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## **National Trauma Registry Analytic Bulletin** **August 2003**

### **Water-related Trauma Hospitalizations in Canada, 2000-2001**

#### **INTRODUCTION**

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This analytic bulletin provides a descriptive analysis of water-related trauma hospitalizations in Canada between April 1, 2000 and March 31, 2001. Information about trauma hospitalizations is drawn from the National Trauma Registry Minimal Data Set (NTR MDS), which is a subset of the Hospital Morbidity Database (HMDB) and contains demographic, diagnostic, and procedural information about all trauma-related acute care hospitalizations in Canada. The Canadian Institute for Health Information (CIHI) manages both the National Trauma Registry and the Hospital Morbidity Database.

#### **AKNOWLEDGEMENTS**

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This bulletin was prepared by Alison Locker, Senior Analyst with CIHI Clinical Registries. Nicole de Guia, Consultant with CIHI Clinical Registries and Lise Snedden, Special Project Assistant with the Lifesaving Society are thanked for reviewing earlier drafts. CIHI should be credited when republishing any part of this document. The suggested citation is:

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## National Trauma Registry Analytic Bulletin

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### METHODOLOGICAL NOTES

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#### A. Definition of Trauma

Cases included in the National Trauma Registry (NTR) meet the conceptual definition of trauma used by the NTR, injury resulting from the transfer of energy, and are defined by specific trauma-related external cause of injury codes (E Codes) from the International Classification of Disease, 9<sup>th</sup> revision (ICD-9). Examples of causes of injury excluded from the NTR are poisonings by drugs and gases (including assault and self-inflicted poisonings), adverse effects of drugs and biological substances, and late effects of injury. Please refer to Appendix A for a listing of E Code groups and diagnosis codes comprising the NTR.

The source of data for this analytic bulletin is the National Trauma Registry Minimal Data Set (NTR MDS). The NTR MDS includes all trauma-related cases discharged from acute care facilities in Canada. Accordingly, the NTR MDS and the case counts presented in this analytic bulletin excluded those who are so severely injured that they die before reaching hospital, e.g., at the scene, en route to hospital. Cases treated in the emergency department (ED) and subsequently released without being admitted to hospital are also excluded.

#### B. Definition of Water-related Trauma

The table shown below provides detail about the four ICD-9 E Code groups used to identify water-related hospitalizations in the NTR MDS. *Water transport* injuries include injuries sustained while on watercraft, such as those due to falling, being struck by objects, on-board machinery, explosions and fires. *Near drowning* includes drowning due to watercraft overturning, falling from a watercraft, while participating in recreational water activities like swimming, or while bathing. Injuries sustained while jumping or *diving into water* are presented separately. Finally, the category for being *struck by objects or other persons* while in water includes injuries caused by colliding with other people or objects in water, as well as being stepped on or kicked by other people while in water.

The E Code categories used in this study represent the greatest level of specificity about water-related injuries available in the ICD-9 coding system. It is important to note, though, that they do not represent an exhaustive list of all possible causes of water-related trauma.

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**Table 1: Water-related trauma hospitalizations – E Code inclusions**

Category	ICD-9 E Code	
	Codes	Description
Water transport injury	E831* E833*, E834*, E835* E836* E837* E838*	Damage to watercraft causing injury Falls in water transport Machinery-related injury in water transport Explosion, fire or burning in watercraft Other and unspecified water transport incident
Near drowning	E830*  E832*  E910*	Drowning and submersion due to damage to watercraft  Other drowning and submersion resulting from other water transport incidents Unintentional drowning and submersion
Diving into water	E883.0	Injury from diving or jumping into water
Struck by objects or other persons while in water	E917.2	Unintentionally striking against or being struck by objects or persons while in running water

\* Includes 4<sup>th</sup> digits that provide further detail regarding injured persons and/or activities at the time of injury.

### C. Comparability to Other Data Sources

A variety of organizations report on water-related injuries, such as the Canadian Red Cross Society, the Canadian Surveillance System for Water-related Fatalities, the Water Incident Research Alliance, and the Lifesaving Society. It is important to note that the counts and rates presented by these and other organizations differ substantially from those presented in this analytic bulletin due to data collection and reporting differences, e.g.:

- Other organizations use a *case definition* that extends beyond hospitalizations, including all deaths, those receiving first aid only, those who were rescued and those classified as self-rescues
- Other organizations include a greater diversity of *causes* of water-related injury than the NTR, e.g., boating (fishing, power boating, canoeing) and non-aquatic causes such as walking and playing near water.

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### Water-related Trauma Hospitalizations in Canada, 2000-2001

#### HISTORIC TREND, 1996-1997 THROUGH 2000-2001

Between fiscal 1996-1997 and 2000-2001 the number of acute care trauma hospitalizations in Canada meeting the definition of water-related trauma used in this study decreased by 27%, from 1,213 to 891. This corresponds to an average annual decrease of 7%. Over five years, hospitalizations caused by diving into water decreased by 39%, while those due to near drowning declined by 35%. Hospitalizations associated with being unintentionally struck by other objects or persons while in water decreased by 22%, and water transport-related trauma hospitalizations declined by 16% (Figure 1).

