48 (0.34, 0.66)	<0.001	0.81 (0.58, 1.14)	0.234
	31-90 days	5.83 (4.55, 7.46)	15.47 (13.41, 17.86)	0.38 (0.28, 0.50)	<0.001	0.72 (0.53, 0.97)	0.030
	91-180 days	5.31 (4.30, 6.56)	13.51 (11.92, 15.31)	0.39 (0.31, 0.50)	<0.001	0.72 (0.55, 0.92)	0.010
	181-365 days	4.19 (3.55, 4.95)	9.76 (8.80, 10.82)	0.43 (0.35, 0.52)	<0.001	0.77 (0.63, 0.95)	0.013
	366-730 days	4.13 (3.66, 4.65)	9.20 (8.52, 9.92)	0.45 (0.39, 0.52)	<0.001	0.73 (0.63, 0.85)	<0.001
Northwest	1-30 days	8.58 (5.60, 13.16)	16.98 (13.10, 22.02)	0.51 (0.31, 0.83)	0.007	0.97 (0.58, 1.62)	0.900
	31-90 days	6.34 (4.46, 9.02)	11.64 (9.33, 14.54)	0.54 (0.36, 0.83)	0.004	1.09 (0.71, 1.67)	0.706
	91-180 days	4.10 (2.87, 5.86)	10.58 (8.75, 12.80)	0.39 (0.26, 0.58)	<0.001	0.69 (0.45, 1.04)	0.079
	181-365 days	4.27 (3.34, 5.45)	10.07 (8.78, 11.54)	0.42 (0.32, 0.56)	<0.001	0.83 (0.62, 1.11)	0.208

		366-730 days	3.85 (3.20, 4.63)	8.87 (7.99, 9.84)	0.43 (0.35, 0.54)	<0.001	0.77 (0.62, 0.96)	0.021
All-cause ED visits	West	1-30 days	483.13 (476.00, 490.37)	565.66 (558.02, 573.42)	0.85 (0.84, 0.87)	<0.001	0.94 (0.92, 0.96)	<0.001
		31-90 days	247.56 (243.94, 251.22)	295.82 (291.90, 299.79)	0.84 (0.82, 0.85)	<0.001	0.95 (0.93, 0.97)	<0.001
		91-180 days	238.97 (236.06, 241.91)	280.37 (277.24, 283.52)	0.85 (0.84, 0.87)	<0.001	0.96 (0.94, 0.97)	<0.001
		181-365 days	229.45 (227.46, 231.46)	268.73 (266.58, 270.89)	0.85 (0.84, 0.86)	<0.001	0.95 (0.94, 0.97)	<0.001
		366-730 days	212.74 (211.37, 214.13)	246.62 (245.15, 248.10)	0.86 (0.86, 0.87)	<0.001	0.96 (0.95, 0.97)	<0.001
	Central	1-30 days	377.42 (370.62, 384.35)	454.37 (446.63, 462.24)	0.83 (0.81, 0.85)	<0.001	0.92 (0.90, 0.95)	<0.001
		31-90 days	184.81 (181.44, 188.24)	213.92 (210.16, 217.74)	0.86 (0.84, 0.89)	<0.001	0.99 (0.97, 1.02)	0.566
		91-180 days	174.41 (171.73, 177.13)	204.43 (201.42, 207.48)	0.85 (0.84, 0.87)	<0.001	0.97 (0.95, 0.99)	0.005
		181-365 days	170.71 (168.85, 172.58)	195.47 (193.41, 197.55)	0.87 (0.86, 0.89)	<0.001	0.99 (0.97, 1.01)	0.187
		366-730 days	159.73 (158.44, 161.02)	182.28 (180.86, 183.72)	0.88 (0.87, 0.89)	<0.001	1.00 (0.99, 1.01)	0.590
	Toronto	1-30 days	430.41 (421.28, 439.73)	529.47 (520.30, 538.81)	0.81 (0.79, 0.84)	<0.001	0.95 (0.93, 0.98)	0.001
		31-90 days	191.31 (187.01, 195.72)	260.79 (256.23, 265.43)	0.73 (0.71, 0.76)	<0.001	0.92 (0.89, 0.95)	<0.001
		91-180 days	182.02 (178.58, 185.53)	236.39 (232.83, 240.00)	0.77 (0.75, 0.79)	<0.001	0.95 (0.93, 0.98)	<0.001
		181-365 days	173.25 (170.89, 175.63)	231.00 (228.53, 233.49)	0.75 (0.74, 0.76)	<0.001	0.93 (0.91, 0.94)	<0.001
		366-730 days	158.93 (157.31, 160.56)	204.71 (203.04, 206.38)	0.78 (0.77, 0.79)	<0.001	0.94 (0.93, 0.96)	<0.001
	East	1-30 days	488.50 (480.45, 496.69)	571.38 (561.87, 581.05)	0.85 (0.83, 0.88)	<0.001	0.95 (0.92, 0.97)	<0.001
		31-90 days	251.12 (247.03, 255.27)	298.86 (293.99, 303.82)	0.84 (0.82, 0.86)	<0.001	0.96 (0.94, 0.99)	0.003
		91-180 days	241.43 (238.15, 244.76)	281.81 (277.94, 285.74)	0.86 (0.84, 0.87)	<0.001	0.97 (0.95, 0.99)	0.008

		181-365 days	234.98 (232.72, 237.28)	266.82 (264.18, 269.49)	0.88 (0.87, 0.89)	<0.001	0.99 (0.98, 1.01)	0.258
		366-730 days	214.23 (212.68, 215.79)	242.18 (240.37, 244.00)	0.88 (0.88, 0.89)	<0.001	0.99 (0.98, 1.00)	0.191
Northeast	1-30 days		788.50 (765.19, 812.52)	901.84 (878.24, 926.08)	0.87 (0.84, 0.91)	<0.001	0.95 (0.91, 0.99)	0.009
	31-90 days		380.38 (368.93, 392.18)	428.58 (417.06, 440.41)	0.89 (0.85, 0.92)	<0.001	1.00 (0.96, 1.05)	0.888
	91-180 days		370.14 (360.89, 379.64)	417.00 (407.69, 426.52)	0.89 (0.86, 0.92)	<0.001	1.00 (0.97, 1.04)	0.790
	181-365 days		363.95 (357.51, 370.50)	390.47 (384.15, 396.90)	0.93 (0.91, 0.95)	<0.001	1.05 (1.02, 1.07)	<0.001
	366-730 days		326.84 (322.47, 331.26)	358.00 (353.66, 362.40)	0.91 (0.90, 0.93)	<0.001	1.03 (1.01, 1.04)	0.009
Northwest	1-30 days		760.09 (726.32, 795.43)	1129.00 (1093.61, 1165.52)	0.67 (0.64, 0.71)	<0.001	0.85 (0.80, 0.90)	<0.001
	31-90 days		405.83 (388.36, 424.09)	569.99 (552.19, 588.36)	0.71 (0.67, 0.75)	<0.001	0.94 (0.88, 0.99)	0.020
	91-180 days		367.01 (353.39, 381.15)	515.32 (501.45, 529.57)	0.71 (0.68, 0.75)	<0.001	0.92 (0.87, 0.96)	<0.001
	181-365 days		367.76 (358.18, 377.60)	500.71 (491.11, 510.50)	0.73 (0.71, 0.76)	<0.001	0.95 (0.92, 0.98)	0.002
	366-730 days		335.20 (328.64, 341.89)	468.34 (461.68, 475.10)	0.72 (0.70, 0.73)	<0.001	0.92 (0.90, 0.94)	<0.001
Psychiatric ED visits	West	1-30 days	30.67 (28.91, 32.53)	45.29 (43.17, 47.53)	0.68 (0.63, 0.73)	<0.001	0.93 (0.86, 1.00)	0.062
		31-90 days	14.21 (13.36, 15.11)	26.34 (25.19, 27.54)	0.54 (0.50, 0.58)	<0.001	0.81 (0.75, 0.88)	<0.001
		91-180 days	12.75 (12.09, 13.44)	23.02 (22.14, 23.94)	0.55 (0.52, 0.59)	<0.001	0.85 (0.80, 0.91)	<0.001
		181-365 days	11.73 (11.29, 12.20)	21.56 (20.96, 22.18)	0.54 (0.52, 0.57)	<0.001	0.83 (0.79, 0.87)	<0.001
		366-730 days	10.59 (10.29, 10.90)	18.84 (18.44, 19.26)	0.56 (0.54, 0.58)	<0.001	0.82 (0.79, 0.85)	<0.001
	Central	1-30 days	20.40 (18.86, 22.06)	36.22 (34.08, 38.49)	0.56 (0.51, 0.62)	<0.001	0.81 (0.73, 0.90)	<0.001

	31-90 days	10.26 (9.49, 11.10)	21.16 (20.00, 22.38)	0.49 (0.44, 0.53)	<0.001	0.79 (0.71, 0.87)	<0.001
	91-180 days	7.93 (7.38, 8.53)	16.54 (15.70, 17.43)	0.48 (0.44, 0.52)	<0.001	0.79 (0.72, 0.86)	<0.001
	181-365 days	7.48 (7.09, 7.88)	15.77 (15.19, 16.37)	0.47 (0.44, 0.51)	<0.001	0.77 (0.72, 0.82)	<0.001
	366-730 days	7.49 (7.21, 7.77)	14.65 (14.25, 15.06)	0.51 (0.49, 0.54)	<0.001	0.84 (0.80, 0.88)	<0.001
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Toronto	1-30 days	32.06 (29.64, 34.68)	62.30 (59.20, 65.56)	0.51 (0.47, 0.57)	<0.001	0.89 (0.81, 0.98)	0.018
	31-90 days	15.57 (14.38, 16.87)	43.70 (41.86, 45.63)	0.36 (0.33, 0.39)	<0.001	0.68 (0.62, 0.75)	<0.001
	91-180 days	13.23 (12.33, 14.20)	36.00 (34.63, 37.42)	0.37 (0.34, 0.40)	<0.001	0.71 (0.65, 0.77)	<0.001
	181-365 days	12.15 (11.54, 12.79)	35.56 (34.60, 36.54)	0.34 (0.32, 0.36)	<0.001	0.66 (0.62, 0.70)	<0.001
	366-730 days	11.46 (11.03, 11.90)	29.58 (28.96, 30.23)	0.39 (0.37, 0.40)	<0.001	0.72 (0.69, 0.76)	<0.001
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East	1-30 days	31.34 (29.35, 33.47)	50.63 (47.86, 53.57)	0.62 (0.57, 0.68)	<0.001	0.87 (0.80, 0.95)	0.002
	31-90 days	16.18 (15.17, 17.26)	29.55 (28.05, 31.14)	0.55 (0.50, 0.60)	<0.001	0.86 (0.79, 0.93)	<0.001
	91-180 days	12.93 (12.19, 13.72)	24.49 (23.36, 25.66)	0.53 (0.49, 0.57)	<0.001	0.83 (0.77, 0.90)	<0.001
	181-365 days	11.85 (11.35, 12.37)	21.97 (21.22, 22.74)	0.54 (0.51, 0.57)	<0.001	0.83 (0.79, 0.88)	<0.001
	366-730 days	10.78 (10.44, 11.13)	19.65 (19.14, 20.18)	0.55 (0.53, 0.57)	<0.001	0.83 (0.80, 0.87)	<0.001
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Northeast	1-30 days	49.91 (44.29, 56.23)	70.16 (63.80, 77.16)	0.71 (0.61, 0.83)	<0.001	1.04 (0.89, 1.22)	0.645
	31-90 days	21.37 (18.78, 24.31)	40.30 (36.88, 44.04)	0.53 (0.45, 0.62)	<0.001	0.89 (0.76, 1.05)	0.171
	91-180 days	17.05 (15.15, 19.19)	34.93 (32.31, 37.77)	0.49 (0.42, 0.56)	<0.001	0.80 (0.69, 0.92)	0.002
	181-365 days	15.60 (14.31, 17.00)	31.49 (29.73, 33.36)	0.50 (0.45, 0.55)	<0.001	0.83 (0.74, 0.92)	0.001

		366-730 days	16.35 (15.39, 17.36)	30.79 (29.53, 32.09)	0.53 (0.49, 0.57)	<0.001	0.85 (0.79, 0.92)	<0.001
All-cause GP visits	Northwest	1-30 days	56.80 (48.10, 67.08)	153.45 (140.76, 167.30)	0.37 (0.31, 0.45)	<0.001	0.72 (0.59, 0.87)	0.001
		31-90 days	32.52 (27.84, 37.99)	90.32 (83.40, 97.81)	0.36 (0.30, 0.43)	<0.001	0.79 (0.66, 0.95)	0.011
		91-180 days	26.51 (23.03, 30.51)	77.37 (72.11, 83.01)	0.34 (0.29, 0.40)	<0.001	0.75 (0.64, 0.88)	<0.001
		181-365 days	23.21 (20.90, 25.78)	78.25 (74.51, 82.18)	0.30 (0.26, 0.33)	<0.001	0.67 (0.59, 0.75)	<0.001
		366-730 days	22.18 (20.54, 23.95)	70.96 (68.39, 73.62)	0.31 (0.29, 0.34)	<0.001	0.66 (0.61, 0.72)	<0.001
All-cause GP visits	West	1-30 days	1882.85 (1868.73, 1897.09)	1955.23 (1940.97, 1969.60)	0.96 (0.95, 0.97)	<0.001	1.00 (0.99, 1.01)	0.478
		31-90 days	967.97 (960.80, 975.19)	1079.29 (1071.79, 1086.85)	0.90 (0.89, 0.91)	<0.001	0.96 (0.95, 0.97)	<0.001
		91-180 days	891.89 (886.26, 897.56)	977.90 (972.05, 983.78)	0.91 (0.90, 0.92)	<0.001	0.98 (0.97, 0.99)	<0.001
		181-365 days	848.55 (844.70, 852.41)	939.65 (935.63, 943.68)	0.90 (0.90, 0.91)	<0.001	0.97 (0.97, 0.98)	<0.001
		366-730 days	808.57 (805.88, 811.26)	890.32 (887.52, 893.12)	0.91 (0.90, 0.91)	<0.001	0.98 (0.98, 0.98)	<0.001
	Central	1-30 days	2265.94 (2249.18, 2282.83)	2529.23 (2510.89, 2547.70)	0.90 (0.89, 0.91)	<0.001	0.92 (0.91, 0.93)	<0.001
		31-90 days	1179.17 (1170.61, 1187.79)	1341.60 (1332.15, 1351.13)	0.88 (0.87, 0.89)	<0.001	0.93 (0.92, 0.94)	<0.001
		91-180 days	1102.40 (1095.64, 1109.21)	1238.45 (1231.02, 1245.93)	0.89 (0.88, 0.90)	<0.001	0.94 (0.93, 0.95)	<0.001
		181-365 days	1067.75 (1063.09, 1072.43)	1170.83 (1165.77, 1175.91)	0.91 (0.91, 0.92)	<0.001	0.97 (0.96, 0.97)	<0.001
		366-730 days	1030.53 (1027.26, 1033.82)	1112.31 (1108.78, 1115.84)	0.93 (0.92, 0.93)	<0.001	0.98 (0.98, 0.99)	<0.001
	Toronto	1-30 days	2167.12 (2146.52, 2187.92)	2386.68 (2367.10, 2406.41)	0.91 (0.90, 0.92)	<0.001	0.95 (0.94, 0.97)	<0.001
		31-90 days	1139.75 (1129.18, 1150.43)	1325.48 (1315.15, 1335.89)	0.86 (0.85, 0.87)	<0.001	0.94 (0.93, 0.95)	<0.001

	91-180 days	1062.46 (1054.10, 1070.88)	1220.17 (1212.05, 1228.34)	0.87 (0.86, 0.88)	<0.001	0.95 (0.94, 0.96)	<0.001
	181-365 days	1018.64 (1012.91, 1024.39)	1171.96 (1166.39, 1177.56)	0.87 (0.86, 0.88)	<0.001	0.95 (0.95, 0.96)	<0.001
	366-730 days	980.19 (976.17, 984.22)	1117.25 (1113.36, 1121.17)	0.88 (0.87, 0.88)	<0.001	0.96 (0.95, 0.96)	<0.001
East	1-30 days	1757.38 (1742.04, 1772.85)	1876.71 (1859.42, 1894.17)	0.94 (0.92, 0.95)	<0.001	0.96 (0.95, 0.97)	<0.001
	31-90 days	974.67 (966.58, 982.82)	1089.09 (1079.76, 1098.51)	0.89 (0.88, 0.91)	<0.001	0.95 (0.94, 0.96)	<0.001
	91-180 days	895.27 (888.93, 901.66)	1002.44 (995.11, 1009.83)	0.89 (0.88, 0.90)	<0.001	0.95 (0.94, 0.96)	<0.001
	181-365 days	860.34 (855.99, 864.71)	950.37 (945.37, 955.39)	0.91 (0.90, 0.91)	<0.001	0.96 (0.96, 0.97)	<0.001
	366-730 days	812.89 (809.86, 815.93)	901.35 (897.86, 904.86)	0.90 (0.90, 0.91)	<0.001	0.96 (0.96, 0.97)	<0.001
Northeast	1-30 days	1219.72 (1190.65, 1249.51)	1412.61 (1382.99, 1442.86)	0.86 (0.84, 0.89)	<0.001	0.96 (0.93, 0.99)	0.017
	31-90 days	686.75 (671.30, 702.55)	906.14 (889.33, 923.28)	0.76 (0.74, 0.78)	<0.001	0.89 (0.86, 0.92)	<0.001
	91-180 days	638.10 (625.91, 650.52)	837.04 (823.80, 850.49)	0.76 (0.74, 0.78)	<0.001	0.89 (0.87, 0.92)	<0.001
	181-365 days	624.85 (616.40, 633.42)	802.11 (793.02, 811.30)	0.78 (0.77, 0.79)	<0.001	0.92 (0.90, 0.94)	<0.001
	366-730 days	615.95 (609.94, 622.01)	771.14 (764.76, 777.59)	0.80 (0.79, 0.81)	<0.001	0.95 (0.94, 0.96)	<0.001
Northwest	1-30 days	1077.61 (1037.26, 1119.54)	1127.51 (1092.15, 1164.01)	0.96 (0.91, 1.00)	0.074	1.03 (0.97, 1.08)	0.342
	31-90 days	661.12 (638.71, 684.31)	757.20 (736.65, 778.33)	0.87 (0.84, 0.91)	<0.001	0.99 (0.94, 1.03)	0.628
	91-180 days	598.33 (580.87, 616.32)	690.72 (674.63, 707.19)	0.87 (0.83, 0.90)	<0.001	0.98 (0.95, 1.02)	0.429
	181-365 days	605.80 (593.47, 618.39)	696.94 (685.60, 708.48)	0.87 (0.85, 0.89)	<0.001	1.00 (0.97, 1.02)	0.759
	366-730 days	588.22 (579.51, 597.06)	688.98 (680.88, 697.17)	0.85 (0.84, 0.87)	<0.001	0.99 (0.97, 1.01)	0.423



Mental-health related GP visits	West	1-30 days	101.21 (97.97, 104.55)	165.63 (161.51, 169.85)	0.61 (0.59, 0.64)	<0.001	0.83 (0.79, 0.86)	<0.001
		31-90 days	92.76 (90.56, 95.01)	150.85 (148.06, 153.69)	0.61 (0.60, 0.63)	<0.001	0.84 (0.81, 0.86)	<0.001
		91-180 days	91.57 (89.78, 93.40)	147.89 (145.63, 150.19)	0.62 (0.60, 0.63)	<0.001	0.84 (0.82, 0.86)	<0.001
		181-365 days	90.86 (89.61, 92.13)	151.71 (150.11, 153.34)	0.60 (0.59, 0.61)	<0.001	0.80 (0.79, 0.82)	<0.001
		366-730 days	92.02 (91.12, 92.94)	153.67 (152.51, 154.84)	0.60 (0.59, 0.61)	<0.001	0.79 (0.78, 0.80)	<0.001
	Central	1-30 days	73.04 (70.08, 76.12)	122.77 (118.78, 126.89)	0.59 (0.56, 0.63)	<0.001	0.79 (0.75, 0.83)	<0.001
		31-90 days	62.59 (60.64, 64.60)	107.71 (105.05, 110.43)	0.58 (0.56, 0.61)	<0.001	0.79 (0.76, 0.82)	<0.001
		91-180 days	61.52 (59.94, 63.15)	104.71 (102.56, 106.90)	0.59 (0.57, 0.61)	<0.001	0.79 (0.77, 0.82)	<0.001
		181-365 days	62.08 (60.96, 63.21)	103.44 (101.94, 104.95)	0.60 (0.59, 0.61)	<0.001	0.81 (0.79, 0.83)	<0.001
		366-730 days	65.63 (64.81, 66.46)	104.60 (103.52, 105.68)	0.63 (0.62, 0.64)	<0.001	0.84 (0.83, 0.85)	<0.001
	Toronto	1-30 days	94.59 (90.37, 99.02)	166.93 (161.81, 172.21)	0.57 (0.54, 0.60)	<0.001	0.79 (0.75, 0.84)	<0.001
		31-90 days	85.39 (82.54, 88.35)	148.59 (145.16, 152.11)	0.57 (0.55, 0.60)	<0.001	0.82 (0.78, 0.85)	<0.001
		91-180 days	83.94 (81.61, 86.33)	145.89 (143.10, 148.73)	0.58 (0.56, 0.60)	<0.001	0.82 (0.79, 0.85)	<0.001
		181-365 days	83.32 (81.70, 84.98)	146.90 (144.94, 148.89)	0.57 (0.55, 0.58)	<0.001	0.80 (0.78, 0.82)	<0.001
		366-730 days	83.42 (82.25, 84.60)	145.01 (143.61, 146.43)	0.58 (0.57, 0.59)	<0.001	0.80 (0.78, 0.81)	<0.001
	East	1-30 days	94.70 (91.19, 98.34)	142.47 (137.76, 147.34)	0.66 (0.63, 0.70)	<0.001	0.87 (0.82, 0.91)	<0.001
		31-90 days	88.82 (86.40, 91.30)	131.61 (128.39, 134.91)	0.67 (0.65, 0.70)	<0.001	0.88 (0.85, 0.92)	<0.001
		91-180 days	87.10 (85.14, 89.11)	129.46 (126.84, 132.13)	0.67 (0.65, 0.69)	<0.001	0.88 (0.85, 0.91)	<0.001

		181-365 days	86.17 (84.80, 87.56)	133.09 (131.23, 134.98)	0.65 (0.63, 0.66)	<0.001	0.84 (0.82, 0.85)	<0.001
		366-730 days	87.39 (86.40, 88.39)	135.18 (133.83, 136.54)	0.65 (0.64, 0.66)	<0.001	0.83 (0.82, 0.84)	<0.001
Northeast	1-30 days		80.22 (73.02, 88.13)	161.28 (151.48, 171.72)	0.50 (0.44, 0.56)	<0.001	0.81 (0.72, 0.91)	<0.001
	31-90 days		67.07 (62.36, 72.13)	159.22 (152.26, 166.49)	0.42 (0.39, 0.46)	<0.001	0.69 (0.63, 0.75)	<0.001
	91-180 days		67.41 (63.52, 71.53)	144.50 (139.06, 150.15)	0.47 (0.43, 0.50)	<0.001	0.74 (0.68, 0.79)	<0.001
	181-365 days		73.39 (70.53, 76.37)	157.27 (153.27, 161.37)	0.47 (0.45, 0.49)	<0.001	0.74 (0.70, 0.78)	<0.001
	366-730 days		85.67 (83.45, 87.95)	161.11 (158.20, 164.07)	0.53 (0.52, 0.55)	<0.001	0.86 (0.83, 0.88)	<0.001
Northwest	1-30 days		93.58 (82.21, 106.52)	176.69 (163.03, 191.50)	0.53 (0.45, 0.62)	<0.001	0.88 (0.75, 1.03)	0.109
	31-90 days		82.64 (74.96, 91.10)	169.89 (160.30, 180.06)	0.49 (0.43, 0.54)	<0.001	0.81 (0.72, 0.91)	<0.001
	91-180 days		75.42 (69.39, 81.99)	159.43 (151.80, 167.44)	0.47 (0.43, 0.52)	<0.001	0.78 (0.71, 0.86)	<0.001
	181-365 days		76.83 (72.52, 81.40)	175.51 (169.86, 181.34)	0.44 (0.41, 0.47)	<0.001	0.72 (0.68, 0.77)	<0.001
	366-730 days		81.57 (78.37, 84.90)	178.51 (174.41, 182.70)	0.46 (0.44, 0.48)	<0.001	0.75 (0.72, 0.79)	<0.001
Psychiatrist visits	West	1-30 days	54.47 (52.11, 56.93)	76.51 (73.73, 79.39)	0.71 (0.67, 0.75)	<0.001	0.98 (0.93, 1.04)	0.535
		31-90 days	50.27 (48.66, 51.94)	74.10 (72.15, 76.10)	0.68 (0.65, 0.71)	<0.001	0.93 (0.89, 0.97)	0.001
		91-180 days	51.84 (50.50, 53.22)	75.59 (73.97, 77.23)	0.69 (0.66, 0.71)	<0.001	0.92 (0.89, 0.96)	<0.001
		181-365 days	52.27 (51.32, 53.23)	73.80 (72.68, 74.94)	0.71 (0.69, 0.73)	<0.001	0.93 (0.91, 0.96)	<0.001
		366-730 days	52.82 (52.14, 53.51)	73.57 (72.77, 74.38)	0.72 (0.71, 0.73)	<0.001	0.93 (0.91, 0.94)	<0.001
	Central	1-30 days	46.62 (44.27, 49.10)	67.07 (64.14, 70.13)	0.70 (0.65, 0.74)	<0.001	0.94 (0.88, 1.01)	0.099

	31-90 days	44.53 (42.89, 46.23)	67.53 (65.43, 69.69)	0.66 (0.63, 0.69)	<0.001	0.87 (0.83, 0.91)	<0.001
	91-180 days	45.67 (44.31, 47.07)	63.91 (62.24, 65.63)	0.71 (0.69, 0.74)	<0.001	0.94 (0.90, 0.98)	0.003
	181-365 days	45.21 (44.26, 46.18)	64.02 (62.84, 65.21)	0.71 (0.69, 0.73)	<0.001	0.92 (0.89, 0.94)	<0.001
	366-730 days	46.73 (46.04, 47.43)	63.76 (62.92, 64.61)	0.73 (0.72, 0.75)	<0.001	0.93 (0.91, 0.94)	<0.001
Toronto	1-30 days	113.33 (108.69, 118.16)	141.53 (136.82, 146.40)	0.80 (0.76, 0.84)	<0.001	1.01 (0.96, 1.07)	0.742
	31-90 days	111.82 (108.54, 115.20)	141.18 (137.83, 144.60)	0.79 (0.76, 0.82)	<0.001	0.97 (0.93, 1.01)	0.104
	91-180 days	112.99 (110.29, 115.76)	142.83 (140.07, 145.64)	0.79 (0.77, 0.82)	<0.001	0.95 (0.92, 0.98)	0.003
	181-365 days	113.02 (111.12, 114.95)	139.14 (137.23, 141.08)	0.81 (0.79, 0.83)	<0.001	0.97 (0.95, 0.99)	0.005
	366-730 days	113.55 (112.19, 114.93)	134.01 (132.67, 135.37)	0.85 (0.83, 0.86)	<0.001	1.00 (0.98, 1.01)	0.705
East	1-30 days	52.78 (50.18, 55.52)	78.02 (74.55, 81.64)	0.68 (0.63, 0.72)	<0.001	0.93 (0.87, 1.00)	0.055
	31-90 days	50.84 (49.01, 52.72)	73.53 (71.14, 76.01)	0.69 (0.66, 0.73)	<0.001	0.93 (0.89, 0.98)	0.005
	91-180 days	49.75 (48.27, 51.27)	72.82 (70.87, 74.84)	0.68 (0.66, 0.71)	<0.001	0.91 (0.87, 0.95)	<0.001
	181-365 days	50.33 (49.28, 51.39)	71.14 (69.78, 72.52)	0.71 (0.69, 0.73)	<0.001	0.93 (0.90, 0.95)	<0.001
	366-730 days	51.46 (50.70, 52.23)	68.79 (67.83, 69.76)	0.75 (0.73, 0.76)	<0.001	0.96 (0.94, 0.98)	<0.001
Northeast	1-30 days	23.84 (20.06, 28.33)	48.70 (43.45, 54.59)	0.49 (0.40, 0.60)	<0.001	0.86 (0.70, 1.07)	0.176
	31-90 days	24.88 (22.08, 28.04)	49.73 (45.91, 53.87)	0.50 (0.43, 0.58)	<0.001	0.87 (0.75, 1.01)	0.068
	91-180 days	24.59 (22.29, 27.13)	47.45 (44.37, 50.73)	0.52 (0.46, 0.58)	<0.001	0.86 (0.76, 0.98)	0.020
	181-365 days	25.46 (23.80, 27.24)	48.32 (46.13, 50.62)	0.53 (0.49, 0.57)	<0.001	0.84 (0.77, 0.92)	<0.001

	366-730 days	26.08 (24.87, 27.35)	46.93 (45.37, 48.54)	0.56 (0.52, 0.59)	<0.001	0.87 (0.82, 0.93)	<0.001
Northwest	1-30 days	18.80 (14.08, 25.10)	37.84 (31.80, 45.03)	0.50 (0.35, 0.70)	<0.001	0.86 (0.61, 1.22)	0.409
	31-90 days	15.75 (12.60, 19.69)	35.83 (31.57, 40.66)	0.44 (0.34, 0.57)	<0.001	0.87 (0.67, 1.14)	0.312
	91-180 days	17.35 (14.58, 20.65)	37.94 (34.31, 41.95)	0.46 (0.37, 0.56)	<0.001	0.84 (0.68, 1.04)	0.106
	181-365 days	17.54 (15.54, 19.79)	38.12 (35.54, 40.89)	0.46 (0.40, 0.53)	<0.001	0.80 (0.70, 0.93)	0.003
	366-730 days	18.47 (16.98, 20.09)	42.50 (40.53, 44.57)	0.43 (0.39, 0.48)	<0.001	0.72 (0.65, 0.80)	<0.001

ED: emergency department; GP: general practitioner; CI: confidence interval

<sup>i</sup>Adjusting for age, sex, neighbourhood income quintile, rurality, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and history of mental health/substance use indications at baseline.

<sup>ii</sup>Comparing rates of outcomes for SR-TBI, compared to TBI from all other causes.  
Refer to Figures S22-S28.

**Table S9.** Association of TBI-type with rates of all-cause and psychiatric service use, by age category

Indicator	Strata	Days after index date	Rate per 100,000 (95% CI)		Unadjusted comparison		Adjusted comparison <sup>i</sup>	
			SR-TBI	TBI from all other causes	Incidence Rate Ratio <sup>ii</sup> (95% Cis)	p-value	Incidence Rate Ratio <sup>ii</sup> (95% Cis)	p-value
All-cause hospitalizations	0-9 years old	1-30 days	15.32 (14.06, 16.69)	20.76 (19.30, 22.34)	0.74 (0.66, 0.83)	<0.001	0.76 (0.67, 0.85)	<0.001
		31-90 days	8.77 (8.10, 9.50)	10.24 (9.51, 11.02)	0.86 (0.77, 0.96)	0.005	0.90 (0.80, 1.00)	0.052
		91-180 days	8.13 (7.60, 8.70)	9.29 (8.72, 9.89)	0.88 (0.80, 0.96)	0.005	0.92 (0.83, 1.00)	0.062
		181-365 days	7.17 (6.82, 7.54)	8.31 (7.93, 8.70)	0.86 (0.81, 0.93)	<0.001	0.90 (0.84, 0.96)	0.003
		366-730 days	6.00 (5.77, 6.24)	6.92 (6.67, 7.18)	0.87 (0.82, 0.92)	<0.001	0.90 (0.85, 0.95)	<0.001
	10-17 years old	1-30 days	18.57 (16.78, 20.56)	33.14 (30.62, 35.86)	0.56 (0.49, 0.64)	<0.001	0.66 (0.58, 0.76)	<0.001
		31-90 days	10.09 (9.15, 11.12)	17.32 (16.04, 18.72)	0.58 (0.51, 0.66)	<0.001	0.74 (0.66, 0.85)	<0.001
		91-180 days	9.48 (8.73, 10.29)	16.18 (15.16, 17.28)	0.59 (0.53, 0.65)	<0.001	0.80 (0.74, 0.86)	<0.001
		181-365 days	10.37 (9.81, 10.95)	16.17 (15.45, 16.92)	0.64 (0.60, 0.69)	<0.001	0.73 (0.70, 0.78)	<0.001
		366-730 days	9.61 (9.23, 10.01)	15.75 (15.24, 16.28)	0.61 (0.58, 0.64)	<0.001	0.65 (0.57, 0.73)	<0.001
	18-24 years old	1-30 days	24.42 (22.14, 26.94)	43.83 (40.83, 47.05)	0.56 (0.49, 0.63)	<0.001	0.65 (0.57, 0.73)	<0.001
		31-90 days	10.34 (9.30, 11.51)	19.41 (18.00, 20.92)	0.53 (0.47, 0.61)	<0.001	0.68 (0.60, 0.78)	<0.001
		91-180 days	11.66 (10.74, 12.65)	19.48 (19.11, 20.80)	0.60 (0.54, 0.66)	<0.001	0.74 (0.66, 0.82)	<0.001
		181-365 days	12.38 (11.71, 13.08)	19.94 (19.11, 20.80)	0.62 (0.58, 0.67)	<0.001	0.76 (0.71, 0.82)	<0.001
		366-730 days	12.73 (12.24, 13.24)	20.05 (19.45, 20.66)	0.63 (0.60, 0.67)	<0.001	0.76 (0.72, 0.80)	<0.001
	25-34 years old	1-30 days	32.86 (30.03, 35.94)	63.53 (59.55, 67.77)	0.52 (0.46, 0.58)	<0.001	0.63 (0.56, 0.70)	<0.001
		31-90 days	13.71 (12.43, 15.13)	32.11 (30.11, 34.35)	0.43 (0.38, 0.48)	<0.001	0.61 (0.54, 0.68)	<0.001

	91-180 days	14.81 (13.71, 16.00)	31.40 (29.78, 33.12)	0.47 (0.43, 0.52)	<0.001	0.65 (0.59, 0.71)	<0.001
	181-365 days	17.44 (16.59, 18.33)	30.48 (29.35, 31.65)	0.57 (0.54, 0.61)	<0.001	0.74 (0.69, 0.79)	<0.001
	366-730 days	19.02 (18.39, 19.68)	28.30 (27.52, 29.10)	0.67 (0.64, 0.70)	<0.001	0.85 (0.81, 0.89)	<0.001
35-44 years old	1-30 days	37.04 (33.56, 40.87)	73.77 (68.79, 79.10)	0.50 (0.44, 0.57)	<0.001	0.69 (0.61, 0.78)	<0.001
	31-90 days	17.08 (15.42, 18.93)	39.00 (36.44, 41.74)	0.44 (0.39, 0.50)	<0.001	0.66 (0.58, 0.74)	<0.001
	91-180 days	16.40 (15.06, 17.87)	35.21 (33.21, 37.33)	0.47 (0.42, 0.52)	<0.001	0.68 (0.62, 0.76)	<0.001
	181-365 days	16.85 (15.89, 17.87)	31.93 (30.59, 33.33)	0.53 (0.49, 0.57)	<0.001	0.76 (0.70, 0.82)	<0.001
	366-730 days	16.57 (15.88, 17.29)	29.88 (29.05, 30.95)	0.55 (0.50, 0.56)	<0.001	0.79 (0.74, 0.83)	<0.001
45-54 years old	1-30 days	53.85 (49.50, 58.58)	97.29 (91.37, 103.59)	0.55 (0.50, 0.61)	<0.001	0.73 (0.65, 0.81)	<0.001
	31-90 days	24.21 (22.15, 26.46)	48.48 (45.52, 51.63)	0.50 (0.45, 0.56)	<0.001	0.73 (0.65, 0.82)	<0.001
	91-180 days	20.50 (18.94, 22.18)	46.75 (44.36, 49.26)	0.44 (0.40, 0.48)	<0.001	0.64 (0.58, 0.70)	<0.001
	181-365 days	22.51 (21.36, 23.73)	42.32 (40.72, 43.99)	0.53 (0.50, 0.57)	<0.001	0.77 (0.72, 0.83)	<0.001
	366-730 days	21.90 (21.08, 22.75)	37.27 (36.19, 38.39)	0.59 (0.56, 0.62)	<0.001	0.83 (0.79, 0.88)	<0.001
55-64 years old	1-30 days	80.08 (73.80, 86.90)	142.32 (133.86, 151.32)	0.56 (0.51, 0.62)	<0.001	0.72 (0.65, 0.80)	<0.001
	31-90 days	39.78 (36.65, 43.19)	73.50 (69.18, 78.08)	0.54 (0.49, 0.60)	<0.001	0.74 (0.67, 0.83)	<0.001
	91-180 days	35.26 (32.84, 37.87)	64.14 (60.83, 67.63)	0.55 (0.50, 0.60)	<0.001	0.76 (0.70, 0.84)	<0.001
	181-365 days	34.15 (32.46, 35.92)	57.28 (55.07, 59.58)	0.60 (0.56, 0.64)	<0.001	0.82 (0.77, 0.88)	<0.001
	366-730 days	32.57 (31.39, 33.80)	53.27 (51.73, 54.85)	0.61 (0.58, 0.64)	<0.001	0.82 (0.79, 0.86)	<0.001

	65-84 years	1-30 days	187.57 (177.89, 197.77)	251.13 (239.89, 262.91)	0.75 (0.70, 0.80)	<0.001	0.82 (0.77, 0.88)	<0.001
		31-90 days	101.07 (96.02, 106.39)	135.68 (129.78, 141.85)	0.74 (0.70, 0.80)	<0.001	0.84 (0.78, 0.90)	<0.001
		91-180 days	84.66 (80.85, 88.65)	106.33 (102.02, 110.82)	0.80 (0.75, 0.85)	<0.001	0.90 (0.84, 0.96)	0.001
		181-365 days	76.00 (73.45, 78.65)	97.88 (94.94, 100.92)	0.78 (0.74, 0.81)	<0.001	0.87 (0.83, 0.92)	<0.001
		366-730 days	72.62 (70.80, 74.48)	89.37 (87.31, 91.47)	0.81 (0.79, 0.84)	<0.001	0.90 (0.87, 0.93)	<0.001
	85+ years old	1-30 days	328.80 (30.5.34, 354.06)	353.84 (329.43, 380.05)	0.93 (0.84, 1.03)	0.162	0.92 (0.83, 1.02)	0.122
		31-90 days	187.12 (174.35, 200.82)	189.44 (176.52, 203.30)	0.99 (0.89, 1.09)	0.809	0.99 (0.89, 1.09)	0.827
		91-180 days	153.02 (143.34, 163.35)	167.10 (156.88, 177.98)	0.92 (0.84, 1.00)	0.057	0.92 (0.84, 1.01)	0.079
		181-365 days	144.50 (137.64, 151.70)	158.60 (151.31, 166.24)	0.91 (0.85, 0.97)	0.007	0.92 (0.85, 0.98)	0.012
		366-730 days	137.51 (132.38, 142.84)	136.22 (131.02, 141.64)	1.01 (0.96, 1.07)	0.735	1.02 (0.96, 1.07)	0.561
Psychiatric hospitalizations	0-9 years old	1-30 days	0.09 (0.03, 0.27)	0.29 (0.16, 0.54)	0.30 (0.08, 1.10)	0.069	*	*
		31-90 days	0.07 (0.03, 0.18)	0.14 (0.08, 0.27)	0.50 (0.17, 1.47)	0.211	*	*
		91-180 days	0.08 (0.04, 0.16)	0.10 (0.05, 0.18)	0.81 (0.32, 2.04)	0.650	*	*
		181-365 days	0.10 (0.07, 0.16)	0.11 (0.07, 0.16)	0.96 (0.54, 1.73)	0.902	*	*
		366-730 days	0.12 (0.09, 0.16)	0.14 (0.11, 0.18)	0.85 (0.59, 1.24)	0.410	*	*
	10-17 years old	1-30 days	4.89 (4.01, 5.96)	11.89 (10.42, 13.56)	0.41 (0.32, 0.52)	<0.001	0.63 (0.49, 0.80)	<0.001
		31-90 days	3.97 (3.40, 4.64)	8.34 (7.46, 9.32)	0.48 (0.39, 0.58)	<0.001	0.72 (0.59, 0.87)	0.001
		91-180 days	3.86 (3.40, 4.39)	7.80 (7.10, 8.57)	0.50 (0.42, 0.58)	<0.001	0.74 (0.63, 0.87)	<0.001
		181-365 days	3.96 (3.62, 4.33)	6.77 (6.31, 7.26)	0.59 (0.52, 0.66)	<0.001	0.83 (0.74, 0.93)	0.001
		366-730 days	3.57 (3.34, 3.82)	6.33 (6.01, 6.67)	0.56 (0.52, 0.61)	<0.001	0.74 (0.68, 0.81)	<0.001
	18-24 years old	1-30 days	5.71 (4.66, 6.99)	11.23 (9.76, 12.92)	0.51 (0.40, 0.65)	<0.001	0.75 (0.58, 0.96)	0.023

