Canadian Surveillance System for Water-Related Fatalities

An Analysis of Drownings and Other Water-Related Injury Fatalities in Canada for 1999

VISUAL SURVEILLANCE REPORT: 2001 EDITION

McGill University

THE CANADIAN RED CROSS SOCIETY

The Canadian Red Cross Society is part of the International Red Cross and Red Crescent Movement and, together with over 175 national societies, they are focused on one strategic goal: ***to improve the situation of the most vulnerable.***

The Mission

To help people deal with situations that threaten:
- their survival and safety
- their security and well-being
- their human dignity

in Canada and around the world.

The Aim of Water Safety Services

To prevent water-related injuries and fatalities.

The Goal of Water Safety Services

To reduce drownings and water-related injuries by providing Canadians with:
- the awareness and knowledge to recognize and avoid dangerous water-related situations
- the knowledge and skills required to save their own lives
- the basic rescue skills to enable them to save others
- the knowledge and awareness to recognize hazardous aquatic environments and equipment in their communities and to provide solutions

To accomplish the aim and goal of the Water Safety Services, water safety training is delivered to over 1.2 million Canadians per year, leadership training is provided to over 32,000 Canadians per year, and safety promotion campaigns reach over 19 million Canadians per year. The development and maintenance of programs depend on having valid, reliable, and current information. The study of water-related deaths provides information that enables The Canadian Red Cross Society to address current issues and design prevention programs aimed at reducing drownings and other water-related injury fatalities.

The Fundamental Principles

In common with Red Cross and Red Crescent Societies around the world, the CRCS is committed to upholding and advocating the principles of:

HUMANITY
IMPARTIALITY
NEUTRALITY
INDEPENDENCE
VOLUNTARY SERVICE
UNITY
UNIVERSALITY

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The Visual Surveillance Report was written and developed by Dr. Peter Barss, in collaboration with The Canadian Red Cross Society.

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Data collectors included volunteers and staff of The Canadian Red Cross Society and the Lifesaving Society. Data collection was made possible through the assistance and co-operation of provincial coroners, medical examiners, their statistical staff, and the National Association of Coroners.

Financing of the work was done collaboratively by sharing resources and staff. Data collection mainly involved The Canadian Red Cross Society, the Lifesaving Society, and provincial coroners. Data coding, verification, and entry were supported by the two Societies and carried out by Isabelle Masson, Peter Barss, and Sophie Lapointe. Data analysis and report writing were by Peter Barss and Sophie Lapointe; this step was funded by The Canadian Red Cross Society. The Society also supported the editing, design, layout, translation and printing of the report, coordinated by Rosemary Hong with the assistance of Caroline Gagnon of The Canadian Red Cross Society. Translation into French was supervised by Monique Edwards of The Canadian Red Cross Society. Hospitalization data for near drownings were supplied by the Canadian Institute for Health Information (CIHI).

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INTRODUCTION

This *Visual Surveillance Report, Edition 2001* for water-related fatalities includes the results of the analyses of the circumstances of drownings and other water-related injury deaths in Canada for 1999. The role of the Canadian Surveillance System for Water-Related Fatalities is to provide ongoing and consistent monitoring of the incidence and circumstances of all categories of unintentional water-related injury deaths. Surveillance data provide a sound basis for setting priorities, targeting of interventions, and monitoring outcomes over time.

The Visual Surveillance Report has been developed to provide a self-explanatory graphical and tabular display of the main risk factors and incidence rates for different categories of drownings grouped by activity. It also includes detailed annex reference tables that present numbers and percents of water-related injury deaths by activity, purpose, age group, sex, year, and province/territories. In order to provide essential data in a timely manner and also to ensure sustainability, text and subanalyses of minor categories have been kept to a minimum and the "stand-alone" graphics are fully labelled.

Readers who require greater detail may wish to refer to the 1996 *Comprehensive Surveillance Report* while using the Visual Report. Several *Special Topic Research Reports* are also based upon the same data source (The Canadian Red Cross Society, 1994b, 1994c, 1996a, 1996b, 1997a, 1997b). Special topic research reports pool data for several years.

An effort is made to retain major categories that were used in previous reports so that trends can be monitored from year to year. One of the annexes provides data for all major categories of incidents from 1991 to 1999, and thus includes information from the inception of the surveillance system. This annex is helpful as a reference point in assessing whether there have been real and statistically significant trends in specific subcategories of water-related injury fatalities over time and for a particular year. The tables on multiple-victim incidents in Parts 1 and 2 are also helpful in reviewing trends. Careful review of long-term trends helps avoid the danger of reading too much into random fluctuations, or changes due to a single incident with several victims.

This year's report continues Canada's unique collaboration among the Red Cross, the Canadian Coast Guard, and a population health injury epidemiologist, which began four years ago with the 1997 reports. This report contains detailed graphics, tables, and annexes for boating. We have included an overview of the 1999 data and trends between 1991 and 1999 in the discussion, together with certain key recommendations for 2001 and beyond. These recommendations are based upon progress, or lack thereof, in reducing the rates of specific subcategories of water-related injury deaths. Nevertheless, we have not reproduced details of use of the Haddon Matrix and the Ottawa Charter for Health Promotion for prevention of water-related injuries. The interested reader should refer to previous reports, as noted above.

While drownings are often considered as a single cause of death, there are many different types of drownings. Each tends to involve specific high-risk subgroups of the population by age and sex, such as toddlers or adult males, with different associated risk factors or determinants. This report provides the numbers and rates for the major subcategories of drownings, which are based upon the type of activity and its purpose.

Personal, equipment, and environmental risk factors are presented graphically for each type of drowning and activity as well as for high-risk subgroups of the Canadian population and for special hazardous environments. Detailed descriptions are limited to major categories with adequate numbers for analysis. Other water-related injury fatalities such as collisions of boats and hypothermia are also described.

The data are based upon coroners' reports and were obtained from the Canadian Surveillance System for Water-Related Fatalities. This system was developed by The Canadian Red Cross Society in collaboration with several other organizations, including the Lifesaving Society, the Injury Prevention Program of the Montreal Public Health Department, and the National Association of Coroners. *This comprehensive surveillance system for water-related fatalities is the first of its kind in the world and is a precious and unique resource for prevention*. The organizations and individuals that operate and sustain the system are guided by and work together towards the common goal of preventing the avoidable burden of water-related injury deaths in Canada. The vast majority of victims are children and adults in their productive years, so the societal impact of these deaths is disproportionate to their number.

The completion of most coroners' investigations for the preceding year generally takes between 6 and 12 months. At this time, data collection, verification, computer entry, analysis, design, and printing of the report can begin; these steps take about 10 months. Thus, while the analyses for this report were completed during 2001, the actual incidents occurred during 1999.

Unintentional injury deaths are included in this surveillance report, while intentional injuries such as homicides and suicides are excluded. Nevertheless, it is possible that a few drownings from non-aquatic falls into water or of unknown type may represent misclassified suicides. The term unintentional injury is used in preference to "accident". The word accident is frequently misused since it can apply to both an injury and the incident causing the injury, and to many people implies fate, bad luck, and non-preventability (Langley, 1988).

A public health definition of surveillance is as follows: "... the ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know. The final link in the surveillance chain is the application of these data to prevention and control" (Centers for Disease Control, 1986). It is particularly important that health surveillance data be provided in a timely manner to individuals and organizations who are in a position to take action (Teutsch and Churchill, 1994; Teutsch and Thacker, 1995).

A major purpose of this surveillance report is to allow monitoring of trends in numbers, rates, and circumstances of various categories of water-related fatalities from year to year. It is essential to make this information available on an annual basis for The Canadian Red Cross Society, government agencies and organizations involved in water and boating safety, and for public health professionals and decision makers involved in injury prevention.

The major categories that are used for classifying surveillance data and for developing water safety initiatives have been planned in a coordinated manner, such that new information can be continuously and systematically incorporated into programmatic activities. These include not only targeted educational initiatives and promotional campaigns, but also support for municipal, provincial, and national legislation to provide automatic protection via safe and user-friendly equipment and environments.

Specific surveillance data on modifiable risk factors should encourage new interventions via lateral thinking processes at all levels of Canadian society (deBono, 1994). The use of a comprehensive multifaceted approach to injury surveillance and prevention helps clarify modifiable risk factors on a population basis as a positive alternative to unproductive and often destructive victim-blaming.

Surveillance data are also useful for evaluating control programs for water-related injury fatalities and changes in pertinent safety practices. With the help of valid and precise surveillance data, scientifically sound evaluation of programmatic impact on outcomes such as the annual rate of specific types of water-related fatal incidents is possible at both national and regional levels.

METHODS

The principal data source for this report was the Canadian Surveillance System for Water-Related Fatalities. All unintentional drownings and other water-related injury deaths investigated by coroners or medical examiners in Canada and with a declared date of death during 1999 were reviewed.

Drownings are generally classified using World Health Organization external cause of injury code E910, which includes drownings during swimming, bathing, etc. as well as falls into water, and codes E830 and E832, which include boating transport immersion drownings due to overturning of boats or falls from boats (WHO, 1977). Drownings that occur when people voluntarily swim or jump from a boat are not counted as boating drownings and are classified under E910.

Other non-drowning injury fatalities related to water transport (E831; E833; E838) and immersion hypothermia without drowning were considered separately. Water-related injuries such as air embolism during scuba diving and blunt trauma as a result of diving or falling into shallow water are specifically requested by checklist from provincial coroners. Since land and air transport drownings tend to be classified with other non-water related transport deaths, these files are also included on the checklist.

The data collection form is the heart of the surveillance system and includes about 15 pages of highly structured questions designed to capture for computer entry and analysis all essential details of water-related deaths. The focus is on personal, equipment, and environmental risk factors for injuries associated with different activities. The form is improved each year based upon a detailed review of the results of data verification and analysis. The data are abstracted annually from coroners' reports by staff and volunteers of The Canadian Red Cross and the Lifesaving Societies. Data are collected for the previous year's deaths in the fall of the following year, by which time the majority of coroners' reports have been completed for the previous year.

Initial review, coding, classification, and grouping of data from provincial coroners were completed by a medically qualified injury epidemiologist in accordance with the principles of external-cause coding of the World Health Organization's *International Classification of Diseases* and with a practical view to prevention. Details of this process were described in the 1994 *Comprehensive Surveillance Report.*

Deaths attributed to both drowning and hypothermia by the coroner were classified as drowning complicated by hypothermia, while immersions with no autopsy evidence of drowning were classified as hypothermia deaths. "Diving" deaths of swimmers were attributed to diving only if there was evidence of head or spinal injury, since many persons who dove into water to swim appeared to have been swept away by current and drowned. Each year, there are several deaths that are classified as unintentional by a coroner, but where suicide has been suspected but unproven. Most of these deaths end up in categories with the activity and the purpose of activity classified as unknown; they are reported on in the section on non-aquatic falls into water. The purpose of activities of children less than 15 years old, including playing and walking, was categorized as recreational rather than daily living.

Population denominators for calculation of 1999 rates are based upon the 1999 estimates, which are projections from the 1996 census. For certain tables and graphics, population averages for the period 1991-1999 were calculated using an average of the 1991 census and the 1996 census. The population used as a basis for computing rates of aboriginal deaths was obtained by adding the 1993 population of registered Indians in Canada with the 1991 population of Inuit in Quebec and the Northwest Territories. While these data are somewhat dated, after comparison of other denominators, we believed that they were the most valid estimates at the time of writing. The First Nations and Inuit population in 1991-1993 was 589,206; this was reported as 588,480 in 1996. In view of the high birth rate among aboriginal peoples, this lack of increase is surprising and may reflect methodological differences in the population counts. Only registered Indians and Inuit were included, since the data collectors believed that victims identified as aboriginal by coroners or data collectors were nearly all registered Indians or Inuit, and not non-registered Indians or Metis. There is undoubtedly a degree of undercounting in both numerators and denominators, which would tend to reduce any error in rates.

In 1999, Nunavut was created from the eastern part of the NWT. Hence for the 1999 data, the terms NWT and Nunavut designate what was formerly known as NWT.

In the following summary, it has sometimes been necessary to make comparisons for slightly different time periods. This was necessary because while complete mortality data for drowning deaths are available in the database of the Canadian Surveillance System for Water-Related Fatalities for 1991-1999, hospitalization data are now accessed from the Canadian Institute for Health Information (CIHI), which took over managing such data from Statistics Canada in 1994. Data from earlier years are expensive to access from the pre-1994 archived Statistics Canada database and we have not attempted to do this for these annual reports, although in 1994 reports we did access those data from Statistics Canada in special research reports on 1991 and 1992 data (Canadian Red Cross Society, 1994b, 1994c).