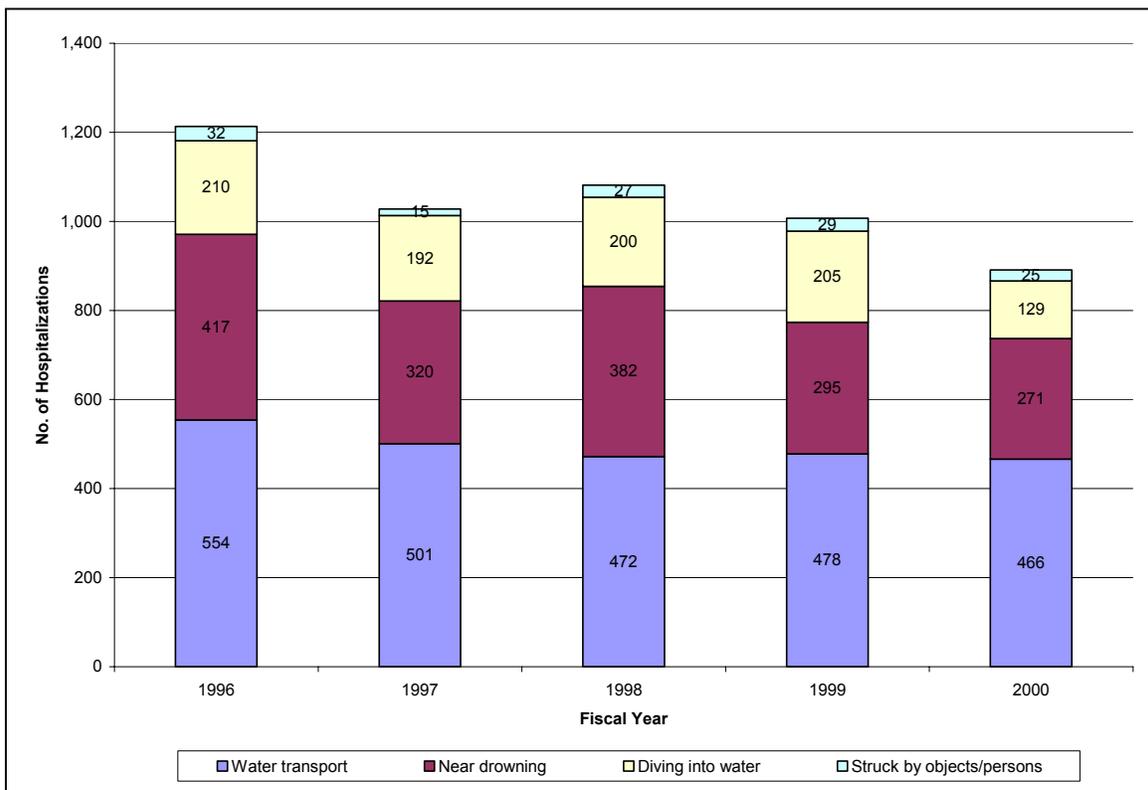


Figure 1: Water-related trauma hospitalizations, Canada, 1996-1997 – 2000-2001

## National Trauma Registry Analytic Bulletin

Water-related Trauma Hospitalizations in Canada, 2000-2001

### OVERVIEW, 2000-2001

In fiscal 2000-2001 there were 891 water-related trauma hospitalizations in Canada. The majority of these were water transport injuries (52%, n = 466), followed by near drowning (30%, n = 271), diving into water (15%, n = 129) and being struck by objects or other persons while in water (3%, n = 25). Table 2 shows that males represented more than two-thirds (68%, n = 608) of all water-related hospitalizations. The overall mean age was 33 years, but cases hospitalized due to water transport-related injuries were relatively older (mean = 40 years) whereas hospitalizations related to the other three causes were relatively younger (means = 24 years and 27 years).

The average length of stay in hospital for water-related trauma was 5 days with 5% dying after admission to hospital. However, cases related to near drowning were characterized by shorter lengths of stay (mean = 4 days) and greater proportions dying in hospital after admission (13%). The highest average length of stay was among cases hospitalized due to injuries sustained while diving into water (mean = 7 days), while the lowest proportion of in-hospital deaths, was among those struck by objects or persons in water (0%). August was the most common month of admission for all types of water-related trauma, with the exception of diving-related hospitalizations, for which the greatest number of hospital admissions occurred in July.

**Table 2: Water-related trauma hospitalizations, Canada, 2000-2001**

	Causes of water-related trauma				
	Water transport	Near drowning	Diving into water	Struck by objects/persons	TOTAL
<b>Number of cases</b>	466	271	129	25	891
<b>Percent male</b>	67%	69%	69%	68%	68%
<b>Age (years)</b>					
Mean	39.8	24.4	26.7	27.1	32.9
SD	19.0	24.6	15.5	16.6	21.6
Range	4 – 94	0.3 – 90	2 – 75	1.7 – 60	0.3 – 94
<b>Length of stay (days)</b>					
Mean	5.2	4.4	7.0	3.0	5.2
SD	7.8	13.1	15.0	3.1	10.8
Range	1 – 101	1 – 165	1 – 94	1 – 15	1 – 165
<b>Percent dying in hospital after admission</b>	2%	13%	1%	0%	5%
<b>Most common month of admission to hospital</b>	August	August	July	August	August

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### COMPARISON BY AGE GROUP, 2000-2001

Figure 2 demonstrates that the majority of water-related trauma hospitalizations were concentrated among cases under the age of 40 years, accounting for nearly two-thirds (63%, n = 563) of all water-related hospitalizations. There was a general trend toward decreasing number of hospitalizations with increasing age group. Water transport-related injuries were the most common cause of water-related hospitalizations among all age groups, with the exception of those under 20 years of age. Near drowning was the most common cause in this youngest age group.