	31-90 days	3.65 (3.05, 4.37)	7.74 (6.87, 8.72)	0.47 (0.38, 0.59)	<0.001	0.76 (0.61, 0.95)	0.017
	91-180 days	3.18 (2.71, 3.72)	6.16 (5.52, 6.87)	0.52 (0.43, 0.62)	<0.001	0.79 (0.65, 0.96)	0.020
	181-365 days	2.65 (2.35, 2.99)	5.50 (5.07, 5.96)	0.48 (0.42, 0.56)	<0.001	0.73 (0.63, 0.85)	<0.001
	366-730 days	2.45 (2.24, 2.68)	4.62 (4.33, 4.92)	0.53 (0.48, 0.59)	<0.001	0.78 (0.70, 0.87)	<0.001
25-34 years old	1-30 days	5.66 (4.56, 7.03)	15.40 (13.50, 17.56)	0.37 (0.29, 0.47)	<0.001	0.72 (0.55, 0.93)	0.013
	31-90 days	3.39 (2.78, 4.13)	11.10 (9.95, 12.38)	0.31 (0.24, 0.38)	<0.001	0.61 (0.48, 0.76)	<0.001
	91-180 days	3.58 (3.06, 4.19)	9.08 (8.23, 10.02)	0.39 (0.33, 0.47)	<0.001	0.76 (0.63, 0.92)	0.005
	181-365 days	3.17 (2.82, 3.56)	7.47 (6.92, 8.06)	0.42 (0.37, 0.49)	<0.001	0.81 (0.71, 0.94)	0.005
	366-730 days	2.51 (2.28, 2.76)	6.32 (5.96, 6.71)	0.40 (0.36, 0.44)	<0.001	0.76 (0.68, 0.85)	<0.001
35-44 years old	1-30 days	7.11 (5.68, 8.90)	15.91 (13.69, 18.50)	0.45 (0.34, 0.59)	<0.001	0.93 (0.70, 1.23)	0.595
	31-90 days	3.84 (3.09, 4.76)	12.14 (10.75, 13.71)	0.32 (0.25, 0.41)	<0.001	0.66 (0.51, 0.85)	0.001
	91-180 days	3.50 (2.91, 4.21)	10.74 (9.67, 11.94)	0.33 (0.26, 0.40)	<0.001	0.64 (0.51, 0.80)	<0.001
	181-365 days	2.74 (2.37, 3.18)	8.71 (8.03, 9.46)	0.32 (0.27, 0.37)	<0.001	0.64 (0.54, 0.76)	<0.001
	366-730 days	2.73 (2.46, 3.04)	7.26 (6.81, 7.74)	0.38 (0.33, 0.43)	<0.001	0.77 (0.68, 0.87)	<0.001
45-54 years old	1-30 days	7.66 (6.13, 9.58)	18.14 (15.69, 20.98)	0.42 (0.32, 0.55)	<0.001	0.78 (0.60, 1.03)	0.079
	31-90 days	4.43 (3.60, 5.46)	11.84 (10.43, 13.45)	0.37 (0.29, 0.48)	<0.001	0.71 (0.56, 0.91)	0.008
	91-180 days	3.36 (2.77, 4.08)	10.53 (9.43, 11.76)	0.32 (0.26, 0.40)	<0.001	0.61 (0.48, 0.77)	<0.001
	181-365 days	2.99 (2.58, 3.45)	9.44 (8.70, 10.25)	0.32 (0.27, 0.37)	<0.001	0.60 (0.51, 0.71)	<0.001
	366-730 days	3.23 (2.92, 3.56)	7.22 (6.75, 7.72)	0.45 (0.40, 0.50)	<0.001	0.82 (0.73, 0.93)	0.001
55-64 years old	1-30 days	8.48 (6.60, 10.90)	17.13 (14.35, 20.44)	0.50 (0.36, 0.67)	<0.001	0.85 (0.62, 1.16)	0.306
	31-90 days	4.11 (3.19, 5.31)	9.59 (8.11, 11.34)	0.43 (0.32, 0.58)	<0.001	0.87 (0.64, 1.20)	0.405
	91-180 days	3.31 (2.62, 4.17)	8.12 (7.00, 9.43)	0.41 (0.31, 0.54)	<0.001	0.72 (0.54, 0.96)	0.025
	181-365 days	3.14 (2.66, 3.71)	7.45 (6.68, 8.31)	0.42 (0.35, 0.52)	<0.001	0.80 (0.65, 0.98)	0.035



		366-730 days	2.56 (2.25, 2.93)	5.34 (4.86, 5.85)	0.48 (0.41, 0.56)	<0.001	0.90 (0.76, 1.06)	0.191
65-84 years		1-30 days	9.59 (7.59, 12.12)	17.98 (15.15, 21.34)	0.53 (0.40, 0.71)	<0.001	0.66 (0.49, 0.89)	0.006
		31-90 days	5.81 (4.70, 7.20)	8.02 (6.68, 9.63)	0.72 (0.55, 0.96)	0.025	0.92 (0.69, 1.22)	0.562
		91-180 days	4.67 (3.84, 5.68)	6.73 (5.71, 7.93)	0.69 (0.54, 0.90)	0.005	0.93 (0.71, 1.20)	0.572
		181-365 days	3.75 (3.22, 4.38)	6.11 (5.41, 6.91)	0.61 (0.50, 0.75)	<0.001	0.80 (0.65, 0.98)	0.027
		366-730 days	3.12 (2.76, 3.52)	5.11 (4.64, 5.64)	0.61 (0.52, 0.71)	<0.001	0.75 (0.64, 0.88)	<0.001
85+ years old		1-30 days	18.29 (13.37, 25.04)	21.17 (15.81, 28.36)	0.86 (0.56, 1.33)	0.504	0.86 (0.56, 1.33)	0.505
		31-90 days	10.46 (7.76, 14.11)	14.02 (10.82, 18.18)	0.75 (0.50, 1.11)	0.147	0.78 (0.52, 1.16)	0.219
		91-180 days	7.48 (5.57, 10.05)	9.52 (7.31, 12.40)	0.79 (0.53, 1.17)	0.233	0.81 (0.54, 1.21)	0.309
		181-365 days	7.48 (6.04, 9.26)	9.14 (7.51, 11.12)	0.82 (0.61, 1.09)	0.175	0.88 (0.65, 1.18)	0.381
		366-730 days	6.82 (5.75, 8.09)	8.24 (7.04, 9.66)	0.83 (0.66, 1.04)	0.111	0.85 (0.67, 1.07)	0.172
All-cause ED visits	0-9 years old	1-30 days	328.87 (322.85, 335.99)	331.57 (325.55, 337.70)	0.99 (0.97, 1.02)	0.538	1.00 (0.97, 1.02)	0.814
		31-90 days	198.79 (195.58, 202.16)	197.67 (194.38, 201.02)	1.01 (0.98, 1.03)	0.642	1.01 (0.98, 1.03)	0.610
		91-180 days	191.52 (188.86, 194.22)	191.59 (188.94, 194.28)	1.00 (0.98, 1.03)	0.972	1.00 (0.98, 1.02)	0.842
		181-365 days	182.29 (180.48, 184.13)	181.27 (179.47, 183.09)	1.01 (0.99, 1.02)	0.436	1.01 (0.99, 1.02)	0.289
		366-730 days	154.75 (153.56, 155.95)	153.60 (152.41, 154.79)	1.01 (1.00, 1.02)	0.182	1.01 (1.00, 1.02)	0.070
	10-17 years old	1-30 days	378.09 (369.67, 386.70)	422.63 (413.39, 432.08)	0.89 (0.87, 0.92)	<0.001	0.97 (0.94, 1.00)	0.052
		31-90 days	210.13 (205.69, 214.66)	240.55 (235.62, 245.59)	0.87 (0.85, 0.90)	<0.001	0.97 (0.94, 1.00)	0.031
		91-180 days	214.34 (210.67, 218.07)	238 (234.31, 242.41)	0.90 (0.88, 0.92)	<0.001	0.99 (0.97, 1.01)	0.393
		181-365 days	216.08 (213.51, 218.69)	234.08 (231.29, 236.90)	0.92 (0.91, 0.94)	<0.001	1.01 (0.99, 1.02)	0.506
		366-730 days	207.90 (206.09, 209.72)	225.41 (223.45, 227.38)	0.92 (0.91, 0.93)	<0.001	1.00 (0.99, 1.02)	0.457

18-24 years old	1-30 days	555.81 (544.48, 567.37)	679.22 (667.10, 691.55)	0.82 (0.80, 0.84)	<0.001	0.92 (0.89, 0.94)	<0.001
	31-90 days	274.73 (269.09, 280.84)	330.03 (324.06, 336.12)	0.83 (0.81, 0.86)	<0.001	0.98 (0.95, 1.01)	0.146
	91-180 days	261.44 (256.95, 266.02)	315.92 (311.14, 320.78)	0.83 (0.81, 0.85)	<0.001	0.96 (0.94, 0.98)	<0.001
	181-365 days	251.51 (248.42, 254.64)	302.17 (298.89, 305.48)	0.83 (0.82, 0.85)	<0.001	0.95 (0.94, 0.97)	<0.001
	366-730 days	234.48 (232.35, 236.63)	282.96 (280.69, 285.24)	0.83 (0.82, 0.84)	<0.001	0.95 (0.93, 0.96)	<0.001
25-34 years old	1-30 days	561.17 (549.10, 573.50)	769.49 (755.34, 783.91)	0.73 (0.71, 0.75)	<0.001	0.87 (0.85, 0.90)	<0.001
	31-90 days	253.10 (247.37, 258.96)	356.46 (349.64, 363.41)	0.71 (0.69, 0.73)	<0.001	0.94 (0.91, 0.96)	<0.001
	91-180 days	246.55 (241.92, 251.27)	335.87 (330.45, 341.37)	0.73 (0.72, 0.75)	<0.001	0.95 (0.92, 0.97)	<0.001
	181-365 days	237.21 (234.03, 240.44)	323.67 (319.95, 327.44)	0.73 (0.72, 0.75)	<0.001	0.94 (0.92, 0.96)	<0.001
	366-730 days	223.23 (221.02, 225.46)	295.21 (292.67, 297.78)	0.76 (0.85, 0.77)	<0.001	0.96 (0.95, 0.97)	<0.001
35-44 years old	1-30 days	535.52 (521.38, 549.57)	797.73 (780.73, 814.60)	0.67 (0.65, 0.69)	<0.001	0.84 (0.81, 0.87)	<0.001
	31-90 days	235.12 (228.71, 241.71)	376.59 (368.45, 384.92)	0.62 (0.60, 0.65)	<0.001	0.88 (0.84, 0.91)	<0.001
	91-180 days	222.05 (216.95, 278.38)	336.64 (330.34, 343.07)	0.66 (0.64, 0.68)	<0.001	0.92 (0.90, 0.95)	<0.001
	181-365 days	219.75 (216.19, 223.36)	317.92 (313.62, 322.27)	0.69 (0.68, 0.71)	<0.001	0.95 (0.93, 0.97)	<0.001
	366-730 days	209.86 (207.38, 212.38)	296.84 (293.87, 299.84)	0.71 (0.70, 0.72)	<0.001	0.95 (0.94, 0.97)	<0.001
45-54 years old	1-30 days	571.73 (557.14, 586.71)	756.57 (739.74, 773.79)	0.76 (0.73, 0.78)	<0.001	0.92 (0.89, 0.95)	<0.001
	31-90 days	238.99 (232.32, 245.85)	348.90 (340.81, 357.18)	0.68 (0.66, 0.71)	<0.001	0.96 (0.92, 0.99)	0.019
	91-180 days	223.17 (217.89, 228.57)	319.73 (313.38, 326.20)	0.70 (0.68, 0.72)	<0.001	0.95 (0.92, 0.98)	0.003

		181-365 days	211.93 (208.33, 215.60)	298.14 (293.84, 302.50)	0.71 (0.70, 0.73)	<0.001	0.97 (0.94, 0.99)	0.003
		366-730 days	200.42 (197.91, 202.96)	276.20 (273.23, 279.19)	0.73 (0.71, 0.74)	<0.001	0.96 (0.95, 0.98)	<0.001
55-64 years old	1-30 days	561.55 (544.50, 579.14)	698.09 (679.03, 717.69)	0.80 (0.77, 0.84)	<0.001	0.93 (0.89, 0.87)	0.001	
	31-90 days	233.83 (226.05, 241.88)	317.68 (308.75, 327.24)	0.74 (0.70, 0.77)	<0.001	0.96 (0.91, 1.00)	0.058	
	91-180 days	215.39 (209.27, 221.69)	283.75 (276.68, 290.99)	0.76 (0.73, 0.79)	<0.001	0.99 (0.95, 1.03)	0.477	
	181-365 days	208.82 (204.59, 213.14)	276.10 (271.20, 281.09)	0.76 (0.74, 0.78)	<0.001	0.98 (0.96, 1.01)	0.226	
	366-730 days	194.68 (191.75, 197.65)	250.56 (247.20, 253.97)	0.78 (0.76, 0.79)	<0.001	0.99 (0.97, 1.01)	0.279	
65-84 years	1-30 days	619.69 (601.89, 638.02)	625.23 (607.33, 643.65)	0.99 (0.95, 1.03)	0.672	1.04 (0.99, 1.08)	0.106	
	31-90 days	274.34 (265.93, 283.02)	289.78 (281.10, 298.73)	0.95 (0.91, 0.99)	0.014	1.05 (1.00, 1.09)	0.046	
	91-180 days	241.56 (235.07, 248.23)	256.38 (249.64, 263.30)	0.94 (0.91, 0.98)	0.002	1.03 (0.99, 1.07)	0.120	
	181-365 days	236.55 (232.01, 241.19)	255.98 (251.20, 260.85)	0.92 (0.90, 0.95)	<0.001	1.01 (0.99, 1.04)	0.337	
	366-730 days	224.72 (221.50, 227.98)	234.44 (231.10, 237.83)	0.96 (0.94, 0.98)	<0.001	1.03 (1.01, 1.05)	0.014	
85+ years old	1-30 days	611.63 (579.32, 645.74)	586.75 (555.07, 620.24)	1.04 (0.96, 1.13)	0.294	1.03 (0.95, 1.12)	0.443	
	31-90 days	350.14 (332.51, 368.71)	322.78 (305.78, 340.73)	1.08 (1.01, 1.17)	0.033	1.07 (0.99, 1.15)	0.080	
	91-180 days	311.13 (297.20, 325.72)	288.14 (274.62, 302.32)	1.08 (1.01, 1.15)	0.023	1.06 (0.99, 1.14)	0.082	
	181-365 days	298.17 (288.24, 308.44)	267.01 (257.50, 276.87)	1.12 (1.06, 1.17)	<0.001	1.11 (1.05, 1.16)	<0.001	
	366-730 days	265.20 (258.04, 272.56)	245.77 (238.74, 253.01)	1.08 (1.04, 1.12)	<0.001	1.06 (1.02, 1.11)	0.002	
Psychiatric ED visits	0-9 years old	1-30 days	2.28 (1.82, 2.84)	2.40 (1.94, 2.98)	0.95 (0.70, 1.29)	0.730	0.93 (0.68, 1.27)	0.655
		31-90 days	0.67 (0.50, 0.90)	0.71 (0.54, 0.94)	0.95 (0.63, 1.41)	0.787	*	*

	91-180 days	0.57 (0.45, 0.74)	0.59 (0.46, 0.76)	0.97 (0.68, 1.39)	0.888	*	*
	181-365 days	0.55 (0.46, 0.66)	0.67 (0.57, 0.79)	0.82 (0.64, 1.05)	0.120	*	*
	366-730 days	0.75 (0.67, 0.84)	0.71 (0.63, 0.80)	1.06 (0.90, 1.24)	0.487	*	*
10-17 years old	1-30 days	25.61 (23.49, 27.93)	34.32 (31.76, 37.09)	0.75 (0.66, 0.84)	<0.001	0.92 (0.81, 1.03)	0.148
	31-90 days	12.26 (11.22, 13.39)	19.58 (18.21, 21.06)	0.63 (0.56, 0.70)	<0.001	0.85 (0.76, 0.96)	0.007
	91-180 days	10.03 (9.26, 10.86)	17.96 (16.88, 19.11)	0.56 (0.50, 0.62)	<0.001	0.77 (0.69, 0.85)	<0.001
	181-365 days	10.07 (9.52, 10.64)	17.79 (17.03, 18.58)	0.57 (0.53, 0.61)	<0.001	0.76 (0.71, 0.82)	<0.001
	366-730 days	10.86 (10.45, 11.28)	17.62 (17.08, 18.18)	0.62 (0.59, 0.65)	<0.001	0.81 (0.77, 0.85)	<0.001
18-24 years old	1-30 days	51.36 (47.99, 54.96)	74.73 (70.43, 78.52)	0.69 (0.63, 0.75)	<0.001	0.94 (0.86, 1.02)	0.151
	31-90 days	24.98 (23.32, 26.76)	45.89 (43.70, 48.19)	0.54 (0.50, 0.59)	<0.001	0.81 (0.75, 0.89)	<0.001
	91-180 days	20.03 (18.82, 21.33)	37.44 (35.81, 39.13)	0.54 (0.50, 0.58)	<0.001	0.80 (0.74, 0.87)	<0.001
	181-365 days	19.78 (18.93, 20.67)	33.55 (32.47, 34.66)	0.59 (0.56, 0.62)	<0.001	0.86 (0.81, 0.91)	<0.001
	366-730 days	18.31 (17.72, 18.92)	32.32 (31.55, 33.09)	0.57 (0.54, 0.59)	<0.001	0.83 (0.79, 0.94)	<0.001
25-34 years old	1-30 days	53.63 (49.99, 57.54)	100.88 (95.84, 106.19)	0.53 (0.49, 0.58)	<0.001	0.86 (0.79, 0.94)	0.001
	31-90 days	25.29 (23.52, 27.19)	64.40 (61.54, 67.39)	0.39 (0.36, 0.43)	<0.001	0.73 (0.67, 0.80)	<0.001
	91-180 days	22.77 (21.40, 24.24)	53.05 (50.93, 55.27)	0.43 (0.40, 0.46)	<0.001	0.80 (0.75, 0.87)	<0.001
	181-365 days	21.22 (20.20, 22.20)	52.30 (50.81, 53.82)	0.41 (0.38, 0.43)	<0.001	0.78 (0.74, 0.82)	<0.001
	366-730 days	18.60 (17.97, 19.25)	43.88 (42.91, 44.88)	0.42 (0.41, 0.44)	<0.001	0.80 (0.77, 0.83)	<0.001
35-44 years old	1-30 days	46.39 (42.48, 50.66)	109.71 (103.61, 116.18)	0.42 (0.38, 0.47)	<0.001	0.75 (0.67, 0.84)	<0.001

	31-90 days	23.26 (21.30, 25.40)	68.62 (65.20, 72.23)	0.34 (0.31, 0.38)	<0.001	0.70 (0.63, 0.78)	<0.001
	91-180 days	19.56 (18.09, 21.15)	58.45 (55.86, 61.16)	0.33 (0.31, 0.37)	<0.001	0.71 (0.65, 0.78)	<0.001
	181-365 days	17.11 (16.14, 18.14)	51.43 (49.82, 53.30)	0.33 (0.31, 0.36)	<0.001	0.71 (0.66, 0.76)	<0.001
	366-730 days	16.80 (16.10, 17.52)	42.59 (41.48, 43.74)	0.39 (0.38, 0.41)	<0.001	0.81 (0.77, 0.85)	<0.001
45-54 years old	1-30 days	50.37 (46.16, 54.95)	98.38 (92.43, 104.72)	0.51 (0.46, 0.57)	<0.001	0.88 (0.79, 0.98)	0.024
	31-90 days	24.46 (22.39, 26.72)	60.42 (57.11, 63.93)	0.40 (0.36, 0.45)	<0.001	0.81 (0.73, 0.91)	<0.001
	91-180 days	20.83 (19.26, 22.53)	47.92 (45.50, 50.46)	0.43 (0.40, 0.48)	<0.001	0.91 (0.83, 1.01)	0.065
	181-365 days	17.47 (16.45, 18.54)	47.58 (45.88, 49.34)	0.37 (0.34, 0.39)	<0.001	0.77 (0.72, 0.83)	<0.001
	366-730 days	15.42 (14.73, 16.13)	40.84 (39.71, 42.00)	0.38 (0.36, 0.40)	<0.001	0.78 (0.74, 0.83)	<0.001
55-64 years old	1-30 days	40.46 (36.07, 45.38)	68.93 (63.12, 75.28)	0.59 (0.51, 0.68)	<0.001	0.93 (0.80, 1.08)	0.359
	31-90 days	21.53 (19.26, 24.07)	39.97 (36.82, 43.39)	0.54 (0.47, 0.62)	<0.001	0.98 (0.85, 1.13)	0.820
	91-180 days	17.05 (15.39, 18.89)	34.56 (32.15, 37.15)	0.49 (0.44, 0.56)	<0.001	0.90 (0.79, 1.03)	0.120
	181-365 days	13.37 (12.33, 14.50)	33.69 (32.01, 35.46)	0.40 (0.36, 0.44)	<0.001	0.73 (0.66, 0.80)	<0.001
	366-730 days	11.36 (10.67, 12.09)	28.10 (26.99, 29.25)	0.40 (0.38, 0.44)	<0.001	0.76 (0.71, 0.82)	<0.001
65-84 years	1-30 days	16.99 (14.25, 20.26)	23.74 (20.45, 27.56)	0.72 (0.57, 0.90)	0.004	0.87 (0.68, 1.10)	0.230
	31-90 days	10.66 (9.10, 12.48)	13.11 (11.37, 15.13)	0.81 (0.66, 1.01)	0.057	1.13 (0.91, 1.40)	0.283
	91-180 days	7.52 (6.44, 8.77)	11.32 (9.97, 12.85)	0.66 (0.54, 0.81)	<0.001	0.92 (0.75, 1.13)	0.411
	181-365 days	6.90 (6.16, 7.73)	11.04 (10.08, 12.09)	0.63 (0.54, 0.72)	<0.001	0.88 (0.76, 1.02)	0.095
	366-730 days	5.67 (5.18, 6.21)	9.57 (8.91, 10.28)	0.59 (0.53, 0.67)	<0.001	0.76 (0.68, 0.86)	<0.001

All-cause GP visits	85+ years old	1-30 days	15.01 (10.61, 21.22)	9.41 (6.07, 14.59)	1.59 (0.91, 2.79)	0.101	1.52 (0.86, 2.68)	0.148
		31-90 days	7.06 (4.90, 10.15)	7.63 (5.36, 10.84)	0.93 (0.56, 1.54)	0.764	0.94 (0.56, 1.58)	0.827
		91-180 days	4.93 (3.43, 7.10)	6.23 (4.50, 8.64)	0.79 (0.49, 1.29)	0.347	0.74 (0.45, 1.21)	0.227
		181-365 days	4.01 (2.99, 5.37)	5.58 (4.34, 7.17)	0.72 (0.49, 1.29)	0.093	0.70 (0.47, 1.04)	0.075
		366-730 days	5.27 (4.34, 6.40)	4.04 (3.22, 5.07)	1.30 (0.97, 1.76)	0.080	1.31 (0.97, 1.78)	0.078
	0-9 years old	1-30 days	1,195.20 (1,183.68, 1,206.83)	1,219.71 (1,208.12, 1,231.42)	0.98 (0.97, 0.99)	0.003	0.98 (0.97, 0.99)	0.004
		31-90 days	676.38 (670.25, 682.57)	711.14 (704.88, 717.46)	0.95 (0.95, 0.96)	<0.001	0.95 (0.94, 0.96)	<0.001
		91-180 days	648.48 (643.58, 653.43)	676.41 (671.41, 681.44)	0.96 (0.95, 0.97)	<0.001	0.96 (0.95, 0.97)	<0.001
		181-365 days	596.73 (593.44, 600.04)	620.90 (617.55, 624.26)	0.96 (0.95, 0.97)	<0.001	0.96 (0.95, 0.97)	<0.001
		366-730 days	515.89 (513.71, 518.09)	533.39 (531.18, 535.61)	0.97 (0.96, 0.97)	<0.001	0.96 (0.96, 0.97)	<0.001
	10-17 years old	1-30 days	1,771.42 (1,753.08, 1,789.94)	1,528.03 (1,510.37, 1,545.91)	1.16 (1.14, 1.18)	<0.001	1.14 (1.12, 1.16)	<0.001
		31-90 days	657.65 (649.75, 665.64)	672.31 (664.03, 680.70)	0.98 (0.96, 1.00)	0.012	1.00 (0.98, 1.02)	0.990
		91-180 days	601.19 (595.02, 607.43)	624.44 (617.91, 631.04)	0.96 (0.95, 0.98)	<0.001	0.99 (0.98, 1.01)	0.237
		181-365 days	595.03 (590.74, 599.35)	617.79 (613.25, 622.36)	0.96 (0.96, 0.97)	<0.001	0.99 (0.98, 1.00)	0.049
		366-730 days	607.02 (603.92, 610.12)	620.39 (617.14, 623.65)	0.98 (0.97, 0.99)	<0.001	1.00 (1.00, 1.01)	0.196
	18-24 years old	1-30 days	1,825.79 (1,805.16, 1,846.66)	1,944.78 (1,924.20, 1,965.58)	0.94 (0.92, 0.95)	<0.001	0.95 (0.93, 0.96)	<0.001
		31-90 days	894.74 (884.53, 905.07)	984.86 (974.50, 995.33)	0.91 (0.89, 0.92)	<0.001	0.95 (0.94, 0.97)	<0.001
		91-180 days	831.30 (823.26, 839.43)	919.02 (910.84, 927.28)	0.90 (0.89, 0.92)	<0.001	0.95 (0.94, 0.97)	<0.001
		181-365 days	824.30 (818.69, 829.94)	910.23 (904.54, 915.97)	0.91 (0.90, 0.91)	<0.001	0.96 (0.95, 0.97)	<0.001
		366-730 days	808.47 (804.50, 812.46)	899.20 (895.15, 903.26)	0.90 (0.89, 0.91)	<0.001	0.95 (0.95, 0.96)	<0.001

25-34 years old	1-30 days	2,044.85 (2,021.69, 2,068.26)	2,511.22 (2,485.54, 2,537.16)	0.81 (0.80, 0.83)	<0.001	0.85 (0.84, 0.87)	<0.001
	31-90 days	1,080.16 (1,068.25, 1,092.20)	1,377.41 (1,363.95, 1,391.00)	0.78 (0.77, 0.80)	<0.001	0.88 (0.86, 0.89)	<0.001
	91-180 days	993.43 (984.09, 1,002.86)	1,252.57 (1,242.07, 1,263.16)	0.79 (0.78, 0.80)	<0.001	0.89 (0.88, 0.90)	<0.001
	181-365 days	970.75 (964.29, 977.25)	1,216.02 (1,208.77, 1,223.30)	0.80 (0.79, 0.81)	<0.001	0.90 (0.89, 0.91)	<0.001
	366-730 days	952.19 (947.61, 956.79)	1,180.09 (1,174.98, 1,185.21)	0.81 (0.80, 0.84)	<0.001	0.91 (0.90, 0.91)	<0.001
35-44 years old	1-30 days	2,355.79 (2,326.87, 2,385.06)	2,854.71 (2,822.85, 2,886.94)	0.83 (0.81, 0.84)	<0.001	0.86 (0.84, 0.87)	<0.001
	31-90 days	1,261.60 (1,246.63, 1,276.75)	1,622.85 (1,605.85, 1,640.04)	0.78 (0.77, 0.79)	<0.001	0.86 (0.85, 0.88)	<0.001
	91-180 days	1,155.45 (1,143.74, 1,167.29)	1,459.72 (1,446.52, 1,473.03)	0.79 (0.78, 0.80)	<0.001	0.89 (0.88, 0.90)	<0.001
	181-365 days	1,118.44 (1,110.37, 1,126.56)	1,382.14 (1,373.15, 1,391.19)	0.81 (0.80, 0.82)	<0.001	0.91 (0.90, 0.92)	<0.001
	366-730 days	1,081.34 (1,075.67, 1,087.04)	1,327.82 (1,321.52, 1,334.15)	0.81 (0.81, 0.82)	<0.001	0.92 (0.91, 0.92)	<0.001
45-54 years old	1-30 days	2,595.00 (2,563.69, 2,626.69)	3,073.64 (3,039.53, 3,108.14)	0.84 (0.83, 0.86)	<0.001	0.87 (0.85, 0.88)	<0.001
	31-90 days	1,401.46 (1,385.18, 1,417.94)	1,734.64 (1,716.49, 1,752.99)	0.81 (0.80, 0.82)	<0.001	0.88 (0.87, 0.89)	<0.001
	91-180 days	1,283.13 (1,270.39, 1,296.00)	1,557.84 (1,543.76, 1,572.05)	0.82 (0.81, 0.83)	<0.001	0.91 (0.89, 0.92)	<0.001
	181-365 days	1,235.63 (1,226.89, 1,244.44)	1,480.85 (1,471.23, 1,490.53)	0.83 (0.83, 0.84)	<0.001	0.92 (0.91, 0.93)	<0.001
	366-730 days	1,215.52 (1,209.32, 1,221.75)	1,430.30 (1,423.53, 1,437.10)	0.85 (0.84, 0.86)	<0.001	0.93 (0.93, 0.94)	<0.001
55-64 years old	1-30 days	2,768.13 (2,729.95, 2,806.85)	3,130.76 (3,090.10, 3,171.95)	0.88 (0.87, 0.90)	<0.001	0.91 (0.89, 0.92)	<0.001
	31-90 days	1,563.16 (1,542.84, 1,583.75)	1,825.89 (1,803.87, 1,848.19)	0.86 (0.84, 0.87)	<0.001	0.92 (0.90, 0.94)	<0.001
	91-180 days	1,430.39 (1,414.48, 1,446.47)	1,639.32 (1,622.22, 1,656.61)	0.87 (0.86, 0.89)	<0.001	0.95 (0.93, 0.96)	<0.001

		181-365 days	1,384.81 (1,373.85, 1,395.87)	1,558.25 (1,546.55, 1,570.04)	0.89 (0.88, 0.90)	<0.001	0.96 (0.95, 0.98)	<0.001
		366-730 days	1,352.80 (1,345.04, 1,360.61)	1,503.61 (1,495.35, 1,511.92)	0.90 (0.89, 0.91)	<0.001	0.97 (0.97, 0.98)	<0.001
65-84 years	1-30 days	3,217.80 (3,176.91, 3,259.22)	3,433.94 (3,391.66, 3,476.75)	0.94 (0.92, 0.95)	<0.001	0.95 (0.93, 0.97)	<0.001	
	31-90 days	2,076.91 (2,053.55, 2,100.55)	2,163.57 (2,139.62, 2,187.78)	0.96 (0.94, 0.98)	<0.001	1.00 (0.98, 1.01)	0.850	
	91-180 days	1,916.08 (1,897.63, 1,934.71)	1,996.36 (1,977.40, 2,015.51)	0.96 (0.95, 0.97)	<0.001	1.00 (0.99, 1.02)	0.831	
	181-365 days	1,859.57 (1,846.76, 1,872.48)	1,934.39 (1,921.17, 1,947.71)	0.96 (0.95, 0.97)	<0.001	1.00 (0.99, 1.01)	0.576	
	366-730 days	1,825.61 (1,816.39, 1,834.87)	1,900.67 (1,891.10, 1,910.28)	0.96 (0.95, 0.97)	<0.001	1.00 (0.99, 1.01)	0.810	
	85+ years old	1-30 days	3,866.77 (3,784.20, 3,951.15)	3,930.79 (3,847.40, 4,016.00)	0.98 (0.95, 1.01)	0.290	0.98 (0.95, 1.01)	0.151
		31-90 days	2,786.79 (2,736, 2,838.30)	2,847.72 (2,796.32, 2,900.08)	0.98 (0.95, 1.00)	0.101	0.98 (0.96, 1.01)	0.248
		91-180 days	2,692.42 (2,650.81, 2,734.68)	2,628.58 (2,587.09, 2,670.73)	1.02 (1.00, 1.05)	0.035	1.03 (1.01, 1.06)	0.005
		181-365 days	2,590.69 (2,561.10, 2,620.63)	2,578.33 (2,548.41, 2,608.59)	1.00 (0.99, 1.02)	0.567	1.02 (1.00, 1.03)	0.037
		366-730 days	2,602.94 (2,580.31, 2,625.78)	2,599.66 (2,576.57, 2,622.96)	1.00 (0.99, 1.01)	0.843	1.01 (1.00, 1.02)	0.133
Mental-health related GP visits	0-9 years old	1-30 days	12.63 (11.50, 13.88)	13.15 (11.99, 14.41)	0.96 (0.84, 1.10)	0.555	0.97 (0.85, 1.11)	0.685
		31-90 days	11.12 (10.36, 11.94)	10.93 (10.18, 11.74)	1.02 (0.92, 1.12)	0.741	1.02 (0.93, 1.13)	0.651
		91-180 days	11.62 (10.98, 12.30)	11.79 (11.15, 12.47)	0.99 (0.91, 1.07)	0.718	0.99 (0.91, 1.07)	0.814
		181-365 days	11.99 (11.53, 12.46)	12.37 (11.90, 12.85)	0.97 (0.92, 1.02)	0.262	0.97 (0.92, 1.02)	0.235
		366-730 days	13.23 (12.88, 13.58)	14.01 (13.65, 14.37)	0.94 (0.91, 0.98)	0.002	0.94 (0.90, 0.97)	0.001
		10-17 years old	1-30 days	31.70 (29.33, 34.27)	44.65 (41.71, 47.79)	0.71 (0.64, 0.79)	<0.001	0.83 (0.74, 0.92)



	31-90 days	24.47 (22.98, 26.05)	35.75 (33.88, 37.73)	0.68 (0.63, 0.74)	<0.001	0.84 (0.77, 0.92)	<0.001
	91-180 days	26.86 (25.58, 28.21)	34.20 (32.70, 35.77)	0.79 (0.74, 0.84)	<0.001	0.96 (0.90, 1.03)	0.219
	181-365 days	26.86 (25.96, 27.79)	36.00 (34.92, 37.12)	0.75 (0.71, 0.78)	<0.001	0.90 (0.86, 0.94)	<0.001
	366-730 days	30.90 (30.21, 31.60)	41.47 (40.64, 42.32)	0.74 (0.72, 0.77)	<0.001	0.88 (0.85, 0.90)	<0.001
18-24 years old	1-30 days	78.85 (74.65, 83.28)	134.01 (128.69, 139.55)	0.59 (0.55, 0.63)	<0.001	0.80 (0.74, 0.85)	<0.001
	31-90 days	67.37 (64.61, 70.25)	117.75 (114.20, 121.41)	0.57 (0.54, 0.60)	<0.001	0.77 (0.73, 0.81)	<0.001
	91-180 days	65.98 (63.74, 68.30)	113.07 (110.22, 115.99)	0.58 (0.56, 0.61)	<0.001	0.79 (0.76, 0.82)	<0.001
	181-365 days	70.28 (68.65, 71.94)	126.57 (124.45, 128.72)	0.56 (0.54, 0.57)	<0.001	0.75 (0.73, 0.78)	<0.001
	366-730 days	78.27 (77.05, 79.52)	139.77 (138.18, 141.38)	0.56 (0.55, 0.57)	<0.001	0.75 (0.73, 0.76)	<0.001
25-34 years old	1-30 days	157.24 (150.91, 163.83)	314.73 (305.72, 324.00)	0.50 (0.48, 0.53)	<0.001	0.76 (0.72, 0.80)	<0.001
	31-90 days	147.95 (143.58, 152.45)	289.09 (282.96, 295.35)	0.51 (0.49, 0.53)	<0.001	0.79 (0.76, 0.82)	<0.001
	91-180 days	142.04 (138.54, 145.64)	292.10 (287.05, 297.24)	0.49 (0.47, 0.50)	<0.001	0.74 (0.72, 0.77)	<0.001
	181-365 days	144.05 (141.57, 146.56)	299.68 (296.09, 303.31)	0.48 (0.47, 0.49)	<0.001	0.73 (0.71, 0.75)	<0.001
	366-730 days	149.08 (147.28, 150.91)	297.70 (295.14, 300.28)	0.50 (0.49, 0.51)	<0.001	0.76 (0.75, 0.77)	<0.001
35-44 years old	1-30 days	158.52 (151.15, 166.25)	326.15 (315.49, 337.16)	0.49 (0.46, 0.52)	<0.001	0.74 (0.70, 0.79)	<0.001
	31-90 days	152.75 (147.60, 158.08)	304.78 (297.46, 312.28)	0.50 (0.48, 0.52)	<0.001	0.78 (0.75, 0.82)	<0.001
	91-180 days	151.91 (147.70, 156.24)	293.48 (287.60, 299.48)	0.52 (0.50, 0.54)	<0.001	0.80 (0.77, 0.83)	<0.001
	181-365 days	147.13 (144.22, 150.09)	289.87 (285.77, 294.03)	0.51 (0.50, 0.52)	<0.001	0.79 (0.77, 0.81)	<0.001

	366-730 days	147.18 (145.10, 149.29)	283.16 (280.26, 286.09)	0.52 (0.51, 0.53)	<0.001	0.80 (0.78, 0.81)	<0.001
45-54 years old	1-30 days	157.47 (149.89, 165.42)	258.57 (248.81, 268.72)	0.61 (0.57, 0.65)	<0.001	0.88 (0.83, 0.94)	<0.001
	31-90 days	135.81 (130.81, 141.01)	237.35 (230.69, 244.19)	0.57 (0.55, 0.60)	<0.001	0.83 (0.79, 0.87)	<0.001
	91-180 days	132.16 (128.12, 136.34)	223.13 (217.84, 228.54)	0.59 (0.57, 0.62)	<0.001	0.86 (0.83, 0.90)	<0.001
	181-365 days	127.54 (124.75, 130.39)	224.54 (220.82, 228.33)	0.57 (0.55, 0.58)	<0.001	0.83 (0.81, 0.85)	<0.001
	366-730 days	128.23 (126.23, 130.26)	212.85 (210.25, 215.48)	0.60 (0.59, 0.61)	<0.001	0.87 (0.85, 0.89)	<0.001
55-64 years old	1-30 days	124.85 (116.95, 133.29)	204.85 (194.64, 215.59)	0.61 (0.56, 0.66)	<0.001	0.84 (0.77, 0.91)	<0.001
	31-90 days	108.62 (103.36, 114.15)	182.06 (175.20, 189.20)	0.60 (0.56, 0.64)	<0.001	0.84 (0.79, 0.90)	<0.001
	91-180 days	105.04 (100.79, 109.47)	176.83 (171.27, 182.57)	0.59 (0.56, 0.63)	<0.001	0.83 (0.79, 0.88)	<0.001
	181-365 days	97.86 (94.98, 100.83)	167.93 (164.11, 171.83)	0.58 (0.56, 0.61)	<0.001	0.80 (0.77, 0.83)	<0.001
	366-730 days	93.70 (91.67, 95.77)	160.48 (157.79, 163.21)	0.58 (0.57, 0.60)	<0.001	0.81 (0.78, 0.83)	<0.001
65-84 years	1-30 days	172.91 (163.62, 182.71)	224.51 (213.89, 235.66)	0.77 (0.72, 0.83)	<0.001	0.91 (0.84, 0.98)	0.013
	31-90 days	164.90 (158.41, 171.65)	205.51 (198.22, 213.07)	0.80 (0.76, 0.85)	<0.001	0.97 (0.92, 1.02)	0.257
	91-180 days	156.99 (151.77, 162.39)	204.14 (198.13, 210.32)	0.77 (0.74, 0.80)	<0.001	0.92 (0.88, 0.97)	0.001
	181-365 days	163.19 (159.43, 167.05)	212.59 (208.24, 217.04)	0.77 (0.74, 0.79)	<0.001	0.91 (0.88, 0.94)	<0.001
	366-730 days	165.14 (162.38, 167.94)	220.61 (217.37, 223.91)	0.75 (0.73, 0.77)	<0.001	0.88 (0.86, 0.90)	<0.001
85+ years old	1-30 days	475.14 (446.76, 505.32)	546.28 (515.75, 578.63)	0.87 (0.80, 0.95)	0.001	0.94 (0.86, 1.02)	0.156
	31-90 days	446.50 (426.53, 467.40)	541.50 (519.34, 564.60)	0.82 (0.78, 0.88)	<0.001	0.87 (0.82, 0.92)	<0.001

		91-180 days	469.42 (452.23, 487.26)	529.18 (510.75, 548.28)	0.89 (0.84, 0.93)	<0.001	0.92 (0.88, 0.97)	0.004
		181-365 days	496.18 (483.33, 509.38)	563.73 (549.83, 577.98)	0.88 (0.85, 0.91)	<0.001	0.92 (0.88, 0.95)	<0.001
		366-730 days	536.86 (526.64, 547.29)	638.76 (627.37, 650.36)	0.84 (0.82, 0.86)	<0.001	0.87 (0.84, 0.89)	<0.001
Psychiatrist visits	0-9 years old	1-30 days	6.01 (5.24, 6.89)	6.23 (5.45, 7.12)	0.97 (0.80, 1.17)	0.719	*	*
		31-90 days	5.74 (5.20, 6.33)	6.47 (5.90, 7.10)	0.89 (0.77, 1.01)	0.080	*	*
		91-180 days	6.65 (6.17, 7.17)	7.80 (7.28, 8.36)	0.85 (0.77, 0.94)	0.002	*	*
		181-365 days	7.23 (6.88, 7.61)	8.32 (7.94, 8.71)	0.87 (0.81, 0.93)	<0.001	*	*
		366-730 days	8.73 (8.45, 9.02)	9.80 (9.51, 10.11)	0.89 (0.85, 0.93)	<0.001	0.94 (0.90, 0.98)	0.005
	10-17 years old	1-30 days	42.69 (39.92, 45.65)	73.69 (69.89, 77.70)	0.58 (0.53, 0.63)	<0.001	0.87 (0.80, 0.95)	0.001
		31-90 days	42.00 (40.04, 44.05)	73.12 (70.42, 75.92)	0.57 (0.54, 0.61)	<0.001	0.84 (0.79, 0.89)	<0.001
		91-180 days	44.32 (42.66, 46.03)	74.14 (71.91, 76.43)	0.60 (0.57, 0.63)	<0.001	0.83 (0.79, 0.87)	<0.001
		181-365 days	47.44 (46.24, 48.67)	74.62 (73.06, 76.22)	0.64 (0.61, 0.66)	<0.001	0.86 (0.83, 0.89)	<0.001
		366-730 days	50.86 (49.97, 51.77)	74.73 (73.61, 75.86)	0.68 (0.67, 0.70)	<0.001	0.87 (0.85, 0.89)	<0.001
	18-24 years old	1-30 days	71.98 (67.97, 76.22)	95.68 (91.20, 100.38)	0.75 (0.70, 0.81)	<0.001	1.03 (0.95, 1.11)	0.508
		31-90 days	66.39 (63.65, 69.25)	93.96 (90.80, 97.23)	0.71 (0.67, 0.75)	<0.001	0.94 (0.89, 1.00)	0.034
		91-180 days	66.06 (63.82, 68.38)	88.75 (86.23, 91.34)	0.74 (0.71, 0.78)	<0.001	0.98 (0.94, 1.03)	0.485
		181-365 days	63.26 (61.72, 64.84)	88.57 (86.80, 90.37)	0.71 (0.69, 0.74)	<0.001	0.93 (0.90, 0.96)	<0.001
		366-730 days	69.08 (67.93, 70.26)	90.56 (89.28, 91.86)	0.76 (0.75, 0.78)	<0.001	0.97 (0.94, 0.99)	0.002
	25-34 years old	1-30 days	94.63 (89.75, 99.78)	143.42 (137.38, 149.72)	0.66 (0.62, 0.71)	<0.001	0.99 (0.93, 1.07)	0.848
		31-90 days	87.77 (84.43, 91.25)	143.42 (139.12, 147.85)	0.61 (0.58, 0.64)	<0.001	0.89 (0.84, 0.93)	<0.001

	91-180 days	87.91 (85.16, 90.75)	141.79 (138.28, 145.38)	0.62 (0.60, 0.65)	<0.001	0.89 (0.85, 0.93)	<0.001
	181-365 days	89.92 (87.97, 91.92)	139.23 (136.79, 141.71)	0.65 (0.63, 0.66)	<0.001	0.90 (0.88, 0.93)	<0.001
	366-730 days	87.74 (86.36, 89.15)	134.49 (132.78, 136.23)	0.65 (0.64, 0.67)	<0.001	0.90 (0.88, 0.92)	<0.001
35-44 years old	1-30 days	101.94 (96.07, 108.18)	156.24 (148.92, 163.92)	0.65 (0.60, 0.70)	<0.001	0.97 (0.90, 1.05)	0.446
	31-90 days	97.58 (93.48, 101.86)	150.80 (145.67, 156.10)	0.65 (0.61, 0.68)	<0.001	0.95 (0.89, 1.00)	0.054
	91-180 days	98.01 (94.64, 101.50)	149.32 (145.14, 153.62)	0.66 (0.63, 0.69)	<0.001	0.94 (0.90, 0.99)	0.013
	181-365 days	98.24 (95.87, 100.67)	149.44 (146.50, 152.43)	0.66 (0.64, 0.68)	<0.001	0.93 (0.90, 0.96)	<0.001
	366-730 days	99.66 (97.95, 101.40)	140.95 (138.90, 143.02)	0.71 (0.69, 0.72)	<0.001	0.98 (0.96, 1.00)	0.055
45-54 years old	1-30 days	108.20 (101.95, 114.82)	158.79 (151.18, 166.78)	0.68 (0.63, 0.74)	<0.001	0.90 (0.83, 0.97)	0.006
	31-90 days	101.78 (97.46, 106.29)	153.98 (148.64, 159.52)	0.66 (0.63, 0.70)	<0.001	0.84 (0.80, 0.89)	<0.001
	91-180 days	109.47 (105.79, 113.28)	158.39 (153.94, 162.97)	0.69 (0.66, 0.72)	<0.001	0.88 (0.84, 0.92)	<0.001
	181-365 days	101.96 (99.47, 104.51)	151.53 (148.48, 154.65)	0.67 (0.65, 0.69)	<0.001	0.85 (0.82, 0.87)	<0.001
	366-730 days	102.13 (100.34, 103.94)	150.30 (148.12, 152.52)	0.68 (0.66, 0.70)	<0.001	0.85 (0.83, 0.87)	<0.001
55-64 years old	1-30 days	108.72 (101.36, 116.62)	139.95 (131.56, 148.88)	0.78 (0.71, 0.85)	<0.001	1.02 (0.93, 1.12)	0.668
	31-90 days	110.64 (105.33, 116.22)	132.58 (126.74, 138.68)	0.83 (0.78, 0.89)	<0.001	1.06 (0.99, 1.14)	0.083
	91-180 days	108.81 (104.49, 113.32)	140.02 (135.08, 145.14)	0.78 (0.74, 0.82)	<0.001	0.99 (0.94, 1.05)	0.753
	181-365 days	115.11 (111.98, 118.32)	136.08 (132.65, 139.60)	0.85 (0.81, 0.88)	<0.001	1.09 (1.05, 1.13)	<0.001
	366-730 days	107.48 (105.31, 109.70)	124.91 (122.54, 127.32)	0.86 (0.84, 0.88)	<0.001	1.09 (1.06, 1.12)	<0.001

65-84 years	1-30 days	83.85 (77.46, 90.76)	91.26 (84.58, 98.47)	0.92 (0.82, 1.03)	0.131	1.08 (0.96, 1.21)	0.191
	31-90 days	85.22 (80.59, 90.11)	95.08 (90.17, 100.27)	0.90 (0.83, 0.97)	0.005	1.06 (0.98, 1.14)	0.174
	91-180 days	81.16 (77.43, 85.06)	85.11 (81.27, 89.14)	0.95 (0.89, 1.02)	0.157	1.13 (1.05, 1.21)	<0.001
	181-365 days	80.19 (77.57, 82.91)	76.58 (73.99, 79.27)	1.05 (1.00, 1.10)	0.060	1.24 (1.18, 1.30)	<0.001
	366-730 days	76.29 (74.43, 78.21)	73.69 (71.82, 75.60)	1.04 (1.00, 1.07)	0.056	1.21 (1.17, 1.26)	<0.001
85+ years old	1-30 days	44.56 (36.44, 54.48)	51.29 (42.51, 61.88)	0.87 (0.66, 1.14)	0.316	*	*
	31-90 days	45.26 (39.20, 52.25)	39.36 (33.71, 45.96)	1.15 (0.93, 1.42)	0.196	1.21 (0.97, 1.50)	0.091
	91-180 days	32.13 (27.86, 37.06)	43.29 (38.24, 49.00)	0.74 (0.61, 0.90)	0.002	0.82 (0.68, 0.99)	0.043
	181-365 days	29.11 (26.12, 32.45)	36.38 (32.98, 40.14)	0.80 (0.69, 0.93)	0.003	0.89 (0.77, 1.03)	0.123
	366-730 days	27.86 (25.61, 30.32)	33.62 (31.09, 36.37)	0.83 (0.74, 0.93)	0.001	0.90 (0.80, 1.01)	0.072

ED: emergency department; GP: general practitioner; CI: confidence interval

<sup>i</sup>Adjusting for sex, neighbourhood income quintiles, rurality, Ontario health region, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and history of mental health/substance use indications at baseline.