CIHI retrieved data by use of the nature-of-injury code N994.1, "drowning and non-fatal submersion", and then further categorized data using E-codes. CIHI was able to verify how many of these hospitalized victims had died in hospital. This avoids double counting of victims under deaths and hospitalizations. The main variables available in the database for near drownings are age, sex, province/territory and duration of the hospitalization. The E-codes for boating allowed near drownings to be classified into boating and non-boating incidents. However, classification by E-codes in vital statistics reporting by Statistics Canada of deaths is less accurate than in the Canadian Surveillance System for Water-Related Fatalities. In previous research, we noted that vital statistics misclassified 33 to 43% of boating drownings as non-boating (E910) (The Canadian Red Cross Society, 1994c). The extent to which such misclassification occurs in hospital data has not been verified; however, it is probably relatively frequent since many health providers and coders are unaware of the importance of specifying that an incident resulted from boating.

NOTE: Percentages have been rounded to the nearest whole number.
Hence the total percentage for some tables and graphics may add up to 99% or 101%.

PART 1

OVERVIEW OF DROWNINGS & OTHER WATER-RELATED INJURY FATALITIES & OF HOSPITALIZATIONS FOR NEAR DROWNINGS

The major categories of water-related injuries include drownings during boating, aquatic activities such as swimming and wading, bathing, and falls into water. Another source of drownings includes land and air transport, mainly travel by off-road vehicles such as snowmobiles and on-road vehicles such as cars. This chapter provides a summary of the numbers and rates of all water-related fatalities for males and females. While many risk factors are pertinent only for specific subcategories of drowning by activity, this chapter does include an overview of risk factors that are pertinent for all drownings, excluding land and air transport which are discussed separately in part 7. Subcategories of drownings are discussed in greater detail in later sections of the report.

Boating continues to be the largest single source of drownings, followed by aquatic activities and falls into water. Toddlers of 1-4 years old and males from 15 to 75 and older are the main risk groups for drowning. Alcohol, often at very high levels, is associated with at least one-third of drownings. For victims where swimming status was known, non-swimmers and weak swimmers accounted for more than half of the total in both age groups 5-14 years and 15 and older. Weak swimmers and non-swimmers are frequent among victims of drowning during wading or playing in water, from falls into water, and during swimming. On the other hand about 10% of victims during swimming and wading were reported to be strong swimmers.

About 60% of both infants less than one-year old, toddlers between 1-4 years old, and 5-14 year-old victims were alone or with a minor when they drowned. For all ages combined, most victims of bathtub drowning and falls into water were alone at the time of the incident. Because infants and toddlers tend to drown during a momentary absence of a caregiver, there is a higher percentage of acute rescue and resuscitation for these age groups than for older victims. A significant proportion, up to one third, of children 1 to 14 who undergo an acute rescue do not receive CPR.

Rivers are the most frequent location of drownings in Quebec and British Columbia, lakes are most frequent in Ontario and the Prairies, and the ocean in the Atlantic region. These differences reflect the geography and activities in the regions. The Northwest Territories and Yukon had the highest drowning rates in 1999, followed by the Atlantic region and British Columbia. The lowest rate was in Ontario.

The relative importance of drowning as a cause of unintentional injury death varies greatly by age. According to Statistics Canada data for 1997, among 0 to 24 year olds, drowning ranked second and among 25-44 year olds it ranked third. Overall among all age groups, drowning was the fourth most frequent cause of unintentional injury death. The male to female ratio of victims is highest for snowmobiling and boating, ranging from about 10 to 20 to 1. The only category where female victims equal or even exceed males in number is bathtub drownings. For aquatic activities and falls into water, the male to female ratio is about 4 to 1.

Water-related injury fatalities other than drownings, such as trauma from boating collisions, diving into shallow water, and immersion hypothermia without drowning, are much less frequent than drownings. There are about 30 to 40 water-related injury fatalities other than drownings in Canada each year. Although the primary cause of death is not drowning, drowning may have complicated another injury. Most occur during boating, during aquatic activities such as diving or scuba diving, and from falls into water or through ice during non-aquatic activities, including land and air transport. Injuries sustained

included head or spinal injuries, internal injuries, air embolism and hypothermia. Contributing circumstances include alcohol consumption, collisions involving boats and personal watercraft, overloading of boats, and adverse weather and light conditions.

In the case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included as non-drownings. Cases of hypothermia that were reported by coroners to be associated with drowning were classified as drownings complicated by hypothermia, irrespective of whether drowning was listed as the primary or the secondary cause of death. These cases are so-called immersion deaths, and in usual practice it is not always feasible to assess the relative contributions of drowning and hypothermia.

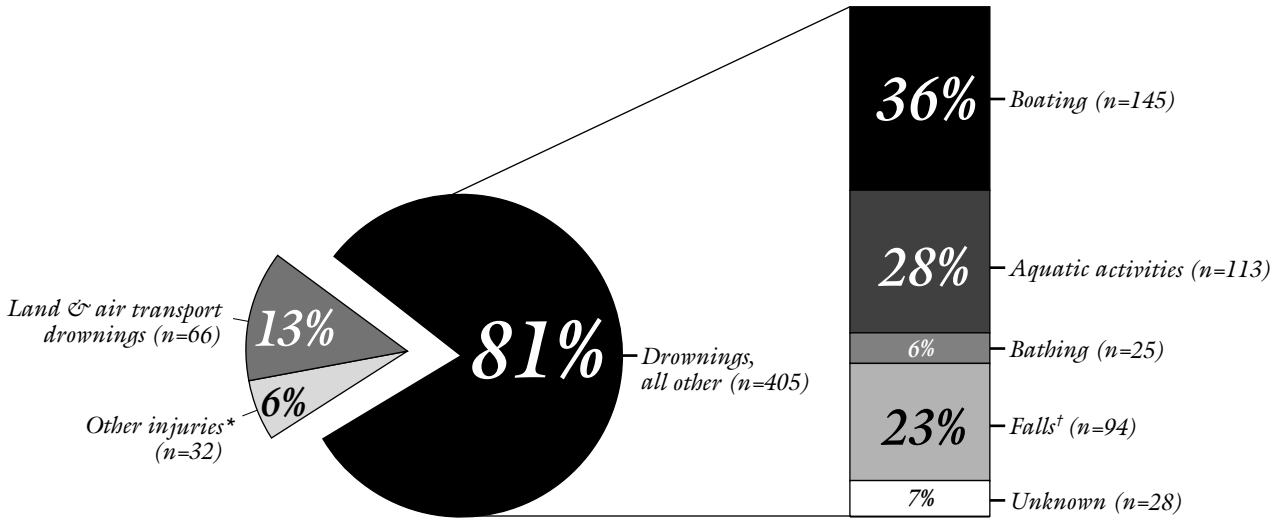
For more details about non-drowning fatalities, please refer to the sections at the end of each chapter and to the appropriate annexes.

Near drownings occur when a drowning victim is rapidly resuscitated and survives to reach hospital. There has been an average of less than one near drowning for every drowning in Canada during 1994-1999. Hence while the drowning rate has averaged about 1.5 per 100,000 population, the near drowning rate averaged 1.2. However, among infants, there are now about 15 times more near drownings than fatal drownings, and among toddlers 4 times more. The significant improvement in drowning rates in small children during 1995-1999 has not been observed for near drowning.

Near drownings are most frequent among children at home who fall into unprotected swimming pools or are left alone momentarily in the bath. Nevertheless, near drownings from boating incidents result in a much longer average duration of hospitalization; this may reflect greater delays before rescue and resuscitation of boaters. Some victims of near drowning are left with brain damage or die in the hospital.

The highest rates of near drowning are seen among toddlers, followed by infants and older children. While boating is infrequent as a source of near drowning among children, boating accounts for as many as half of all near drownings among older adults.

Figure 1.1 **WATER-RELATED DEATHS BY TYPE OF INJURY & ACTIVITY, CANADA 1999 (n=503)**



** Includes all injuries other than drownings*
† Falls into water during non-aquatic activities such as walking or playing near water or on ice

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Table 1.1 **SUMMARY OF NUMBERS, PERCENTS* AND RATIOS FOR WATER-RELATED FATALITIES BY SEX, CANADA 1999 (n=503)**

	MALE		FEMALE		TOTAL		MALE : FEMALE
	No.	%	No.	%	No.	%	RATIO
DROWNINGS (E910, E830, E832) (excludes land & air transport)	**331**	**81**	**74**	**80**	**405**	**81**	**4.5**
Boating	**133**	**40**	**12**	**16**	**145**	**36**	**11.1**
Recreational	110	83	12	100	122	84	9.2
♦ Small open powerboat† (≤5.5m)	38		3		41		12.7
♦ Canoe	16		0		16		—
♦ Other boat‡	56		9		65		6.2
Daily living	11	8	0	0	11	8	—
Occupational	9	7	0	0	9	6	—
Rescue	3	2	0	0	3	2	—
Other/unknown	0	0	0	0	0	0	—
Aquatic activities	**90**	**27**	**23**	**31**	**113**	**28**	**3.9**
Recreational	77	86	19	83	96	85	4.1
♦ Swimming	58		12		70		4.8
– Home swimming pool	2		0		2		—
– Other swimming pool	5		4		9		1.3
– Other body of water	51		8		59		6.4
♦ Playing/wading in water	6		2		8		3.0
♦ Other	13		5		18		2.6
Daily living	0	0	0	0	0	0	—
Occupational	3	3	0	0	3	3	—
Rescue	9	10	4	17	13	12	2.3
Other/unknown	1	1	0	0	1	1	—
Bathing in bathtub	**12**	**4**	**13**	**18**	**25**	**6**	**0.9**
Non-aquatic activities – falls into water	**74**	**22**	**20**	**27**	**94**	**23**	**3.7**
Recreational‡	50	68	16	80	66	70	3.1
♦ Swimming pool	7		4		11		1.8
♦ Other body of water‡	43		12		55		3.6
Daily living	19	26	1	5	20	21	19.0
♦ Walking near water or on ice	8		1		9		8.0
♦ Other	11		0		11		—
Occupational	3	4	1	5	4	4	3.0
Rescue	1	1	0	0	1	1	—
Other	0	0	0	0	0	0	—
Unknown	1	1	2	10	3	3	0.5
Unknown activities	**22**	**7**	**6**	**8**	**28**	**7**	**3.7**
LAND & AIR TRANSPORT DROWNINGS	**56**	**14**	**10**	**11**	**66**	**13**	**5.6**
On-road motor vehicle, on-road incident	28	50	10	100	38	58	2.8
On-road motor vehicle, off-road incident	7	13	0	0	7	11	—
Snowmobile§	17	30	0	0	17	26	—
All-terrain vehicle	0	0	0	0	0	0	—
Other off-road vehicle	2	4	0	0	2	3	—
Aircraft	2	4	0	0	2	3	—
NON-DROWNING FATALITIES¶	**24**	**6**	**8**	**9**	**32**	**6**	**3.0**
Boating	9	38	3	38	12	38	3.0
♦ Collision between boats**	2		0		2		—
♦ Collision of boat with fixed object††	0		1		1		—
♦ Collision, other‡‡	0		1		1		—
♦ Immersion hypothermia§§	5		1		6		5.0
♦ Propeller injury	0		0		0		—
♦ Fell out of boat¶¶	1		0		1		—
♦ Rope struck victim***	1		0		1		—
Scuba diving with air embolism	3	13	2	25	5	16	1.5
Diving into water with head or spinal injury	3	13	0	0	3	9	—
Diving into water, other/unspecified injury	0	0	0	0	0	0	—
Jumping into water	0	0	0	0	0	0	—
Other aquatic activity	0	0	0	0	0	0	—
Falls with physical injury	3	13	0	0	3	9	—
Land and air transport with physical injury	6	25	3	38	9	28	2.0
♦ Snowmobile, immersion hypothermia	3		2		5		1.5
♦ On-road vehicle, on-road incident	1		0		1		—
♦ ATV	1		0		1		—
♦ Aircrash	1		1		2		1.0
Other/Unknown	0	0	0	0	0	0	—
TOTAL	**411**	**82**	**92**	**18**	**503**	**100**	**4.5**

** Values in light shaded areas refer to dark shaded totals above; values in unshaded areas relate to light shaded areas above*