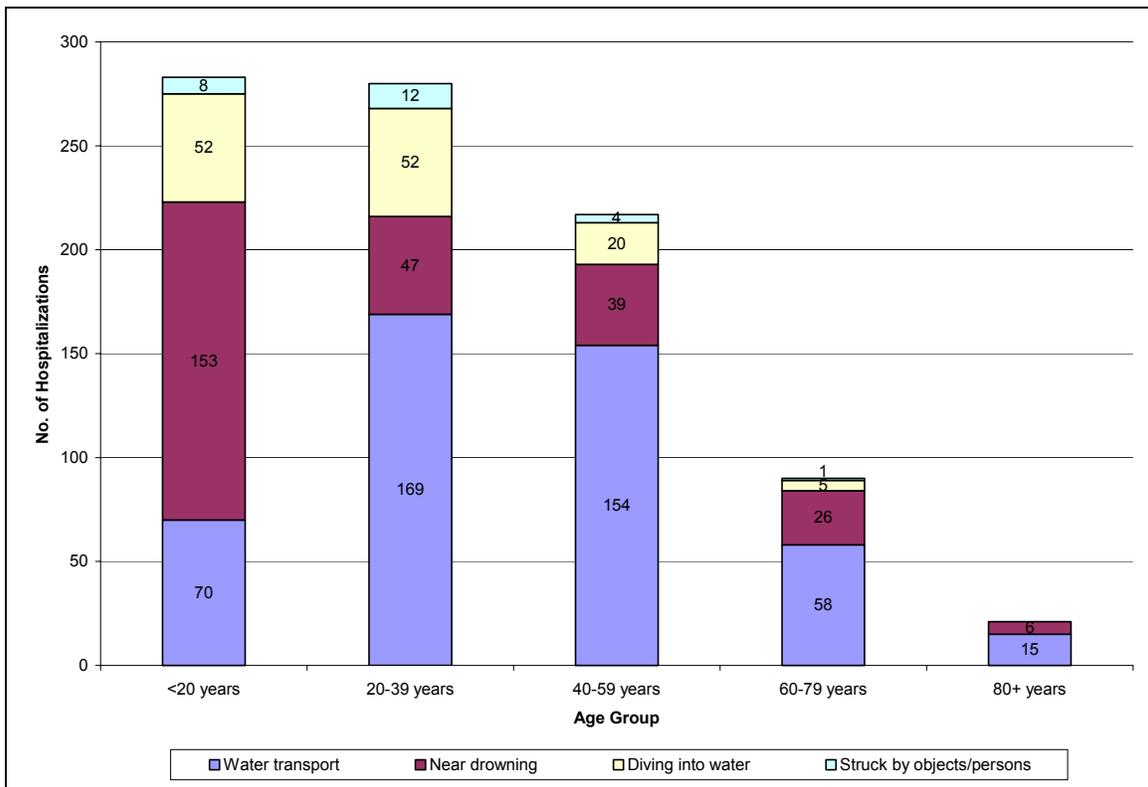


Figure 2: Water-related trauma hospitalizations by age group, Canada, 2000-2001

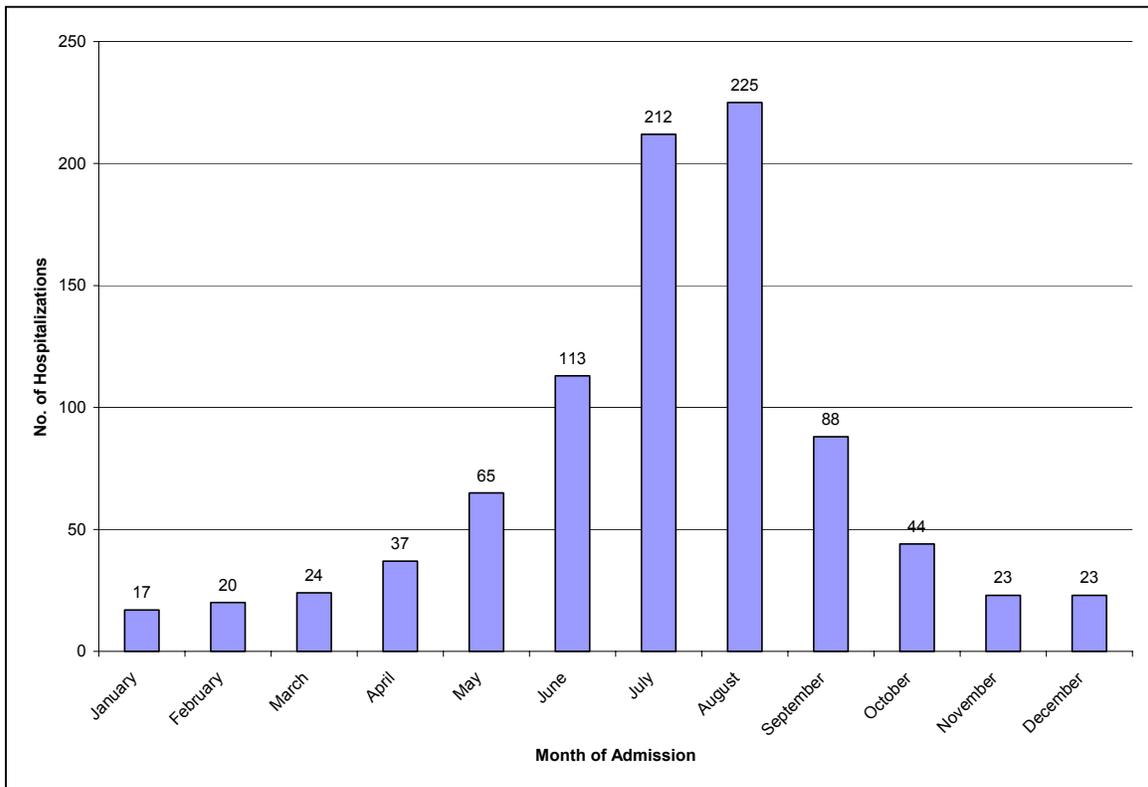
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### COMPARISON BY MONTH OF ADMISSION TO HOSPITAL, 2000-2001