<sup>ii</sup>Comparing rates of outcomes for SR-TBI, compared to TBI from all other causes.

\*Model was not fit due to data sparsity/convergence issues.

Refer to Figures S29-S35.

**Table S10.** Association of TBI-type with subsequent service use and all-cause mortality up to four years post-index date, by sex

	Strata	Proportion		Unadjusted comparison		Adjusted comparison <sup>i</sup>	
		Sports-related TBI	TBI from all other causes	Hazard Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value	Hazard Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value
Mental illness	Female	46413/165815 (27.99%)	52277/165815 (31.53%)	0.86 (0.85, 0.87)	<0.001	0.92 (0.91, 0.94)	<0.001
	Male	53976/242744 (22.24%)	69337/242744 (28.56%)	0.74 (0.73, 0.75)	<0.001	0.85 (0.84, 0.86)	<0.001
Substance use disorder	Female	7392/165815 (4.46%)	12396/165815 (7.48%)	0.58 (0.57, 0.60)	<0.001	0.73 (0.71, 0.75)	<0.001
	Male	14989/242744 (6.17%)	28436/242744 (11.71%)	0.51 (0.50, 0.52)	<0.001	0.70 (0.68, 0.71)	<0.001
Self-harm	Female	1813/165815 (1.09%)	3096/165815 (1.87%)	0.58 (0.55, 0.62)	<0.001	0.78 (0.74, 0.83)	<0.001
	Male	1648/242744 (0.68%)	3451/242744 (1.42%)	0.47 (0.45, 0.50)	<0.001	0.75 (0.71, 0.80)	<0.001
Overdose	Female	3088/165815 (1.86%)	4938/165815 (2.98%)	0.62 (0.59, 0.65)	<0.001	0.78 (0.75, 0.82)	<0.001
	Male	3004/242744 (1.24%)	5981/242744 (2.46%)	0.50 (0.47, 0.52)	<0.001	0.72 (0.69, 0.76)	<0.001
30-day outpatient follow up	Female	21290/165815 (12.84%)	15855/165815 (9.56%)	1.36 (1.34, 1.39)	<0.001	1.30 (1.27, 1.33)	<0.001
	Male	21928/242744 (9.03%)	17685/242744 (7.29%)	1.25 (1.22, 1.27)	<0.001	1.19 (1.16, 1.21)	<0.001
All-cause mortality	Female	5075/165815 (3.06%)	6415/165815 (3.87%)	0.79 (0.76, 0.82)	<0.001	0.84 (0.81, 0.87)	<0.001
	Male	5730/242744 (2.36%)	9067/242744 (3.74%)	0.63 (0.61, 0.65)	<0.001	0.72 (0.70, 0.74)	<0.001

<sup>i</sup>Adjusting for age, neighbourhood income quintiles, rurality, Ontario health region, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and history of mental health/substance use indications at baseline.

<sup>ii</sup>Risk of outcome for SR-TBI group, compared to TBI from all other causes.  
Refer to Figures S36 to S41.

**Table S11.** Association of TBI-type with subsequent service use and all-cause mortality up to four years post-index date, by neighbourhood income quintile

	Strata	Proportion		Unadjusted comparison		Adjusted comparison <sup>i</sup>	
		Sports-related TBI	TBI from all other causes	Hazard Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value	Hazard Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value
Mental illness	Quintile 1 (lowest)	22059/75444 (29.24%)	32076/92181 (34.80%)	0.80 (0.78, 0.81)	<0.001	0.89 (0.88, 0.91)	<0.001
	Quintile 2	19464/74824 (26.01%)	25179/81594 (30.86%)	0.81 (0.79, 0.82)	<0.001	0.90 (0.88, 0.92)	<0.001
	Quintile 3	19162/79810 (24.01%)	22738/80126 (28.38%)	0.81 (0.80, 0.83)	<0.001	0.89 (0.87, 0.91)	<0.001
	Quintile 4	19881/89197 (22.29%)	21047/77892 (27.02%)	0.79 (0.78, 0.81)	<0.001	0.86 (0.84, 0.88)	<0.001
	Quintile 5 (highest)	19283/87519 (22.03%)	19705/74647 (26.40%)	0.80 (0.79, 0.82)	<0.001	0.88 (0.86, 0.90)	<0.001
Substance use disorder	Quintile 1 (lowest)	6411/75444 (8.50%)	13476/92181 (14.62%)	0.56 (0.54, 0.57)	<0.001	0.74 (0.72, 0.77)	<0.001
	Quintile 2	4529/74824 (6.05%)	8642/81594 (10.59%)	0.55 (0.53, 0.57)	<0.001	0.70 (0.68, 0.73)	<0.001
	Quintile 3	4003/79810 (5.02%)	6918/80126 (8.63%)	0.57 (0.54, 0.59)	<0.001	0.72 (0.69, 0.75)	<0.001
	Quintile 4	3706/89197 (4.15%)	5880/77892 (7.55%)	0.54 (0.52, 0.56)	<0.001	0.67 (0.65, 0.70)	<0.001
	Quintile 5 (highest)	3485/87519 (3.98%)	5370/74647 (7.19%)	0.54 (0.52, 0.56)	<0.001	0.69 (0.66, 0.72)	<0.001
Self-harm	Quintile 1 (lowest)	979/75444 (1.30%)	2156/92181 (2.34%)	0.55 (0.51, 0.59)	<0.001	0.78 (0.73, 0.85)	<0.001
	Quintile 2	715/74824 (0.96%)	1365/81594 (1.67%)	0.57 (0.52, 0.62)	<0.001	0.79 (0.72, 0.87)	<0.001
	Quintile 3	595/79810 (0.75%)	1095/80126 (1.37%)	0.54 (0.49, 0.60)	<0.001	0.75 (0.68, 0.84)	<0.001
	Quintile 4	606/89197 (0.68%)	982/77892 (1.26%)	0.53 (0.48, 0.59)	<0.001	0.75 (0.67, 0.83)	<0.001
	Quintile 5 (highest)	513/87519 (0.59%)	859/74647 (1.15%)	0.50 (0.45, 0.56)	<0.001	0.70 (0.63, 0.79)	<0.001
Overdose	Quintile 1 (lowest)	1726/75444 (2.29%)	3477/92181 (3.77%)	0.60 (0.56, 0.63)	<0.001	0.79 (0.75, 0.84)	<0.001
	Quintile 2	1256/74824 (1.68%)	2263/81594 (2.77%)	0.60 (0.56, 0.64)	<0.001	0.79 (0.74, 0.85)	<0.001
	Quintile 3	1023/79810 (1.28%)	1894/80126 (2.36%)	0.54 (0.50, 0.58)	<0.001	0.69 (0.64, 0.74)	<0.001
	Quintile 4	1098/89197 (1.23%)	1707/77892 (2.19%)	0.56 (0.52, 0.60)	<0.001	0.73 (0.68, 0.79)	<0.001
	Quintile 5 (highest)	931/87519 (1.06%)	1436/74647 (1.92%)	0.55 (0.50, 0.59)	<0.001	0.72 (0.66, 0.79)	<0.001

30-day outpatient follow up	Quintile 1 (lowest)	6128/75444 (8.12%)	5953/92181 (6.46%)	1.27 (1.22, 1.31)	<0.001	1.26 (1.22, 1.31)	<0.001
	Quintile 2	7312/74824 (9.77%)	6285/81594 (7.70%)	1.28 (1.24, 1.32)	<0.001	1.25 (1.21, 1.29)	<0.001
	Quintile 3	8418/79810 (10.55%)	6646/80126 (8.29%)	1.28 (1.24, 1.33)	<0.001	1.26 (1.22, 1.30)	<0.001
	Quintile 4	10062/89197 (11.28%)	7110/77892 (9.13%)	1.25 (1.21, 1.29)	<0.001	1.20 (1.16, 1.24)	<0.001
	Quintile 5 (highest)	11129/87519 (12.72%)	7375/74647 (9.88%)	1.30 (1.27, 1.34)	<0.001	1.23 (1.20, 1.27)	<0.001
All-cause mortality	Quintile 1 (lowest)	2628/75444 (3.48%)	4259/92181 (4.62%)	0.75 (0.71, 0.79)	<0.001	0.78 (0.74, 0.82)	<0.001
	Quintile 2	2180/74824 (2.91%)	3405/81594 (4.17%)	0.69 (0.66, 0.73)	<0.001	0.76 (0.72, 0.80)	<0.001
	Quintile 3	2039/79810 (2.55%)	2829/80126 (3.53%)	0.72 (0.68, 0.76)	<0.001	0.78 (0.74, 0.83)	<0.001
	Quintile 4	2129/89197 (2.39%)	2590/77892 (3.33%)	0.71 (0.67, 0.76)	<0.001	0.78 (0.74, 0.83)	<0.001
	Quintile 5 (highest)	1776/87519 (2.03%)	2290/74647 (3.07%)	0.66 (0.62, 0.70)	<0.001	0.74 (0.70, 0.79)	<0.001

<sup>i</sup>Adjusting for age, sex, rurality, Ontario health region, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and history of mental health/substance use indications at baseline.

<sup>ii</sup>Risk of outcome for SR-TBI group, compared to TBI from all other causes.  
Refer to Figures S42 to S47.



**Table S12.** Association of TBI-type with subsequent service use and all-cause mortality up to four years post-index date, by rurality

	Strata	Proportion		Unadjusted comparison		Adjusted comparison <sup>i</sup>	
		Sports-related TBI	TBI from all other causes	Hazard Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value	Hazard Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value
Mental illness	Urban	87795/355530 (24.69%)	106415/357610 (29.76%)	0.79 (0.79, 0.80)	<0.001	0.89 (0.88, 0.90)	<0.001
	Rural	12141/51721 (23.47%)	14448/49329 (29.29%)	0.76 (0.74, 0.78)	<0.001	0.86 (0.84, 0.89)	<0.001
Substance use disorder	Urban	19200/355530 (5.40%)	34921/357610 (9.77%)	0.54 (0.53, 0.55)	<0.001	0.71 (0.70, 0.72)	<0.001
	Rural	3015/51721 (5.83%)	5475/49329 (11.10%)	0.51 (0.48, 0.53)	<0.001	0.70 (0.67, 0.73)	<0.001
Self-harm	Urban	2892/355530 (0.81%)	5461/357610 (1.53%)	0.53 (0.50, 0.55)	<0.001	0.76 (0.73, 0.80)	<0.001
	Rural	539/51721 (1.04%)	1005/49329 (2.04%)	0.50 (0.45, 0.56)	<0.001	0.76 (0.68, 0.84)	<0.001
Overdose	Urban	5165/355530 (1.45%)	9306/357610 (2.60%)	0.55 (0.53, 0.57)	<0.001	0.75 (0.72, 0.77)	<0.001
	Rural	887/51721 (1.71%)	1486/49329 (3.01%)	0.56 (0.52, 0.61)	<0.001	0.75 (0.69, 0.82)	<0.001
30-day outpatient follow up	Urban	38483/355530 (10.82%)	30004/357610 (8.39%)	1.30 (1.28, 1.32)	<0.001	1.24 (1.22, 1.26)	<0.001
	Rural	4577/51721 (8.85%)	3363/49329 (6.82%)	1.31 (1.25, 1.37)	<0.001	1.23 (1.18, 1.29)	<0.001
All-cause mortality	Urban	9417/355530 (2.65%)	13513/357610 (3.78%)	0.70 (0.68, 0.72)	<0.001	0.77 (0.75, 0.79)	<0.001
	Rural	1341/51721 (2.59%)	1893/49329 (3.84%)	0.67 (0.63, 0.72)	<0.001	0.76 (0.71, 0.82)	<0.001

<sup>i</sup>Adjusting for age, sex, neighbourhood income quintiles, Ontario health region, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and history of mental health/substance use indications at baseline.

<sup>ii</sup>Risk of outcome for SR-TBI group, compared to TBI from all other causes.  
Refer to Figures S48 to S53.

**Table S13.** Association of TBI-type with subsequent service use and all-cause mortality up to four years post-index date, by Ontario health region

	Strata	Proportion		Unadjusted comparison		Adjusted comparison <sup>i</sup>	
		Sports-related TBI	TBI from all other causes	Hazard Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value	Hazard Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value
Mental illness	West	30300/120014 (25.25%)	37235/122372 (30.43%)	0.79 (0.78, 0.81)	<0.001	0.89 (0.88, 0.91)	<0.001
	Central	22819/102549 (22.25%)	25758/95711 (26.91%)	0.79 (0.78, 0.81)	<0.001	0.88 (0.86, 0.89)	<0.001
	Toronto	15442/64808 (23.83%)	22822/79252 (28.80%)	0.79 (0.77, 0.81)	<0.001	0.88 (0.86, 0.90)	<0.001
	East	25071/94985 (26.39%)	24924/79743 (31.26%)	0.81 (0.79, 0.82)	<0.001	0.89 (0.87, 0.90)	<0.001
	Northeast	4775/18043 (26.46%)	6916/20219 (34.21%)	0.72 (0.69, 0.74)	<0.001	0.86 (0.83, 0.89)	<0.001
	Northwest	1982/8160 (24.29%)	3959/11202 (35.34%)	0.63 (0.60, 0.66)	<0.001	0.83 (0.79, 0.88)	<0.001
Substance use disorder	West	7233/120014 (6.03%)	12447/122372 (10.17%)	0.58 (0.56, 0.59)	<0.001	0.73 (0.71, 0.75)	<0.001
	Central	4356/102549 (4.25%)	7447/95711 (7.78%)	0.53 (0.51, 0.55)	<0.001	0.71 (0.69, 0.74)	<0.001
	Toronto	3472/64808 (5.36%)	7876/79252 (9.94%)	0.52 (0.50, 0.54)	<0.001	0.68 (0.66, 0.71)	<0.001
	East	5155/94985 (5.43%)	7508/79743 (9.42%)	0.56 (0.54, 0.58)	<0.001	0.71 (0.69, 0.74)	<0.001
	Northeast	1320/18043 (7.32%)	2840/20219 (14.05%)	0.49 (0.46, 0.53)	<0.001	0.68 (0.64, 0.73)	<0.001
	Northwest	845/8160 (10.36%)	2714/11202 (24.23%)	0.39 (0.36, 0.42)	<0.001	0.63 (0.58, 0.68)	<0.001
Self-harm	West	1137/120014 (0.95%)	2010/122372 (1.64%)	0.57 (0.53, 0.61)	<0.001	0.79 (0.73, 0.85)	<0.001
	Central	614/102549 (0.60%)	1124/95711 (1.17%)	0.51 (0.46, 0.56)	<0.001	0.75 (0.68, 0.83)	<0.001
	Toronto	458/64808 (0.71%)	1099/79252 (1.39%)	0.50 (0.45, 0.56)	<0.001	0.74 (0.66, 0.82)	<0.001
	East	881/94985 (0.93%)	1330/79743 (1.67%)	0.55 (0.51, 0.60)	<0.001	0.76 (0.70, 0.83)	<0.001
	Northeast	215/18043 (1.19%)	512/20219 (2.53%)	0.46 (0.39, 0.54)	<0.001	0.68 (0.58, 0.81)	<0.001
	Northwest	156/8160 (1.91%)	472/11202 (4.21%)	0.44 (0.37, 0.53)	<0.001	0.77 (0.63, 0.92)	0.005
Overdose	West	2026/120014 (1.69%)	3595/122372 (2.94%)	0.57 (0.54, 0.60)	<0.001	0.74 (0.70, 0.79)	<0.001
	Central	1231/102549 (1.20%)	2012/95711 (2.10%)	0.57 (0.53, 0.61)	<0.001	0.77 (0.71, 0.83)	<0.001
	Toronto	745/64808 (1.15%)	1705/79252 (2.15%)	0.53 (0.48, 0.57)	<0.001	0.75 (0.68, 0.81)	<0.001
	East	1529/94985 (1.61%)	2241/79743 (2.81%)	0.57 (0.53, 0.60)	<0.001	0.74 (0.69, 0.79)	<0.001
	Northeast	380/18043 (2.11%)	807/20219 (3.99%)	0.52 (0.46, 0.58)	<0.001	0.74 (0.65, 0.84)	<0.001
	Northwest	181/8160 (2.22%)	559/11202 (4.99%)	0.43 (0.37, 0.51)	<0.001	0.70 (0.59, 0.83)	<0.001

30-day outpatient follow up	West	13354/120014 (11.13%)	10550/122372 (8.62%)	1.31 (1.27, 1.34)	<0.001	1.25 (1.22, 1.28)	<0.001
	Central	10981/102549 (10.71%)	8508/95711 (8.89%)	1.22 (1.18, 1.25)	<0.001	1.18 (1.14, 1.21)	<0.001
	Toronto	6630/64808 (10.23%)	6287/79252 (7.93%)	1.30 (1.26, 1.35)	<0.001	1.24 (1.20, 1.28)	<0.001
	East	10214/94985 (10.75%)	6568/79743 (8.24%)	1.32 (1.28, 1.36)	<0.001	1.26 (1.22, 1.30)	<0.001
	Northeast	1282/18043 (7.11%)	1002/20219 (4.96%)	1.45 (1.33, 1.57)	<0.001	1.36 (1.25, 1.48)	<0.001
	Northwest	757/8160 (9.28%)	625/11202 (5.58%)	1.69 (1.52, 1.88)	<0.001	1.50 (1.35, 1.67)	<0.001
All-cause mortality	West	3555/120014 (2.96%)	4814/122372 (3.93%)	0.75 (0.72, 0.78)	<0.001	0.80 (0.77, 0.84)	<0.001
	Central	2452/102549 (2.39%)	2873/95711 (3.00%)	0.79 (0.75, 0.84)	<0.001	0.78 (0.73, 0.82)	<0.001
	Toronto	1418/64808 (2.19%)	3166/79252 (3.99%)	0.54 (0.51, 0.58)	<0.001	0.71 (0.67, 0.76)	<0.001
	East	2844/94985 (2.99%)	3243/79743 (4.07%)	0.73 (0.70, 0.77)	<0.001	0.78 (0.74, 0.82)	<0.001
	Northeast	386/18043 (2.14%)	898/20219 (4.44%)	0.48 (0.42, 0.54)	<0.001	0.67 (0.60, 0.76)	<0.001
	Northwest	150/8160 (1.84%)	488/11202 (4.36%)	0.42 (0.35, 0.50)	<0.001	0.59 (0.49, 0.72)	<0.001

<sup>i</sup>Adjusting for age, sex, neighbourhood income quintiles, rurality, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and history of mental health/substance use indications at baseline.

<sup>ii</sup>Risk of outcome for SR-TBI group, compared to TBI from all other causes.  
Refer to Figures S54 to S59.

**Table S14.** Association of TBI-type with subsequent service use and all-cause mortality up to four years post-index date, by age category

	Strata	Proportion		Unadjusted comparison		Adjusted comparison <sup>i</sup>	
		Sports-related TBI	TBI from all other causes	Hazard Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value	Hazard Ratio <sup>ii</sup> (95% Cis)	<i>p</i> -value
Mental illness	0-9 years old	14293/114257 (12.51%)	14922/115135 (12.96%)	0.96 (0.94, 0.98)	0.001	0.97 (0.95, 0.99)	0.007
	10-17 years old	16441/66770 (24.62%)	18466/61989 (29.79%)	0.79 (0.77, 0.81)	<0.001	0.89 (0.87, 0.91)	<0.001
	18-24 years old	15098/54334 (27.79%)	20146/58218 (34.60%)	0.76 (0.75, 0.78)	<0.001	0.87 (0.85, 0.89)	<0.001
	25-34 years old	13751/48312 (28.46%)	18510/48323 (38.30%)	0.68 (0.67, 0.70)	<0.001	0.83 (0.81, 0.85)	<0.001
	35-44 years old	10692/35658 (29.98%)	14303/35652 (40.12%)	0.68 (0.67, 0.70)	<0.001	0.84 (0.82, 0.87)	<0.001
	45-54 years old	10179/33504 (30.38%)	12797/33497 (38.20%)	0.74 (0.72, 0.76)	<0.001	0.88 (0.86, 0.91)	<0.001
	55-64 years old	6926/24010 (28.85%)	8432/24025 (35.10%)	0.77 (0.74, 0.79)	<0.001	0.92 (0.89, 0.95)	<0.001
	65-84 years old	8898/24471 (36.36%)	9859/24484 (40.27%)	0.85 (0.83, 0.87)	<0.001	0.93 (0.90, 0.95)	<0.001
	85+ years old	4111/7243 (56.76%)	4179/7236 (57.75%)	0.93 (0.89, 0.97)	0.001	0.94 (0.90, 0.98)	0.005
Substance use disorder	0-9 years old	107/114257 (0.09%)	89/115135 (0.08%)	1.21 (0.91, 1.60)	0.182	*	*
	10-17 years old	3043/66770 (4.56%)	4646/61989 (7.49%)	0.60 (0.57, 0.62)	<0.001	0.72 (0.69, 0.76)	<0.001
	18-24 years old	4785/54334 (8.81%)	9212/58218 (15.82%)	0.53 (0.52, 0.55)	<0.001	0.67 (0.65, 0.70)	<0.001
	25-34 years old	4738/48312 (9.81%)	9550/48323 (19.76%)	0.47 (0.45, 0.48)	<0.001	0.65 (0.63, 0.68)	<0.001
	35-44 years old	3461/35658 (9.71%)	6773/35652 (19.00%)	0.48 (0.46, 0.50)	<0.001	0.72 (0.69, 0.75)	<0.001
	45-54 years old	3209/33504 (9.58%)	5726/33497 (17.09%)	0.53 (0.51, 0.55)	<0.001	0.78 (0.75, 0.82)	<0.001
	55-64 years old	1849/24010 (7.70%)	3228/24025 (13.44%)	0.55 (0.52, 0.58)	<0.001	0.79 (0.74, 0.83)	<0.001

	65-84 years old	1074/24471 (4.39%)	1458/24484 (5.95%)	0.71 (0.66, 0.77)	<0.001	0.84 (0.78, 0.91)	<0.001
	85+ years old	115/7243 (1.59%)	150/7236 (2.07%)	0.73 (0.58, 0.94)	0.013	0.71 (0.56, 0.91)	0.007
Self-harm	0-9 years old	SC	SC	0.97 (0.71, 1.32)	0.850	*	*
	10-17 years old	SC	SC	0.58 (0.53, 0.63)	<0.001	0.74 (0.68, 0.80)	<0.001
	18-24 years old	SC	SC	0.53 (0.48, 0.57)	<0.001	0.72 (0.66, 0.78)	<0.001
	25-34 years old	SC	SC	0.47 (0.43, 0.52)	<0.001	0.78 (0.71, 0.86)	<0.001
	35-44 years old	SC	SC	0.41 (0.36, 0.46)	<0.001	0.73 (0.65, 0.83)	<0.001
	45-54 years old	SC	SC	0.48 (0.42, 0.55)	<0.001	0.81 (0.70, 0.93)	0.003
	55-64 years old	SC	SC	0.60 (0.49, 0.73)	<0.001	0.92 (0.75, 1.14)	0.463
	65-84 years old	SC	SC	0.93 (0.68, 1.27)	0.651	*	*
	85+ years old	SC	SC	*	*	*	*
Overdose	0-9 years old	717/114257 (0.63%)	794/115135 (0.69%)	0.91 (0.82, 1.01)	0.065	0.91 (0.82, 1.01)	0.063
	10-17 years old	1416/66770 (2.12%)	2084/61989 (3.36%)	0.63 (0.58, 0.67)	<0.001	0.77 (0.72, 0.83)	<0.001
	18-24 years old	1109/54334 (2.04%)	2233/58218 (3.84%)	0.53 (0.49, 0.57)	<0.001	0.69 (0.64, 0.74)	<0.001
	25-34 years old	936/48312 (1.94%)	2219/48323 (4.59%)	0.41 (0.38, 0.45)	<0.001	0.66 (0.61, 0.71)	<0.001
	35-44 years old	638/35658 (1.79%)	1480/35652 (4.15%)	0.42 (0.39, 0.46)	<0.001	0.71 (0.65, 0.78)	<0.001
	45-54 years old	566/33504 (1.69%)	1090/33497 (3.25%)	0.51 (0.46, 0.56)	<0.001	0.80 (0.72, 0.88)	<0.001
	55-64 years old	340/24010 (1.42%)	597/24025 (2.48%)	0.56 (0.49, 0.63)	<0.001	0.83 (0.72, 0.95)	0.007

	65-84 years old	304/24471 (1.24%)	376/24484 (1.54%)	0.78 (0.67, 0.91)	0.001	0.90 (0.78, 1.05)	0.198
	85+ years old	66/7243 (0.91%)	46/7236 (0.64%)	1.38 (0.95, 2.02)	0.090	*	*
30-day outpatient follow up	0-9 years old	4822/114257 (4.22%)	4941/115135 (4.29%)	0.98 (0.94, 1.02)	0.390	0.98 (0.94, 1.01)	0.215
	10-17 years old	14779/66770 (22.13%)	8511/61989 (13.73%)	1.68 (1.64, 1.73)	<0.001	1.60 (1.55, 1.64)	<0.001
	18-24 years old	6207/54334 (11.42%)	4864/58218 (8.35%)	1.39 (1.34, 1.44)	<0.001	1.33 (1.28, 1.38)	<0.001
	25-34 years old	5045/48312 (10.44%)	4272/48323 (8.84%)	1.19 (1.14, 1.24)	<0.001	1.13 (1.09, 1.18)	<0.001
	35-44 years old	4067/35658 (11.41%)	3496/35652 (9.81%)	1.17 (1.12, 1.23)	<0.001	1.09 (1.05, 1.15)	<0.001
	45-54 years old	3787/33504 (11.30%)	3338/33497 (9.97%)	1.14 (1.09, 1.19)	<0.001	1.07 (1.02, 1.12)	0.008
	55-64 years old	2442/24010 (10.17%)	2153/24025 (8.96%)	1.14 (1.08, 1.21)	<0.001	1.07 (1.01, 1.14)	0.022
	65-84 years old	1760/24471 (7.19%)	1646/24484 (6.72%)	1.07 (1.00, 1.14)	0.050	1.01 (0.94, 1.08)	0.834
	85+ years old	309/7243 (4.27%)	319/7236 (4.41%)	0.96 (0.83, 1.13)	0.653	0.97 (0.83, 1.14)	0.726
All-cause mortality	0-9 years old	43/114257 (0.04%)	50/115135 (0.04%)	0.87 (0.58, 1.30)	0.490	*	*
	10-17 years old	81/66770 (0.12%)	158/61989 (0.25%)	0.48 (0.36, 0.62)	<0.001	0.60 (0.45, 0.78)	<0.001
	18-24 years old	159/54334 (0.29%)	409/58218 (0.70%)	0.42 (0.35, 0.50)	<0.001	0.54 (0.45, 0.65)	<0.001
	25-34 years old	264/48312 (0.55%)	648/48323 (1.34%)	0.41 (0.35, 0.47)	<0.001	0.62 (0.54, 0.72)	<0.001
	35-44 years old	288/35658 (0.81%)	776/35652 (2.18%)	0.37 (0.32, 0.42)	<0.001	0.57 (0.50, 0.66)	<0.001
	45-54 years old	604/33504 (1.80%)	1386/33497 (4.14%)	0.43 (0.39, 0.47)	<0.001	0.63 (0.57, 0.69)	<0.001
	55-64 years old	1007/24010 (4.19%)	1956/24025 (8.14%)	0.50 (0.47, 0.54)	<0.001	0.69 (0.64, 0.75)	<0.001

65-84 years old	4329/24471 (17.69%)	5799/24484 (23.68%)	0.72 (0.69, 0.75)	<0.001	0.81 (0.78, 0.84)	<0.001
85+ years old	4030/7243 (55.64%)	4300/7236 (59.43%)	0.90 (0.86, 0.94)	<0.001	0.91 (0.87, 0.95)	<0.001

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Cohort matched on sex, date of birth ( $\pm 365$  days) and index date ( $\pm 365$  days)

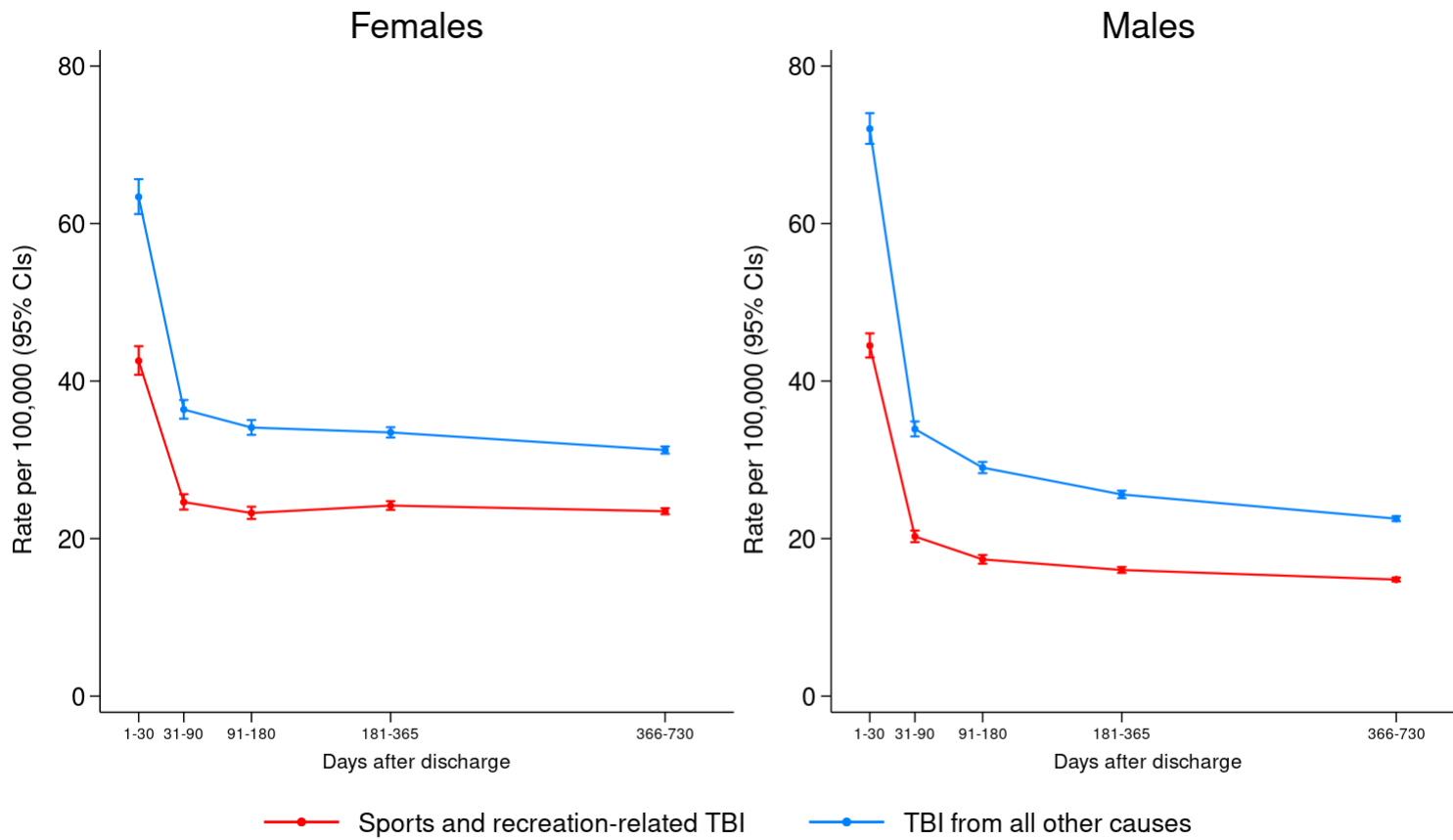
<sup>i</sup>Adjusting for sex, neighbourhood income quintiles, rurality, Ontario health region, Charlson comorbidity score, consistent PCP and psychiatric care, previous TBI exposure, self-harm history, overdose history, history of emergency department use for psychiatric reasons, history of psychiatric hospitalizations, and history of mental health/substance use indications at baseline.

<sup>ii</sup>Risk of outcome for SR-TBI group, compared to TBI from all other causes.

\*Model was not fit due to data sparsity.

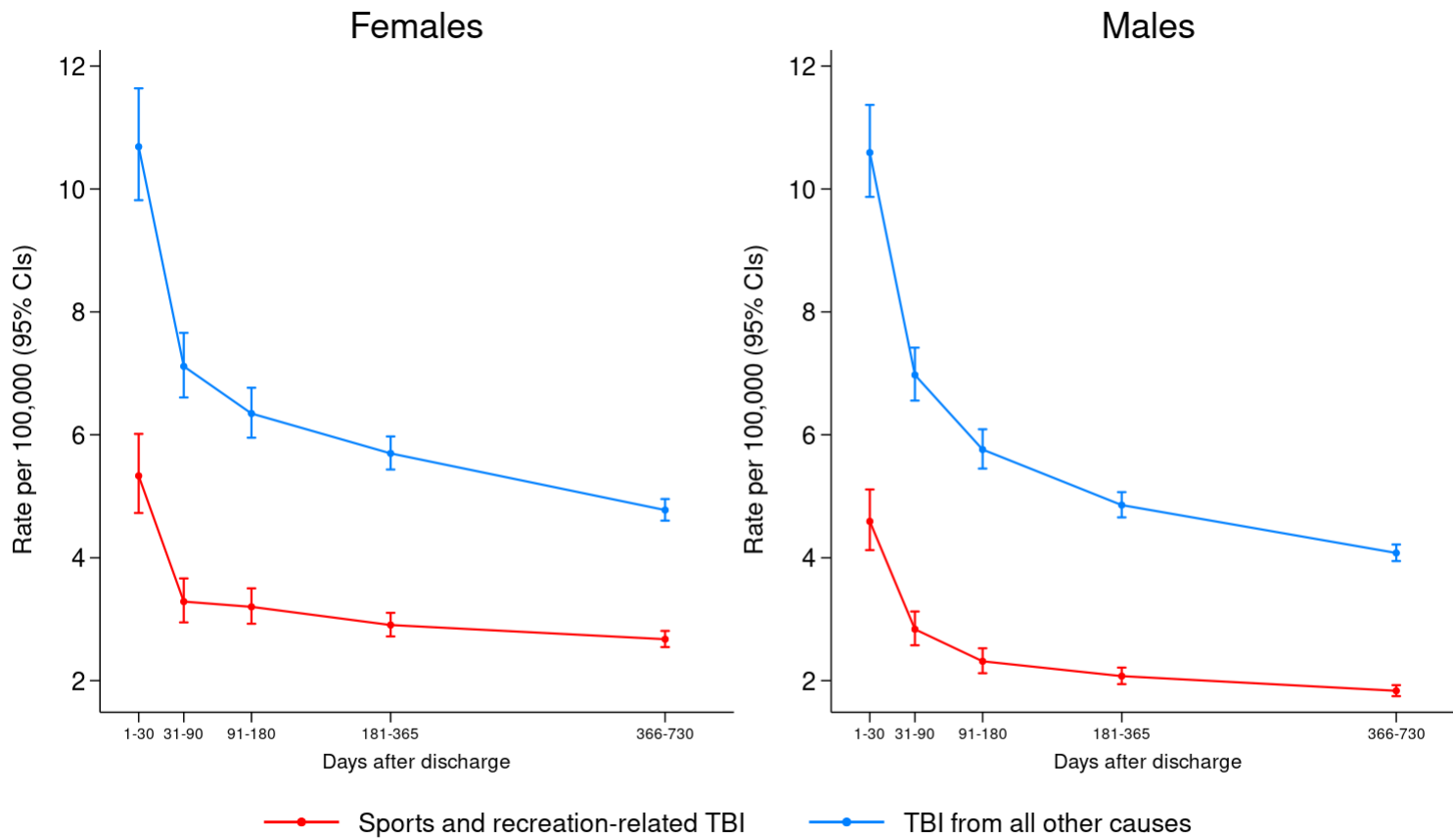
SC: small cell (<10 individuals) present – counts and proportions were suppressed to protect the identity of participants.

Refer to Figures S60 to S65.