† Includes open outboard motorboats & other open powered boats such as inflatables; excludes personal watercraft

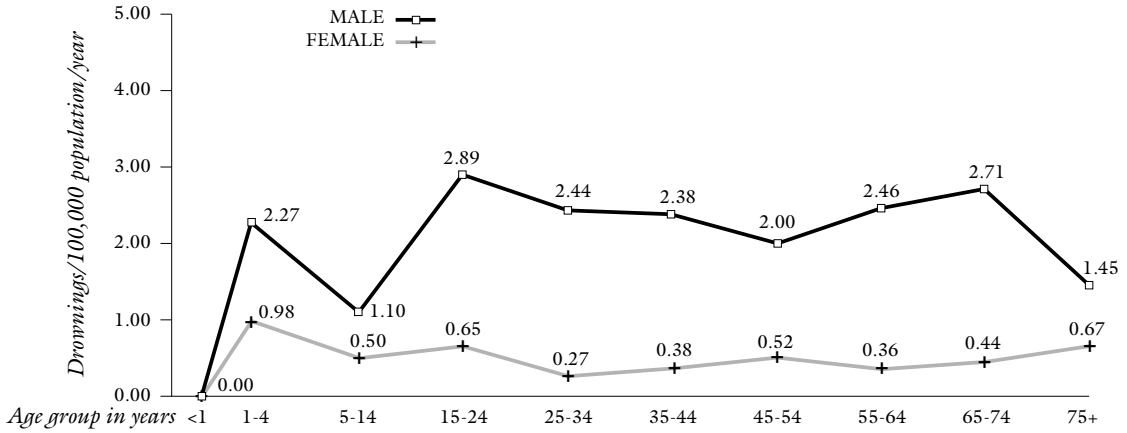
‡ Sex unknown for 1 victim, imputed male § 1 incident was on-road ¶ Primary cause of death was injury other than drowning, although drowning may have complicated another injury; in case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included here

*** Including large powerboat (>5.5m) 1, personal watercraft 1 †† Including personal watercraft 1 ‡‡ Including powerboat size unspecified 1*

*§§ Including small open powerboat (≤5.5m) 5, large powerboat (>5.5m) 1 ¶¶ Including non-powered inflatable 1 *** Including large powerboat (>5.5m) 1*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 1.2 **RATE AND NUMBER OF DROWNINGS* BY AGE & SEX, CANADA 1999 (n=405; 331 MALES & 74 FEMALES)†**



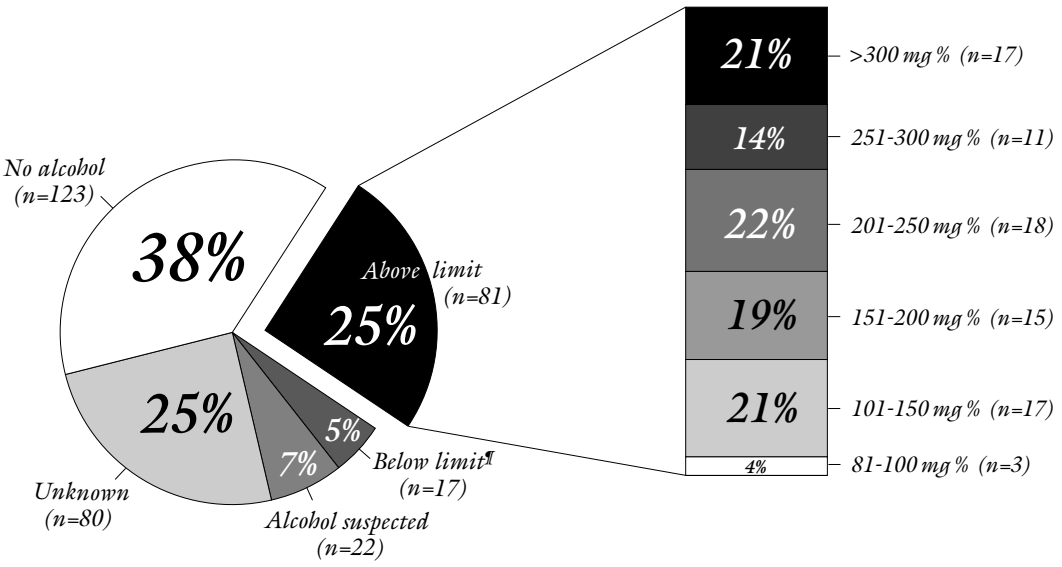
Number of drownings in age group

Male	0	17	23	61	55	63	42	33	27	9
Female	0	7	10	13	6	10	11	5	5	7

** Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings*
† Age unknown for 1 male victim; sex unknown for 2 victims, imputed male (2-year-old, 36-year-old)

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

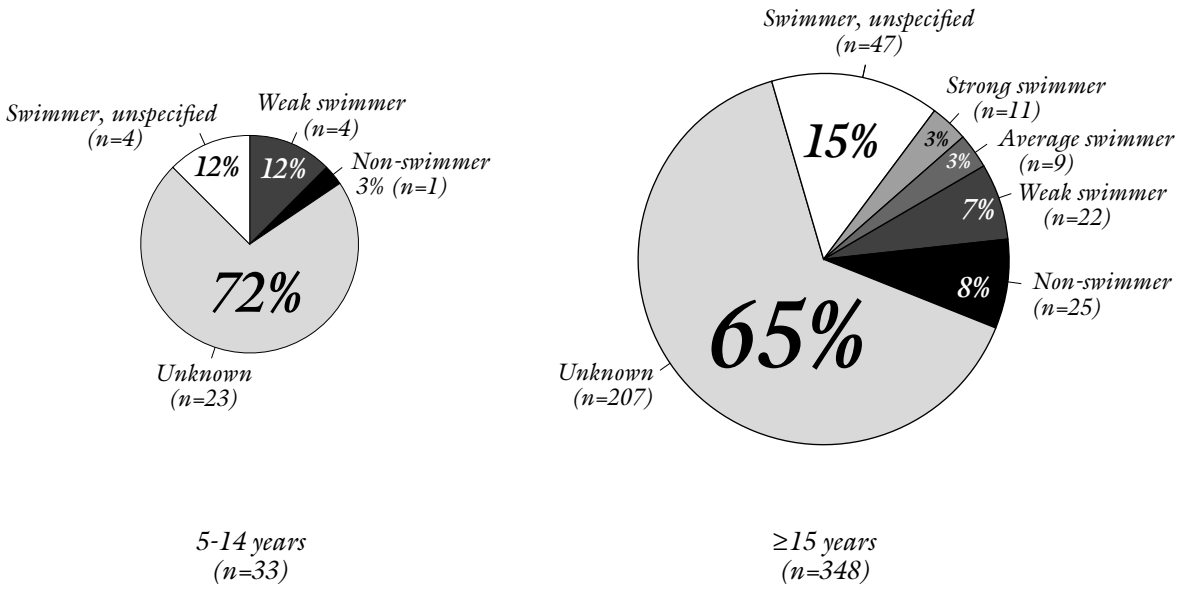
Figure 1.3 **BLOOD ALCOHOL LEVELS* FOR ALL DROWNINGS,† CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=348)‡§**



** Legal limit is 80 mg % † Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings ‡ This figure excludes 25 victims; decomposition rendered blood alcohol unreliable*
§ Age unknown for 1 victim, presumed adult ¶ 7 at 1-49 mg %, 10 at 50-80 mg %

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 1.4 **DROWNINGS* BY SWIMMING ABILITY BY AGE, CANADA 1999 (VICTIMS ≥5 YEARS OF AGE; n=381)†‡**



** Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings † Age unknown for 1 victim, presumed adult*
‡ This figure excludes 28 cases where swimming ability was considered irrelevant (5-14 years 1, ≥ 15 years 27)

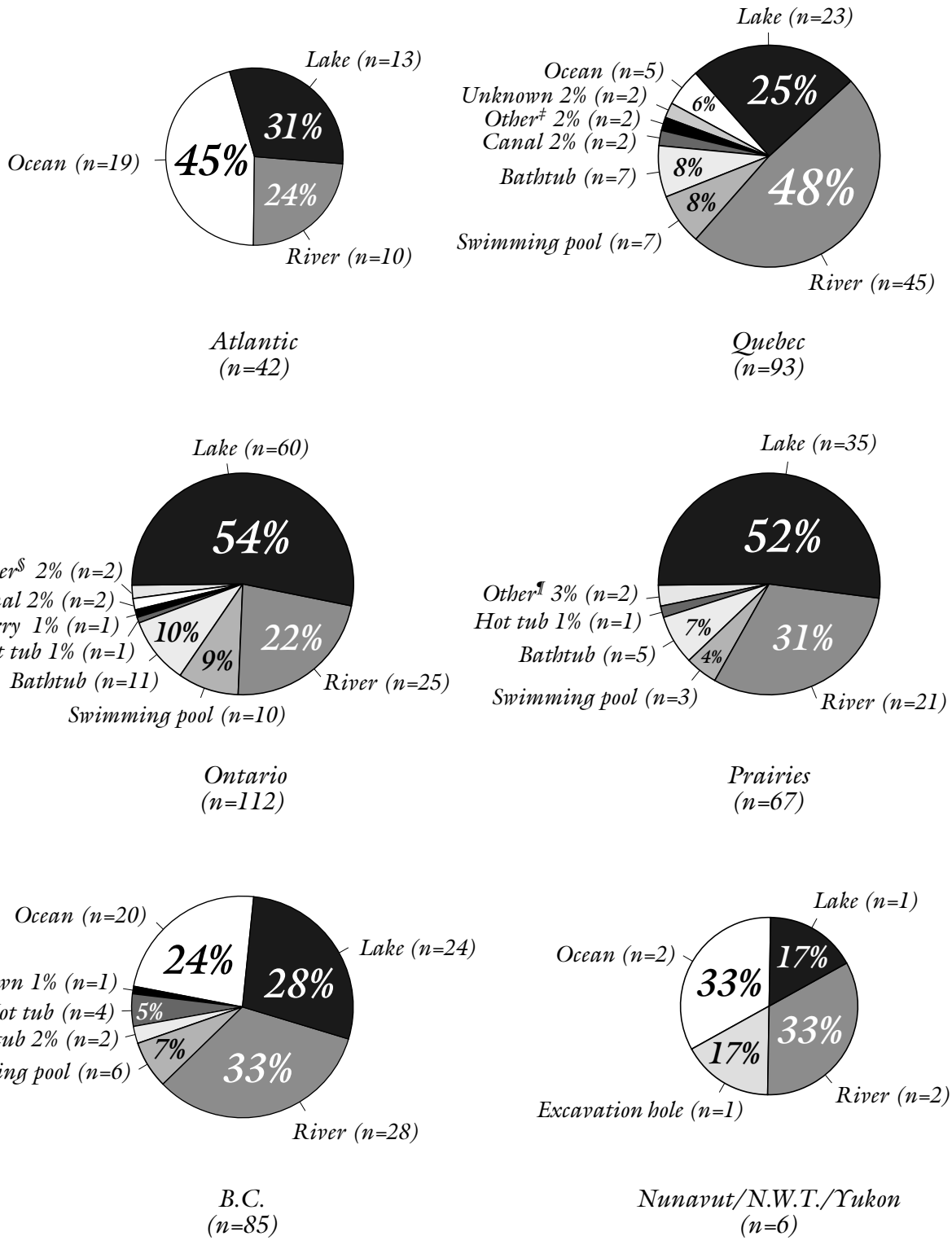
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Table 1.2 **DROWNINGS BY TYPE OF RECREATIONAL ACTIVITY AND BY SWIMMING ABILITY, CANADA 1999 (VICTIMS ≥5 YEARS OF AGE; n=262)**

	SWIMMING ABILITY						
ACTIVITY	Strong %	Average %	Weak %	Swimmer, unspecified * %	Non-swimmer %	Unknown/ irrelevant† %	Total %
Aquatic (n=96)	7	6	15	36	4	26	100
Swimming (n=70)	9	7	16	43	3	23	100
Playing/wading (n=8)	13	0	25	13	13	38	100
Other (n=18)	0	6	6	22	6	33	100
Boating (n=119)	2	2	5	5	9	77	100
Falls into water (n=47)‡	0	2	4	4	11	79	100

** Swimmer, level of ability unspecified † Irrelevant for 5 other aquatic victims ‡ Falls during walking, playing, etc.*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