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Nearly one half (49%, n = 437) of all water-related trauma cases were admitted to hospital in the summer months of July and August. One in five (20%, n = 178) were admitted in the pre-summer months of May and June. The fewest cases were admitted in the winter months of January and February (Figure 3).



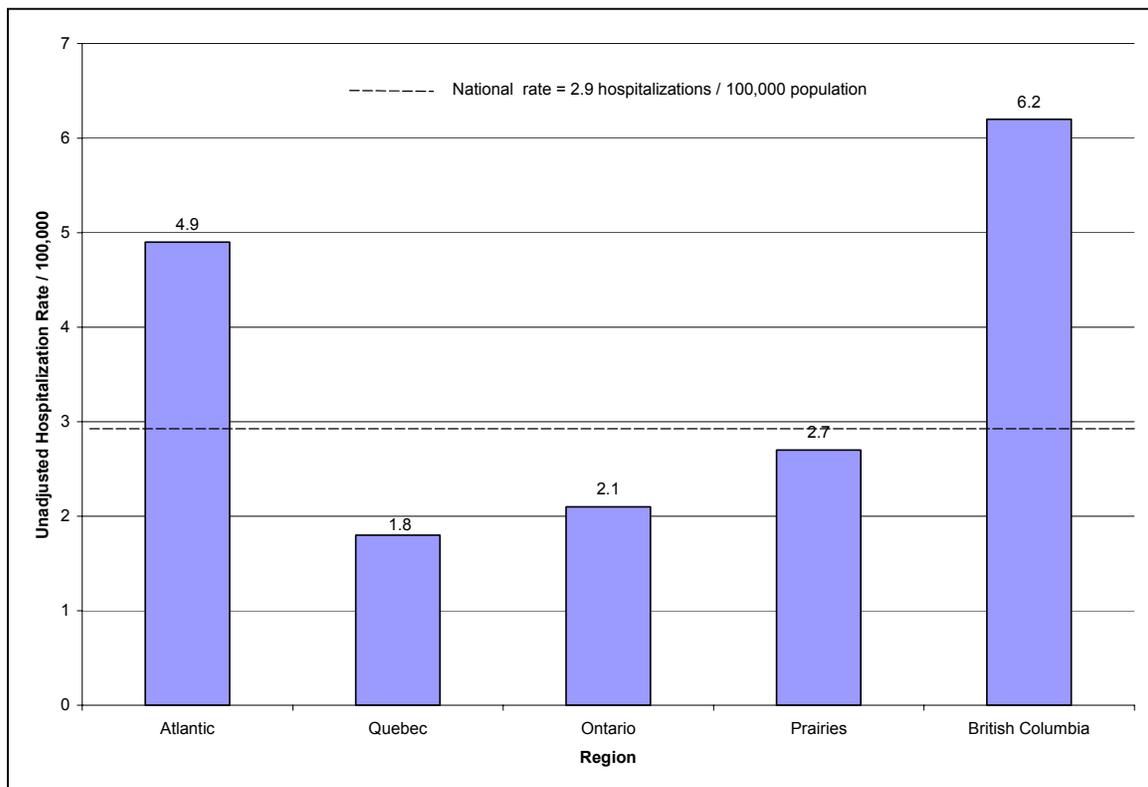
**Figure 3: Water-related trauma hospitalizations by month of admission to hospital, Canada, 2000-2001**

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Water-related Trauma Hospitalizations in Canada, 2000-2001

### REGIONAL COMPARISON, 2000-2001

British Columbia had the highest unadjusted water-related trauma hospitalization rate (6.2 hospitalizations per 100,000 population) followed by the Atlantic provinces (4.9 per 100,000). Respectively, these rates were 114% and 69% higher than the national average of 2.9 water-related hospitalizations per 100,000 population (Figure 4).



**Figure 4: Water-related trauma hospitalizations by region, Canada, 2000-2001**

*Note: Water-related hospitalizations from the Territories have been excluded from regional analyses due to low case counts. Cases from the Territories are included in the national rate.*

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### NEAR DROWNING HOSPITALIZATIONS

Near drowning is a high profile cause of water-related trauma hospitalizations, one toward which many injury prevention initiatives are directed. Accordingly, further analyses were undertaken for the purposes of this study.

Three ICD-9 E Code groups comprise the near drowning category: E830 – Damage to watercraft causing drowning, e.g., watercraft overturning or sinking, E832 – Other watercraft incidents causing drowning, e.g., falling or being washed overboard, and E910 – Other causes of unintentional drowning, e.g., while swimming, diving, or bathing. Appendix B provides more detail about these categories.

#### A. Historic Trend – Near Drowning, 1996-1997 through 2000-2001

Between fiscal 1996-1997 and 2000-2001 the number of acute care trauma hospitalizations in Canada due to near drowning decreased by 35%, from 417 to 271, corresponding to an average annual decrease of 9%. Figure 5 shows that over five years drowning hospitalizations in the ICD-9 categories of E830 – Damage to watercraft causing drowning and E832 – Other watercraft incidents causing drowning declined by 62% and 65%, respectively. Near drowning hospitalizations classified as E910 – Other causes of drowning decreased by 29%.