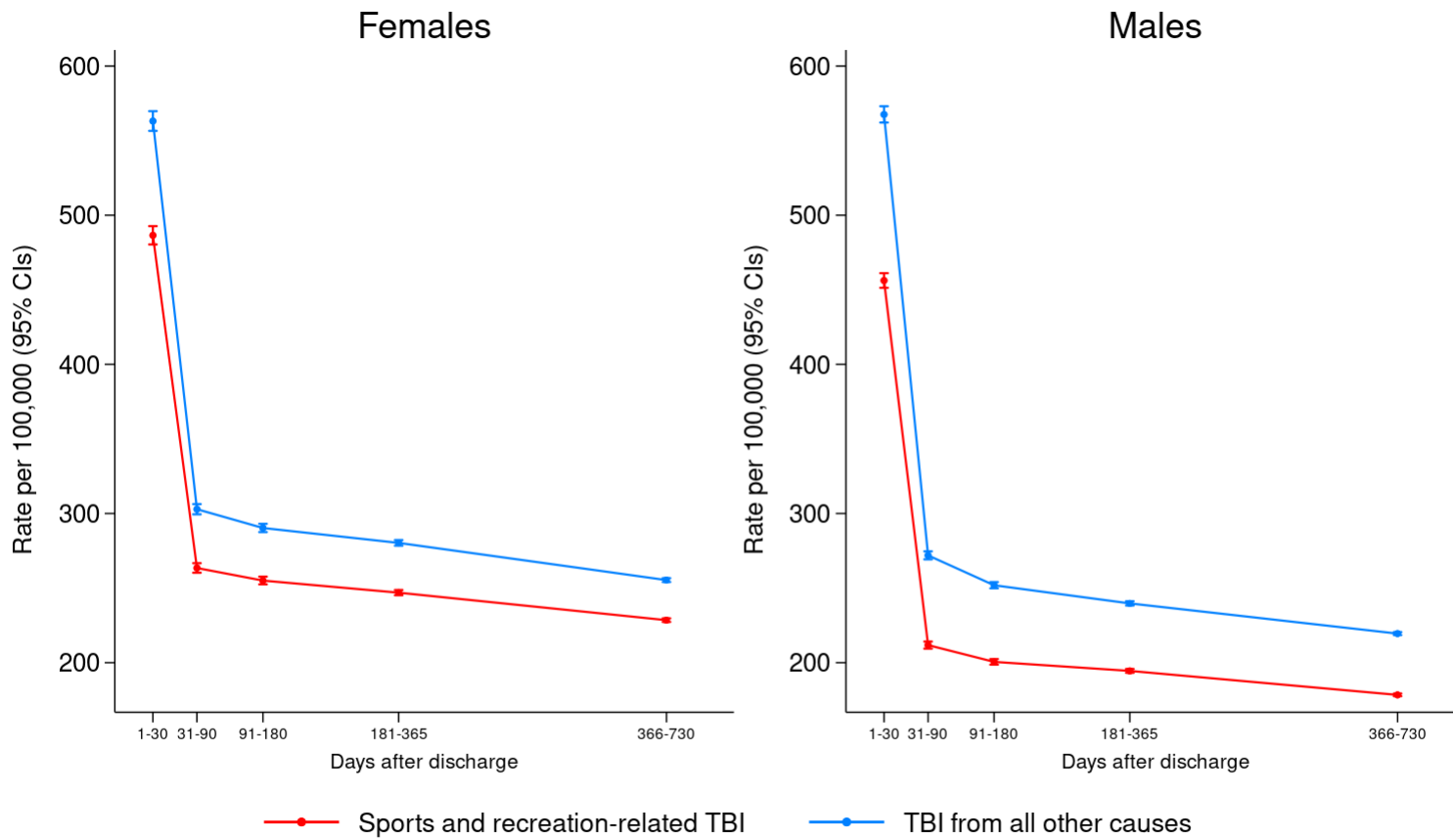


**Figure S1: Piecewise rates of all-cause hospitalizations, by TBI-type and sex**

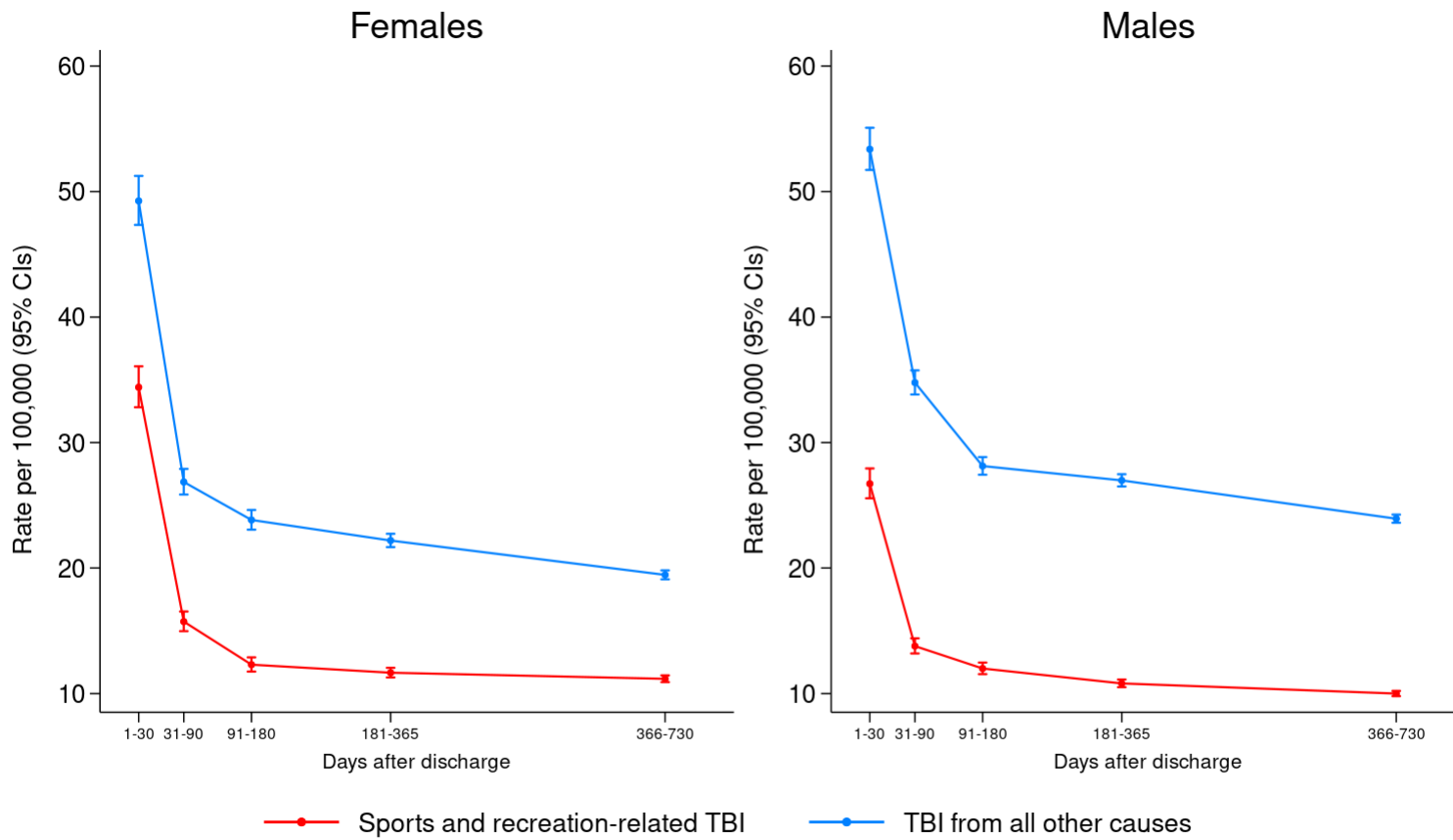




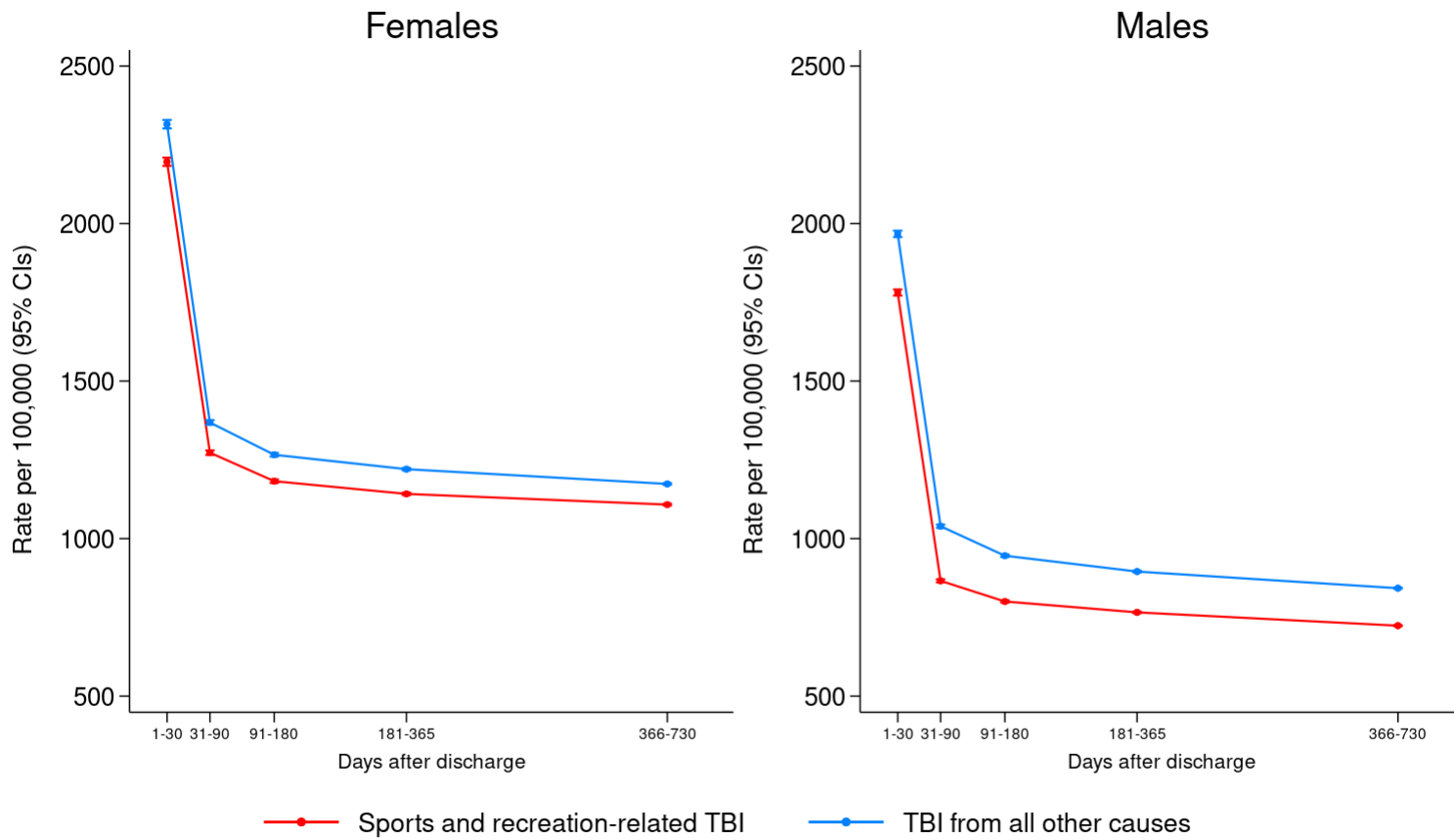
**Figure S2: Piecewise rates of psychiatric hospitalizations, by TBI-type and sex**



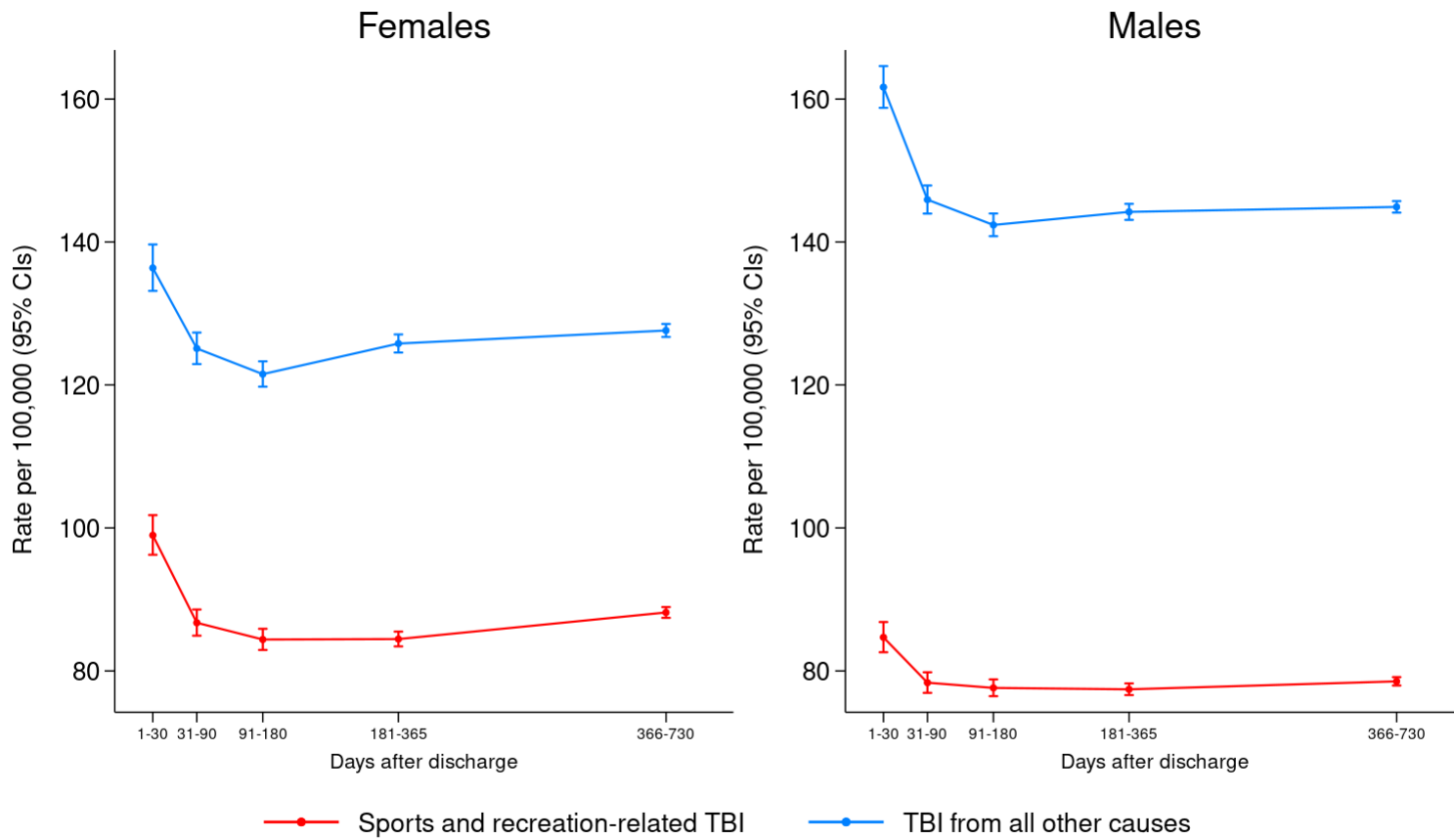
**Figure S3: Piecewise rates of all-cause emergency department visits, by TBI-type and sex**



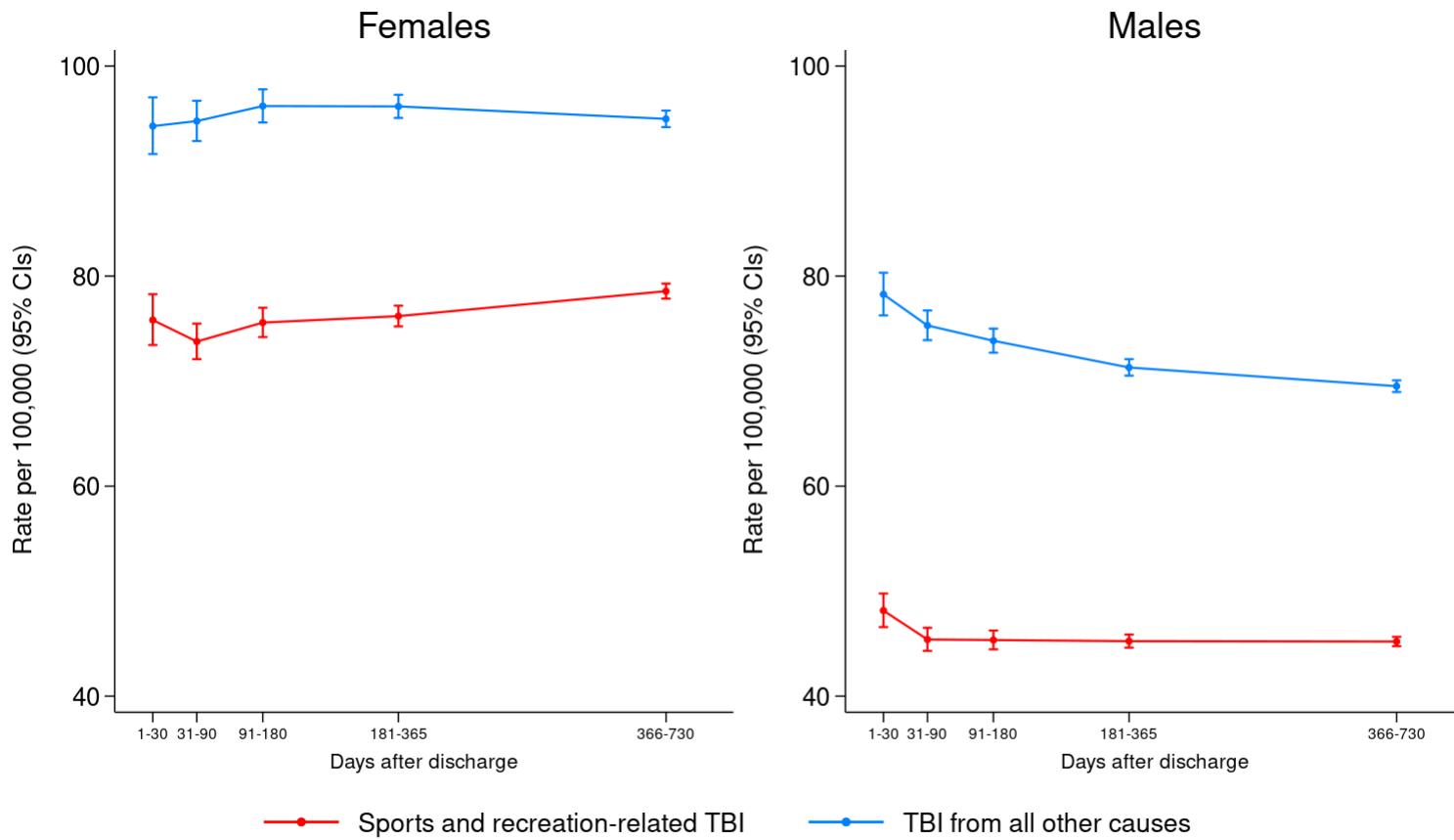
**Figure S4: Piecewise rates of psychiatric emergency department visits, by TBI-type and sex**



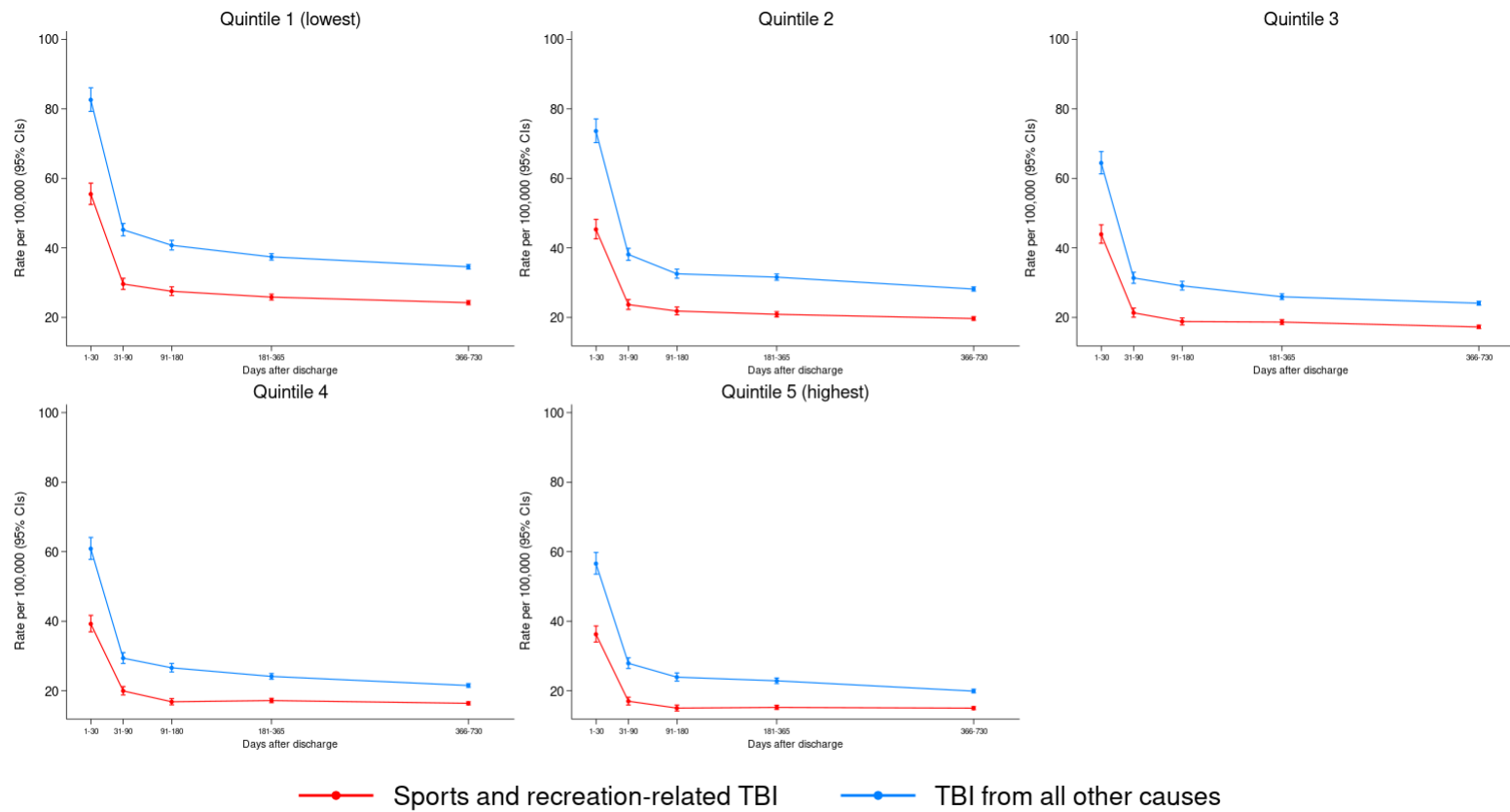
**Figure S5: Piecewise rates of all-cause general practitioner visits, by TBI-type and sex**



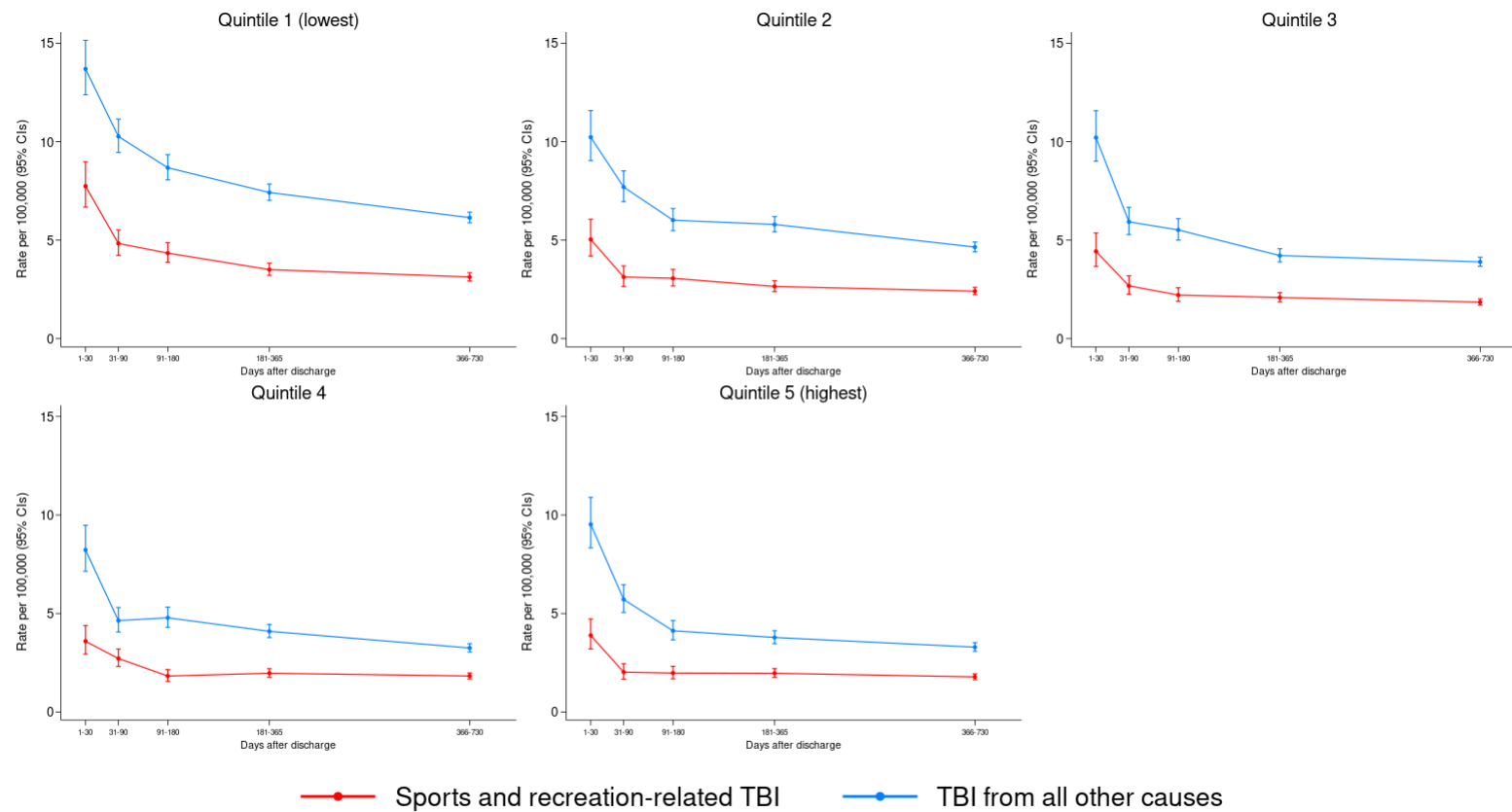
**Figure S6: Piecewise rates of mental health-related general practitioner visits, by TBI-type and sex**



**Figure S7: Piecewise rates of psychiatrist visits, by TBI-type and sex**

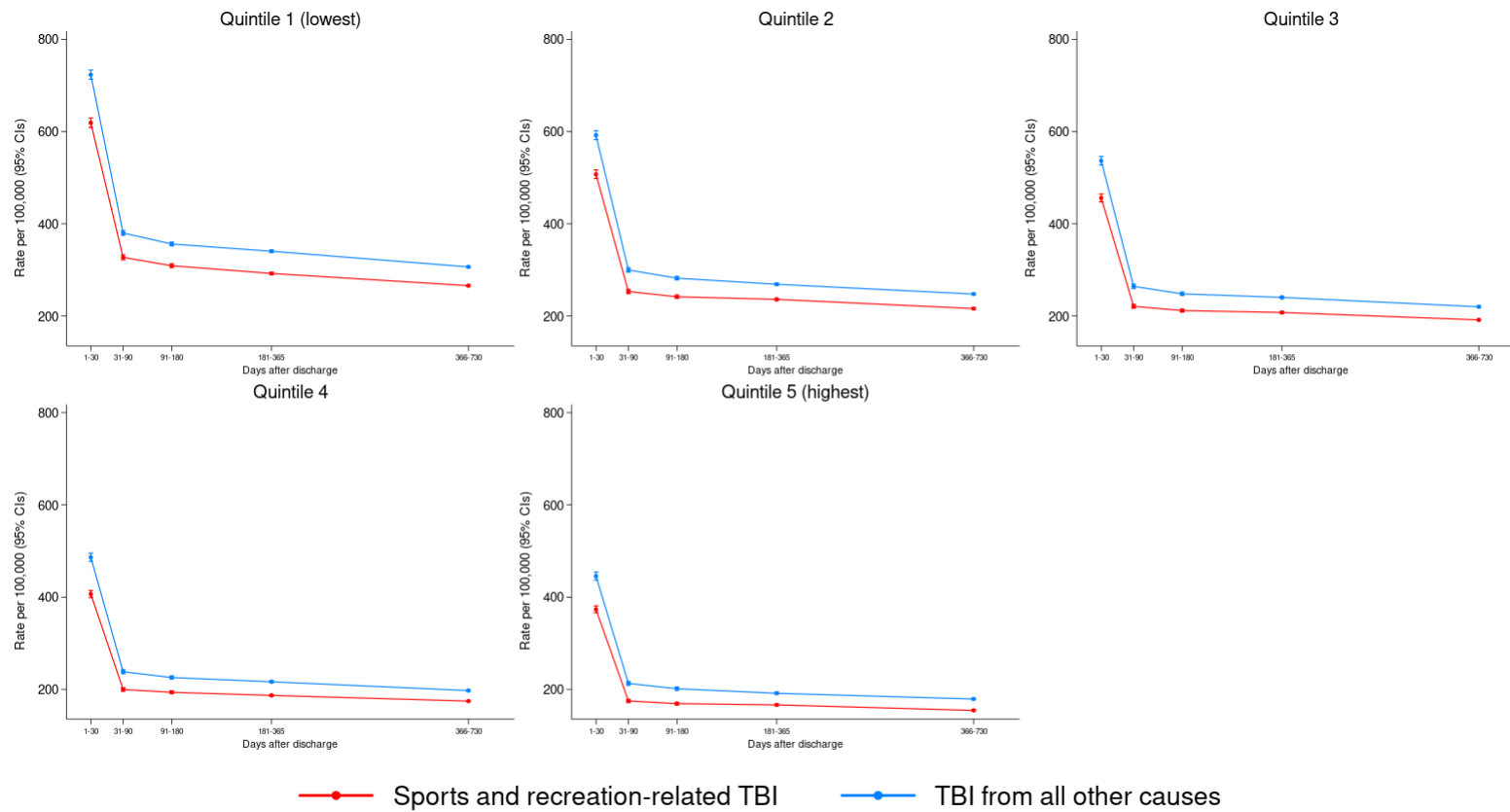


**Figure S8: Piecewise rates of all-cause hospitalizations, by TBI-type and neighbourhood income quintile**

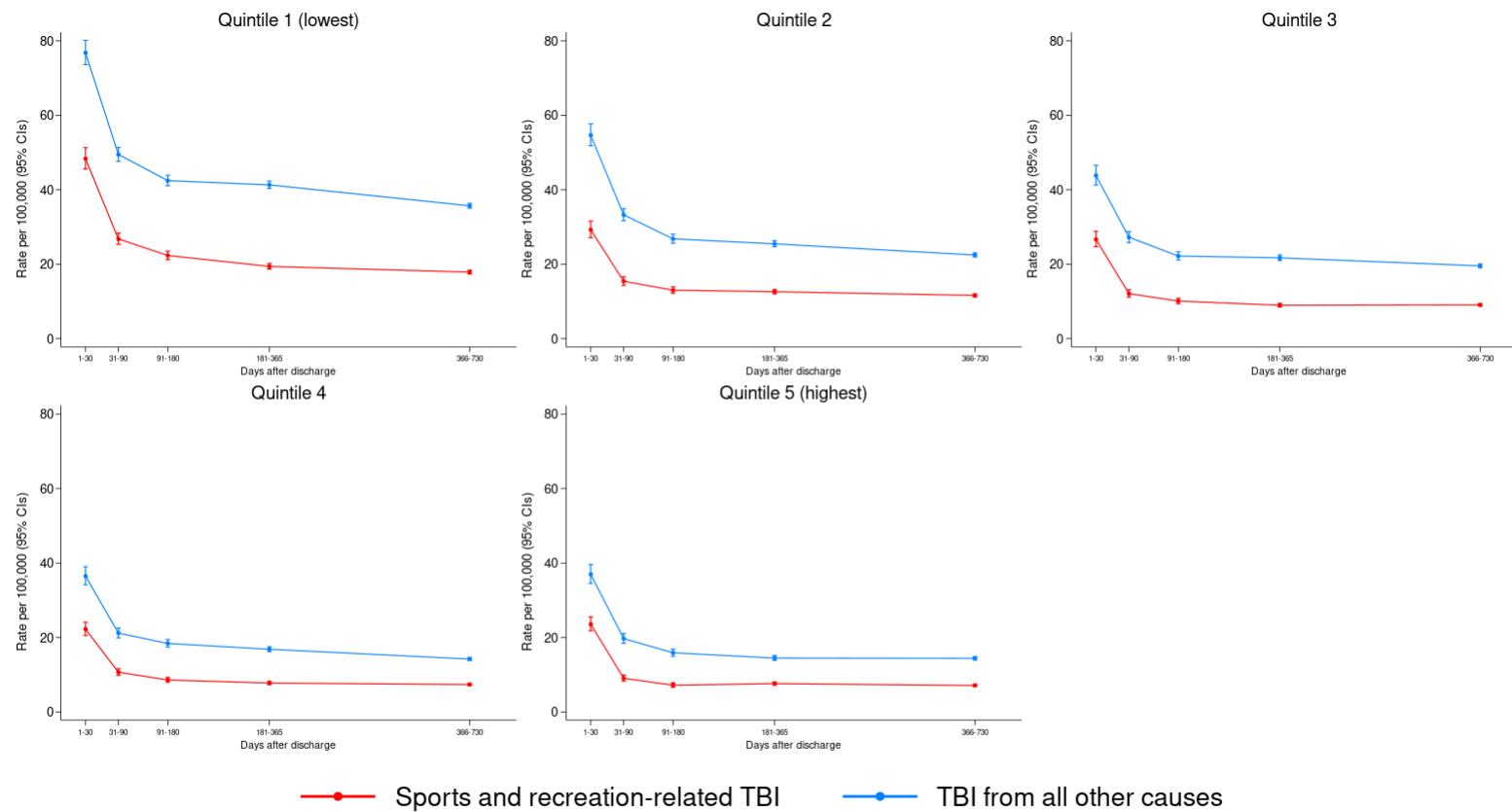


**Figure S9: Piecewise rates of psychiatric hospitalizations, by TBI-type and neighbourhood income quintile**

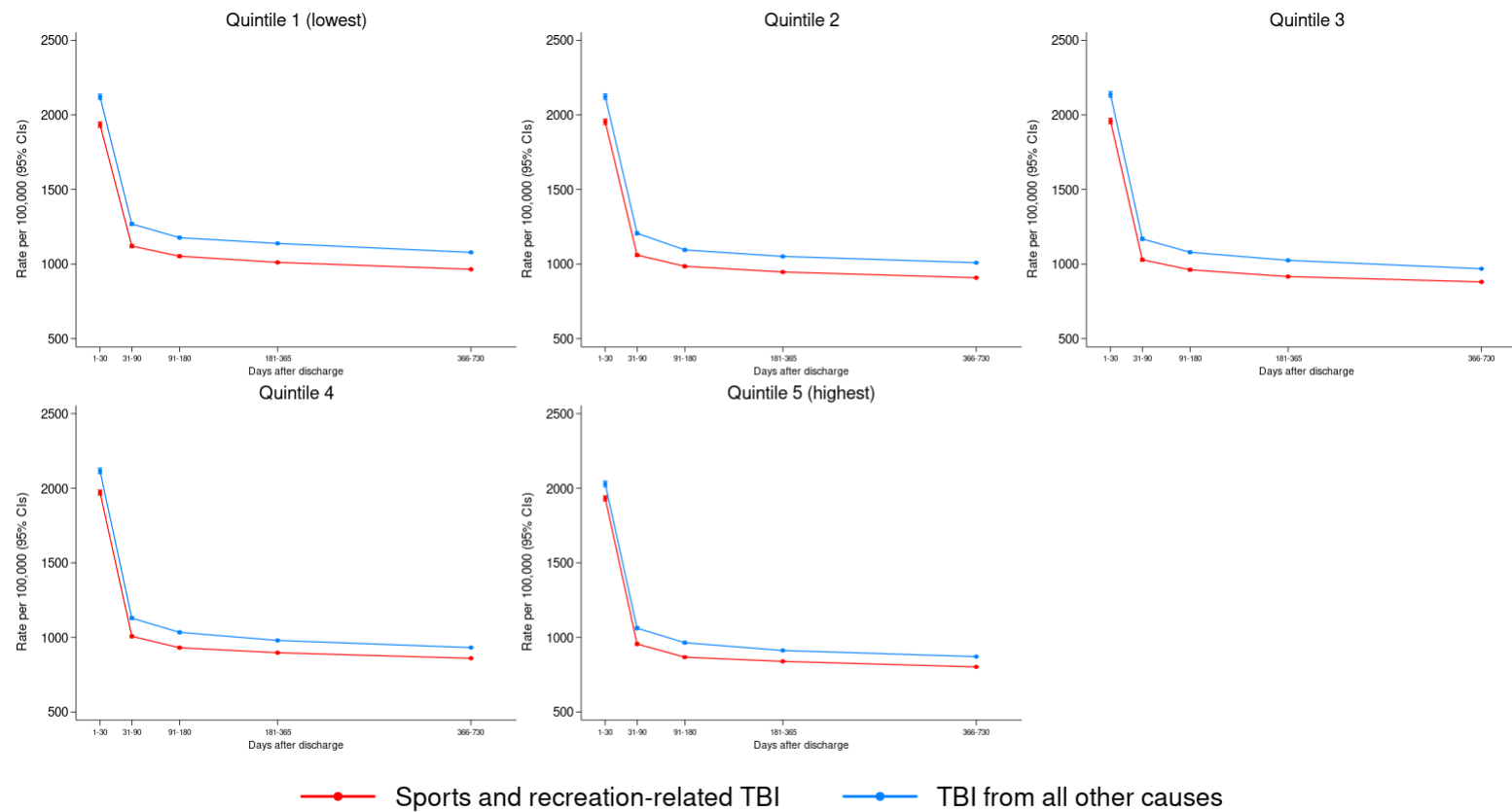




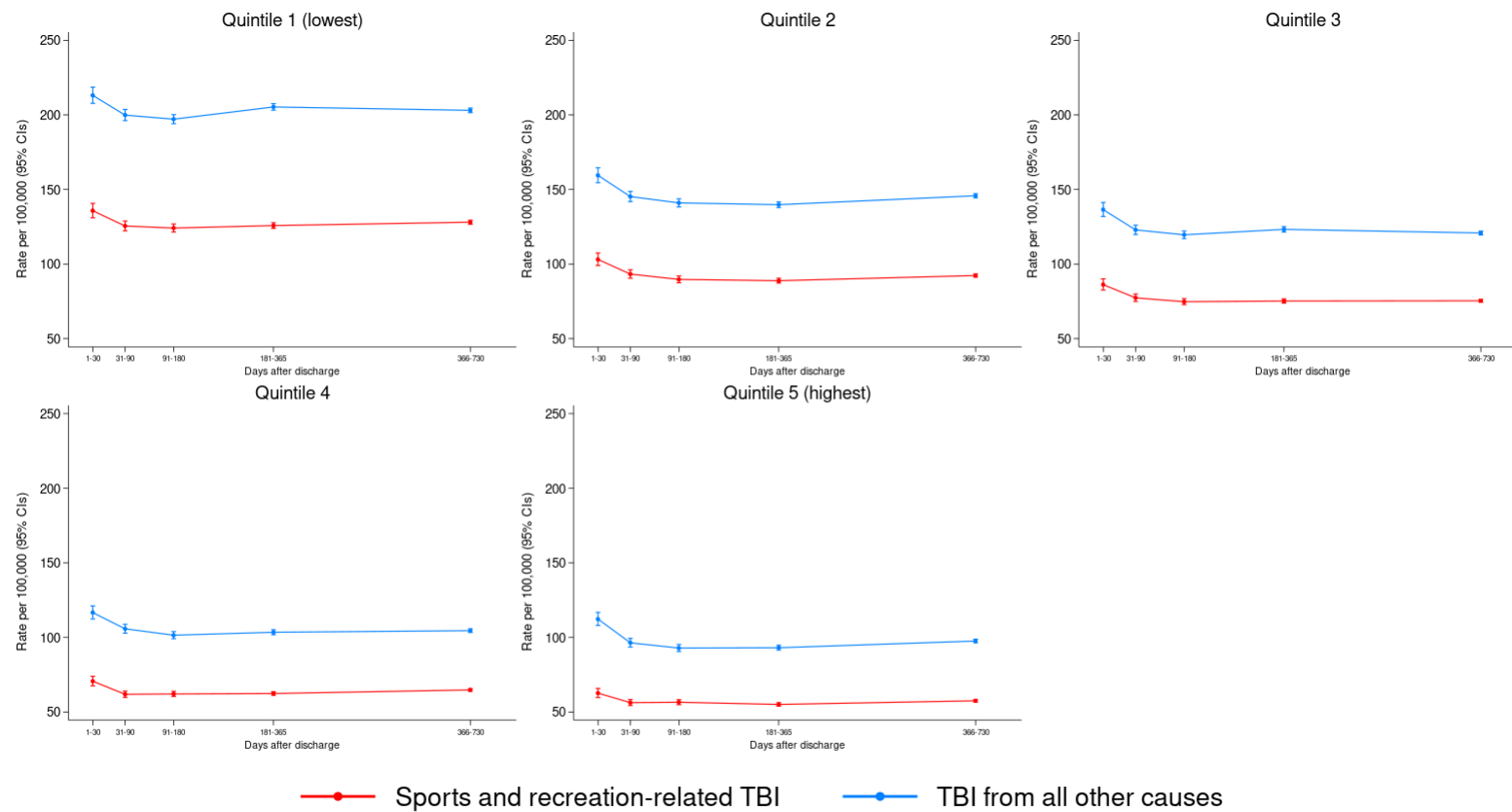
**Figure S10: Piecewise rates of all-cause emergency department visits, by TBI-type and neighbourhood income quintile**