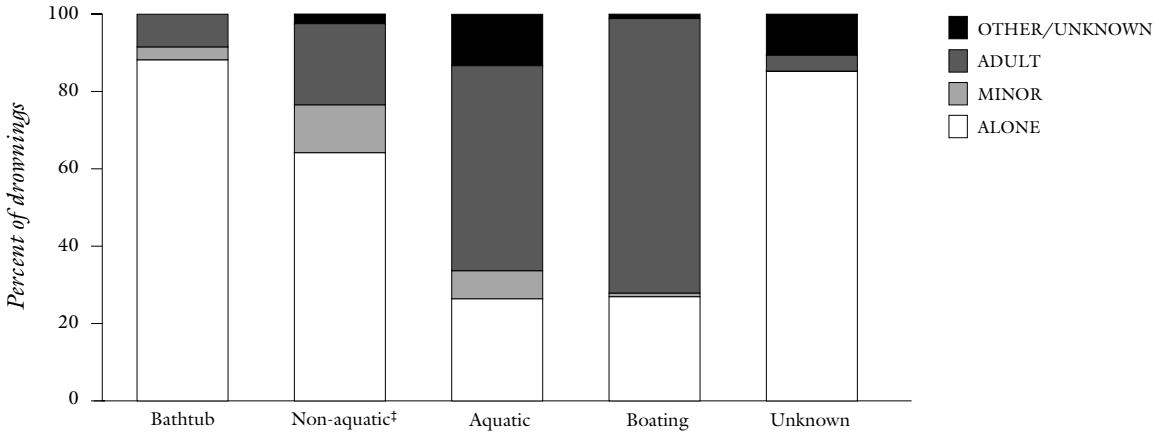
Figure 1.5 **DROWNINGS* BY REGION & TYPE OF BODY OF WATER,† CANADA 1999 (n=405)**



**Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings*
†"Lake" includes pond & reservoir ‡ Including ditch, rut
§Including dam, cattle watering trough ¶ Including dam, shallow well

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 1.6 **DROWNINGS* BY ACCOMPANYING PERSONS† AND ACTIVITY, CANADA 1999 (n=405)**

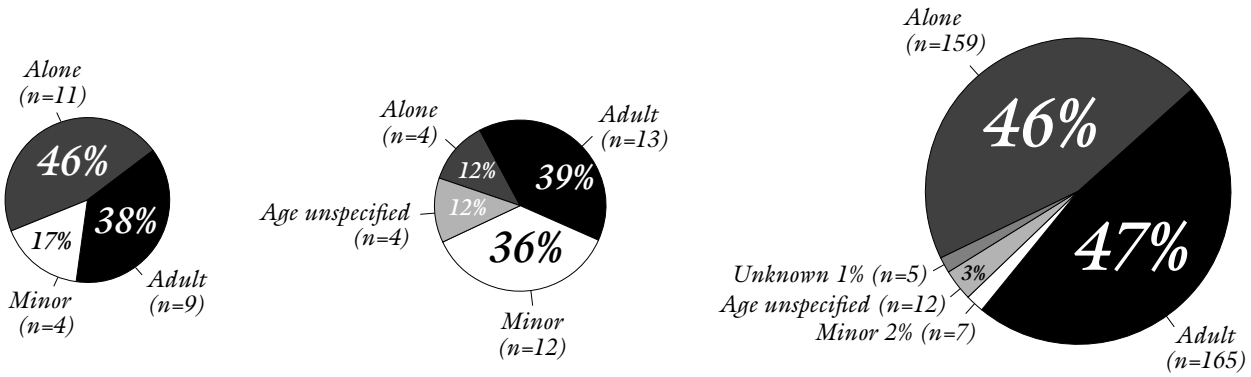


	Bathtub		Non-aquatic‡		Aquatic		Boating		Unknown	
	No.	%	No.	%	No.	%	No.	%	No.	%
Other/unknown	0	0	2	2	15	13	1	1	3	11
Adult	2	8	20	21	60	53	104	72	1	4
Minor	1	4	12	13	9	8	1	1	0	0
Alone	22	88	60	64	29	26	39	27	24	86

** Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings*
† "Adult" indicates that victim was accompanied by adult(s); does not exclude presence of minor(s) (<18 years);
"Minor" indicates presence of minor(s) only ‡ Falls into water

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 1.7 **DROWNINGS* BY AGE OF VICTIMS & ACCOMPANYING PERSONS,† CANADA 1999 (n=405)‡**

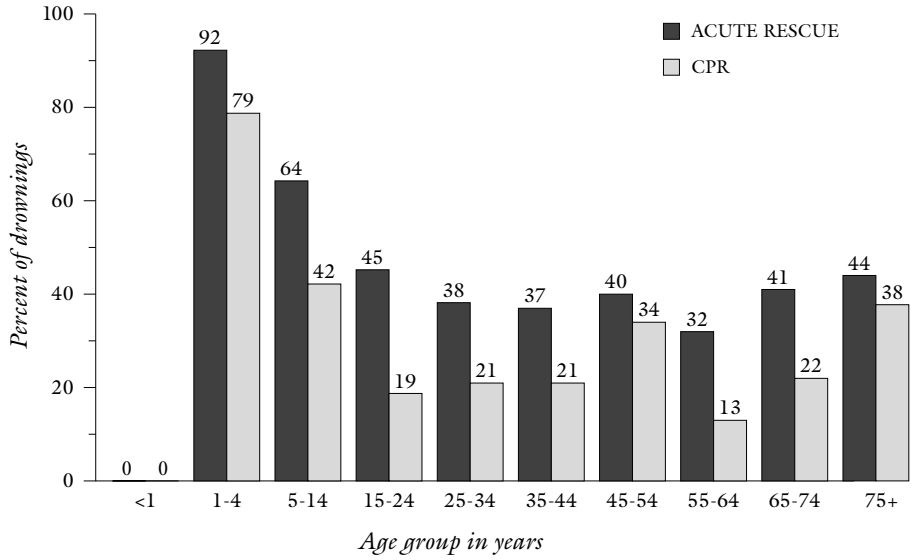


0-4 yrs§ (n=24) *5-14 yrs (n=33)* *≥15 yrs (n=348)*

** Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings*
† "Adult" indicates that victim was accompanied by adult(s); does not exclude presence of minor(s) (<18 years);
"Minor" indicates presence of minor(s) only ‡ Age unknown for 1 victim, presumed adult
§ There were no infant (<1 year) drownings in 1999

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

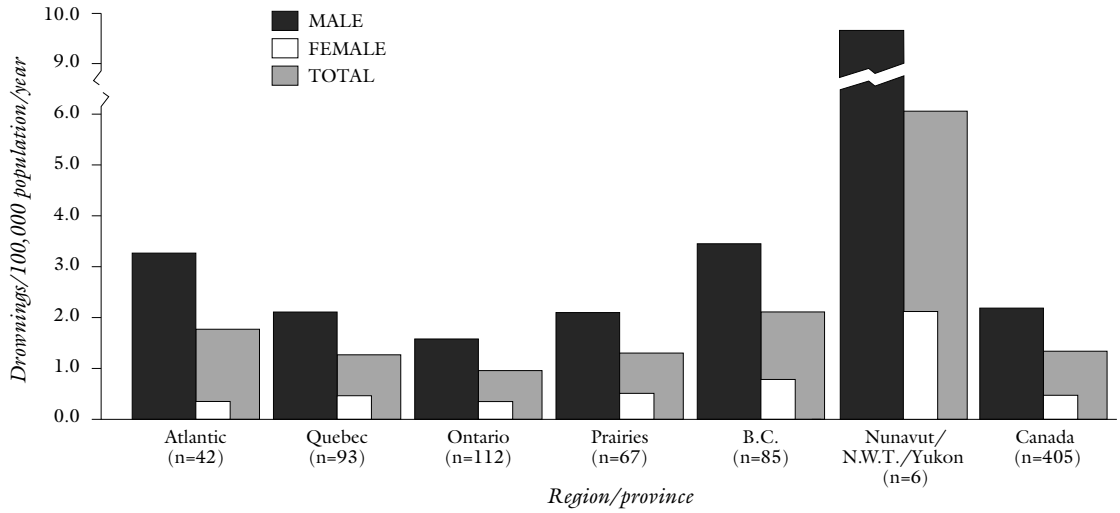
Figure 1.8 **PERCENT OF DROWNINGS* WITH ACUTE RESCUE† & WITH RESUSCITATION BY CPR‡ BY AGE, CANADA 1999 (n=405)§¶**



** Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings*
† For a potentially survivable victim; excludes extended body searches ‡ Cardiopulmonary resuscitation
§ Age unknown for 1 victim, presumed adult, without acute rescue or CPR ¶ There were no infant (<1 year) drownings in 1999

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 1.9 **RATE* OF DROWNINGS† BY SEX & REGION, CANADA 1999 (n=405)‡**

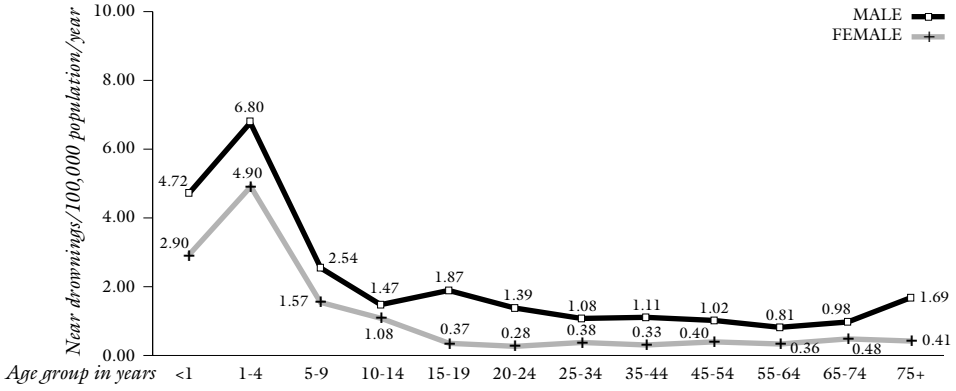


Male	3.25	2.10	1.57	2.10	3.45	9.68	2.19
Female	0.33	0.46	0.39	0.51	0.79	2.10	0.48
Total	1.77	1.27	0.97	1.30	2.11	6.04	1.33

** Rates shown are actual rates (unadjusted)*
† Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings
‡ Sex unknown for 2 victims, imputed male (Prairies 1, B.C. 1)

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 1.10 **RATE* AND NUMBER OF HOSPITALIZATIONS FOR NEAR DROWNINGS† BY AGE & SEX, CANADA 1994-1999 (n=1,777)‡**

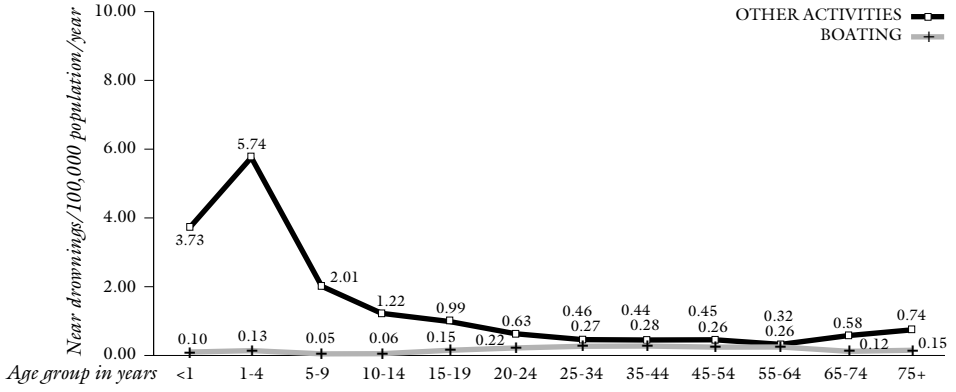


	Number of near drownings in age group												Total
1994-95 Male	5	57	26	15	16	20	29	32	19	17	5	7	248
1994-95 Female	5	39	14	8	8	4	13	6	4	3	2	3	109
1995-96 Male	13	68	33	14	24	15	23	40	21	8	11	8	278
1995-96 Female	2	44	11	13	5	2	6	11	7	1	7	2	111
1996-97 Male	8	54	20	24	19	15	23	25	17	11	11	12	239
1996-97 Female	2	43	15	12	3	2	11	10	13	2	4	7	124
1997-98 Male	9	43	26	14	15	8	18	7	17	6	10	8	181
1997-98 Female	10	35	18	7	2	0	8	4	5	5	6	6	106
1998-99 Male	11	54	26	9	23	13	36	35	22	9	10	12	260
1998-99 Female	8	28	19	13	0	6	7	10	9	12	8	1	121