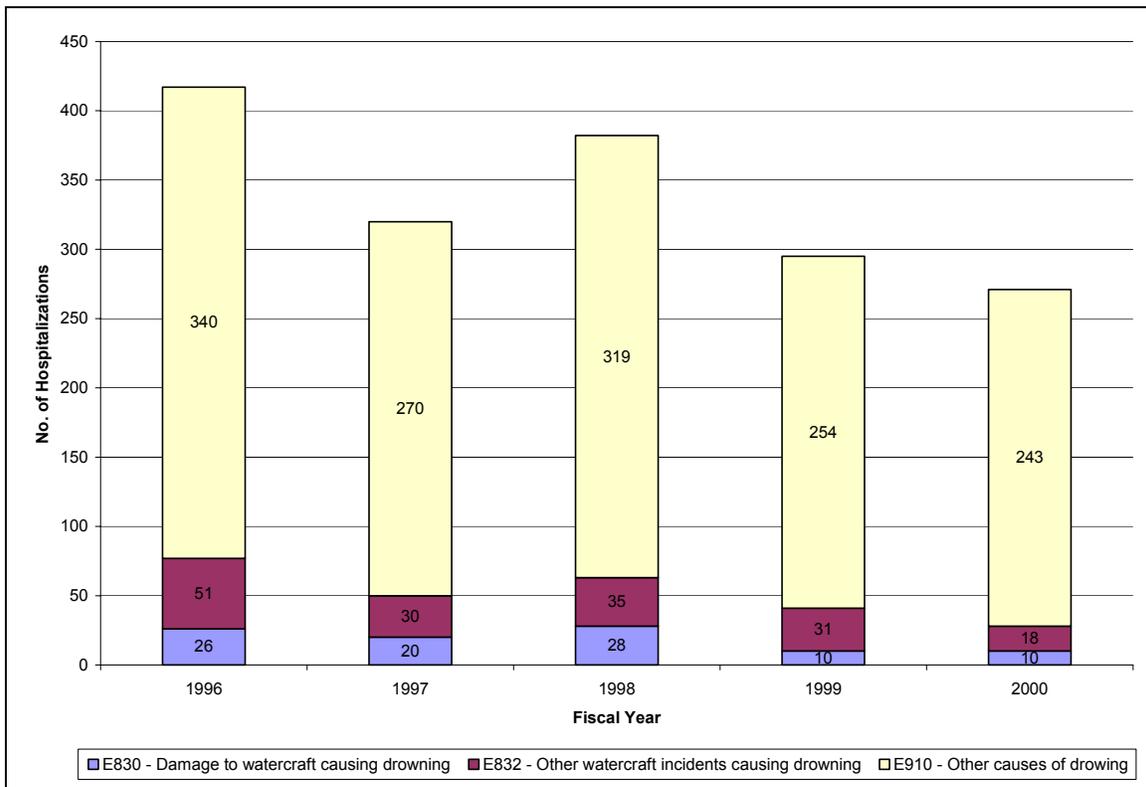


Figure 5: Near drowning trauma hospitalizations, Canada, 1996-1997 – 2000-2001

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### Water-related Trauma Hospitalizations in Canada, 2000-2001

#### B. Overview – Near Drowning, 2000-2001

In fiscal 2000-2001 there were 271 water-related trauma hospitalizations in Canada due to near drowning. The majority (90%, n = 243) of these fell into the aggregate category E910 – Other causes of near drowning, which includes those while engaged in recreational activities like swimming and water skiing, as well as near drowning while bathing. Table 3 shows that similar to all water-related hospitalizations, males accounted for the majority of near drowning-related hospitalizations (69%, n = 188), but there was variation in this proportion by cause, ranging from 40% to 71%. The mean age of all cases was 24 years, but watercraft-related near drowning cases were relatively older (means = 44 and 45 years). The most common months of admission to hospital for near drowning were June, July, and August.