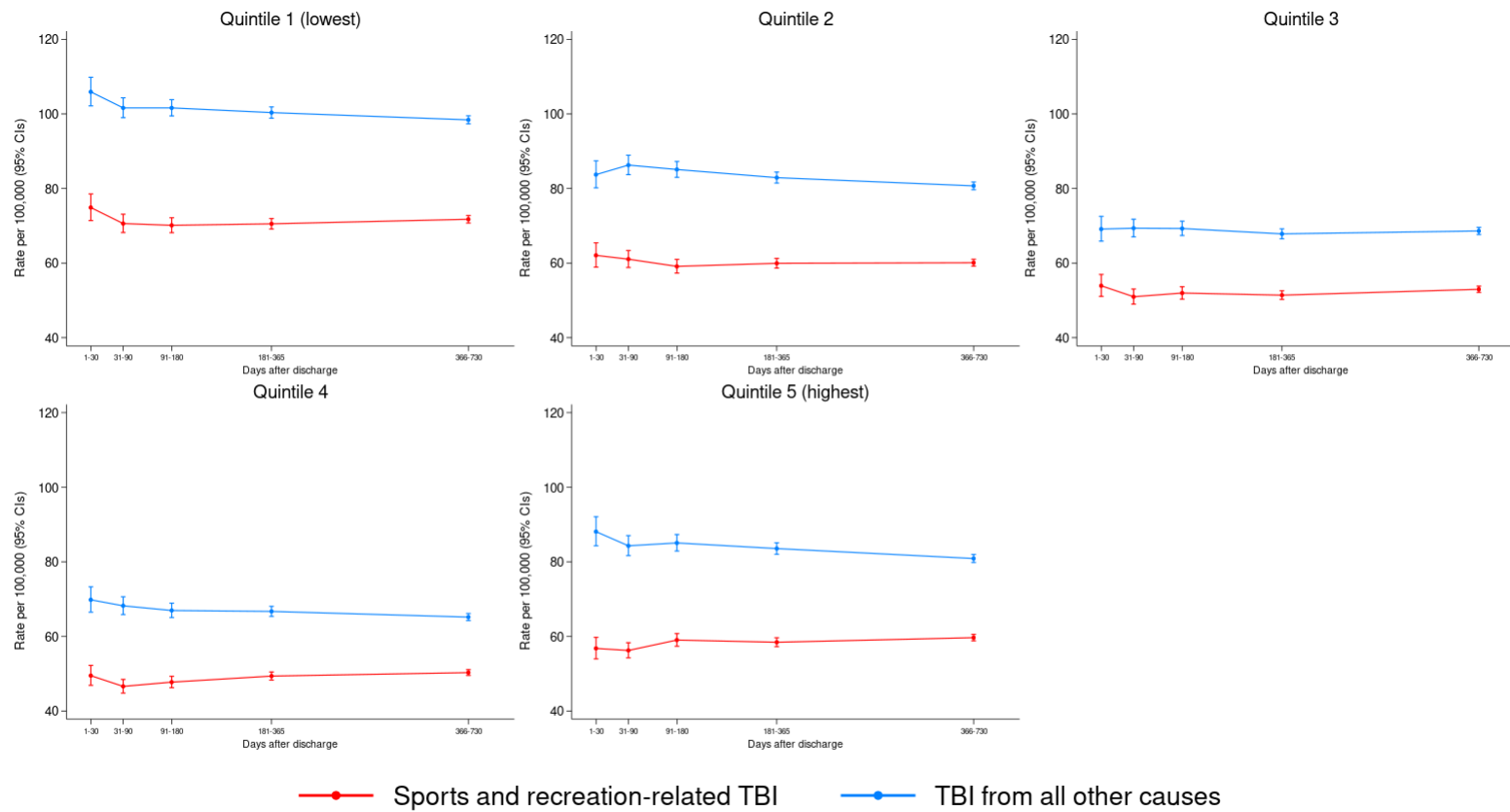
**Figure S11: Piecewise rates of psychiatric emergency department visits, by TBI-type and neighbourhood income quintile**



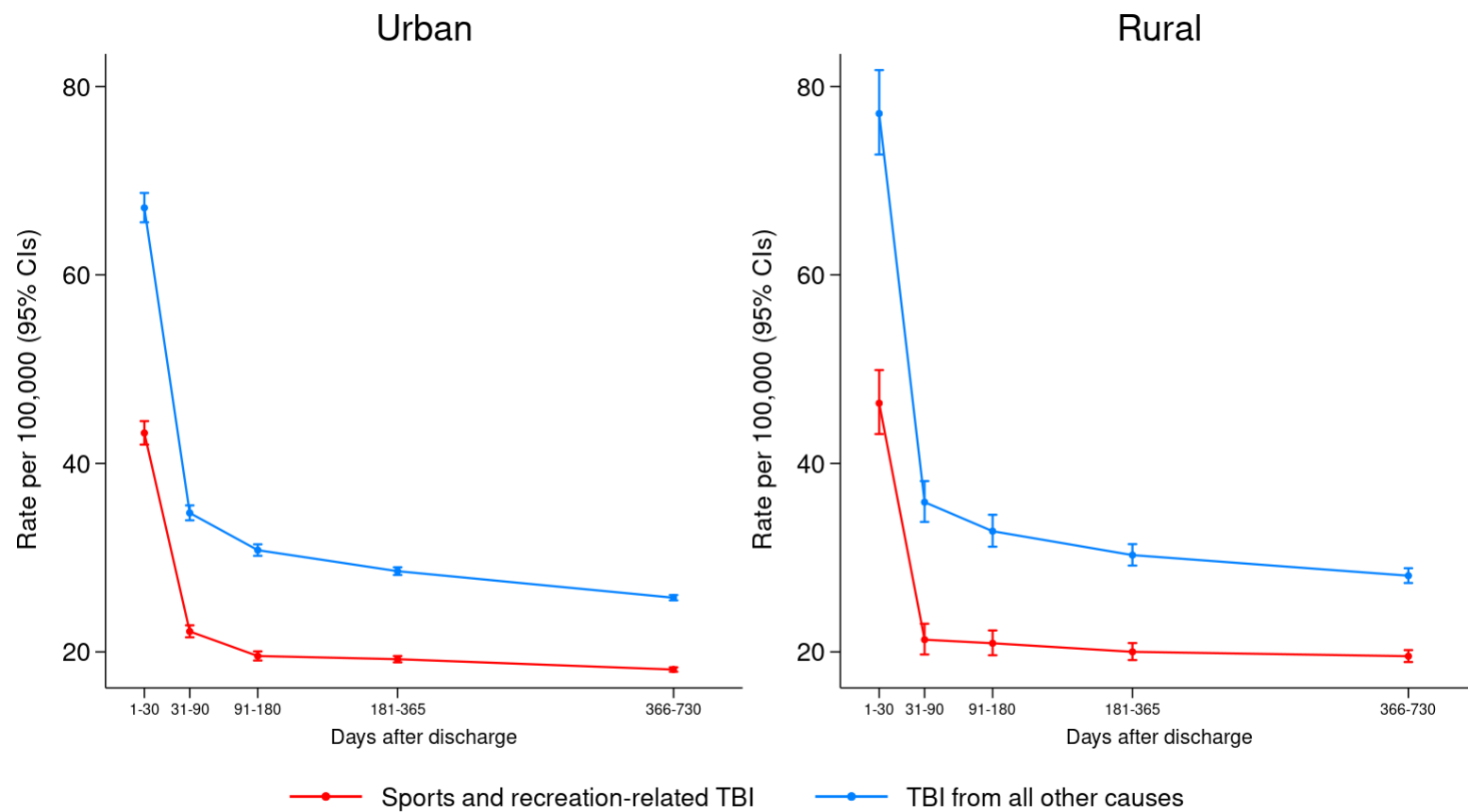
**Figure S12: Piecewise rates of all-cause general practitioner visits, by TBI-type and neighbourhood income quintile**



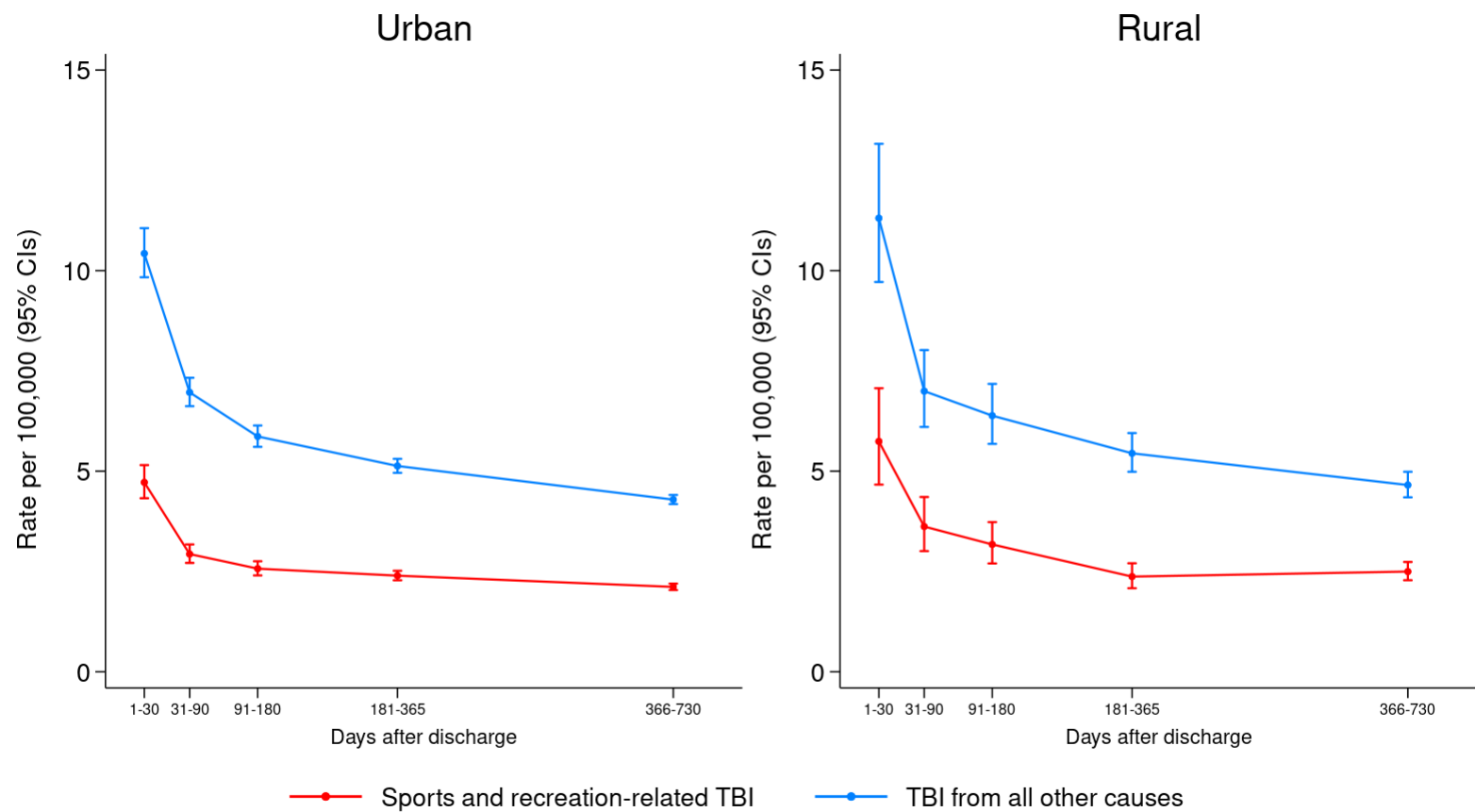
**Figure S13: Piecewise rates of mental health-related general practitioner visits, by TBI-type and neighbourhood income quintile**



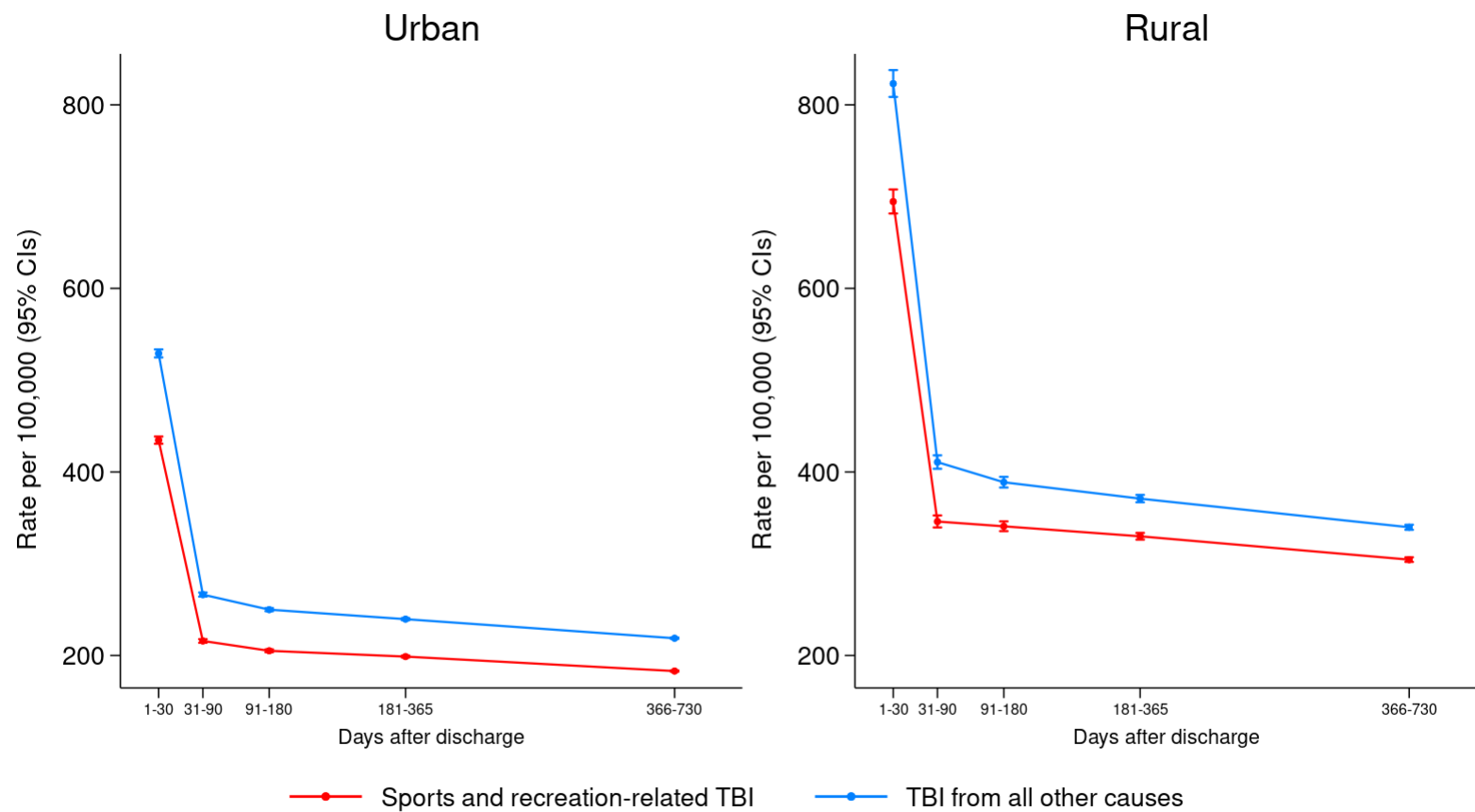
**Figure S14: Piecewise rates of psychiatrist visits, by TBI-type and neighbourhood income quintile**



**Figure S15: Piecewise rates of all-cause hospitalizations, by TBI-type and rurality**

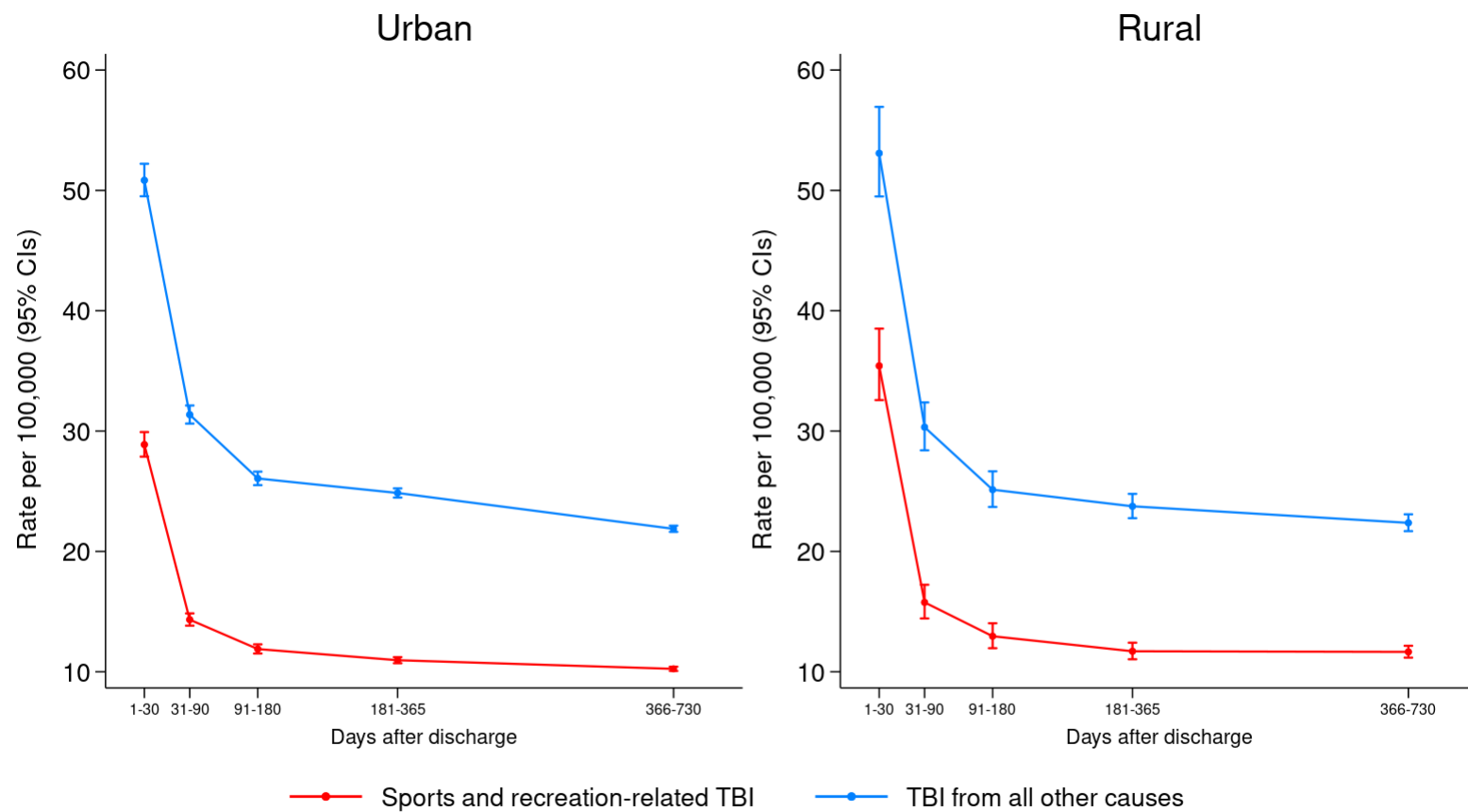


**Figure S16: Piecewise rates of psychiatric hospitalizations, by TBI-type and rurality**

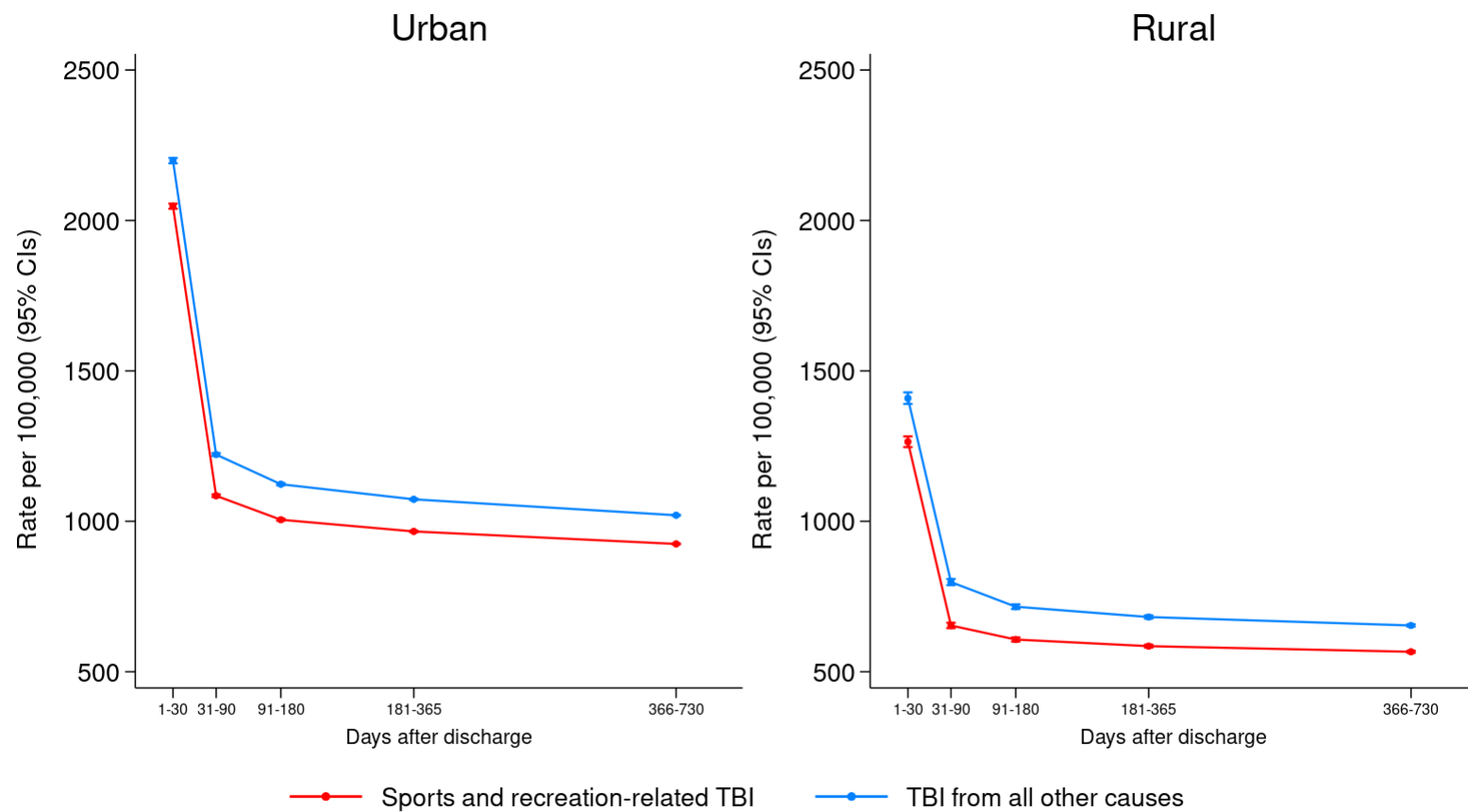


**Figure S17: Piecewise rates of all-cause emergency department visits, by TBI-type and rurality**

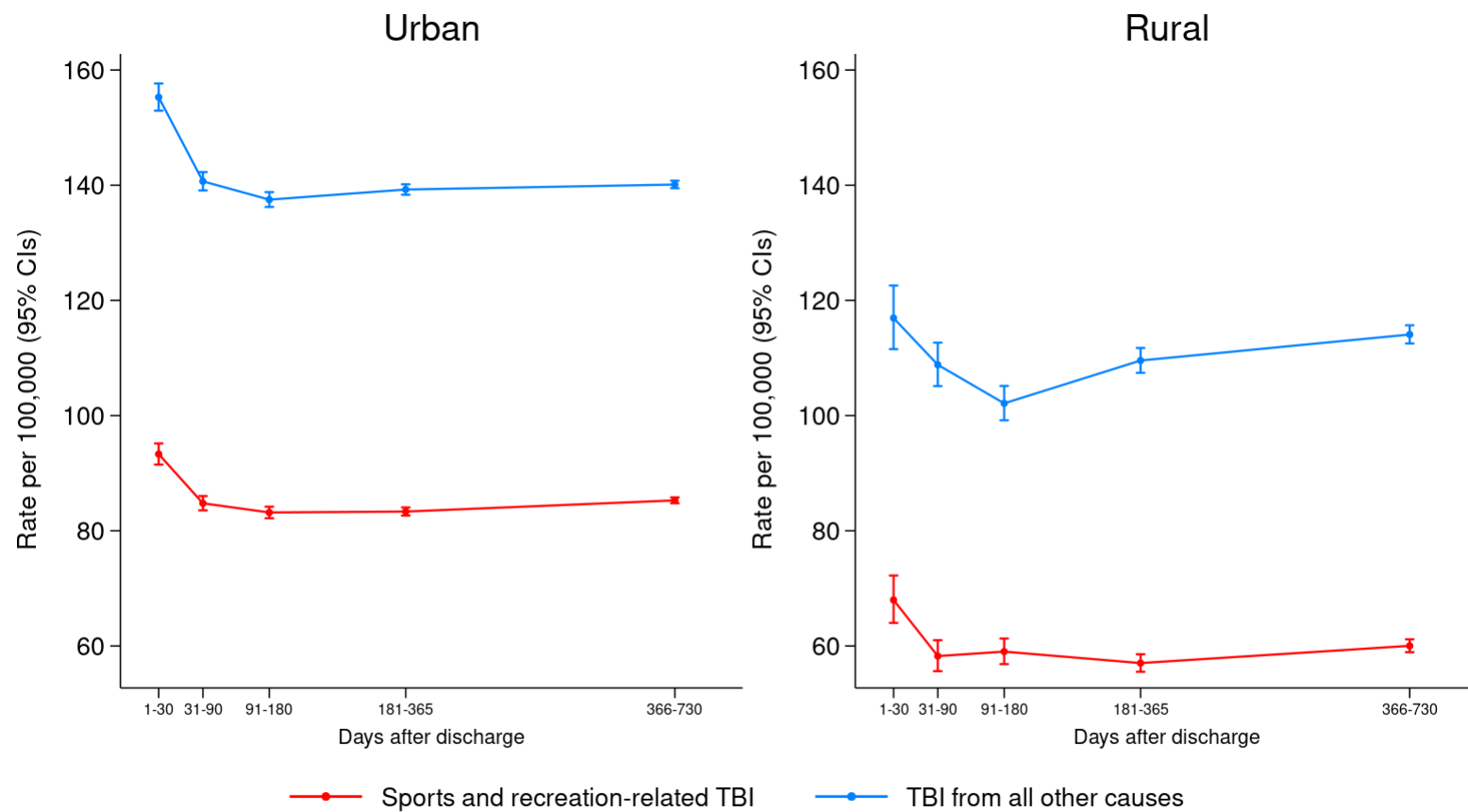




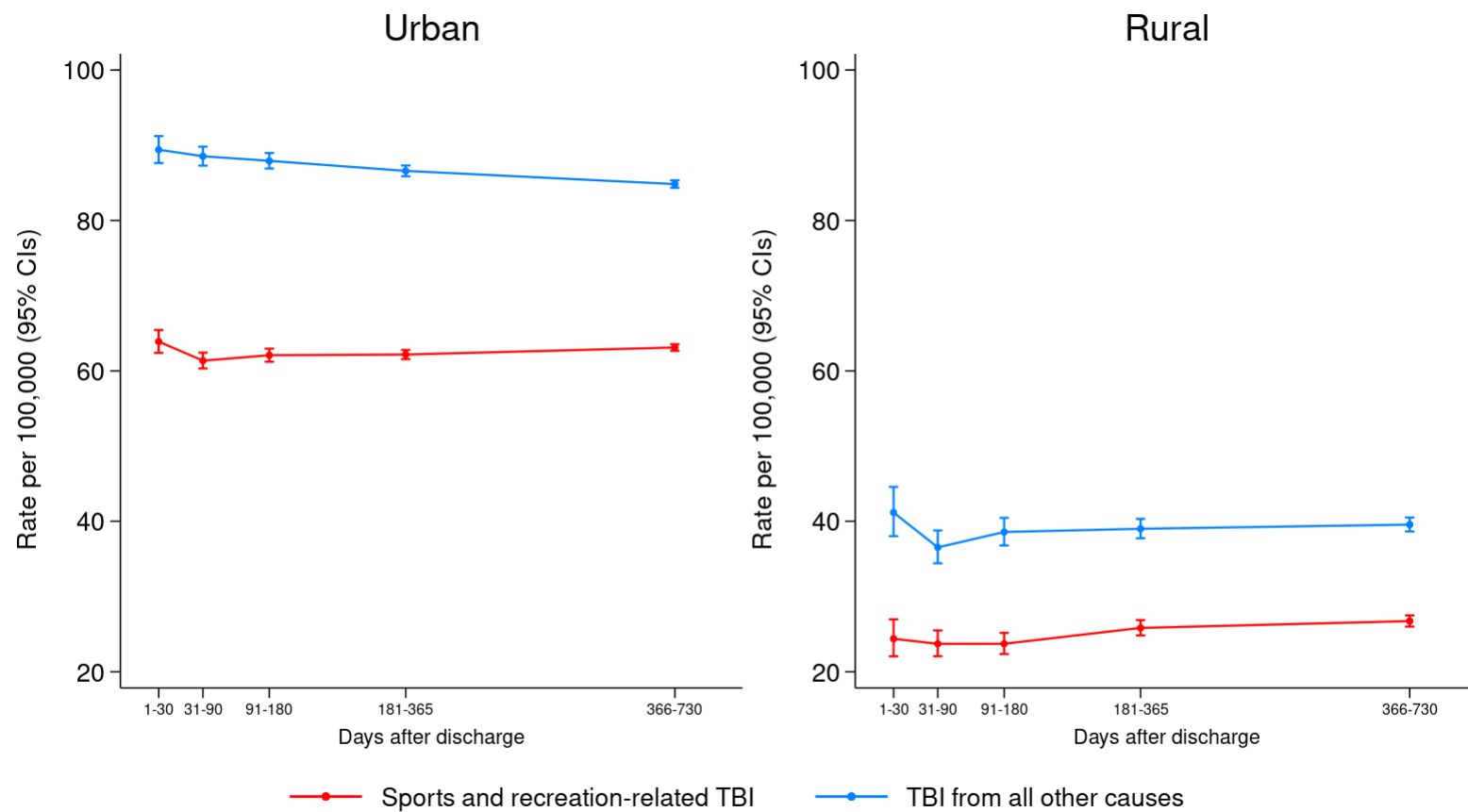
**Figure S18: Piecewise rates of psychiatric emergency department visits, by TBI-type and rurality**



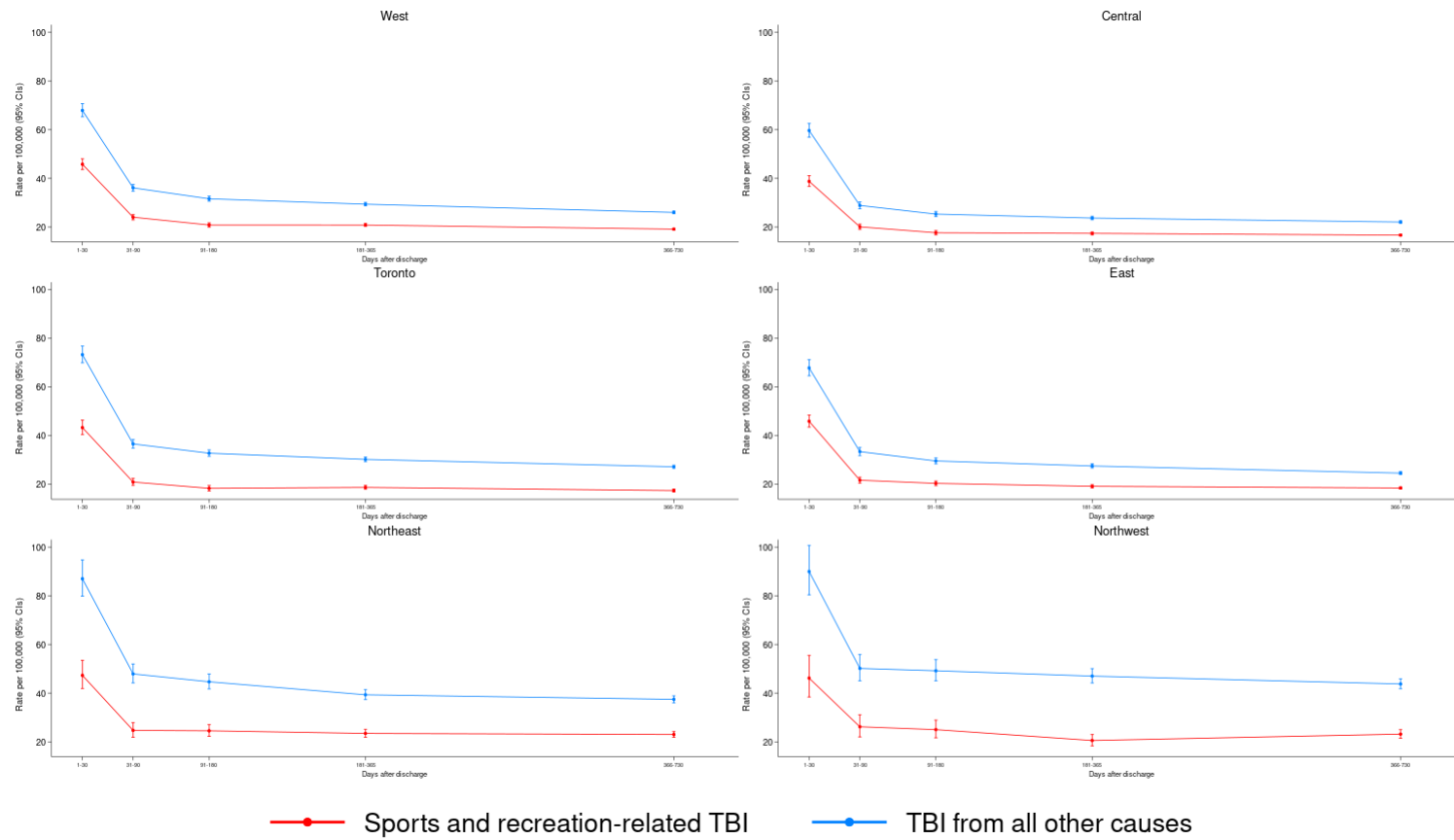
**Figure S19: Piecewise rates of all-cause general practitioner visits, by TBI-type and rurality**



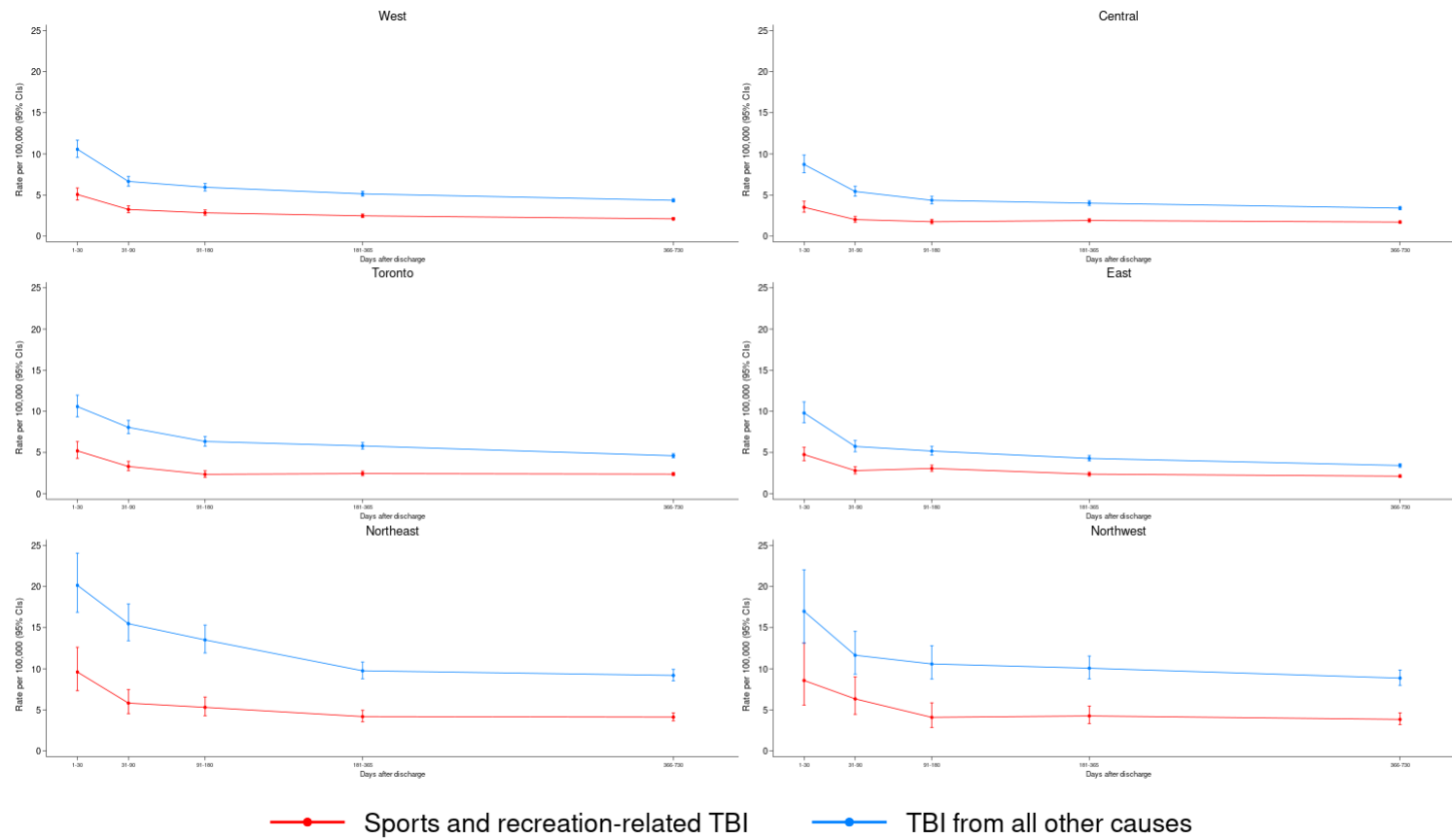
**Figure S20: Piecewise rates of mental health-related general practitioner visits, by TBI-type and rurality**



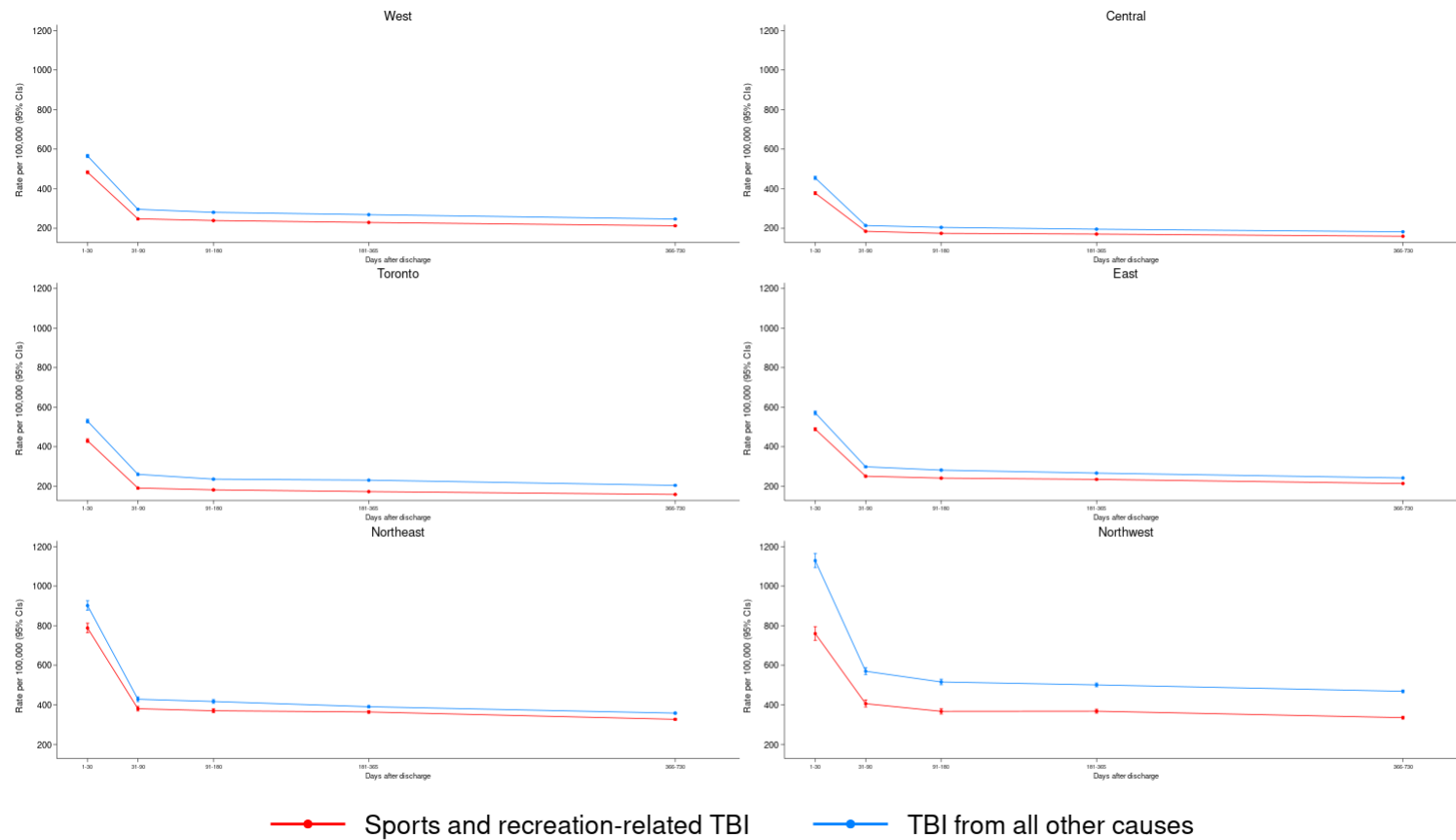
**Figure S21: Piecewise rates of psychiatrist visits, by TBI-type and rurality**