** Rates are an average for the 4-year period; population denominators from the 1996 census*
† Includes survivors but not in-hospital deaths, of which there were 51 in 1994-95, 35 in 1995-96, 53 in 1996-97, 33 in 1997-98, & 45 in 1998-99
‡ Data are by fiscal year, April 1 to March 31

Source: Adapted from unpublished data provided by Canadian Institute for Health Information, 2001

Figure 1.11 **RATE* AND NUMBER OF HOSPITALIZATIONS FOR NEAR DROWNINGS† BY ACTIVITY & AGE, CANADA 1994-1999 (n=1,777)‡**

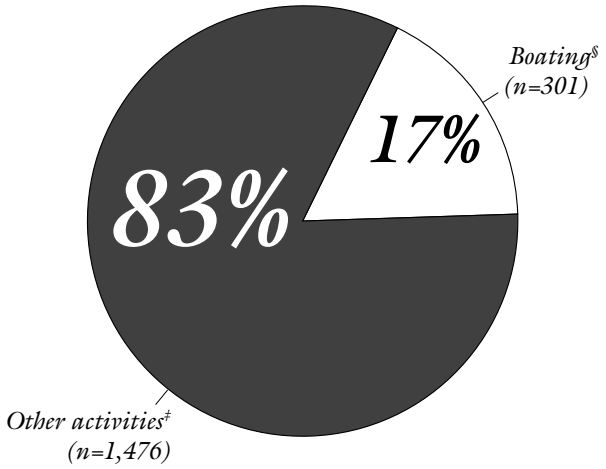


	Number of near drownings in age group												Total
1994-95 Other activities	8	95	39	22	22	19	25	22	17	10	6	6	291
1994-95 Boating	2	1	1	1	2	5	17	16	6	10	1	4	66
1995-96 Other activities	15	109	42	26	24	13	22	34	18	2	16	10	331
1995-96 Boating	0	3	2	1	5	4	7	17	10	7	2	0	58
1996-97 Other activities	10	96	34	33	19	11	21	18	18	7	11	15	293
1996-97 Boating	0	1	1	3	3	6	13	17	12	6	4	4	70
1997-98 Other activities	19	73	44	21	14	8	11	9	11	9	12	12	243
1997-98 Boating	0	5	0	0	3	0	15	2	11	2	4	2	44
1998-99 Other activities	19	82	44	21	21	12	30	27	21	13	16	12	318
1998-99 Boating	0	0	1	1	2	7	13	18	10	8	2	1	63

** Rates are an average for the 4-year period; population denominators from the 1996 census*
† Includes survivors but not in-hospital deaths, of which there were 51 in 1994-95, 35 in 1995-96, 53 in 1996-97, 33 in 1997-98, & 45 in 1998-99
‡ Data are by fiscal year, April 1 to March 31

Source: Adapted from unpublished data provided by Canadian Institute for Health Information, 2001

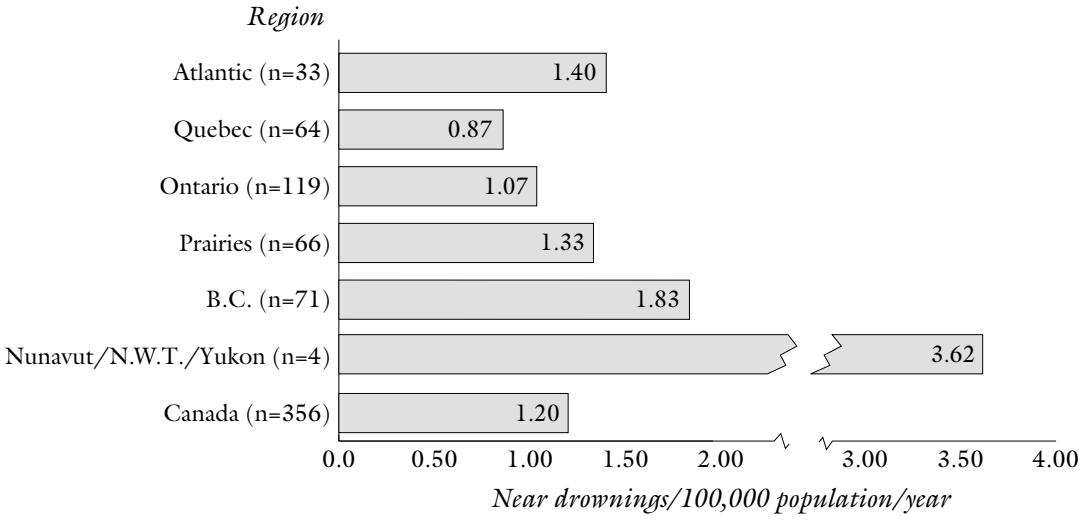
Figure 1.12 **PROPORTION OF HOSPITALIZATIONS FOR NEAR DROWNINGS* BY ACTIVITY, CANADA 1994-1999 (n=1,777)†**



** Includes survivors but not in-hospital deaths, of which there were 51 in 1994-95, 35 in 1995-96, 53 in 1996-97, 33 in 1997-98, & 45 in 1998-99*
† Data are by fiscal year, April 1 to March 31 ‡ E910 § E830, E832

Source: Adapted from unpublished data provided by Canadian Institute for Health Information, 2001

Figure 1.13 **RATE* OF HOSPITALIZATION FOR NEAR DROWNINGS† BY REGION, CANADA 1994-1999 (n=356)‡**



** Rates and numbers are an average for the 6-year period; population denominators from the 1996 census*
† Includes survivors but not in-hospital deaths, of which there were 51 in 1994-95, 35 in 1995-96, 53 in 1996-97, 33 in 1997-98, & 45 in 1998-99
‡ Data are by fiscal year, April 1 to March 31

Source: Adapted from unpublished data provided by Canadian Institute for Health Information, 2001

Table 1.3 **MULTIPLE-VICTIM INCIDENTS AS A PROPORTION* OF ALL DROWNING INCIDENTS,† WITH INCIDENCE RATES‡ BY ACTIVITY, CANADA 1999 (n=446)**

	Single-victim	Multiple-victim					All incidents	
Activity	Incidents No.	Incidents No.	%	Victims No.	%	Avg. no. deaths per incident	Multiple-victim incidents as % of all incidents	No.	Rate‡
Boating§	96	17	46	49	55	2.9	15	113	0.37
Aquatic¶	96	10	27	17	19	1.7	9	106	0.35
Non-aquatic¶	85	6	16	9	10	1.5	7	91	0.30
Unknown	28	0		0			0	28	0.09
On-road vehicle, on-road incident	25	6	16	13	15	2.2	19	31	0.10
On-road vehicle, off-road incident	7	0	0	0	0	—	0	7	0.02
Snowmobile**	16	1	3	1	1	1.0	6	17	0.06
All-terrain vehicle	0	0	0	0	0	—	0	0	0.00
Other off-road vehicle	2	0	0	0	0	—	0	2	0.01
Aircraft	2	0	0	0	0	—	0	2	0.01
Total	357	37	100	89	100	2.4	20	394	1.29

** Percents total to 100% vertically in 3rd and 5th columns of figures and do not total for 7th column*
† Excludes drownings in bathtubs, where there were no multiple-victim incidents
‡ Number of both single and multiple-victim incidents per 100,000 population per year
§ Including 1 multiple-victim incident with 4 drowning & 1 non-drowning injury death
¶ Including 3 multiple-victim incidents with 1 aquatic drowning & 1 non-aquatic drowning, each counted once in total
*** Including 1 multiple-victim incident with 1 drowning & 2 non-drowning injury deaths*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Table 1.4 **DROWNINGS* AS A CAUSE OF UNINTENTIONAL INJURY DEATH BY RANK,† BY AGE & SEX, CANADA 1997‡**

	RANK		
AGE GROUP IN YEARS	Males	Females	Both sexes
0-14	2	2	2
15-24	2	2	2
25-44	3	5	3
45-64	4	6	4
65-74	6	6	5
75+	6	6	6
All ages	4	6	4

** Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings*
† Causes ranked include most frequent categories of unintentional injuries; excludes "other" unintentional injuries (see Table 1.5)
‡ More recent data is unavailable at this time

Source: Causes of death during 1997, Statistics Canada

Table 1.5 **WATER-RELATED INJURY FATALITIES OTHER THAN DROWNINGS,* CANADA 1999 (n=32)**

Activity/incident	Nature of Injury	No.	%†
All activities other than land & air transport		**23**	**72**
Boating		**12**	**38**
Collision			
Boat with another boat‡	Head injury	2	
Boat with fixed object§	Head injury	1	
Immersion in cold water¶	Hypothermia	6	
Fell out of boat**	Head injury	1	
Struck by boat††	Head & cervical spine injury	1	
Struck by rope‡‡	Head injury	1	
Aquatic		**8**	**25**
Scuba diving	Air embolism	5	
Diving into water	Head injury	3	
Non-aquatic		**3**	**9**
Walking/playing near water/on ice	Hypothermia	1	
	Head injury	2	
Land & air transport		**9**	**28**
Snowmobile travelling on ocean	Hypothermia	1	
Snowmobile travelling on lake	Hypothermia	4	
Car/truck went off road	Head injury	1	
All-terrain vehicle went through ice	Hypothermia	1	
Helicopter crash	Head injury	1	
Float plane crash	Spinal injury	1	
Total		**32**	**100**

** Primary cause of death was injury other than drowning, although drowning may have complicated another injury; in case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included here*
† Values in light shaded areas refer to dark shaded totals above; values in unshaded areas relate to light shaded areas above
‡ Including large powerboat (>5.5m) 1, personal watercraft 1 § Included personal watercraft 1
*¶ Including small open powerboat (≤5.5m) 5, large powerboat (>5.5m) 1 ** Including unpowered inflatable 1*
†† Including powerboat, size unspecified 1 ‡‡ Including large powerboat (<5.5m) 1

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Table 1.6 **NUMBER AND RATE* OF INJURY FATALITIES BY CAUSE OF DEATH, BY AGE & SEX, CANADA 1997† (n=8,369)‡**

MALES	0-14		15-24		25-44		45-64		65-74		75+		Total	
TYPE OF INJURY	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Unintentional injuries	**265**	**8.6**	**819**	**1.4**	**1,581**	**32.2**	**975**	**30.1**	**480**	**49.4**	**1,059**	**182.9**	**5,179**	**34.9**
Road traffic & bicycle	124	4.0	567	27.4	737	15.0	359	11.1	160	16.4	150	25.9	2,097	14.1
Falls	10	0.3	35	1.7	78	1.6	130	4.0	129	13.2	701	121.1	1,083	7.3
Poisoning	3	0.1	30	1.4	318	6.4	135	4.2	17	1.7	14	2.4	517	3.5
Boating drownings (E830, E832)	**0**	—	**18**	**0.9**	**35**	**0.7**	**22**	**0.7**	**11**	**1.1**	**1**	**0.2**	**87**	**0.6**
Non-boating drownings (E910)	**37**	**1.2**	**40**	**1.9**	**80**	**1.6**	**39**	**1.2**	**15**	**1.5**	**11**	**1.9**	**222**	**1.5**
All other drownings§	*1*	*0.0*	*15*	*0.7*	*34*	*0.7*	*15*	*0.5*	*7*	*0.7*	*5*	*0.9*	*77*	*0.5*
Fire & burns	18	0.6	15	0.7	51	1.0	48	1.5	28	2.9	23	4.0	183	1.2
Suffocation	29	0.9	20	1.0	43	0.9	38	1.2	33	3.4	71	12.3	234	1.6
All others	44	1.4	94	4.5	239	4.9	204	6.3	87	9.0	88	15.2	756	5.1
Intentional injuries	**65**	**2.1**	**536**	**25.3**	**1,384**	**27.5**	**917**	**27.4**	**227**	**22.2**	**171**	**28.7**	**3,300**	**21.6**
All suicide	39	1.3	464	22.4	1,228	25.0	826	25.5	201	20.6	156	26.9	2,914	19.6
Suicide by drowning	**0**	—	**12**	**0.6**	**33**	**0.7**	**31**	**1.0**	**11**	**1.1**	**5**	**0.9**	**92**	**0.6**
All homicide	26	0.8	60	2.9	123	2.5	60	1.9	15	1.5	10	1.7	294	2.0
Homicide by drowning	**2**	**0.1**	**0**	—	**0**	—	**1**	**0.0**	**0**	—	**0**	—	**3**	**0.0**
Injuries, intent undetermined	**7**	**0.2**	**15**	**0.7**	**104**	**2.1**	**63**	**1.9**	**13**	**1.3**	**9**	**1.6**	**211**	**1.4**
Drownings, intent undetermined	**0**	—	**0**	—	**13**	**0.3**	**9**	**0.3**	**2**	**0.2**	**0**	—	**24**	**0.2**