**Table 3: Near drowning trauma hospitalizations, Canada, 2000-2001**

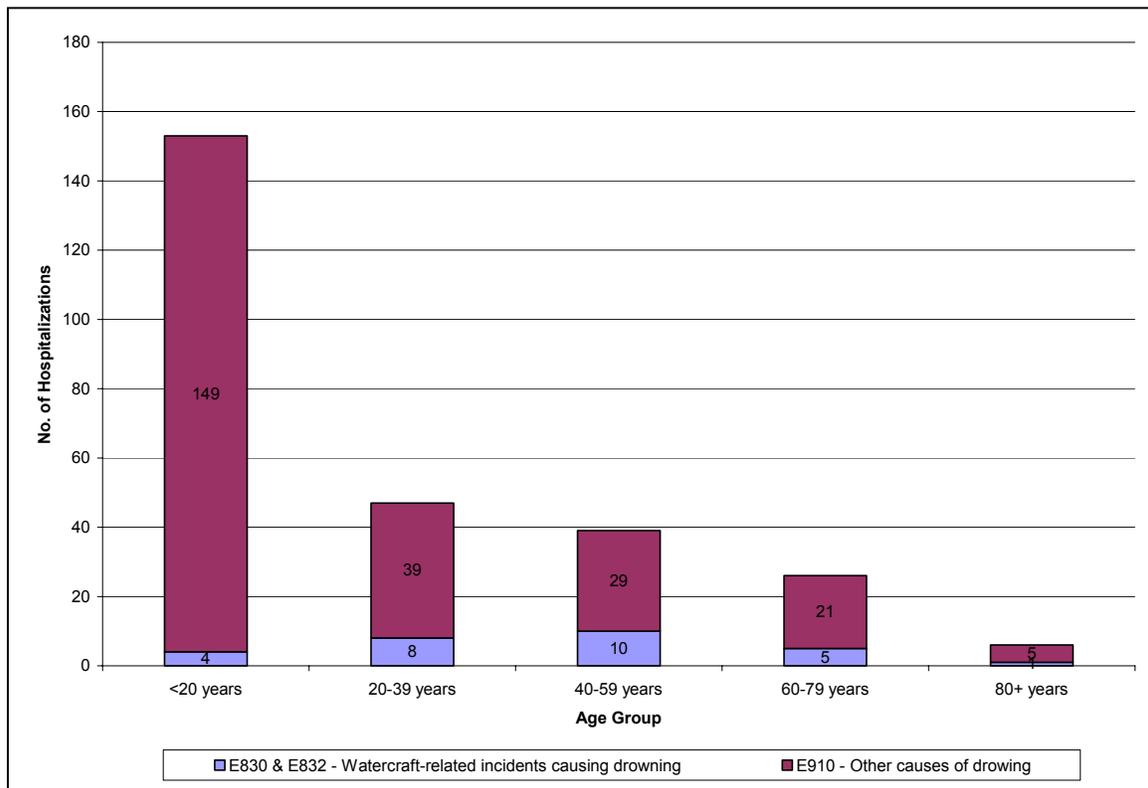
	Causes of near drowning			
	E830 – Damage to watercraft	E832 – Other watercraft incidents	E910 – Other causes	TOTAL
<b>Number of cases</b>	10	18	243	271
<b>Percent male</b>	40%	67%	71%	69%
<b>Age (years)</b>				
Mean	43.5	44.6	22.2	24.4
SD	22.4	21.6	23.9	24.6
Range	9 – 71	10 – 80	0.3 – 90	0.3 – 90
<b>Length of stay (days)</b>				
Mean	2.0	2.7	4.7	4.4
SD	1.5	2.2	13.8	13.1
Range	1 – 5	1 – 7	1 – 165	1 – 165
<b>Percent dying in hospital after admission</b>	10%	11%	13%	13%
<b>Most common month(s) of admission to hospital</b>	August	July & August	June	August

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#### C. Comparison by Age Group – Near Drowning, 2000-2001

Cases under the age of 20 years comprised more than one-half (56%, n = 153) of near drowning hospitalizations. Overall, there was a general trend toward a decreasing number of near drowning hospitalizations with increasing age group.



**Figure 6: Near drowning trauma hospitalizations by age group, Canada, 2000-2001**

*Note: Cases classified as E830 – Damage to watercraft causing drowning and E832 – Other watercraft incidents causing drowning have been aggregated due to low case counts across all age groups.*

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### Water-related Trauma Hospitalizations in Canada, 2000-2001

#### D. Comparison by Month of Admission to Hospital – Near Drowning, 2000-2001

Figure 7 shows that more than one-half (58%, n = 156) of near drowning trauma cases were admitted to hospital in the summer months of June, July, and August. Similar to all water-related hospitalizations, admissions to hospital for near drowning were least common in the winter months.