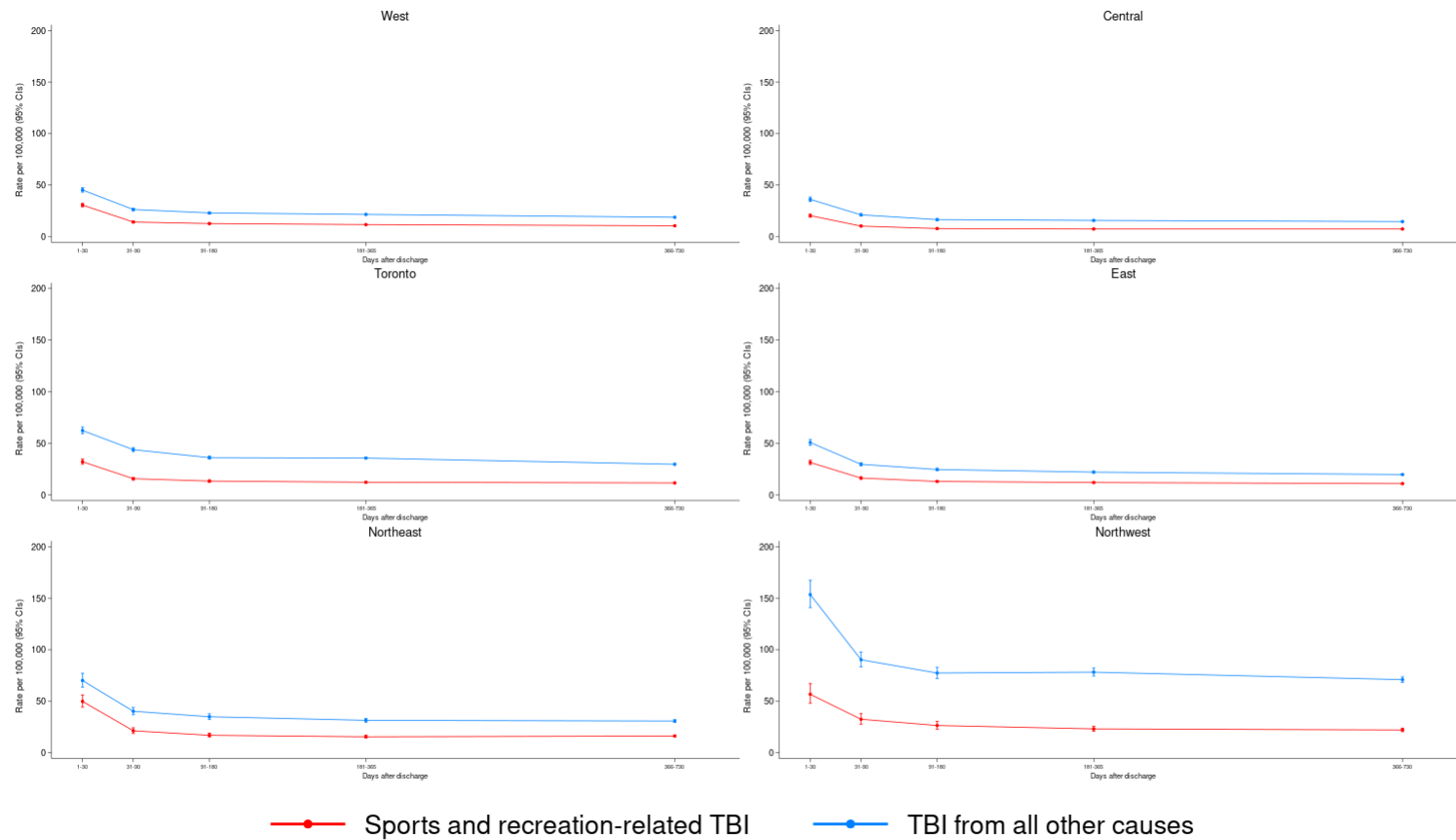
**Figure S22: Piecewise rates of all-cause hospitalizations, by TBI-type and Ontario health region**



**Figure S23: Piecewise rates of psychiatric hospitalizations, by TBI-type and Ontario health region**

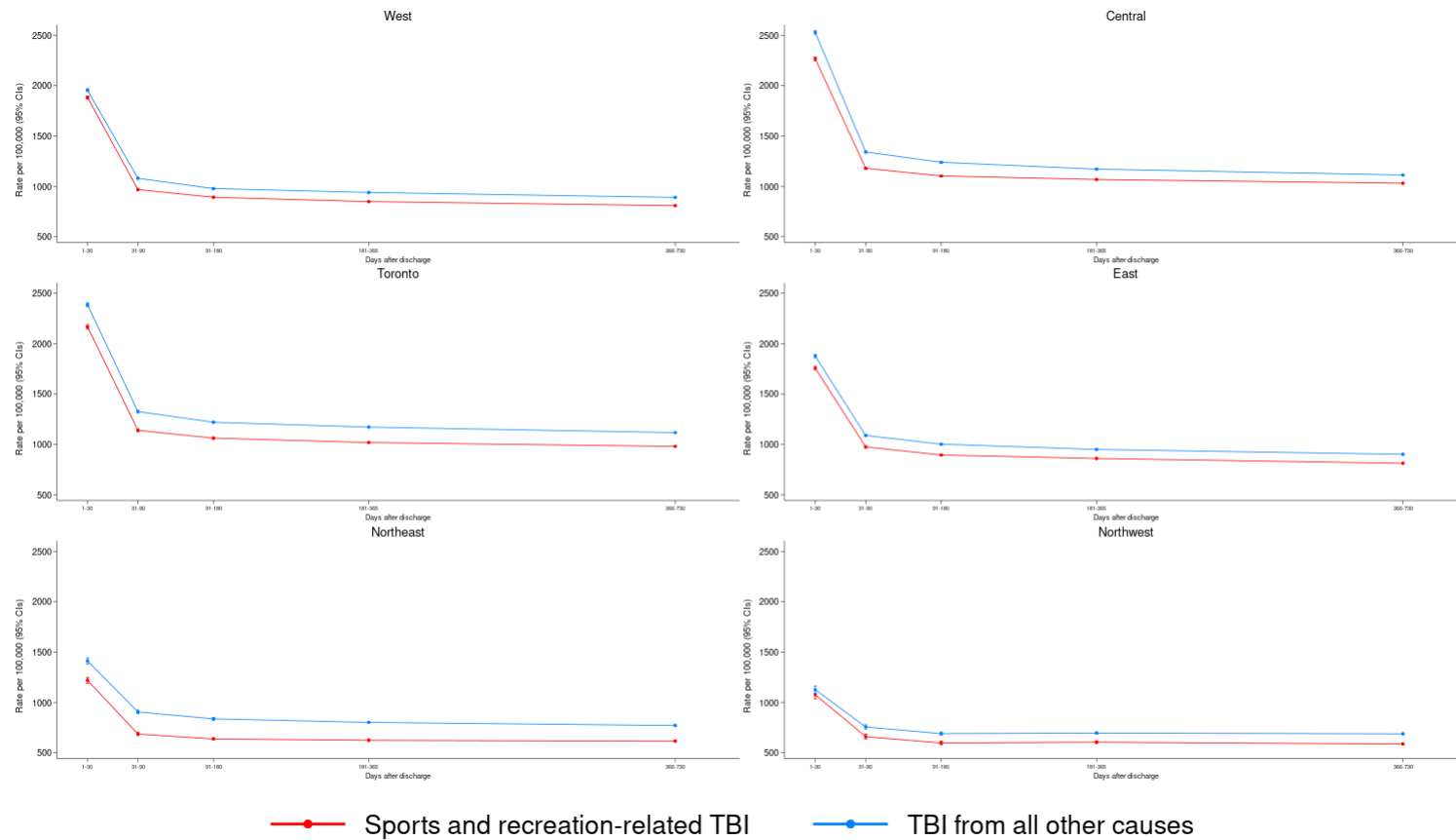


**Figure S24: Piecewise rates of all-cause emergency department visits, by TBI-type and Ontario health region**

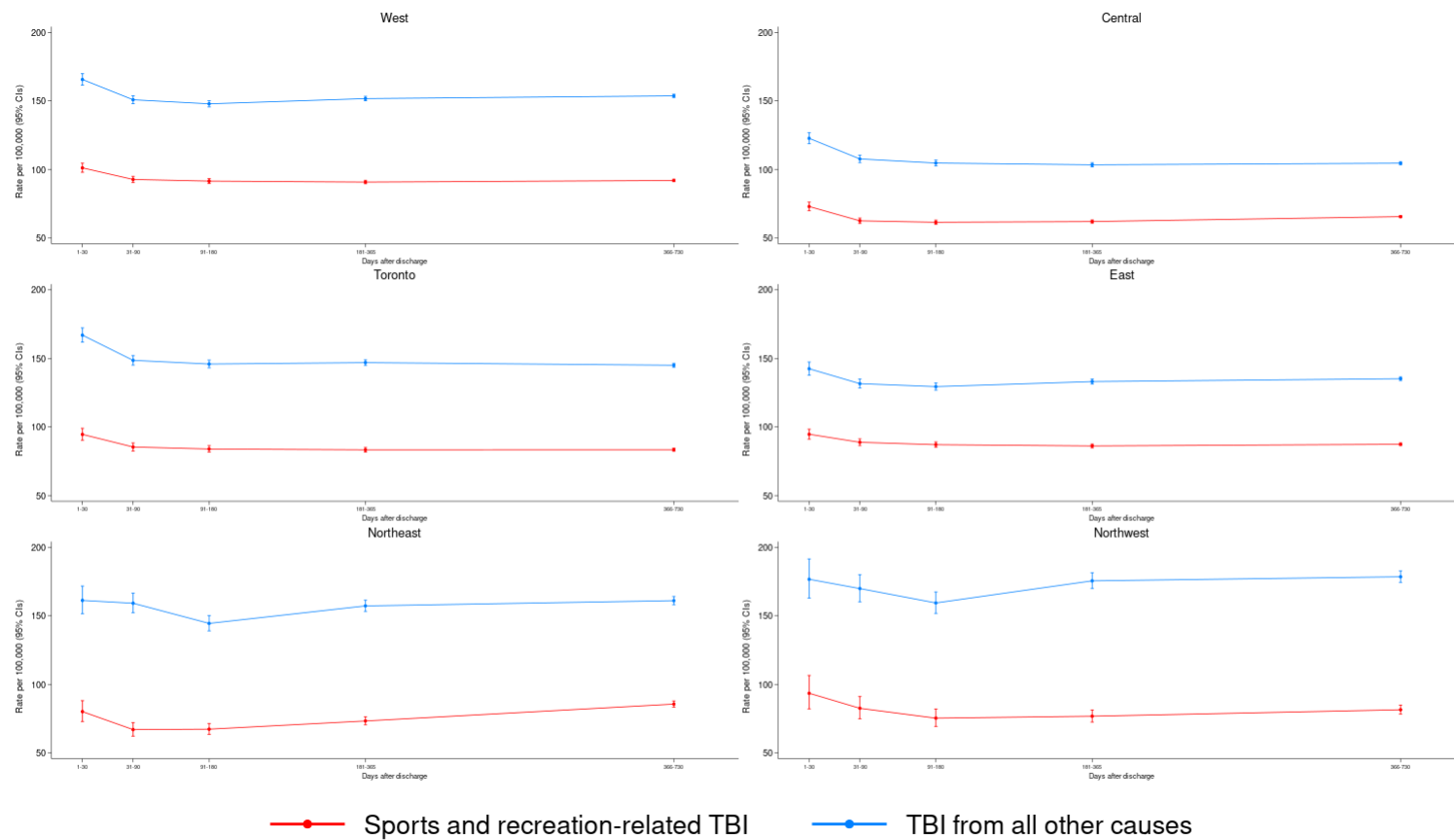


**Figure S25: Piecewise rates of psychiatric emergency department visits, by TBI-type and Ontario health region**

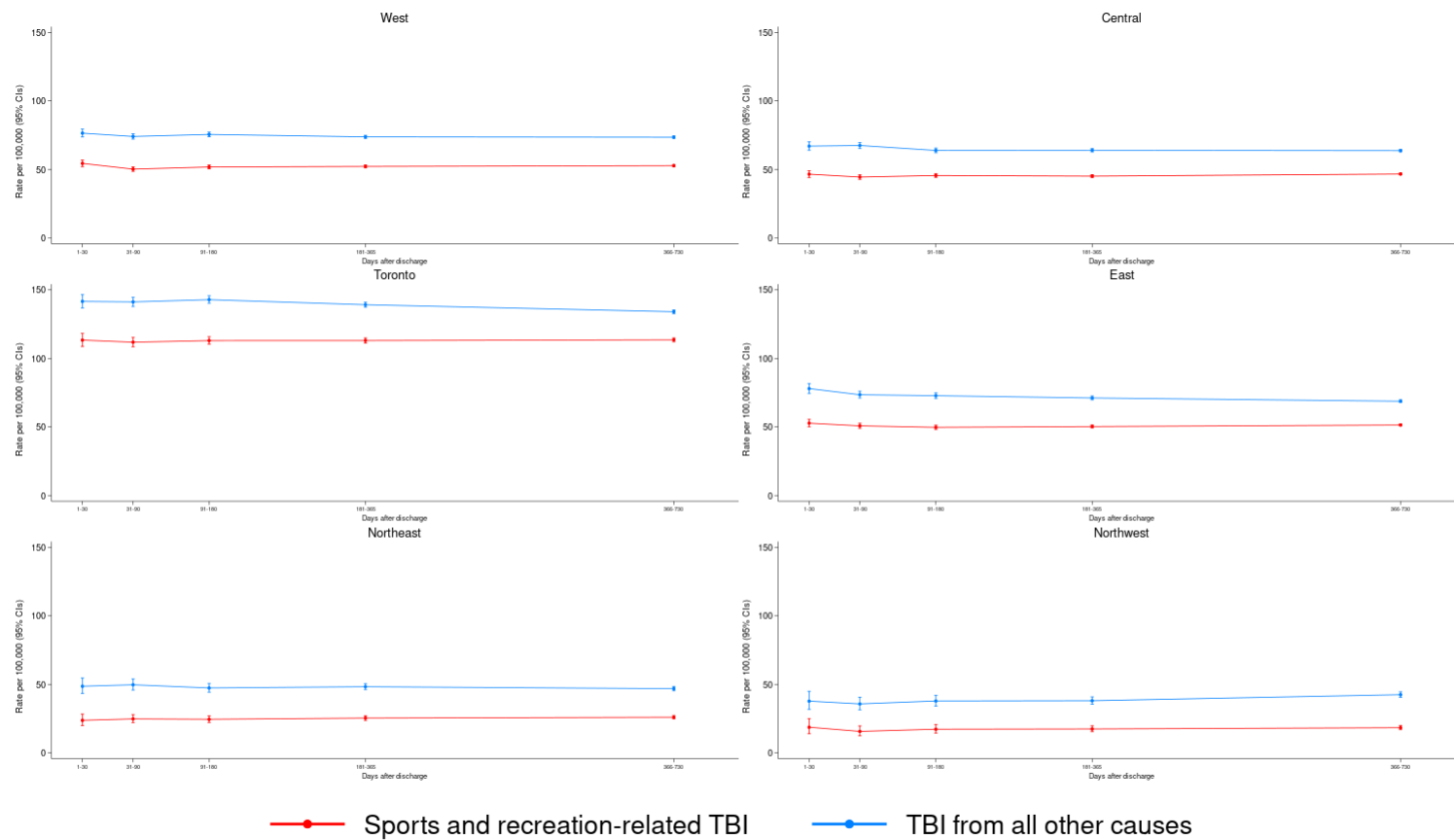




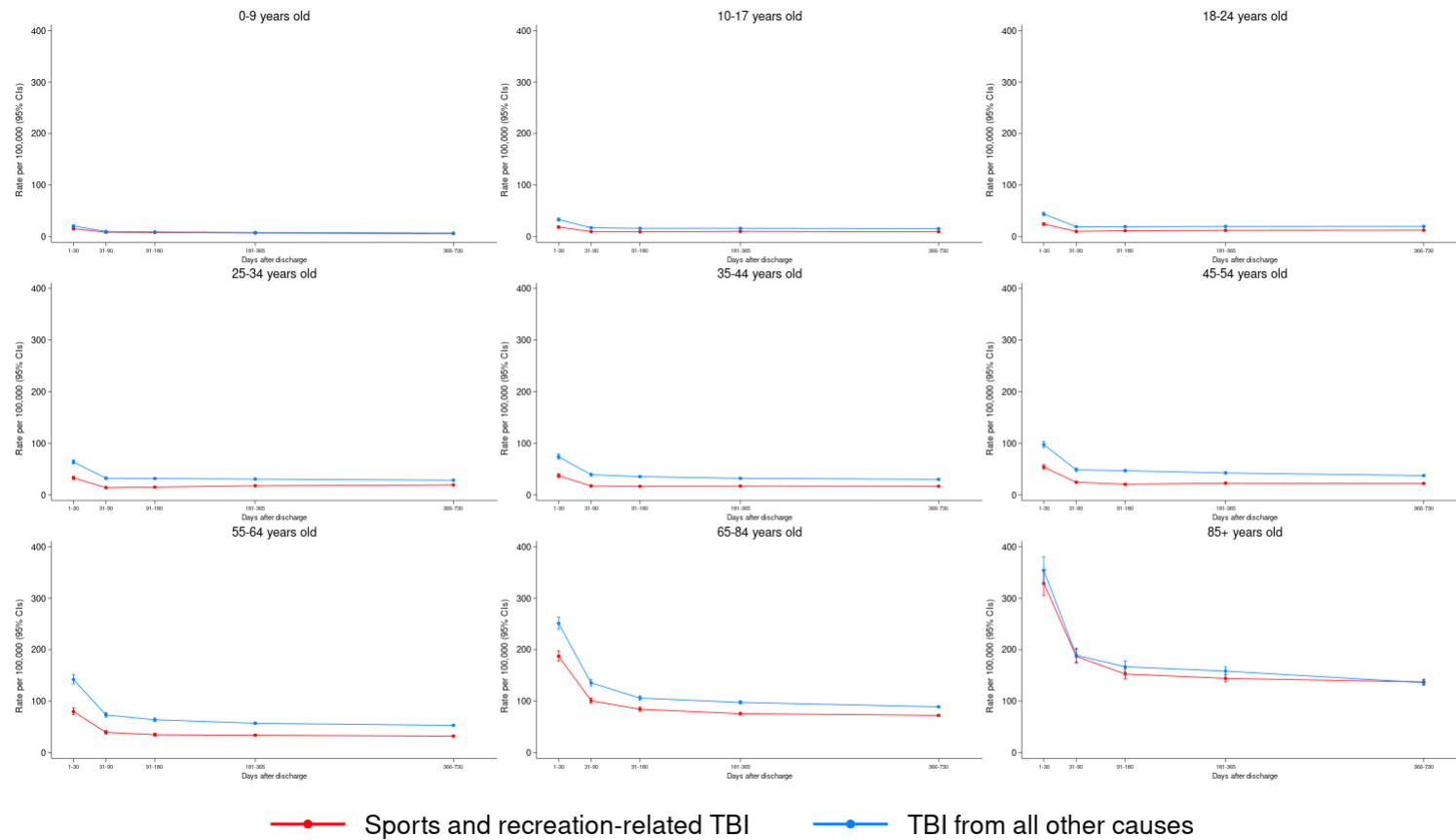
**Figure S26: Piecewise rates of all-cause general practitioner visits, by TBI-type and Ontario health region**



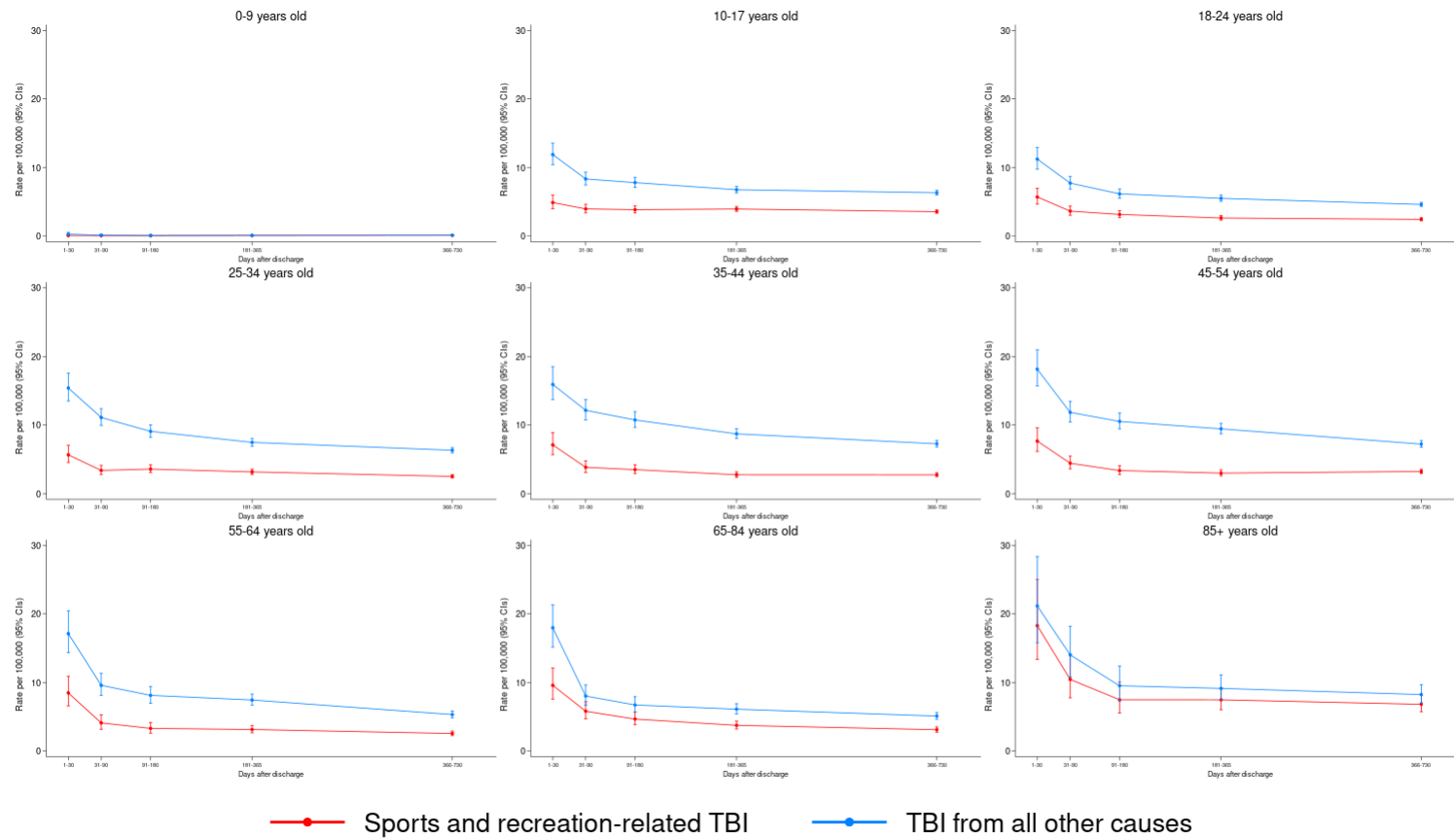
**Figure S27: Piecewise rates of mental health-related general practitioner visits, by TBI-type and Ontario health region**



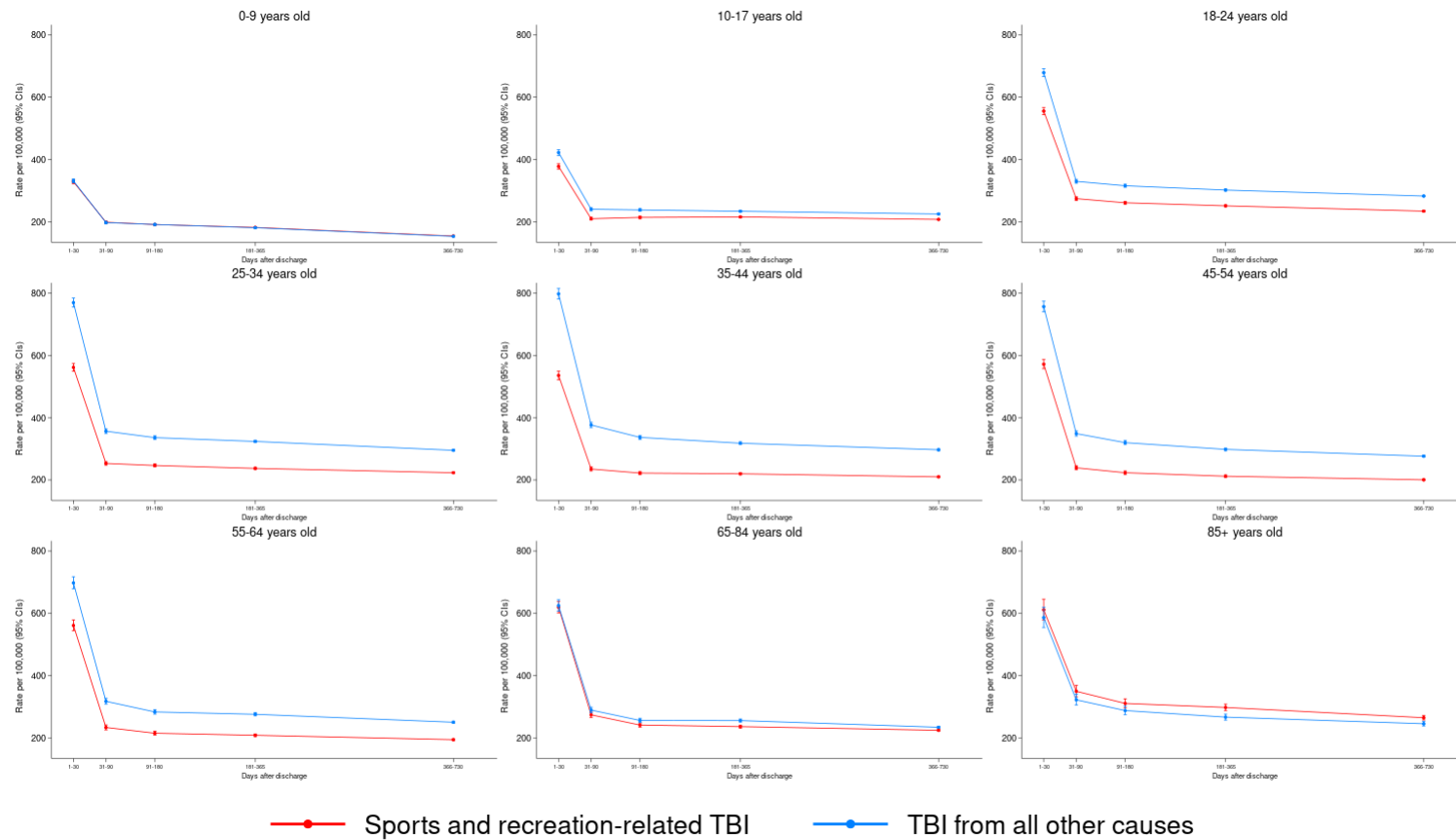
**Figure S28: Piecewise rates of psychiatrist visits, by TBI-type and Ontario health region**



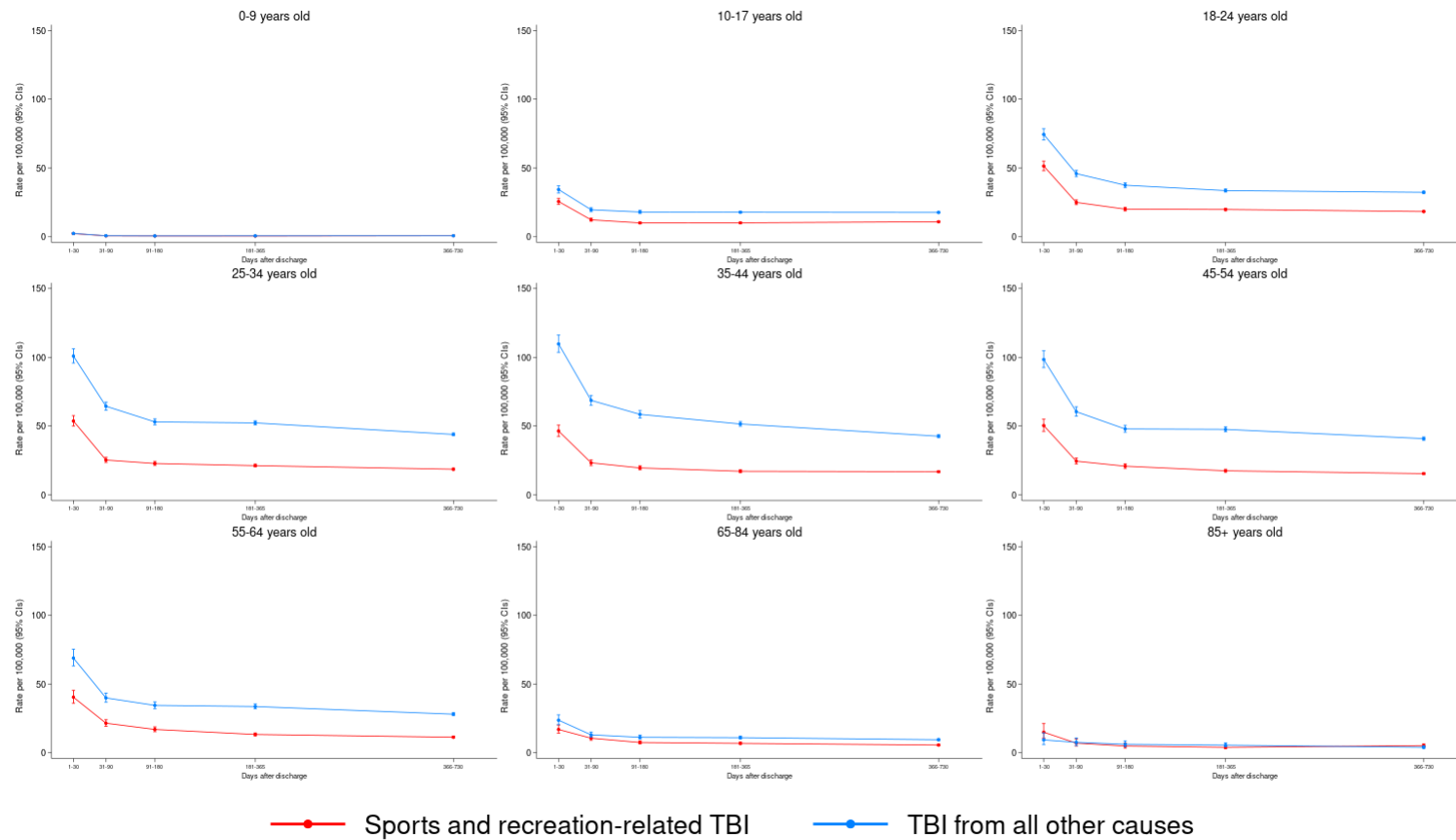
**Figure S29: Piecewise rates of all-cause hospitalizations, by TBI-type and age category**



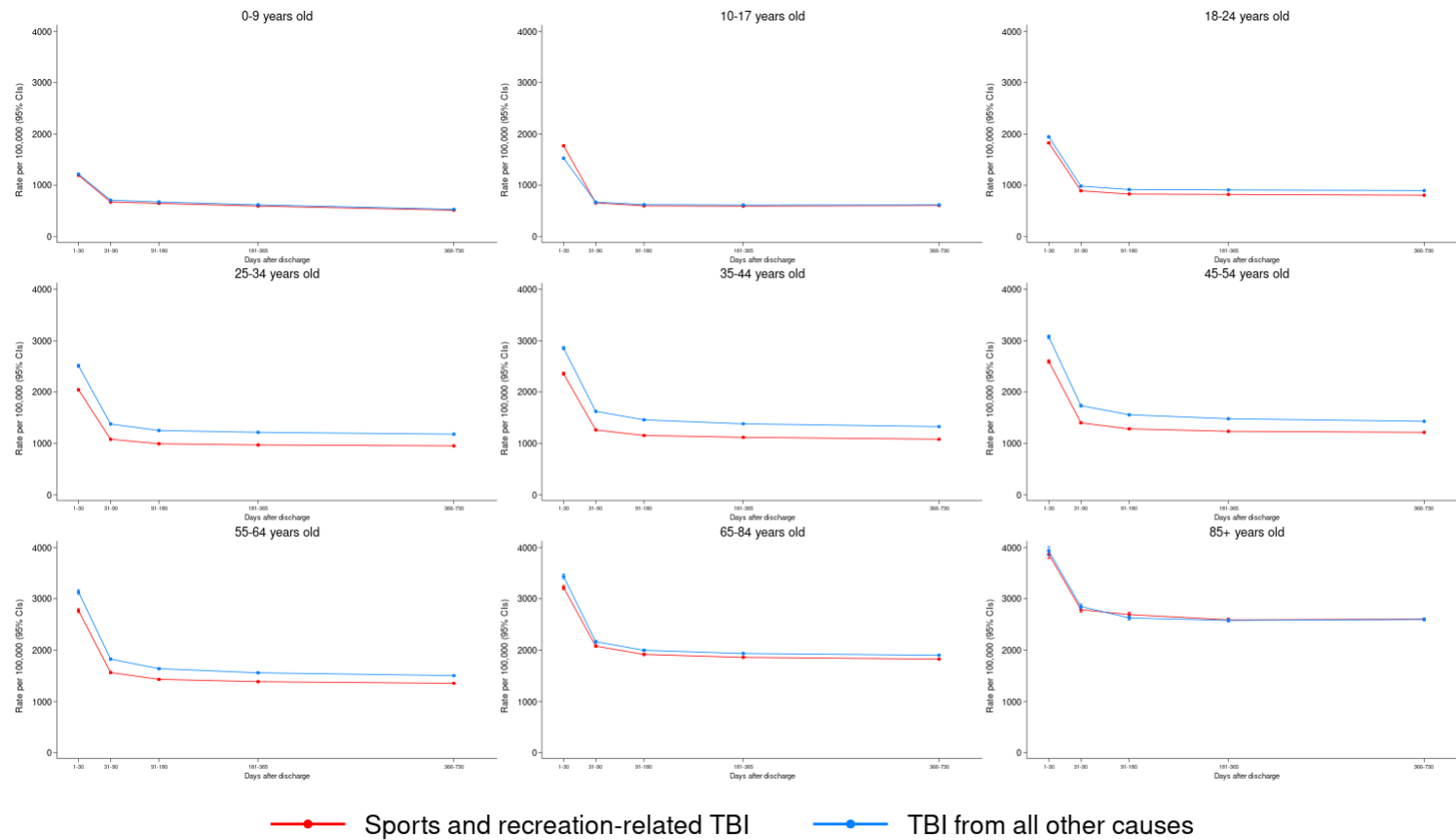
**Figure S30: Piecewise rates of psychiatric hospitalizations, by TBI-type and age category**



**Figure S31: Piecewise rates of all-cause emergency department visits, by TBI-type and age category**

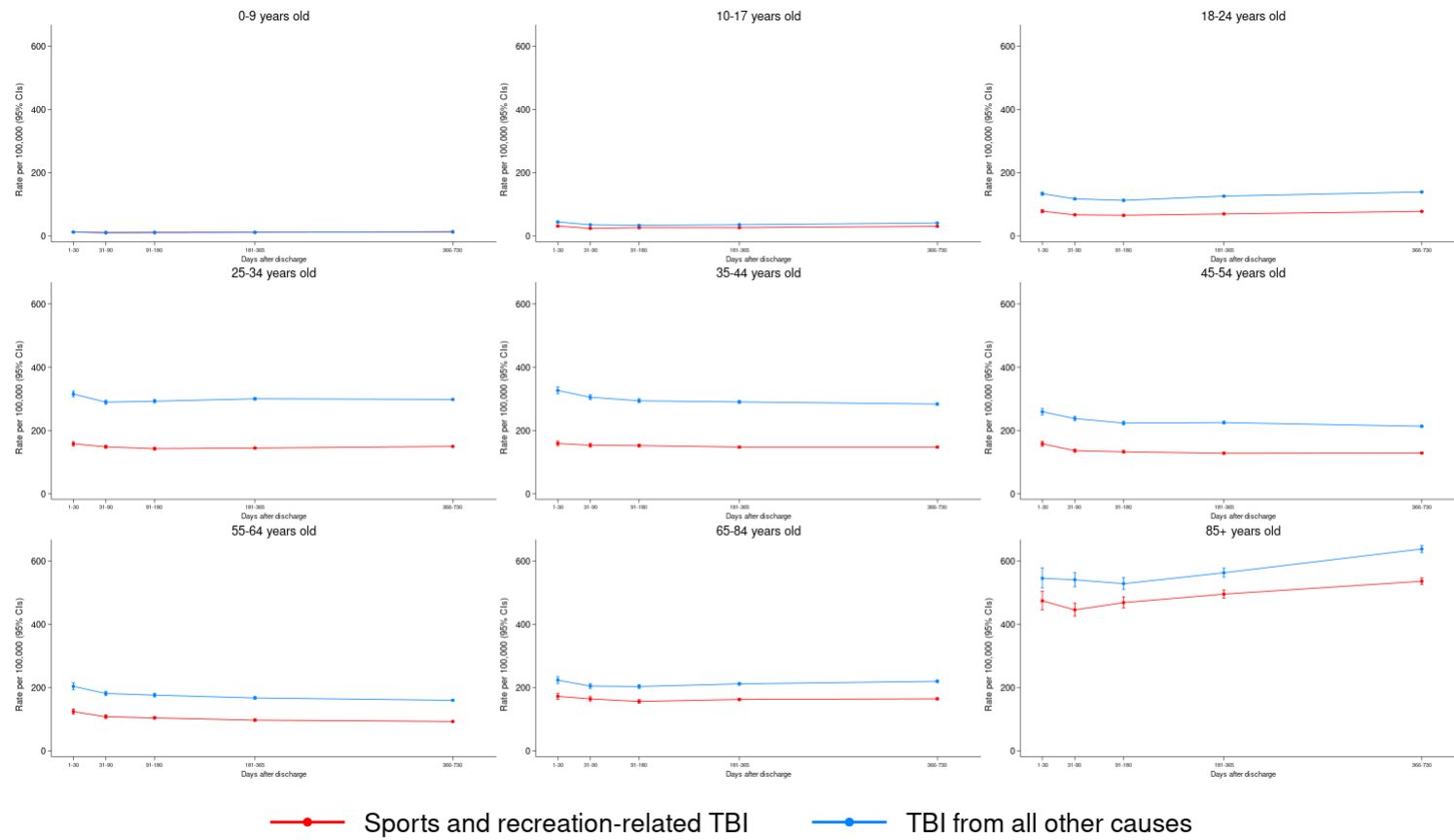


**Figure S32: Piecewise rates of psychiatric emergency department visits, by TBI-type and age category**

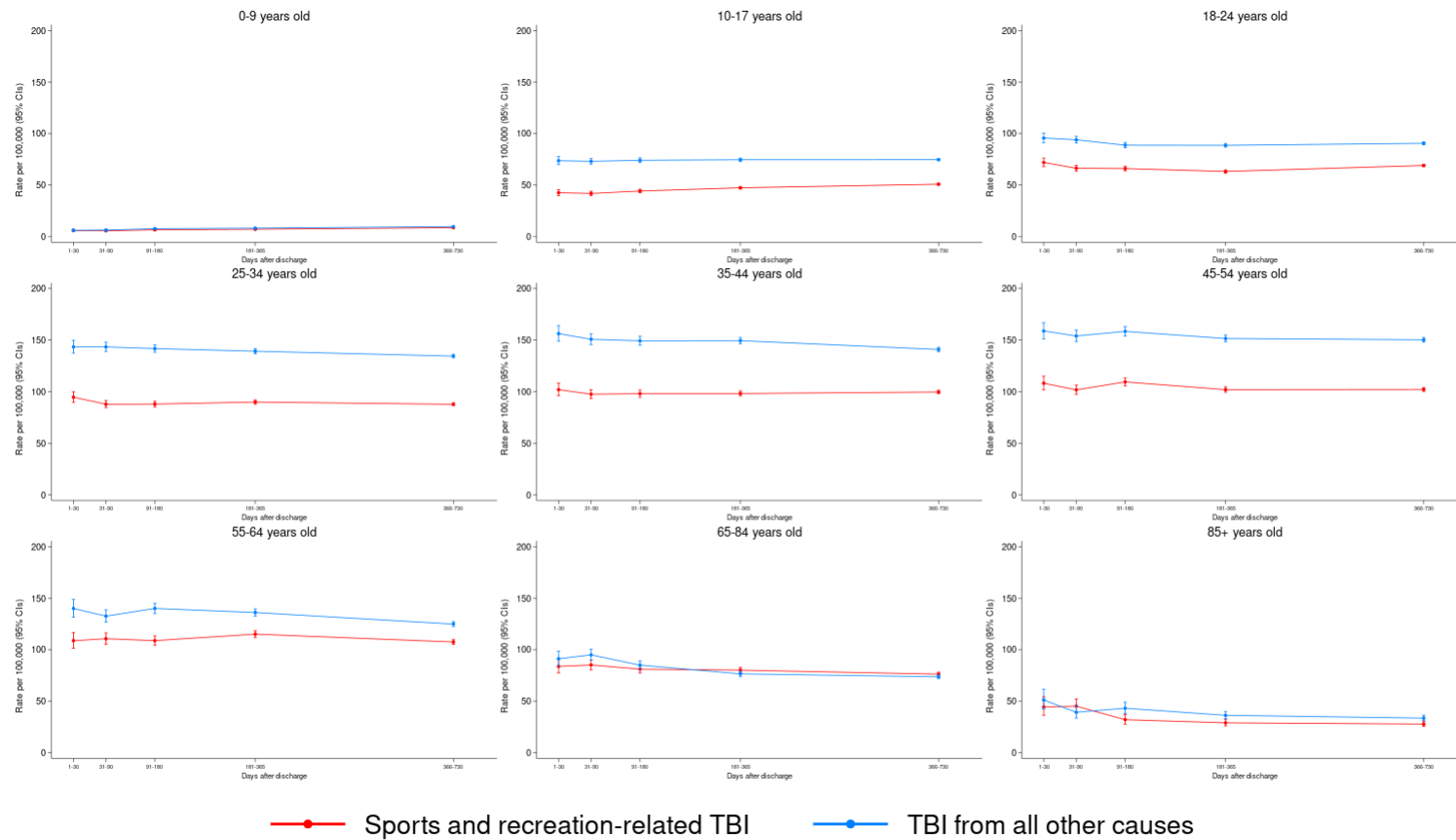


**Figure S33: Piecewise rates of all-cause general practitioner visits, by TBI-type and age category**





**Figure S34: Piecewise rates of mental health-related general practitioner visits, by TBI-type and age category**



**Figure S35: Piecewise rates of psychiatrist visits, by TBI-type and age category**

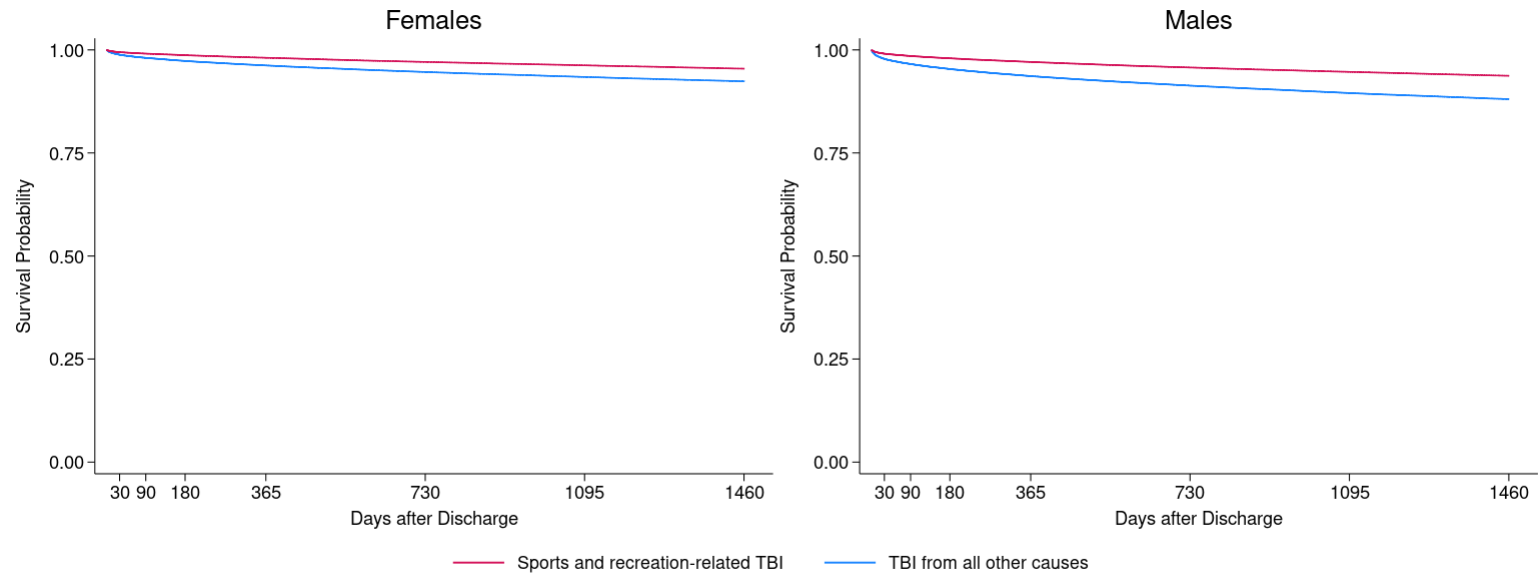


Figure S37: Time to first indication of substance use disorder, by TBI-type and sex