FEMALES	0-14		15-24		25-44		45-64		65-74		75+		Total	
TYPE OF INJURY	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Unintentional injuries	**161**	**5.5**	**270**	**13.7**	**400**	**8.2**	**378**	**11.5**	**311**	**27.4**	**1,669**	**171.6**	**3,190**	**21.1**
Road traffic & bicycle	80	2.7	228	11.5	218	4.5	195	5.9	104	9.2	120	12.3	945	6.2
Falls¶	1	0.0	4	0.2	15	0.3	42	1.3	137	12.1	1,339	137.7	1,539	10.2
Poisoning	5	0.2	9	0.5	94	1.9	51	1.6	12	1.1	15	1.5	186	1.2
Boating drownings (E830, E832)	**3**	**0.1**	**4**	**0.2**	**1**	**0.0**	**2**	**0.1**	**0**	—	**0**	—	**10**	**0.1**
Non-boating drownings (E910)	**23**	**0.8**	**5**	**0.3**	**11**	**0.2**	**11**	**0.3**	**3**	**0.3**	**8**	**0.8**	**61**	**0.4**
All other drownings§	*1*	*0.0*	*6*	*0.3*	*8*	*0.2*	*10*	*0.3*	*4*	*0.4*	*1*	*0.1*	*30*	*0.2*
Fire & burns	11	0.4	3	0.2	22	0.5	24	0.7	16	1.4	36	3.7	112	0.7
Suffocation	20	0.7	3	0.2	8	0.2	21	0.6	21	1.9	72	7.4	145	1.0
All others	18	0.6	14	0.7	31	0.6	32	1.0	18	1.6	79	8.1	192	1.3
Intentional injuries	**32**	**1.1**	**112**	**5.6**	**392**	**7.9**	**299**	**8.5**	**61**	**5.0**	**56**	**5.3**	**952**	**6.0**
All suicide	12	0.4	90	4.6	321	6.6	249	7.9	53	4.7	42	4.3	767	5.1
Suicide by drowning	**0**	—	**2**	**0.1**	**10**	**0.2**	**19**	**0.6**	**4**	**0.4**	**4**	**0.4**	**39**	**0.3**
All homicide	20	0.7	20	1.0	61	1.3	31	0.9	4	0.4	10	1.0	146	1.0
Homicide by drowning	**0**	—	**0**	—	**0**	—	**0**	—	**0**	—	**0**	—	**0**	—
Injuries, intent undetermined	**6**	**0.2**	**5**	**0.3**	**39**	**0.8**	**26**	**0.8**	**11**	**1.0**	**4**	**0.4**	**91**	**0.6**
Drownings, intent undetermined	**0**	—	**0**	—	**1**	**0.0**	**2**	**0.1**	**2**	**0.2**	**1**	**0.1**	**6**	**0.0**

** Number of deaths per 100,000 population per year † More recent data is unavailable at this time ‡ Excludes misadventures to patients during surgical care (E870-E876), complications of medical procedures (E878-E879), substances causing adverse effects in therapeutic use (E930) § Includes cases such as motor vehicle incidents, including on-road and off-road motor vehicle drownings which have been identified using N code 994.1; these deaths may also be counted under the E code for motor vehicle injuries, therefore they have not been included in the total of unintentional injuries; however in order to obtain the true death rate from all drownings these deaths would be included in the total, as they are in the remainder of the report ¶ Age was unspecified for 1 fall victim*

Source: Causes of death during 1997, Statistics Canada

PART 2

DROWNINGS & OTHER WATER-RELATED INJURY FATALITIES DURING BOATING

DROWNINGS DURING BOATING

Boating drownings are the most important category of drownings in Canada. Boating tends to account for about 40% of all drownings and 45% of drownings during recreational activities, excluding land and air transport. This represents between 150 and 200 Canadians each year, and 1675 deaths during 1991-1999. If this many people died in an air crash, there would be an extensive investigation Among aboriginals, many of whom use boats for daily transport, boating represents close to 50% of all drownings. Aboriginals constitute a significant proportion of boating drowning victims, and they are greatly overrepresented among all victims on the basis of their population. You will find more information on drowning among aboriginal peoples in Part 6.

There are significant differences in the relative importance of boating drownings by sex, since during 1991-1997, boating accounted for about 45% of all drownings among males and only about 10% among females. However, in 1998, 23% of drownings among females occurred during boating. In 1999, 40% of drownings among males occurred during boating, and for females, 16%. Boating is generally rare as a cause of drowning among children 0-14 years old, although in 1999 seven children less than 15 years old drowned during boating. On the other hand, for persons of 15 and older, boating accounts for about 50% of all drownings for males and 25% for females.

The rate of boating drownings in Canada has been high with respect to the United States and certain European countries, similar to rates in Sweden and Australia, and substantially lower than in other Scandinavian countries, as evidenced in data for 1988-1992 (The Canadian Red Cross Society, 1994a). Rates in Canada were nearly double those in the United States, about 4 times higher than in Scotland, 7 times higher than in England, and 12 times higher than in France. On the other hand, rates in Finland and Norway were about 4 or more times greater than rates in Canada. In Canada, vital statistics data appear to undercount up to about 33-43% of boating drownings (Codes E830 & E832), because of misclassification of many boating drownings as non-boating drownings (Code E910) (The Canadian Red Cross Society, 1994a).

A single multiple-victim incident, such as the loss of a ferry boat or large fishing vessel, can exaggerate the usual national rate and cause marked fluctuation of rates. Hence, to facilitate the interpretation of trends, rates are included in this report by individual deaths and also by incident.

Recreational boating is the major source of boating drownings, followed by occupational boating and travel by boat as part of daily or subsistence living. *While there are some common risk factors for recreational, occupational, and daily living boating, there are also significant differences.*

For the purposes of this report, recreational, daily living, and occupational boating are defined as follows:

- *Recreational boating* is boating for leisure and sporting activities. This includes predominantly recreational fishing and travel in powerboats and canoes for pleasure and as part of other recreational activities.

- *Daily living boating* is boat travel as part of normal daily life by people who use boats for transport to and from their home. It also includes boating for subsistence hunting and fishing. Most daily living boating incidents involve aboriginal peoples who use a boat for daily travel and for hunting and fishing for food rather than cash profit. Daily living boating does not include use of boats at cottages during holidays.
- *Occupational boating* is use of a boat that generates revenue. This includes commercial fishing, trapping, aquaculture, guiding or other paid activities. Occupational boating can be as a member of a paid crew or self-employment.

Since *small open powerboats* <5.5 metres long and *canoes* account for most recreational boating drownings, data are provided in greater detail for these high-risk boaters. Most frequent drowning incidents involving these boats are capsizing, swamping, and falls into water that potentially affect all occupants of the boat, and alcohol consumption which is as unwise for passengers as for operators.

Canoeing victims tend to be younger than powerboaters, with the highest drowning rate for canoeists among 15-24 year olds and for powerboaters among 15 to 75+ year olds. Small powerboat drownings rates are high at all ages, with a trend to the highest rates among middle-aged and elderly males. Alcohol is associated with about 25% of drowning in small powerboats and canoes; the frequency of alcohol associated with boating drownings has decreased during 1991-1999.

Non-wearing of a flotation device continues to be associated with the vast majority of drownings in these small boats, even among non-swimmers and weak swimmers. Between 1991 and 1999, the proportion of victims wearing a flotation device has remained very low, at 10%. Hence 90% of boating victims did not wear a flotation device, and only about 30% had consumed alcohol. Boaters who drown during occupational activities rarely were wearing a flotation device and rarely consumed alcohol.

While staying with the boat is often recommended when a boater finds themselves in the water, this is not always possible. When a lone boater falls in, the boat (with the unworn flotation device in it) sometimes continues on alone or runs about in circles. In some cases where immediate rescue is not feasible water and wind are so cold that fine muscles lose function and the boater is unable to find and put on their flotation device nor to hang on to the boat for long. In comparing data for survivors and victims, it is apparent that in both groups more than half attempted to swim to shore. No dogmatic advice can be given to support either strategy in all situations. The well-informed boater will be in the best position to decide on the most appropriate strategy for a specific situation pending on his/er assessment of the situation (e.g. very cold water, distance to shore, rescue is not likely to arrive soon, etc.).

As for other injuries, fatal incidents often result from a combination of more than one risk factor. Other frequent risk factors include cold, wind, waves, and darkness. Extremely cold water below 10 degrees is a frequent risk factor in recreational boating drownings, very frequent in daily living drownings, and present in almost all occupational drownings. Although the summer months are most popular for boating, many fatal incidents occur during spring and fall. Lakes are by far the most frequent type of body of water for recreational boating drownings; however, in Quebec and British Columbia rivers are also important, and in the Atlantic region and British Columbia oceans are another frequent source of drownings.

An acute rescue for a potentially salvageable victim occurred in only 30% of boating drownings. The fact that so few boaters wear a flotation device that would keep them alive in the water together with the fact that immediate rescue is often not feasible make for a deadly combination.

During 1991-1999, recreational and daily living boating drowning rates in coastal provinces have averaged about twice those in inland provinces, and rates in northern territories have averaged about 20 times higher. Occupational drowning rates are about three times higher in the Atlantic region and the northern territories than in British Columbia, and about 20 times higher than in the inland provinces.

OTHER INJURY FATALITIES DURING BOATING

Boating fatalities other than drownings killed about 15 Canadians per year during 1991-1999. They fall into two major categories, including:

* Collisions, propeller wounds, & crushing injuries with blunt or lacerating trauma
* Immersion hypothermia without drowning

Boating collisions may involve another boat or a fixed object such as a log, rock, or dock. Waterskiers or persons being towed on tubes and other devices can collide with a fixed object or be struck by a propeller. Boaters and bystanders who fall in and swimmers are also at risk of propeller injuries, since most motors are still not equipped with a propeller guard.

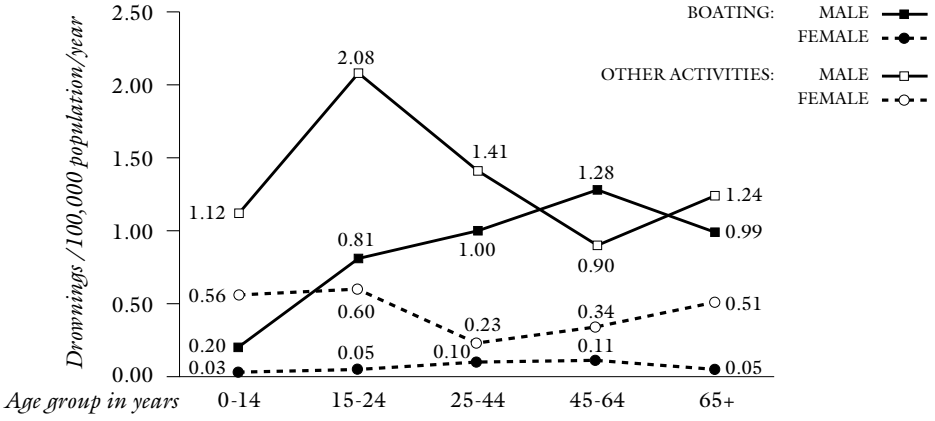
In some of these incidents, drowning is also a factor in the death, but is assessed to be secondary to other injuries, often severe head trauma. While small open powerboats and canoes are the most frequent types of boats associated with boating drownings, this is not the case with fatal traumatic injuries. Boats involved in fatal collisions tend to be either large powerboats more than 5.5 metres long or personal watercraft.

Alcohol and darkness are involved in more than 50% of boating collisions. Thus boating collisions have about twice as frequent an involvement of alcohol as boating drowning incidents. Collisions also occur about twice as frequently in darkness as drowning incidents.

For more information about water-related fatalities during boating in Canada, the reader may wish to consult the Special Research Reports: *Drowning Among Recreational Boaters in Canada* and *Drowning & Other Injury Fatalities during Boating*. Other details are included in the *Comprehensive Surveillance Report: National Drowning Report* and the annual *Visual Surveillance Reports* (The Canadian Red Cross Society, 1994a, 1994c, 1996, 1997b, 1998, 1999, 2000).