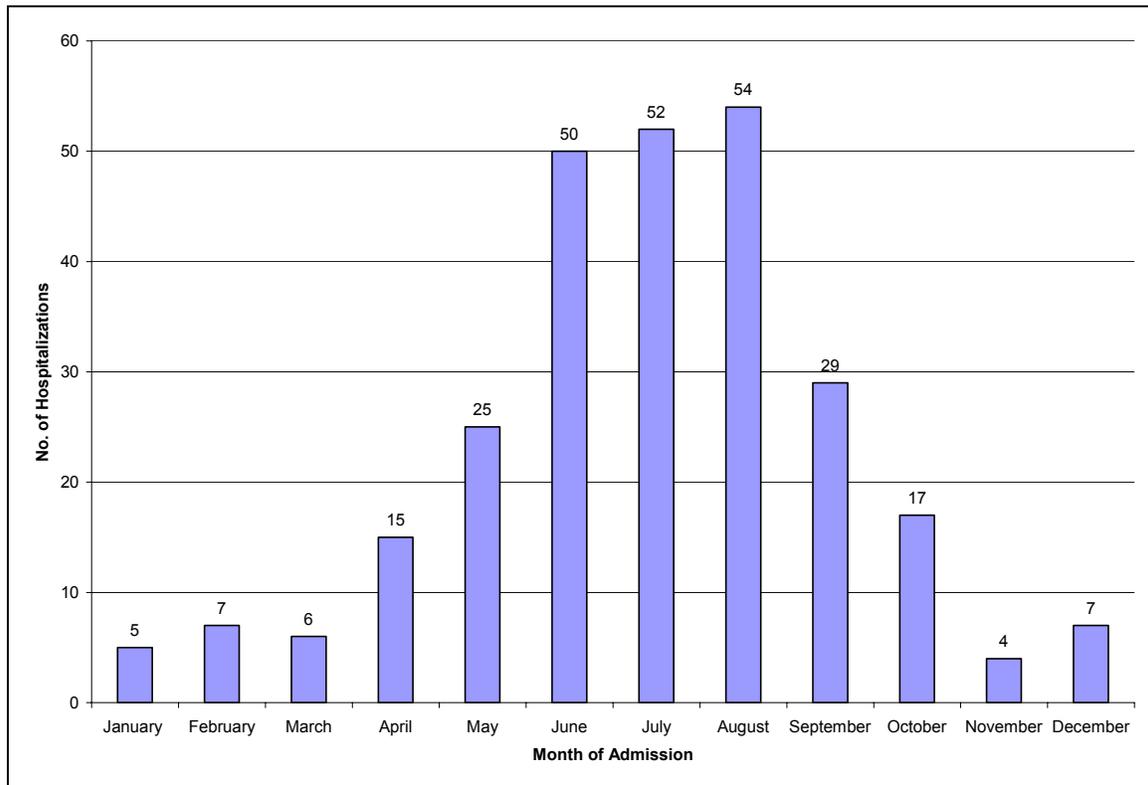


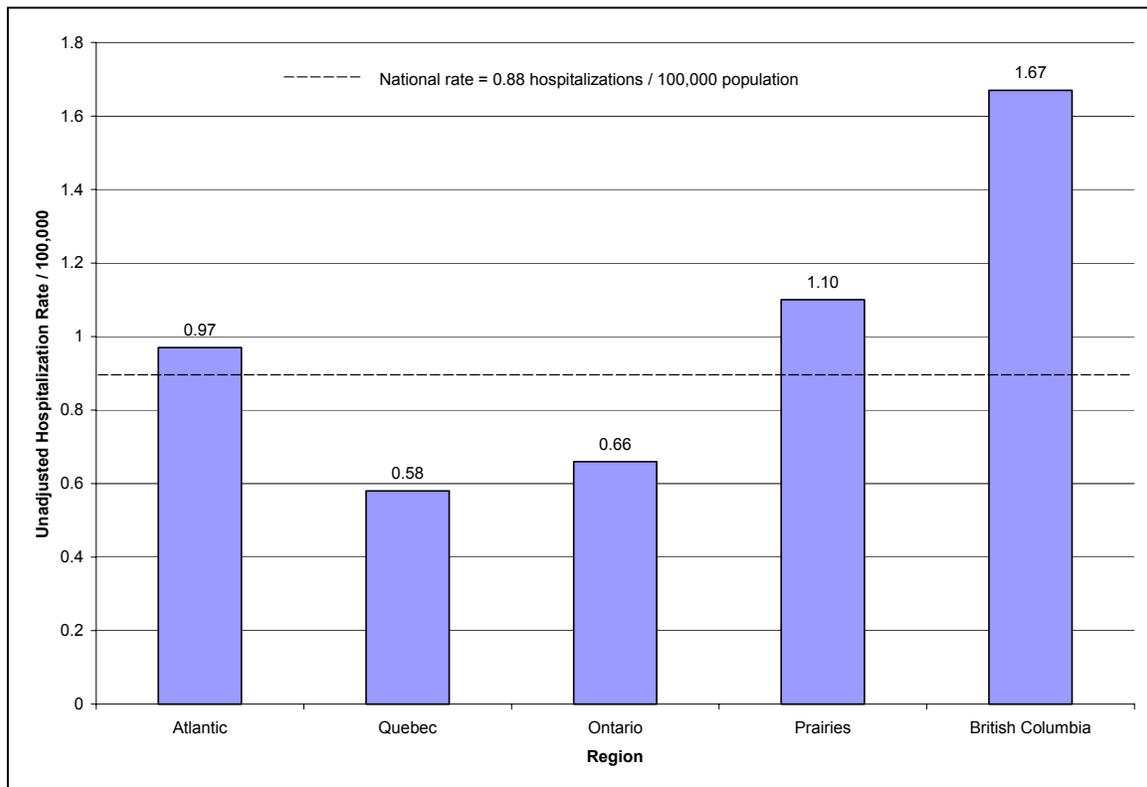
Figure 7: Near drowning trauma hospitalizations by month of admission to hospital, Canada, 2000-2001

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### E. Regional Comparison – Near Drowning, 2000-2001

The unadjusted national rate of near drowning hospitalizations was 0.88 drowning hospitalizations per 100,000 population. The Atlantic region (0.97 per 100,000), Prairies (1.10 per 100,000) and British Columbia (1.67 per 100,000) all exceeded the national rate by 10%, 25%, and 90%, respectively (Figure 8).



**Figure 8: Near drowning trauma hospitalizations by region, Canada, 2000-2001**

*Note: Water-related hospitalizations from the Territories have been excluded from regional analyses due to low case counts. Cases from the Territories are included in the national rate.*

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#### SUMMARY

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In fiscal 2000-2001 there were 891 water-related trauma hospitalizations in Canada, a decrease of 27% compared to 1996-1997. More than two-thirds (68%, n=608) of cases were males. The average age was 33 years and there was a general trend toward decreasing number of hospitalizations with increasing age group. The majority of water-related hospitalizations were due to water transport injuries (52%, n=466), followed by near drowning (30%, n=271), diving into water (15%, n=129) and being struck by other objects or persons while in water (3%, n=25). Admissions to hospital for water-related trauma were most common in the summer months of July and August (49%, n=437). The water-related trauma hospitalization rate in Canada was 2.9 hospitalizations per 100,000 population, with higher rates characterizing the coastal provinces.