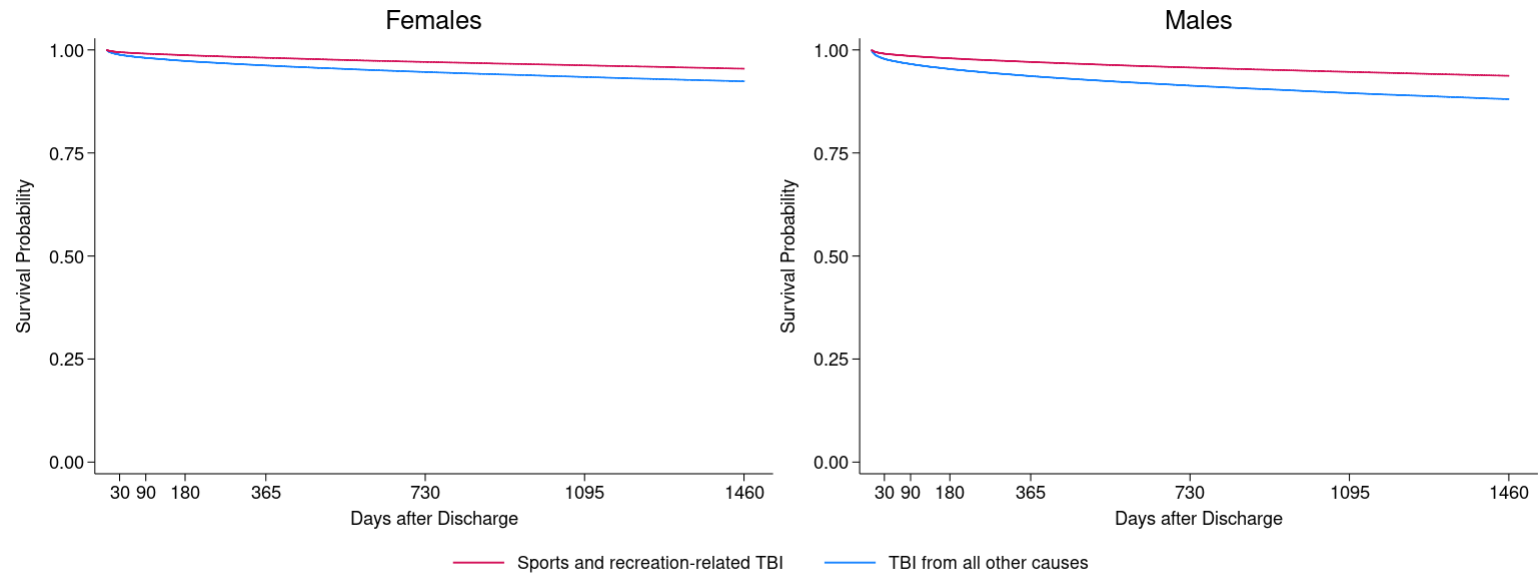
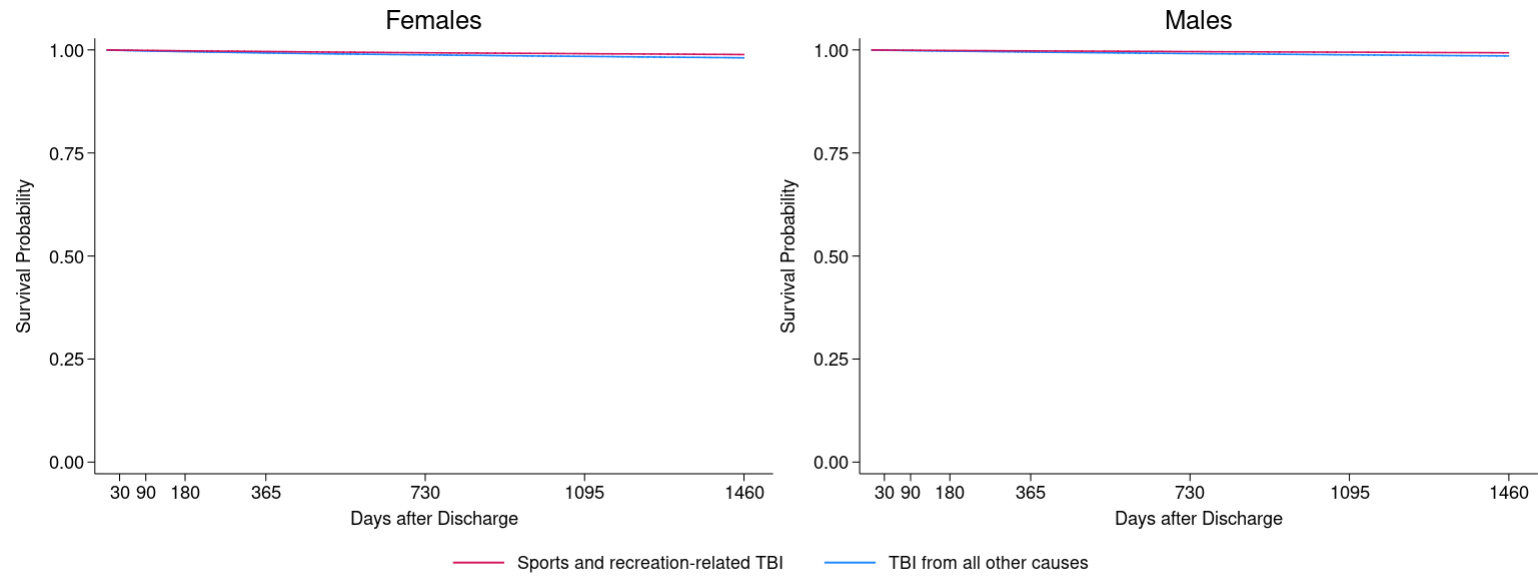


Figure S37: Time to first indication of substance use disorder, by TBI-type and sex



**Figure S38: Time to first indication of self-harm, by TBI-type and sex**

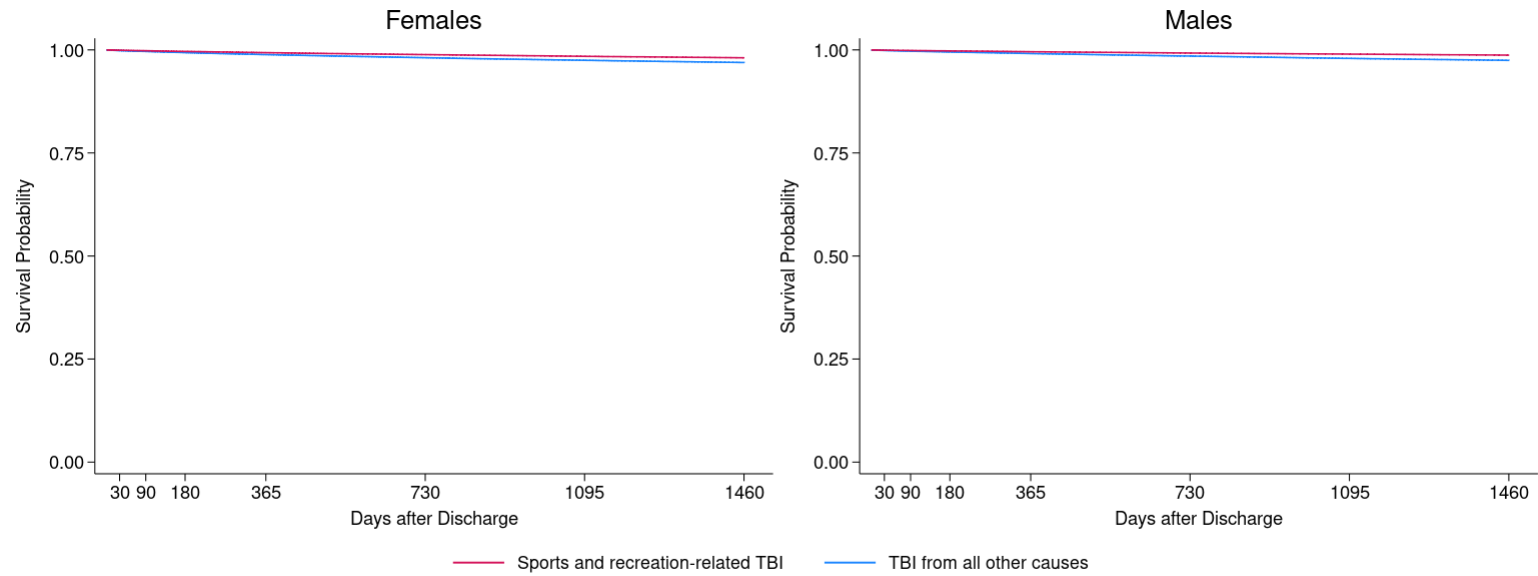


Figure S39: Time to first indication of overdose, by TBI-type and sex

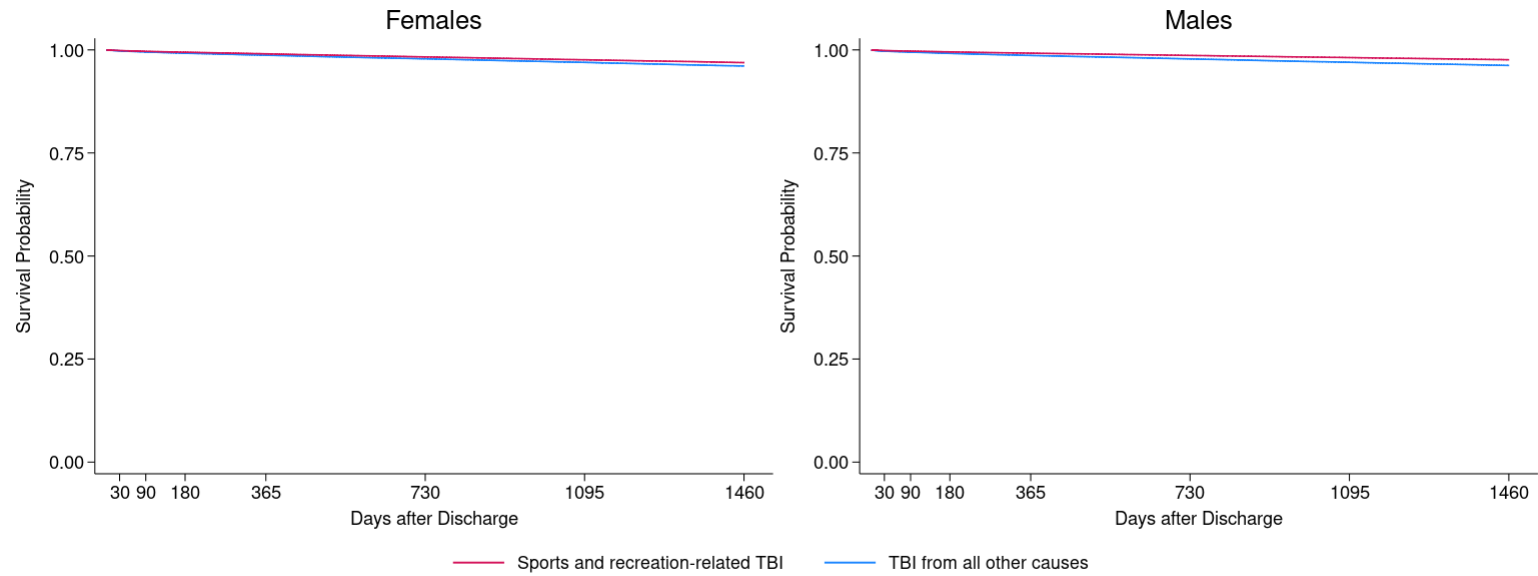


Figure S40: Time to all-cause mortality, by TBI-type and sex

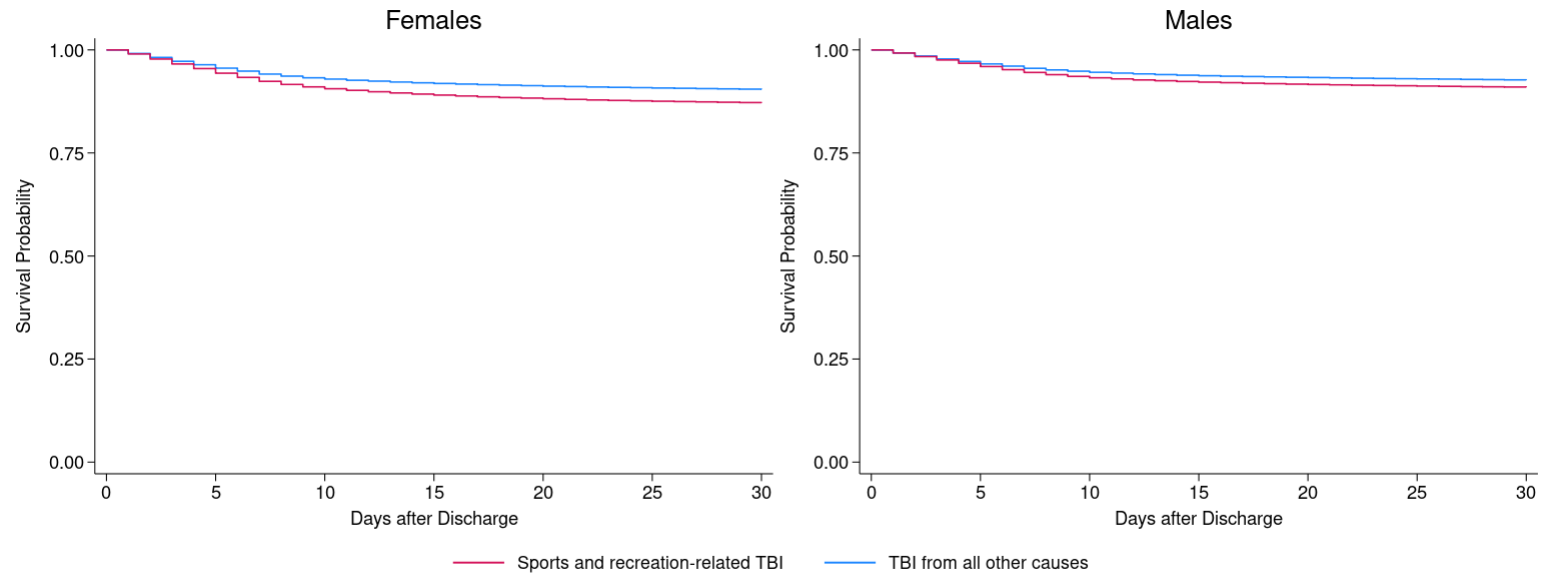
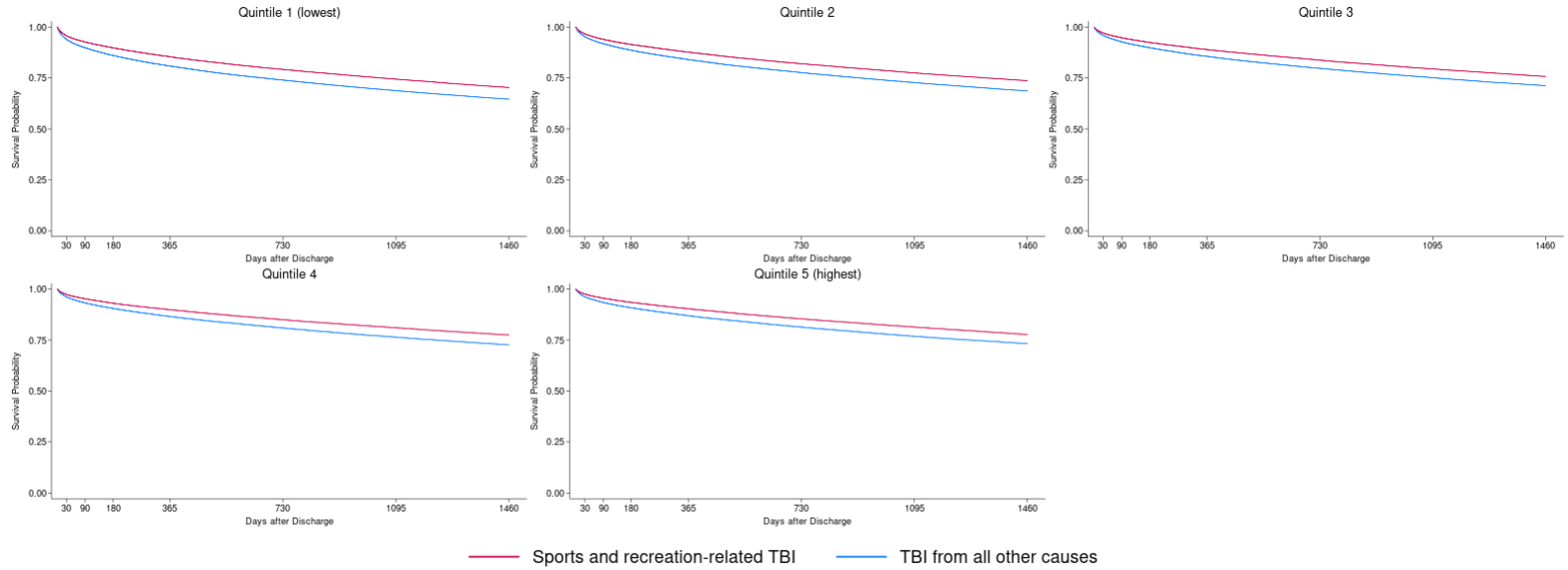
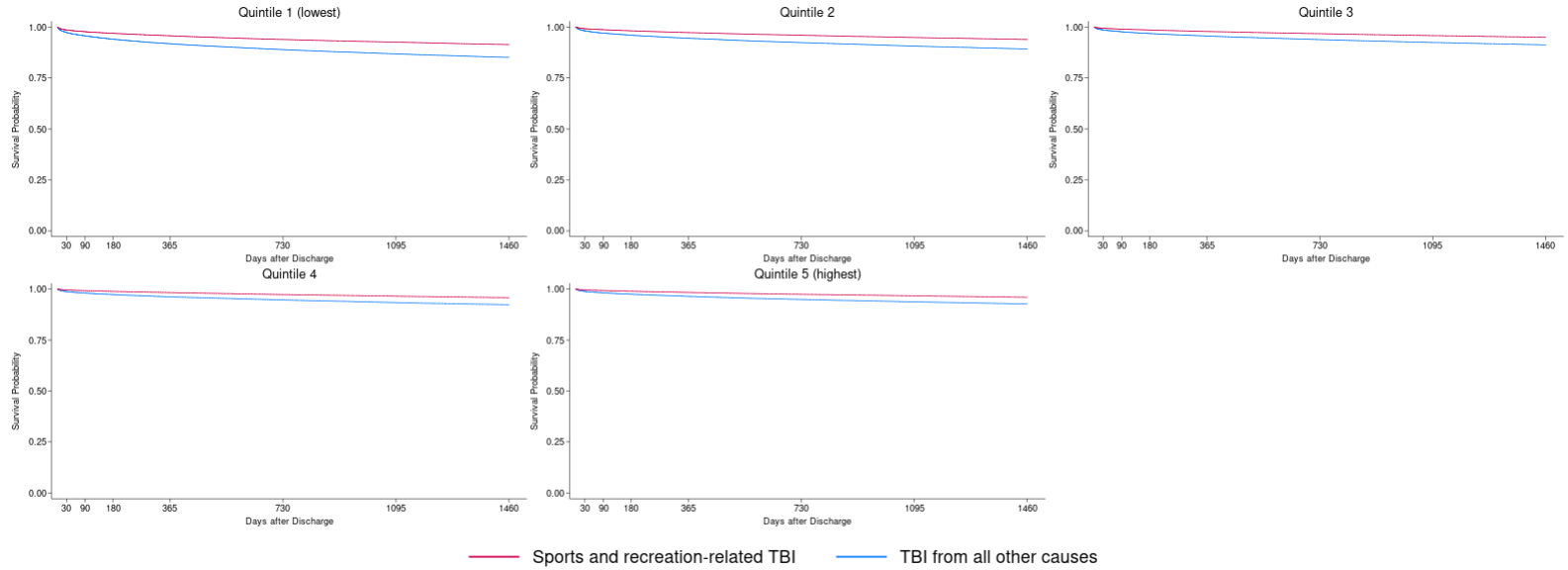


Figure S41: Time to thirty-day outpatient follow up, by TBI-type and sex

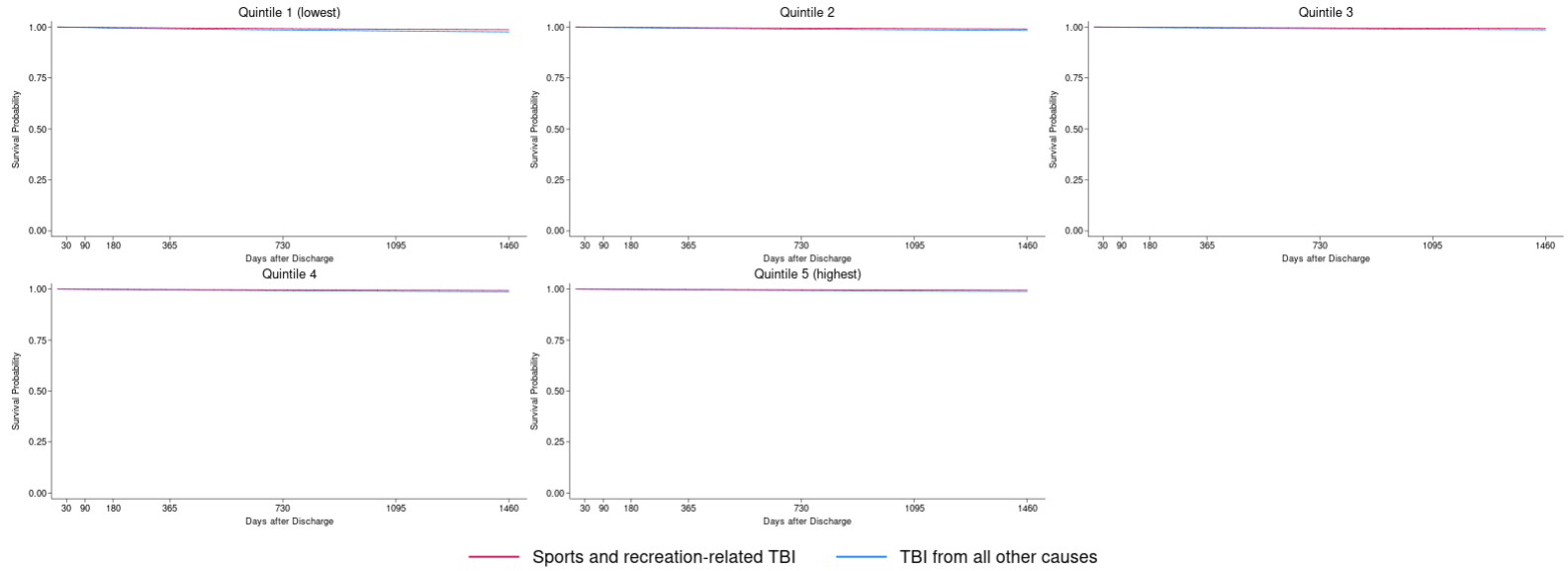




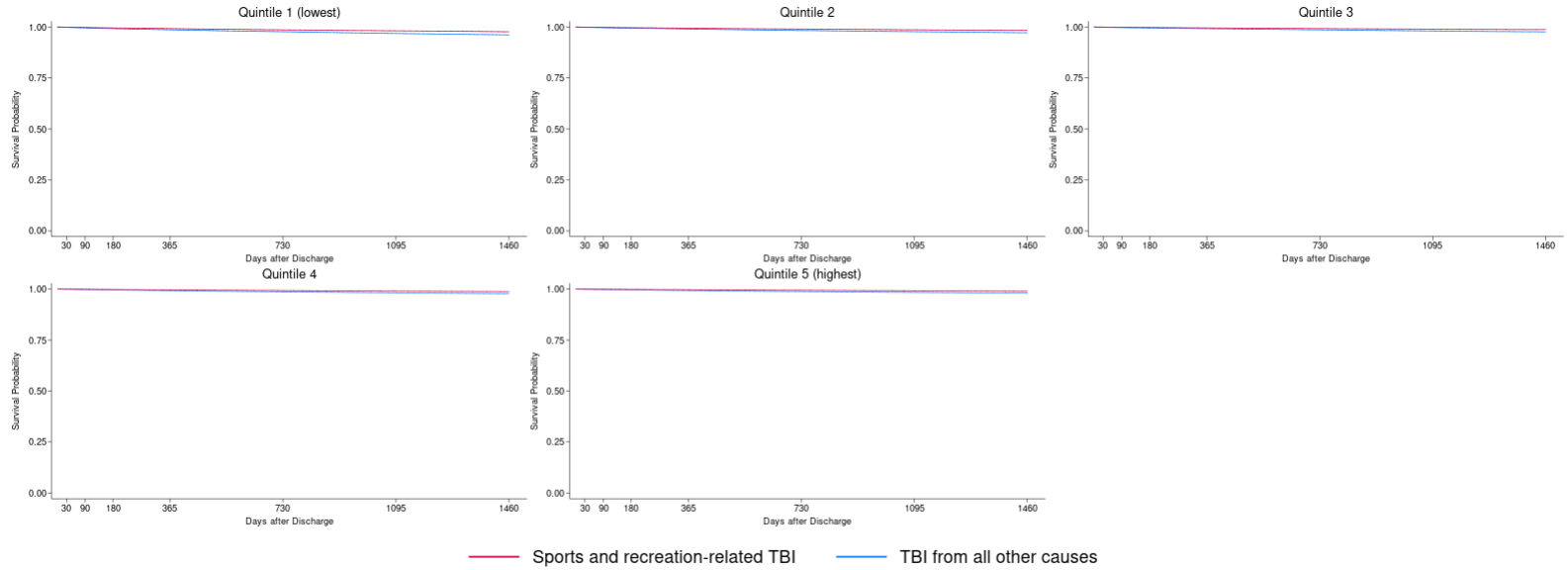
**Figure S42: Time to first indication of mental illness, by TBI-type and neighbourhood income quintiles**



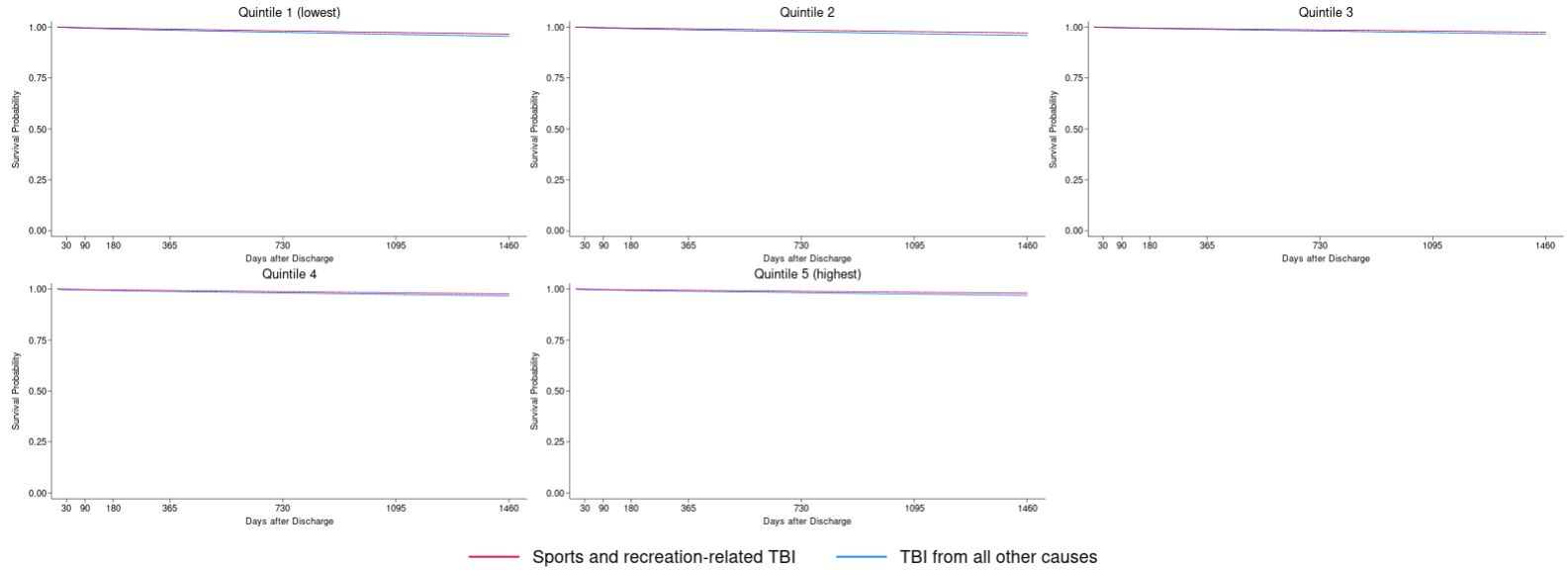
**Figure S43: Time to first indication of substance use disorder, by TBI-type and neighbourhood income quintiles**



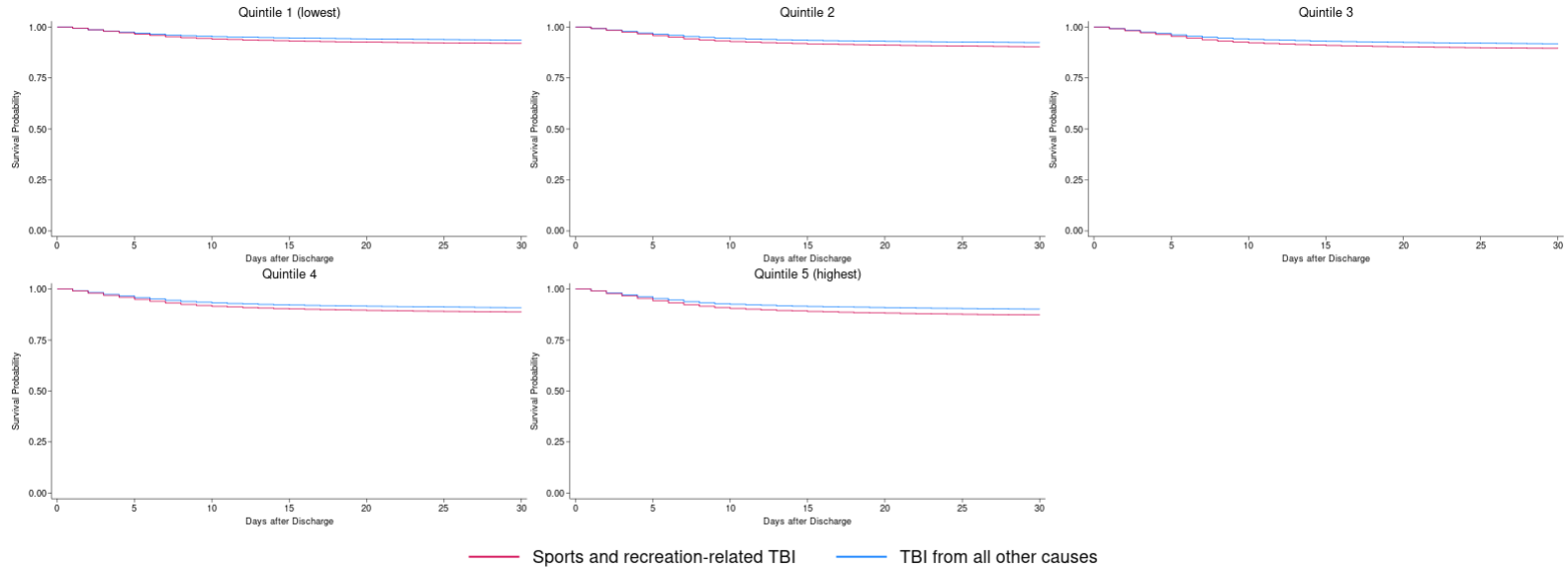
**Figure S44: Time to first indication of self-harm, by TBI-type and neighbourhood income quintiles**



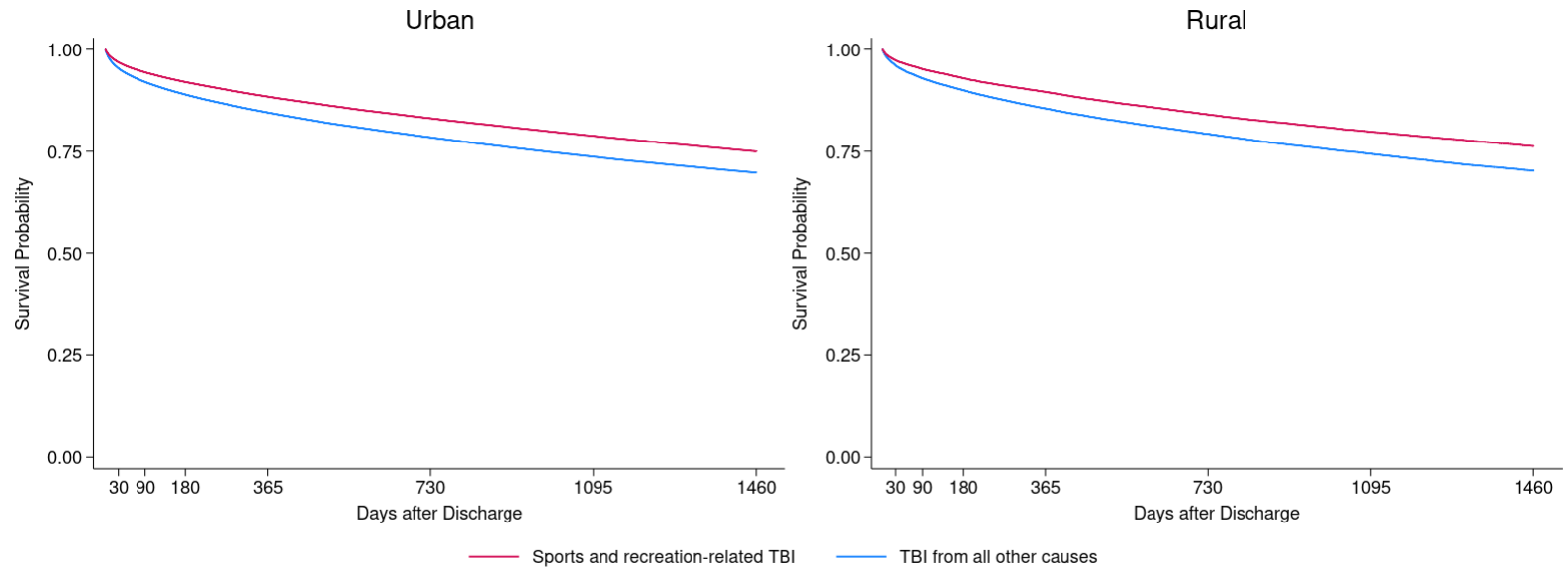
**Figure S45: Time to first indication of overdose, by TBI-type and neighbourhood income quintiles**



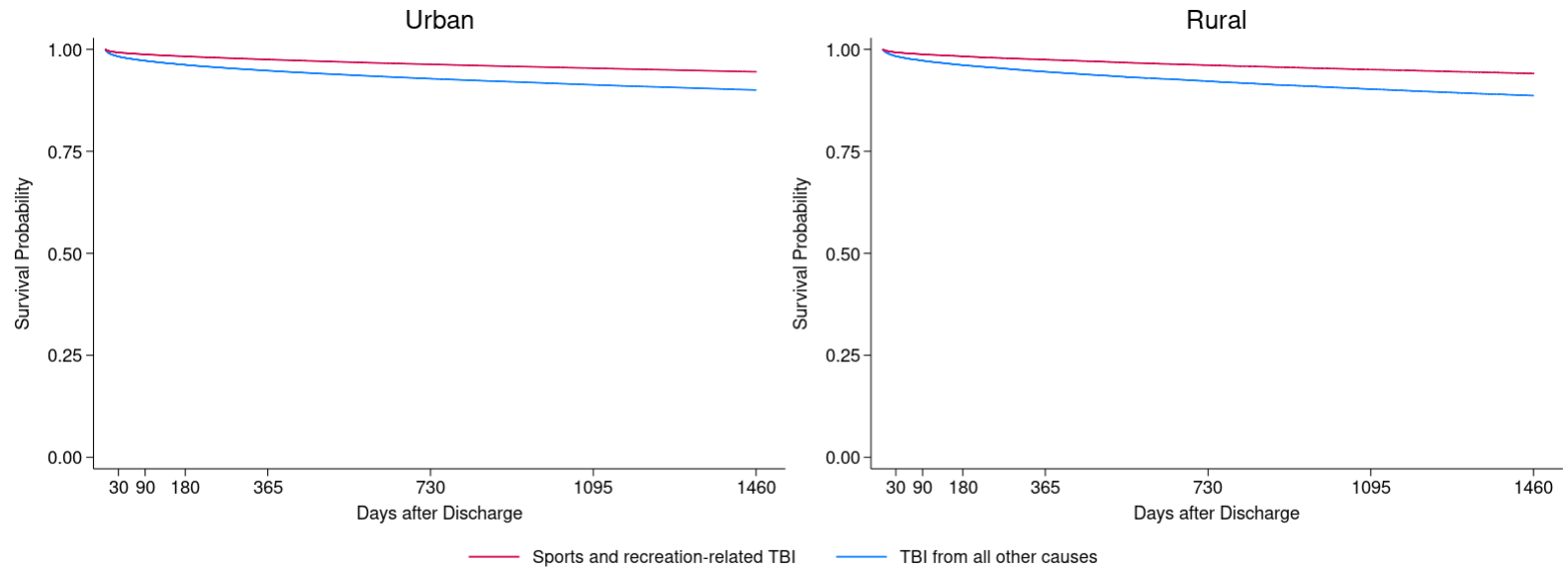
**Figure S46: Time to all-cause mortality, by TBI-type and neighbourhood income quintiles**