OVERVIEW OF BOATING DROWNINGS

Figure 2.1 **RATE AND NUMBER OF BOATING DROWNINGS* & ALL OTHER DROWNINGS† BY AGE & SEX, CANADA 1999 (n=405; 145 BOATING, 260 OTHER ACTIVITIES)‡**



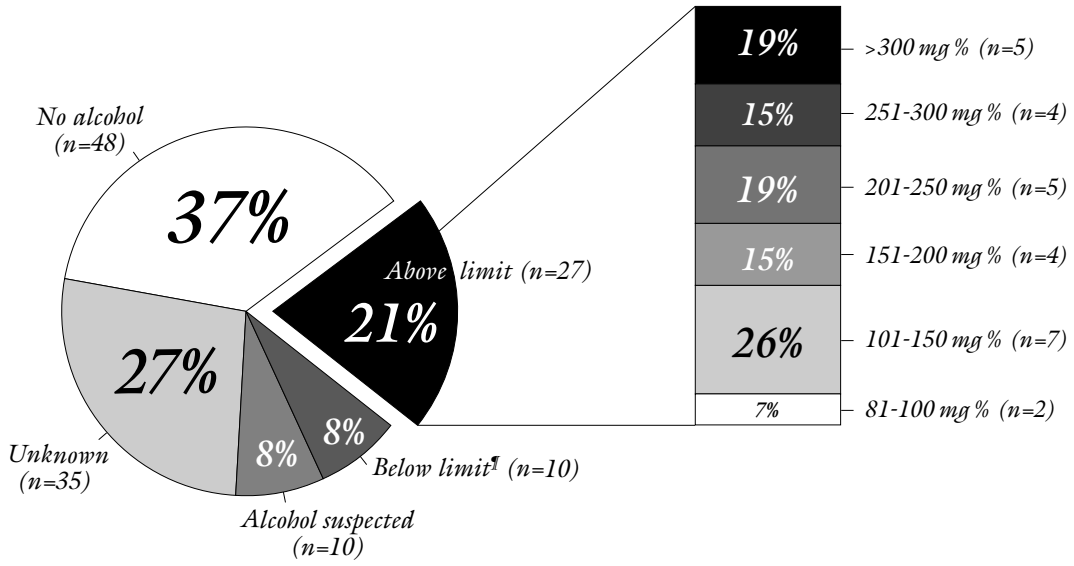
Number of drownings in age group

Boating, male	6	17	49	44	16
Boating, female	1	1	5	4	1
Other activities, male	34	44	69	31	20
Other activities, female	16	12	11	12	11

** Includes recreational, occupational, daily living & other boating drownings (E830 & E832)*
† Includes aquatic & non-aquatic drownings (E910); excludes land & air transport drownings
‡ Age unknown for 1 male victim, presumed adult, boating;
sex unknown for 2 victims, imputed male: 36-year-old, boating and 2-year-old, other activities

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

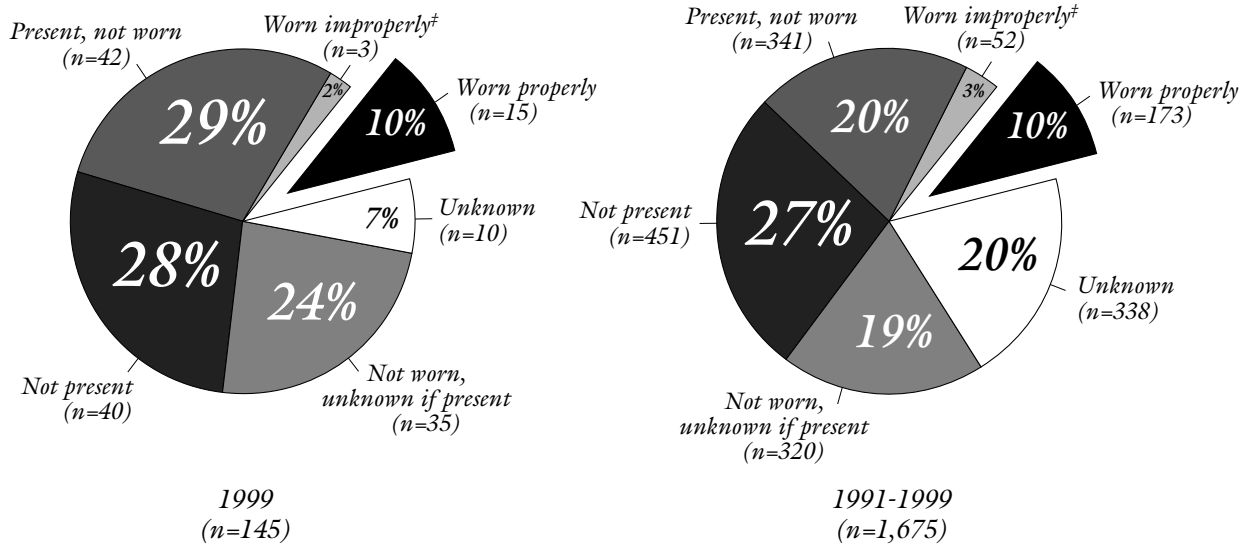
Figure 2.2 **BLOOD ALCOHOL LEVELS* FOR ALL BOATING DROWNINGS,† CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=138)‡§**



** Legal limit is 80 mg % † Includes recreational, occupational, daily living & other boating drownings (E830 & E832)*
‡ This figure excludes 8 victims; decomposition rendered blood alcohol unreliable § Age unknown for 1 male victim, presumed adult
¶ 4 at 1-49 mg %, 6 at 50-80 mg %

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

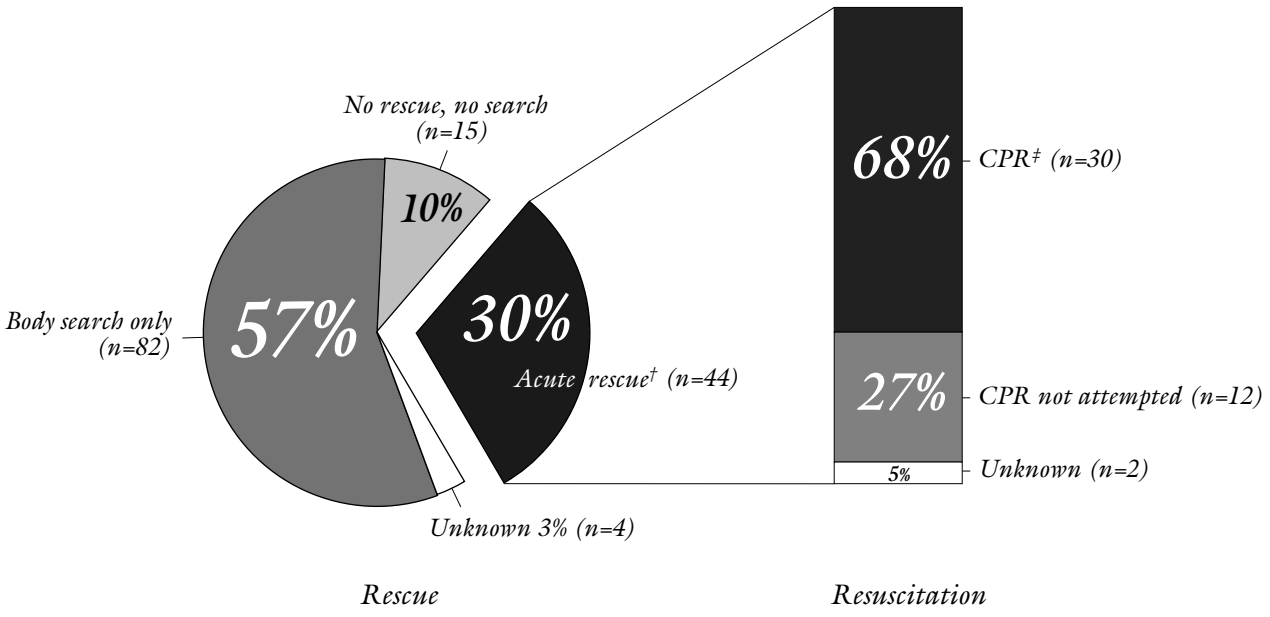
Figure 2.3 **BOATING DROWNINGS* BY USE OF A FLOTATION DEVICE,† CANADA 1999 (n=145) AND 1991-1999 (n=1,675)**



** Includes recreational, occupational, daily living & other boating drownings (E830 & E832)*
† Personal flotation device or lifejacket ‡ Not fastened or inappropriate size

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.4 **BOATING DROWNINGS* BY RESCUE & RESUSCITATION, CANADA 1999 (n=145)**

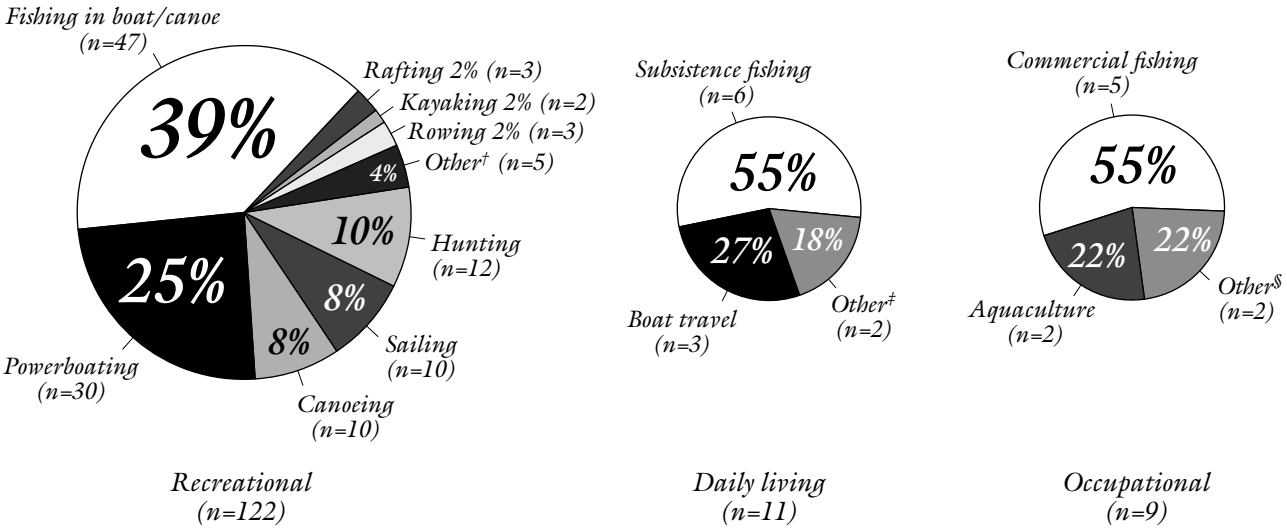


** Includes recreational, occupational, daily living & other boating drownings (E830 & E832)*
† Including 28 cases with acute rescue for a potentially survivable victim & 16 with acute rescue followed by an extended body search
‡ Cardiopulmonary resuscitation

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

BOATING DROWNINGS BY PURPOSE OF ACTIVITY: RECREATIONAL, DAILY LIVING & OCCUPATIONAL

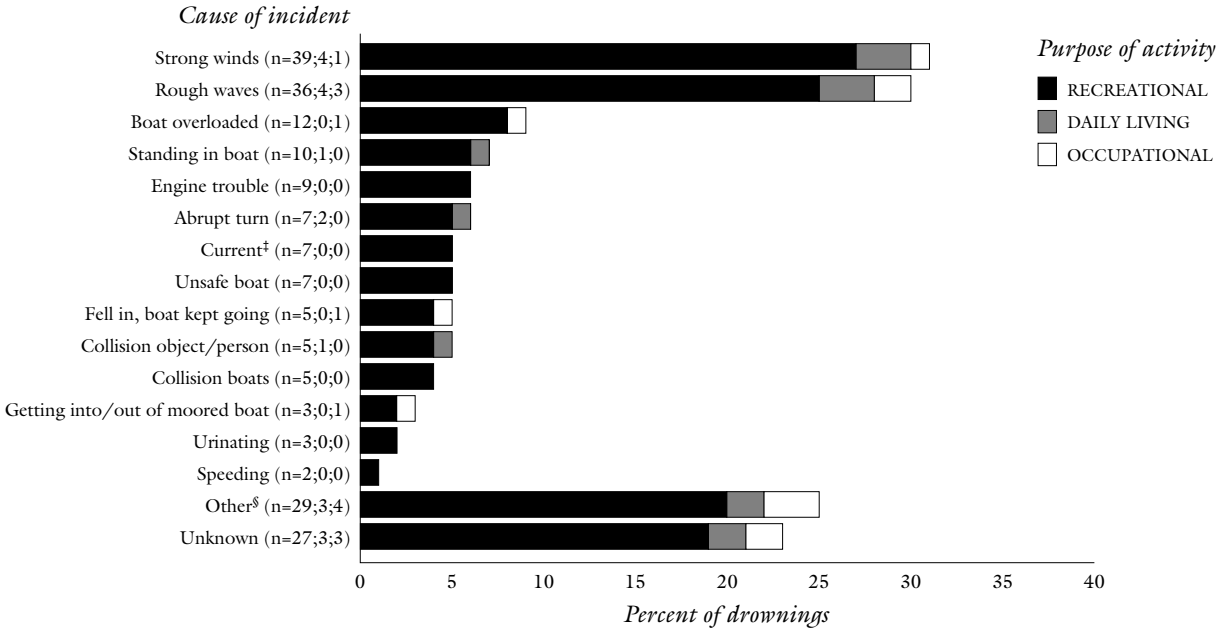
Figure 2.5 **BOATING DROWNINGS BY ACTIVITY & PURPOSE, CANADA 1999 (n=145)***