The 271 near drowning hospitalizations recorded for 2000-2001 represented a 35% decline compared to 1996-1997. The majority (90%, n=243) of these fell into the aggregate category E910 – Other causes of drowning, which includes drowning while engaged in recreational activities like swimming and water skiing, as well as drowning while bathing or in a swimming pool. Watercraft-related drowning, e.g., drowning after falling from a boat, accounted for the remainder (10%, n=28). The average age was 24 years, with near drowning hospitalizations dropping substantially beyond the age of 20 years. Males comprised 69% (n=188) of near drowning hospitalizations. June, July and August were the most common months of admission to hospital due to near drowning. The rates of near drowning hospitalizations in Canada's coastal and Prairie provinces were higher than the national rate of 0.88 hospitalizations per 100,000 population.

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### Appendix A: NTR Definition of Trauma – E Code & Diagnosis Code Inclusions

#### External Causes of Injury (E Codes)

In the NTR, trauma is defined as injury resulting from the transfer of energy. The following table lists the International Classification of Diseases (ICD-9) external cause of injury code (E Codes) categories included in this definition. The terms 'accident' and 'accidental' used in ICD-9 definitions have been substituted with 'incident' and 'unintentional'.

E Code Inclusions	
E Code Category	Definition
E800 – E807	Railway incidents
E810 – E819	Motor vehicle traffic incidents
E820 – E825	Motor vehicle non-traffic incidents
E826	Pedal cycles
E827 – E829	Other road vehicle incidents
E830 – E838	Water transport incidents
E840 – E845	Air and space transport incidents
E846 – E848	Vehicle incidents not elsewhere classifiable
E880 – E888	Unintentional falls
E890 – E899	Incidents caused by fire and flame
E900 – E902, E906 – E909	Incidents due to natural and environmental factors
E910, E913	Incidents caused by drowning and suffocation
E914 – E915	Foreign bodies (excluding choking)
E916 – E928	Other incidents
E953 – E958	Suicide and attempted suicide (excluding poisoning)
E960 – E961, E963 – E968	Assault-related (excluding poisoning)
E970 – E976, E978	Legal intervention
E983 – E988	Injury undetermined whether unintentionally or purposely inflicted
E990 – E998	Injury resulting from operations of war

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### Injury Diagnosis Codes

The following table lists the diagnosis code categories included in the NTR.

N Code Inclusions	
Diagnosis Code Category	Definition
800-801, 803-804	Fractured skull
802, 830	Facial injuries
805	Fractured vertebrae
806	Fractured vertebrae with spinal cord injury
839.0 – 839.5	Dislocations of vertebrae
807.0 – 807.4	Fractured ribs or sternum
807.5, 807.6	Fractured larynx or trachea
808	Fractured pelvis
809	Other bones of the trunk
810 – 819, 831 – 834	Fractures and dislocations of upper limbs
820 – 829, 835 – 838	Fractures and dislocations of lower limbs
839.6 – 839.9	Other dislocations
840 – 848	Sprains and strains
850 – 854	Intracranial injury
860 – 869	Internal injuries to the chest, abdomen, or pelvic organs
870 – 879	Open wounds of the head, neck, or trunk
880 – 884, 890 – 894	Open wounds of the limbs, excluding amputations
885 – 886, 895	Traumatic amputation of digits
887	Traumatic amputation of upper limb
896 – 897	Traumatic amputation of lower limb
900 – 904	Vascular injuries
910 – 919, 920 – 924	Superficial injuries or contusions
925, 929	Crushing injuries
930 – 939 (excluding 933.1)	Foreign bodies (excluding choking)
940 – 949	Burns
952	Spinal cord injury with no bony abnormality
950 – 951, 953 – 957	Other nerve injuries
959, 990 – 994 (excluding 994.2, 994.3, 994.6)	Other and unspecified injuries

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### Appendix B: Near Drowning Subcategories – E Code Inclusions

The following table lists the ICD-9 E Codes comprising the subcategories of near drowning hospitalizations.

Category	ICD-9 E Code	
	Sub-categories	Description and Notes
E830 Damage to watercraft causing drowning and submersion	.0 – Occupant of small boat*, unpowered .1 – Occupant of small boat*, powered .2 – Occupant of other watercraft – crew .3 – Occupant of other watercraft – non-crew .4 – Water skier .5 – Swimmer .6 – Dockers, stevedores .8 – Other specified persons .9 – Unspecified person	Includes drowning due to: – watercraft overturning – watercraft sinking – falling or jumping from damaged watercraft
E832 Other watercraft incidents causing drowning and submersion	.0 – Occupant of small boat*, unpowered .1 – Occupant of small boat*, powered .2 – Occupant of other watercraft – crew .3 – Occupant of other watercraft – non-crew .4 – Water skier .5 – Swimmer .6 – Dockers, stevedores .8 – Other specified persons .9 – Unspecified person	Includes drowning due to: – falling from watercraft – thrown overboard by the motion of the watercraft – washed overboard  <i>Excludes swimmers and divers who drown after voluntarily jumping from watercraft</i>
E910 Unintentional drowning and submersion (other causes)	.0 – While water skiing .1 – Sports & recreational activities with diving equipment .2 – Sports & recreational activities without diving equipment .3 – While swimming or diving for purposes other than recreation or sport .4 – In bathtub .8 – Other .9 – Unspecified	Includes: – swimming in open water & swimming pools – swimmers & divers who drown after voluntarily jumping from watercraft – scuba & skin diving – surfboarding – marine salvage & repair – attempting to rescue another person

\* Watercraft propelled by paddle, oars, or small motor with a passenger capacity of less than 10.