**Figure S47: Time to thirty-day outpatient follow up, by TBI-type and neighbourhood income quintiles**

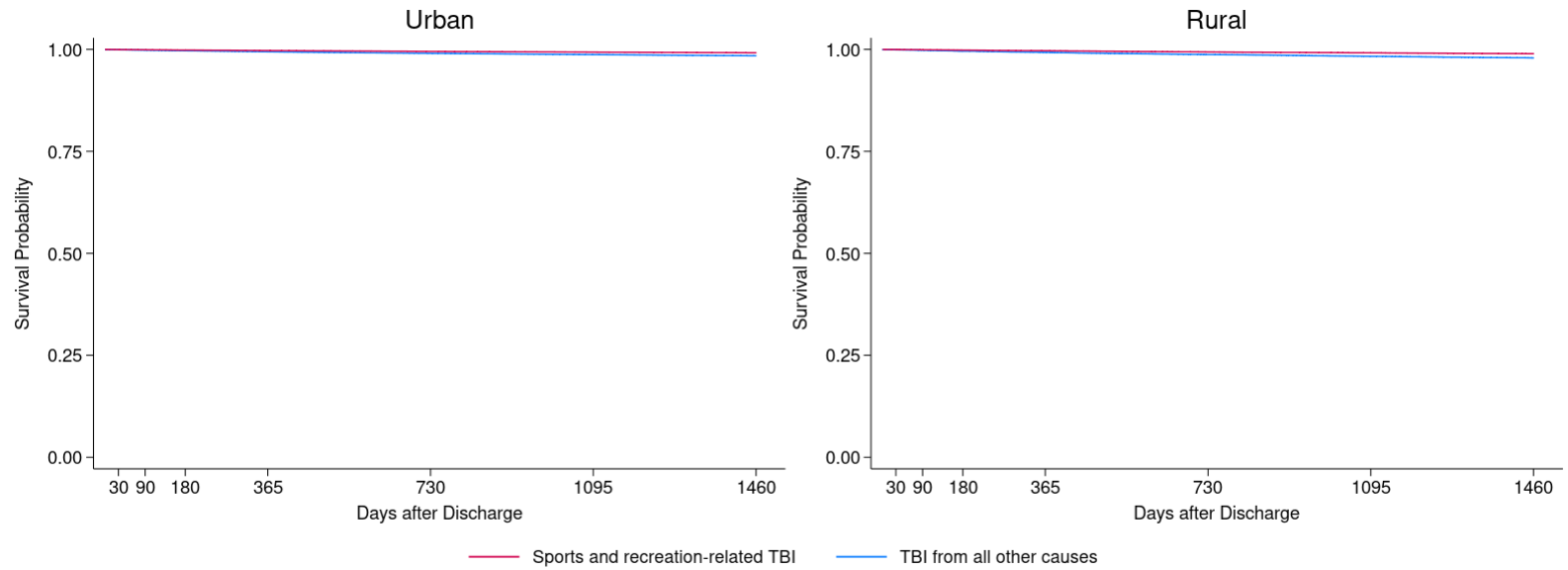


**Figure S48: Time to first indication of mental illness, by TBI-type and rurality**

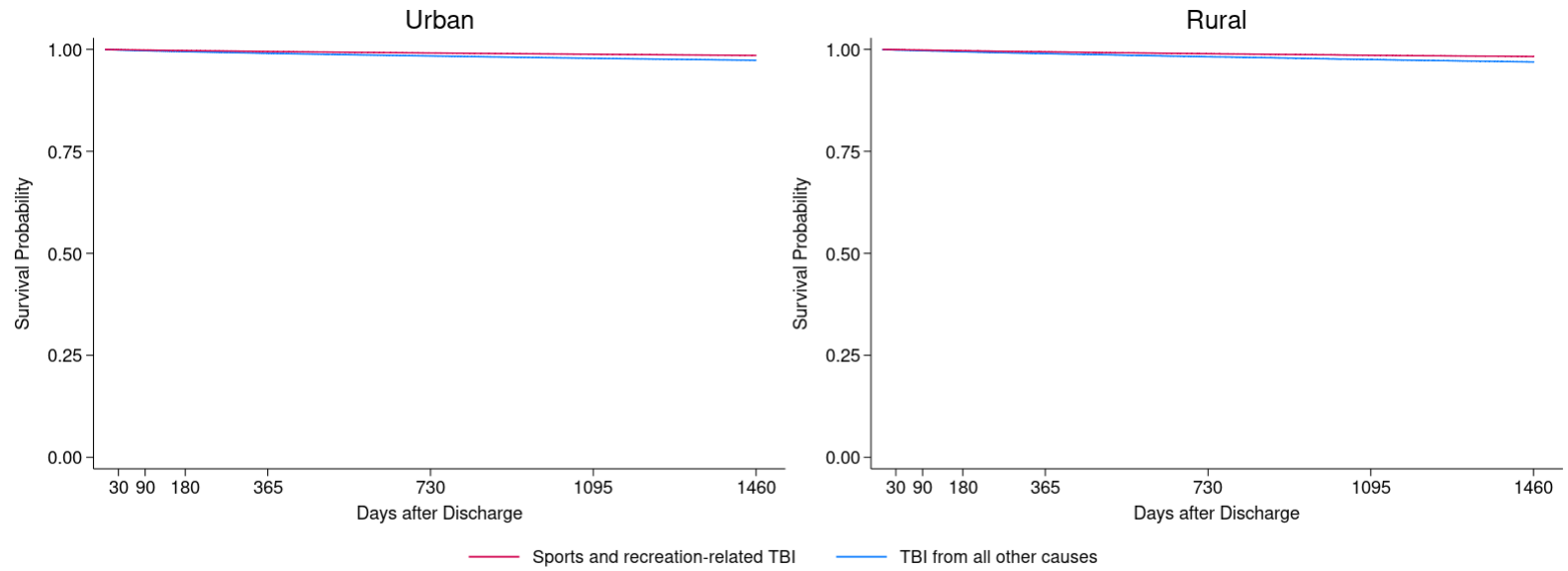


**Figure S49: Time to first indication of substance use disorder, by TBI-type and rurality**

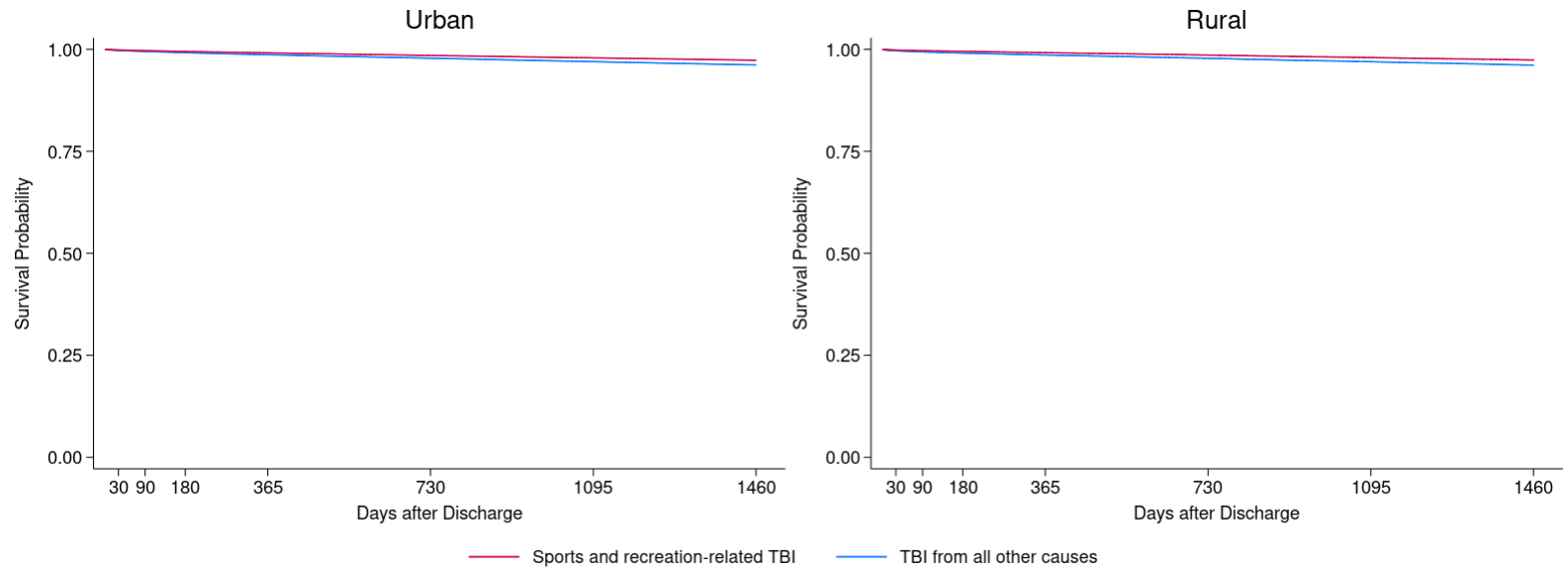




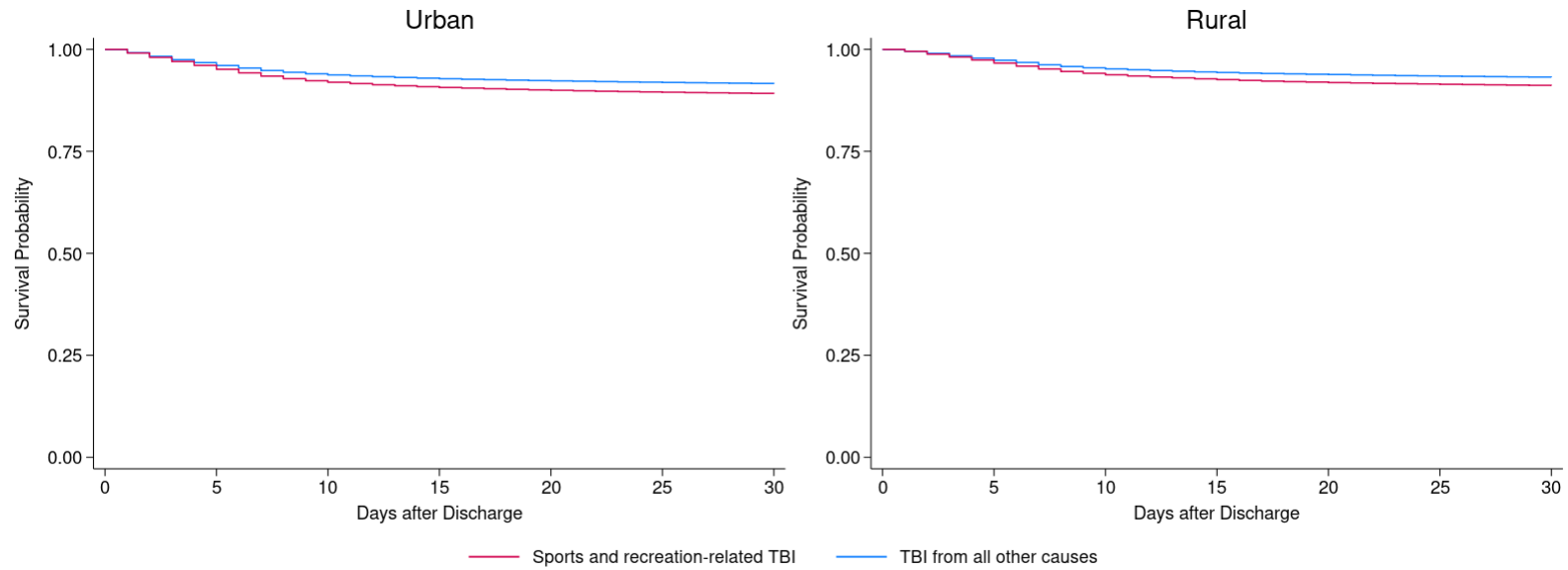
**Figure S50: Time to first indication of self-harm, by TBI-type and rurality**



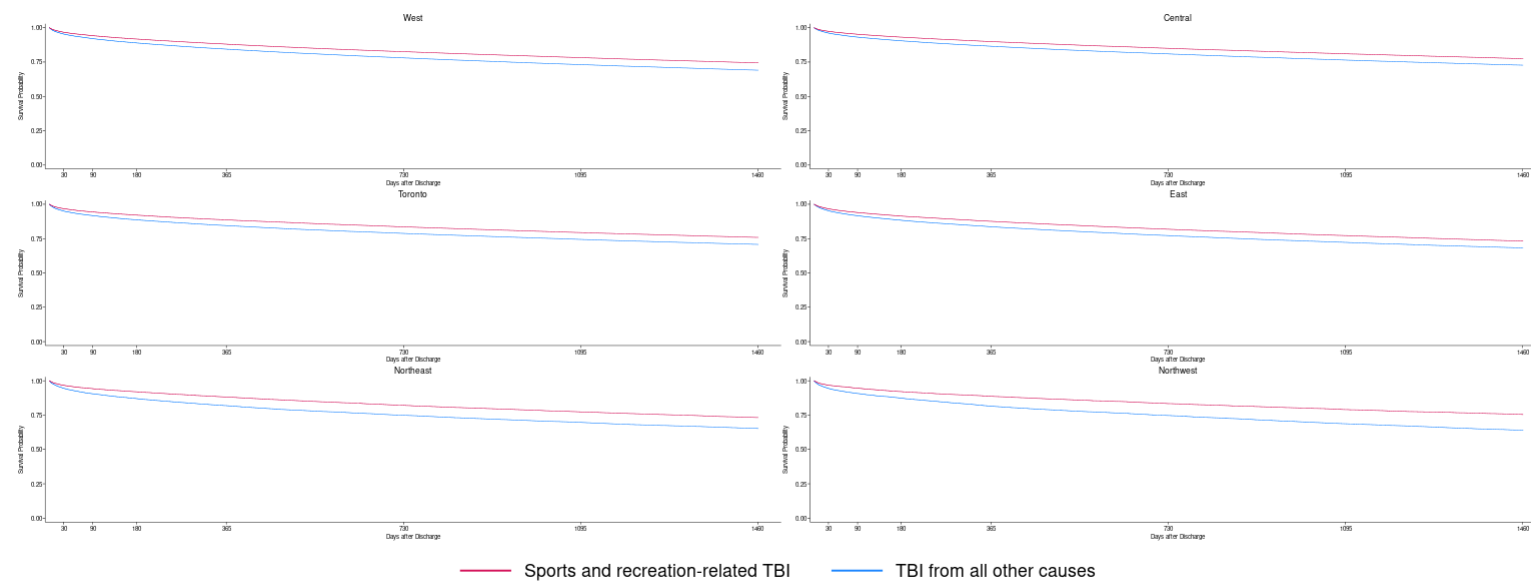
**Figure S51: Time to first indication of overdose, by TBI-type and rurality**



**Figure S52: Time to all-cause mortality, by TBI-type and rurality**



**Figure S53: Time to thirty-day outpatient follow up, by TBI-type and rurality**



**Figure S54: Time to first indication of mental illness, by TBI-type and Ontario health region**

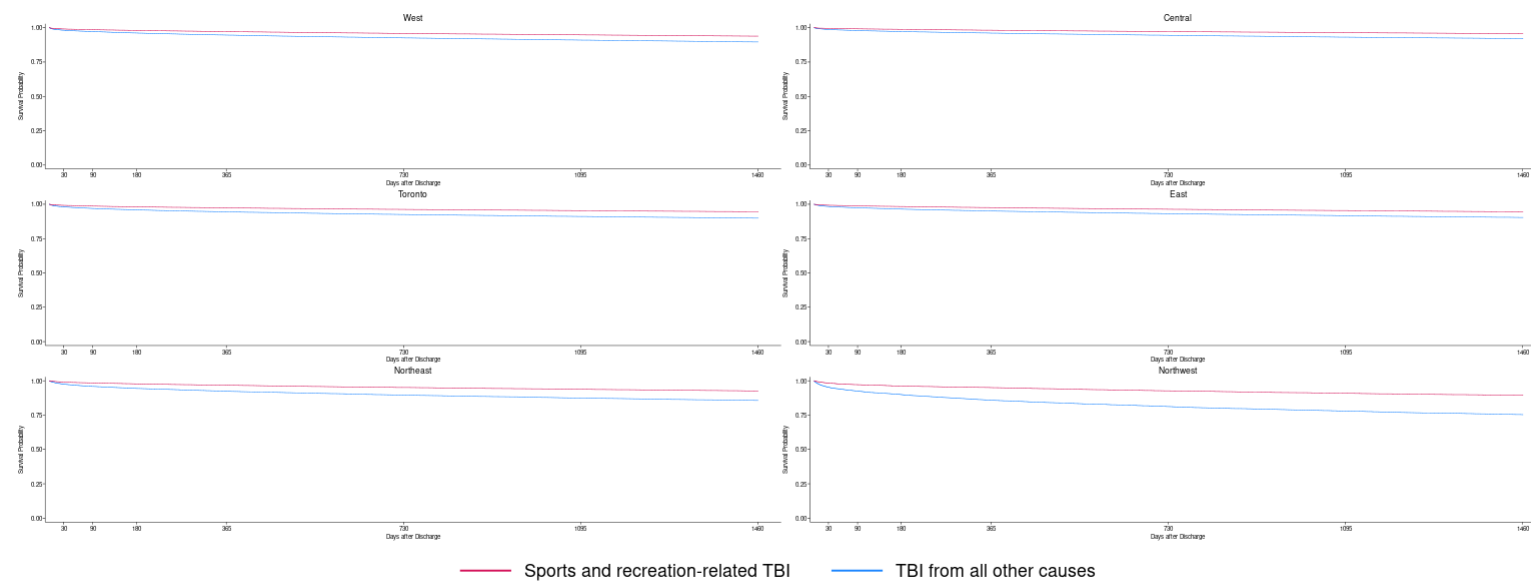


Figure S55: Time to first indication of substance use disorder, by TBI-type and Ontario health region

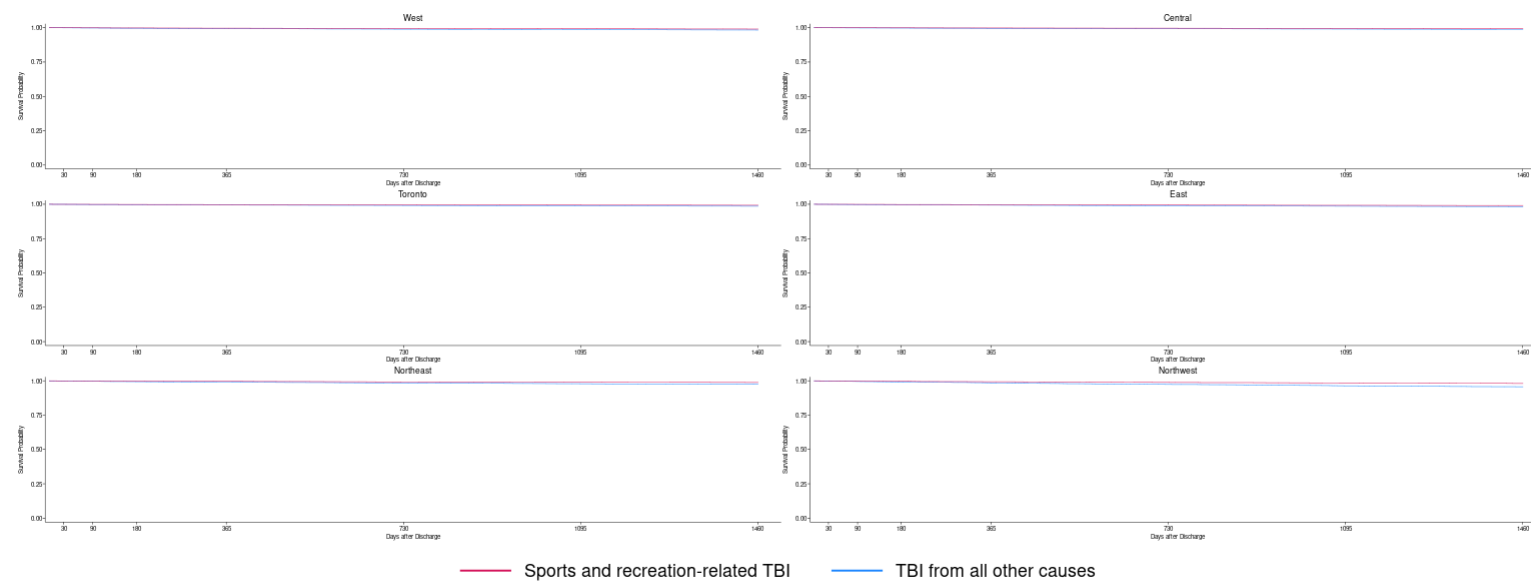
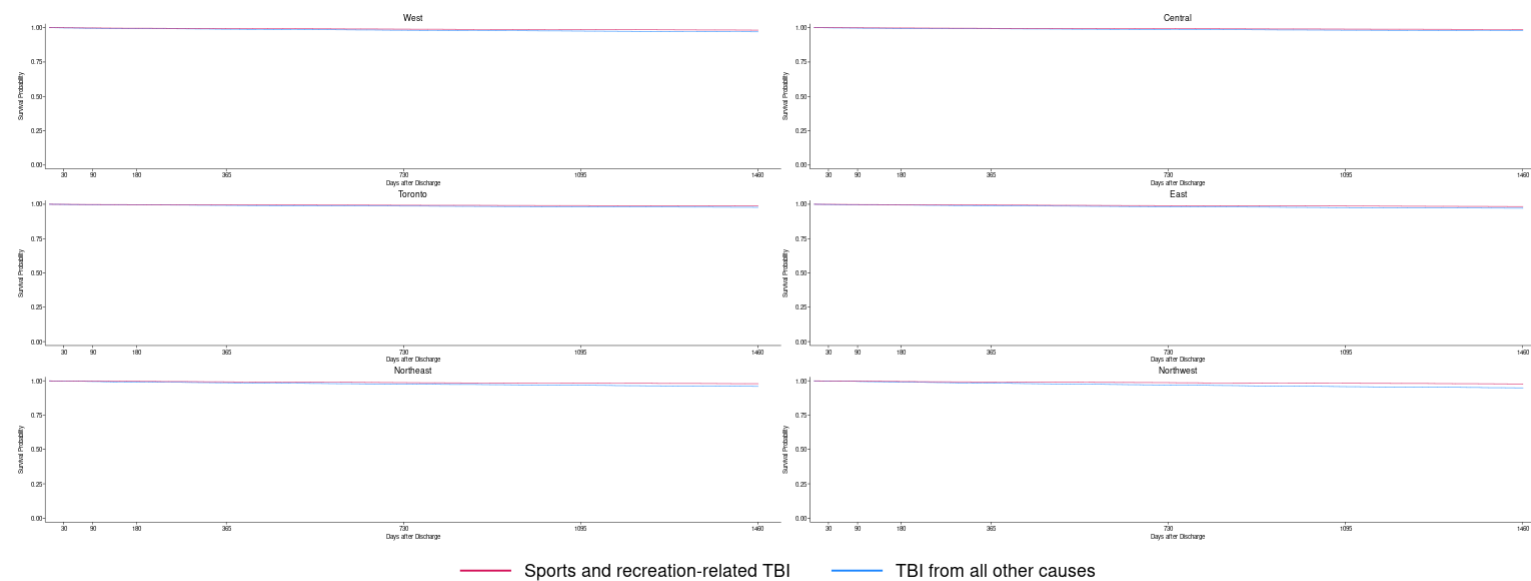
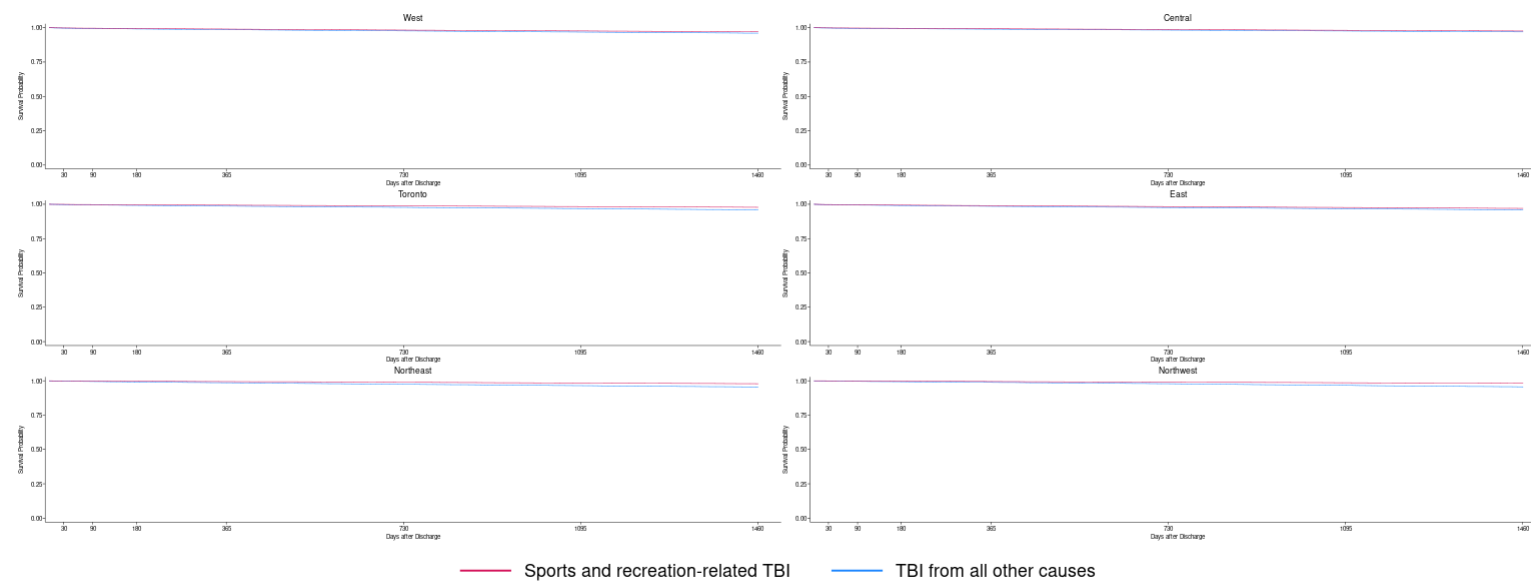


Figure S56: Time to first indication of self-harm, by TBI-type and Ontario health region

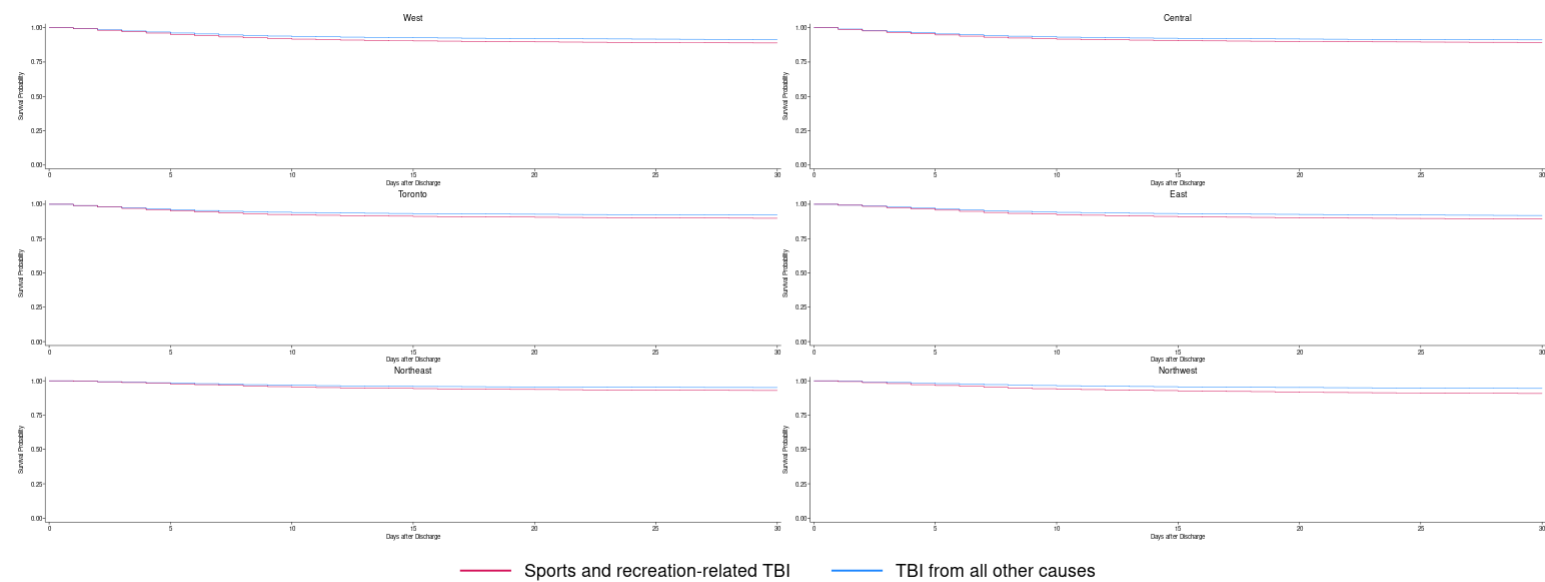


**Figure S57: Time to first indication of overdose, by TBI-type and Ontario health region**

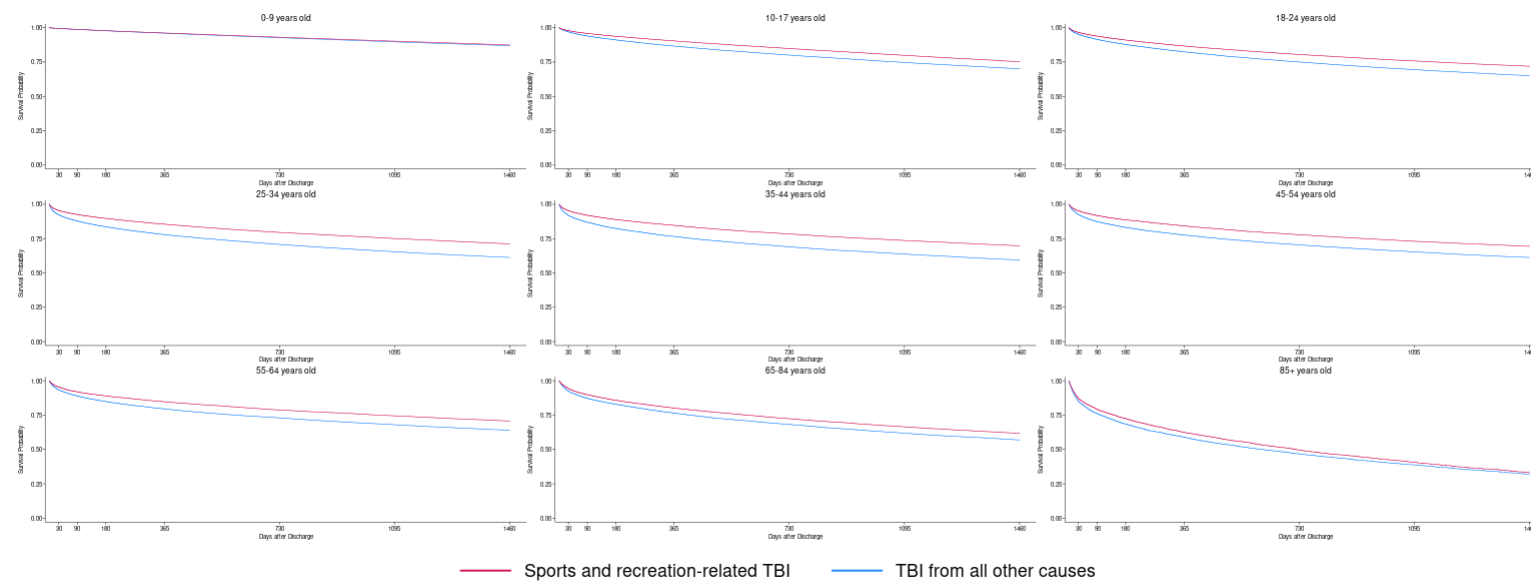




**Figure S58: Time to all-cause mortality, by TBI-type and Ontario health region**



**Figure S59: Time to thirty-day outpatient follow up, by TBI-type and Ontario health region**



**Figure S60: Time to first indication of mental illness, by TBI-type and age category**

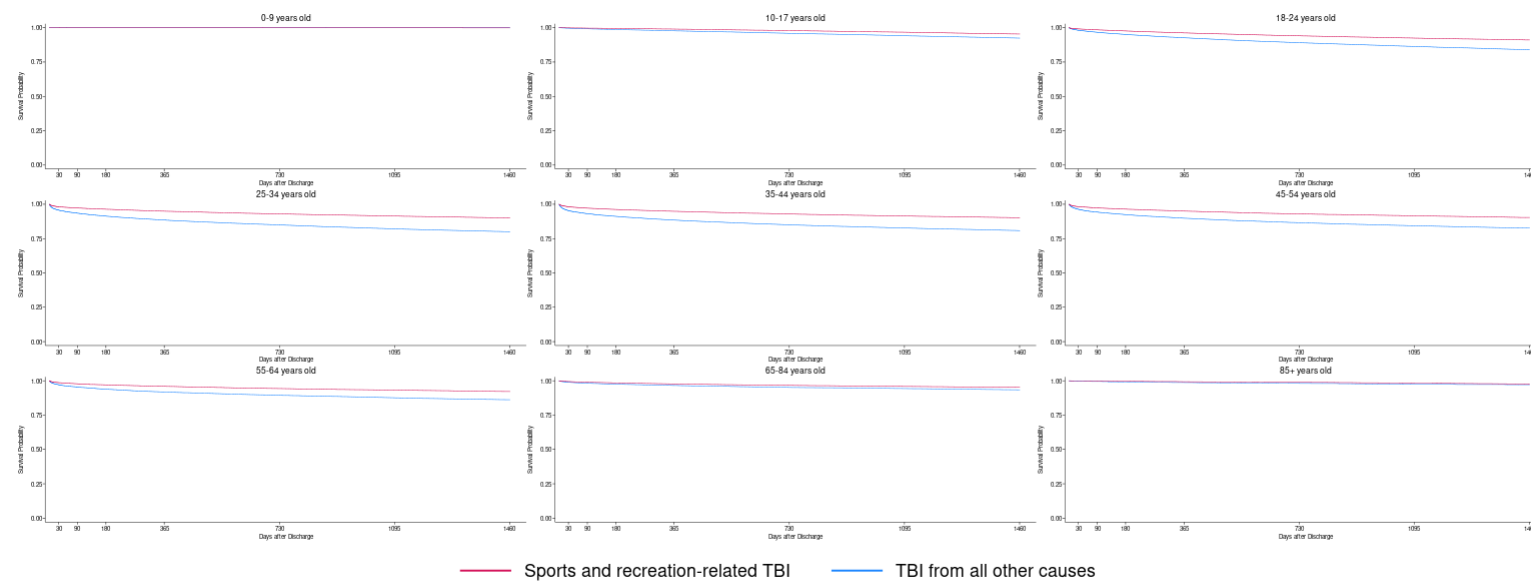


Figure S61: Time to first indication of substance use disorder, by TBI-type and age category

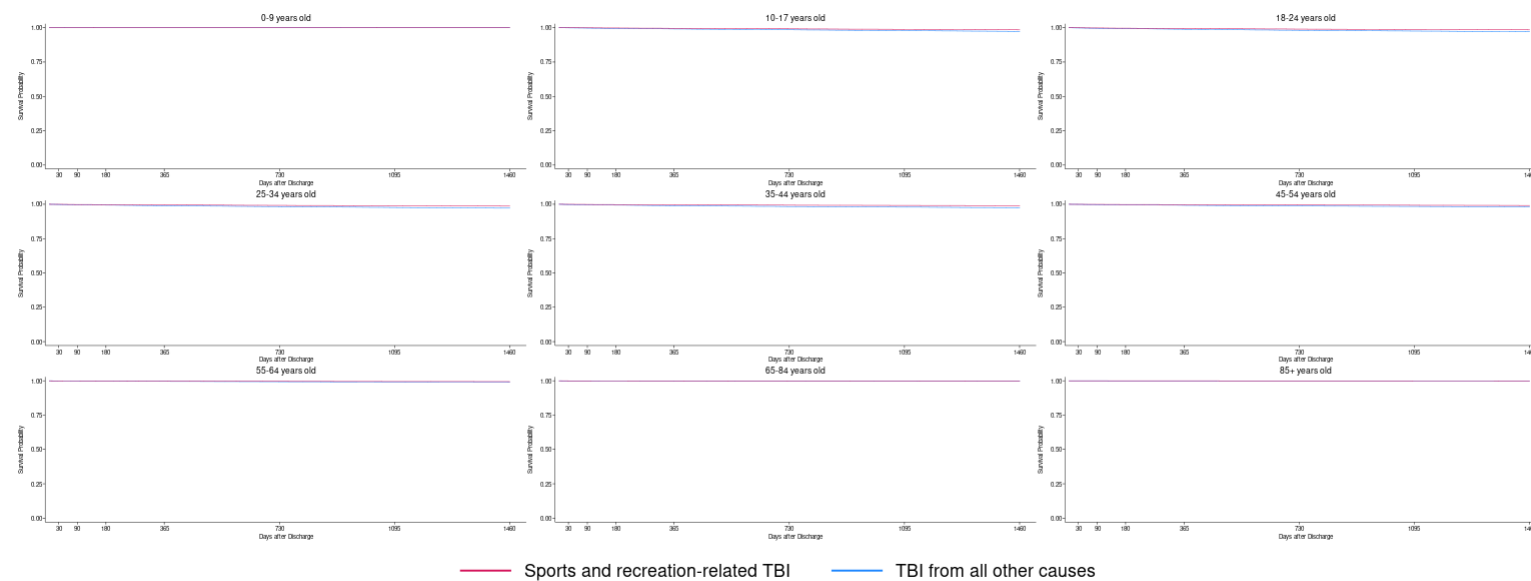
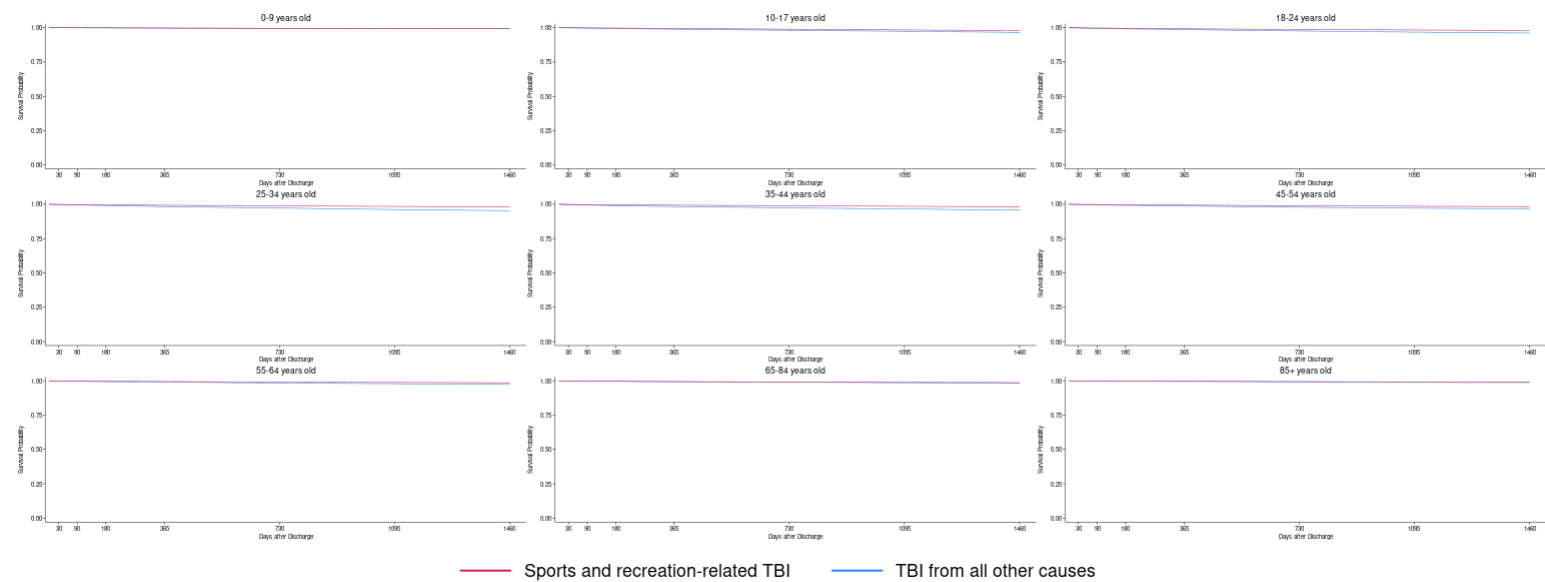


Figure S62: Time to first indication of self-harm, by TBI-type and age category



**Figure S63: Time to first indication of overdose, by TBI-type and age category**

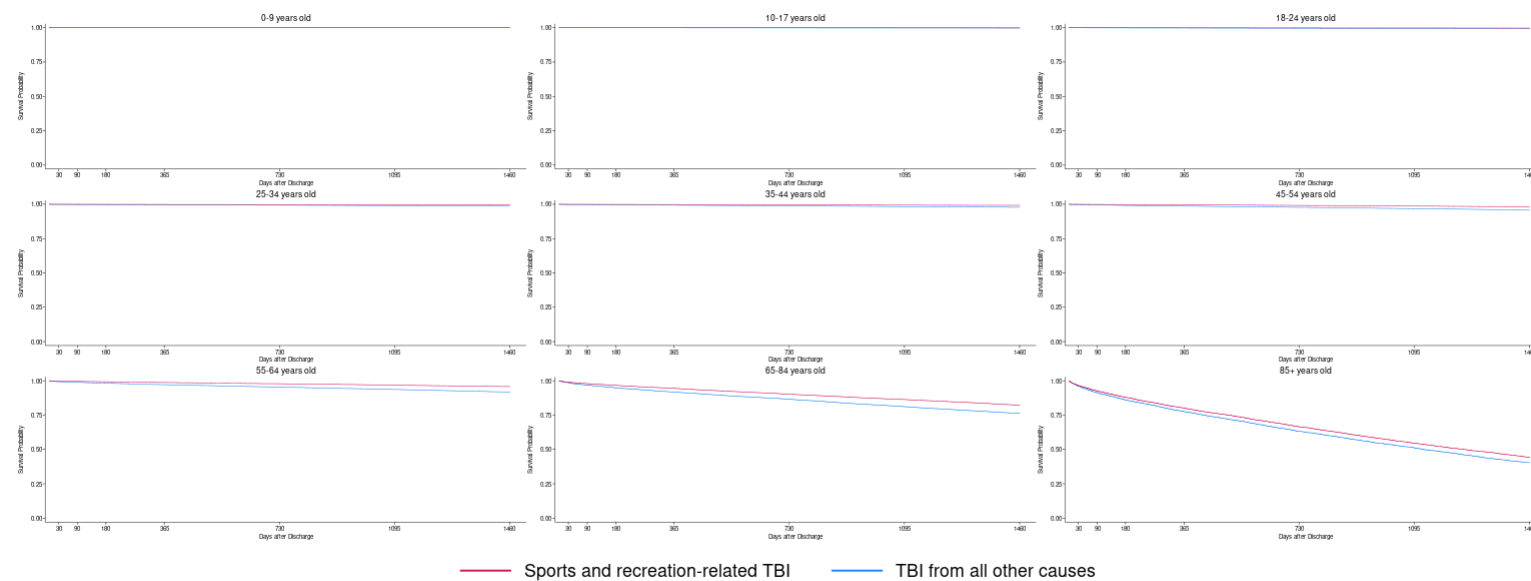
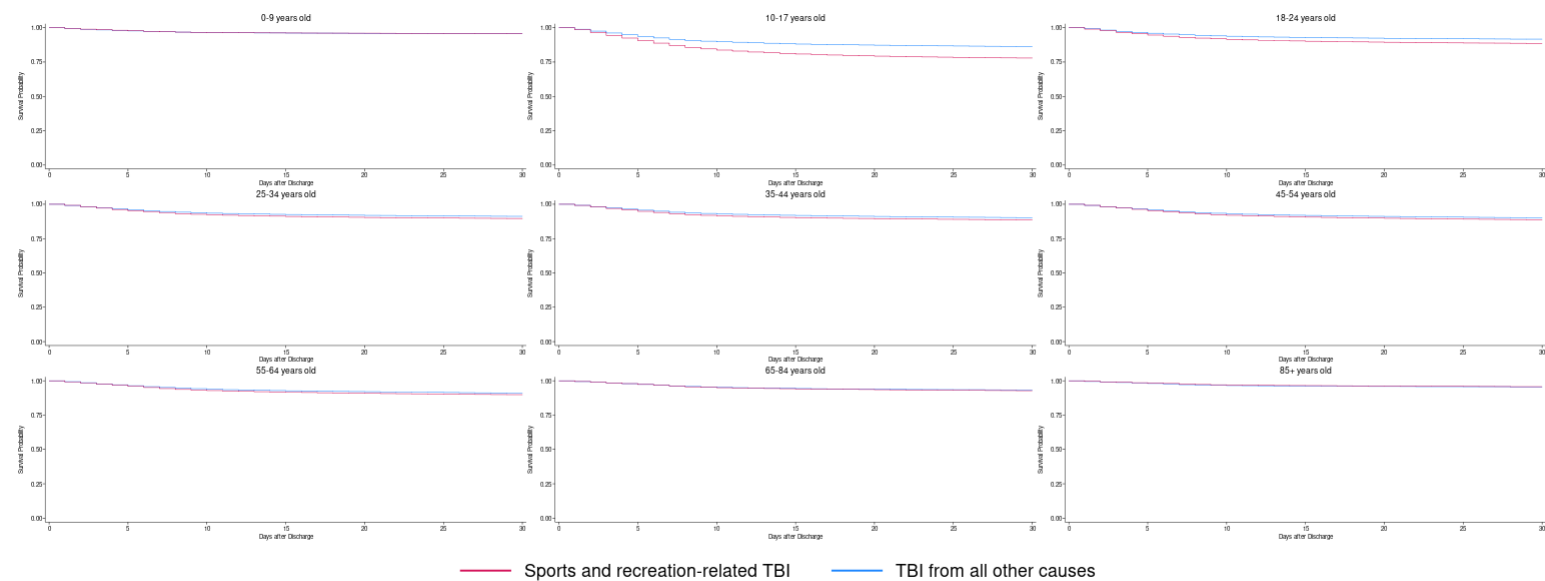


Figure S64: Time to all-cause mortality, by TBI-type and age category



**Figure S65: Time to thirty-day outpatient follow up, by TBI-type and age category**