** This figure excludes 3 victims who were attempting rescue*
† Including 1 each of being pulled by boat on tube, attempting to hold boat at dock, swimming to retrieve drifted boat, using unpowered inflatable craft, boarding or leaving boat
‡ Including 1 each of salvaging log, removing log pushed against wharf by current
§ Including 1 each of using water taxi, towing with a heavy cable

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

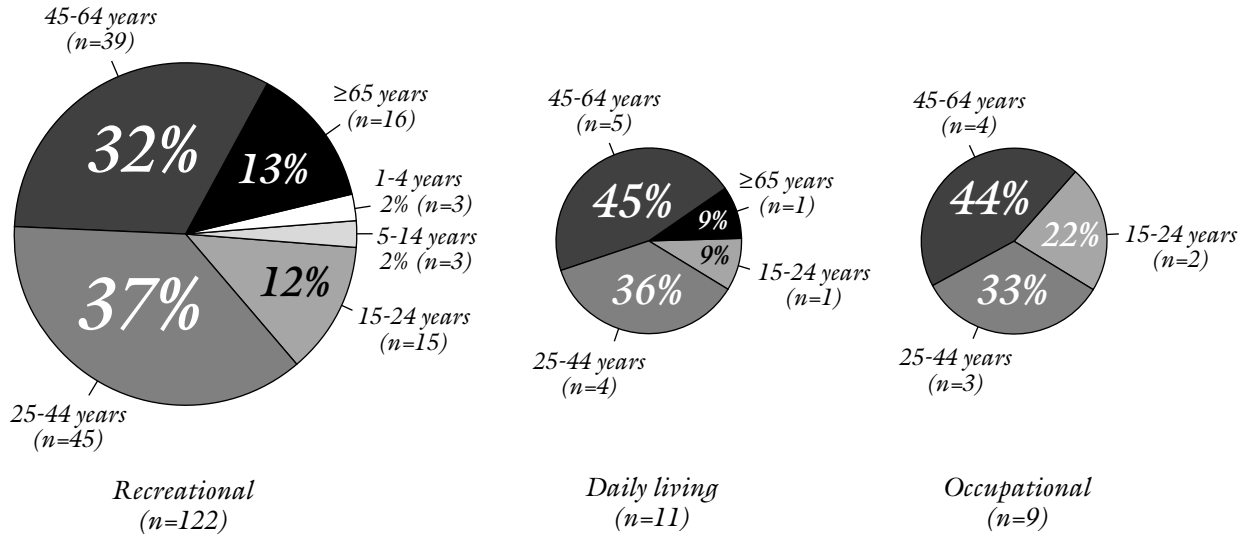
Figure 2.6 **BOATING DROWNINGS BY CAUSE OF INCIDENT AND BY PURPOSE OF ACTIVITY,* CANADA 1999 (n=145)†**



** There may be more than one cause per incident † This figure excludes 3 victims who were attempting rescue*
‡ Including eddy 2 § Including, among other things, transferring passengers 7, heavy fishing gear 2

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

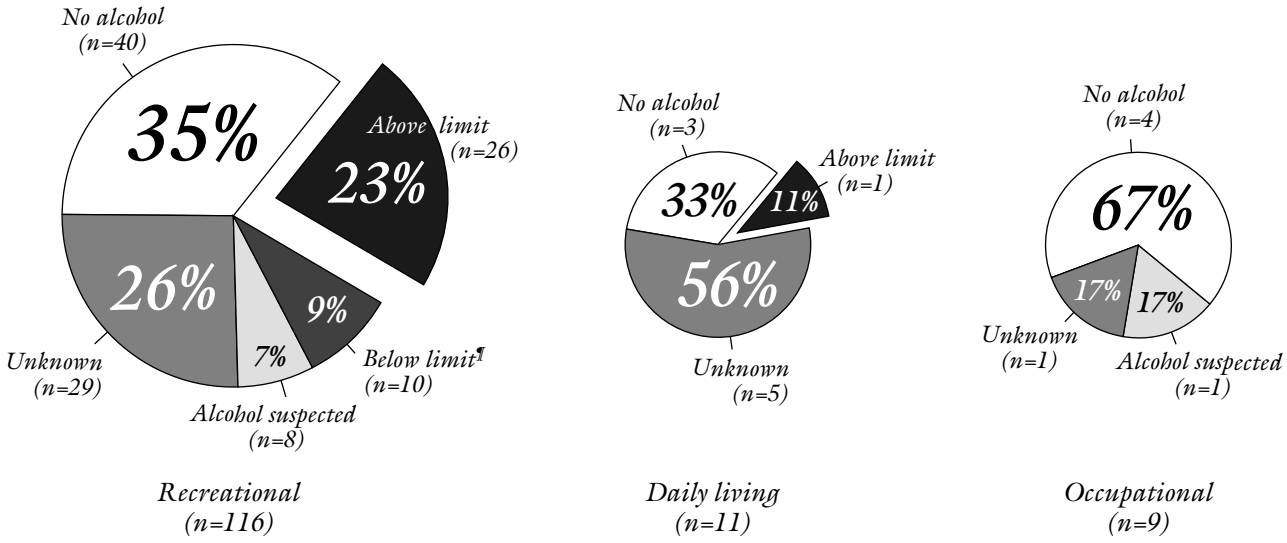
Figure 2.7 **BOATING DROWNINGS BY AGE & PURPOSE, CANADA 1999 (n=145)*†**



** This figure excludes 3 victims who were attempting rescue*
† Age unknown for 1 recreational victim

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

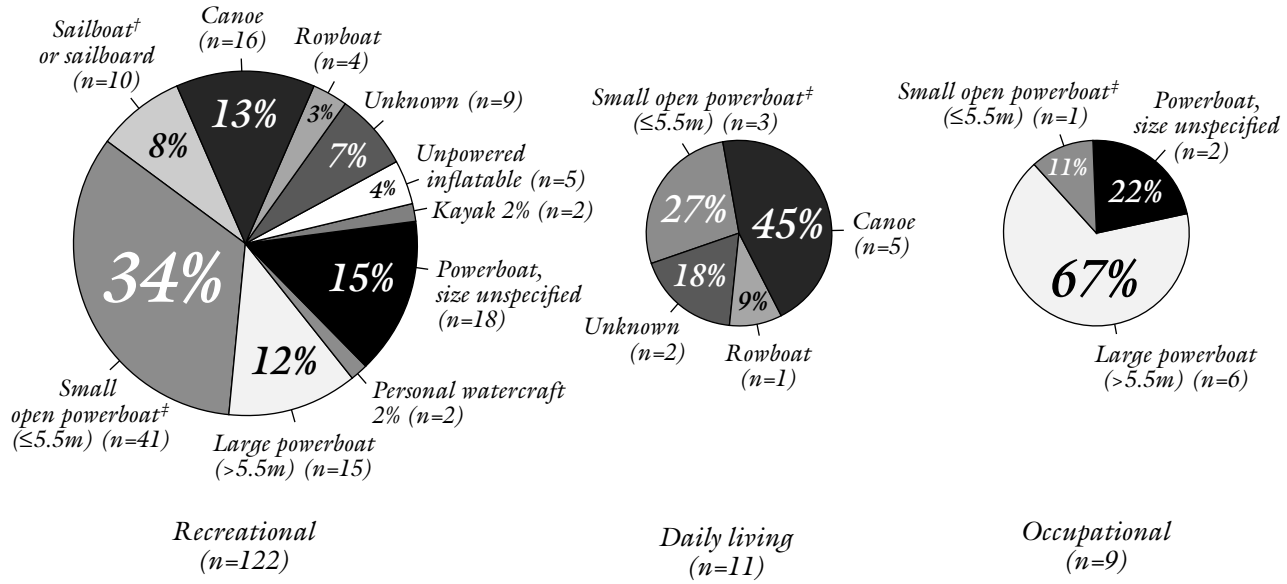
Figure 2.8 **BLOOD ALCOHOL LEVELS* FOR BOATING DROWNINGS BY PURPOSE, CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=138)†‡§**



** Legal limit is 80 mg % † This figure excludes 2 victims who were attempting rescue ‡ Age unknown for 1 recreational victim, presumed adult*
§ This figure excludes 8 victims; decomposition rendered blood alcohol unreliable (recreational 3, daily living 2, occupational 3)
¶ 4 at 1-49 mg %, 6 at 50-80 mg %

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

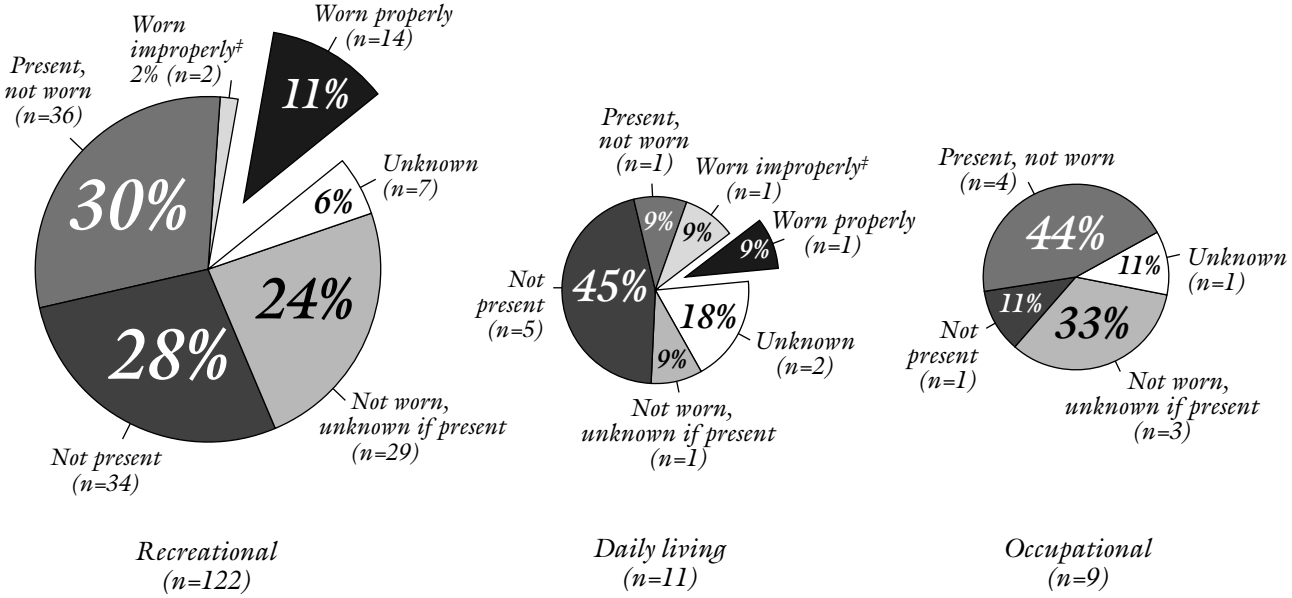
Figure 2.9 **BOATING DROWNINGS BY TYPE OF BOAT & PURPOSE, CANADA 1999 (n=145)***



** This figure excludes 3 victims who were attempting rescue*
† Including sailboat ≤ 5.5m 3, sailboat >5.5m 2, & sailboat, unknown size 5
‡ Includes open outboard motorboats and other open powered boats such as inflatables; excludes personal watercraft

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

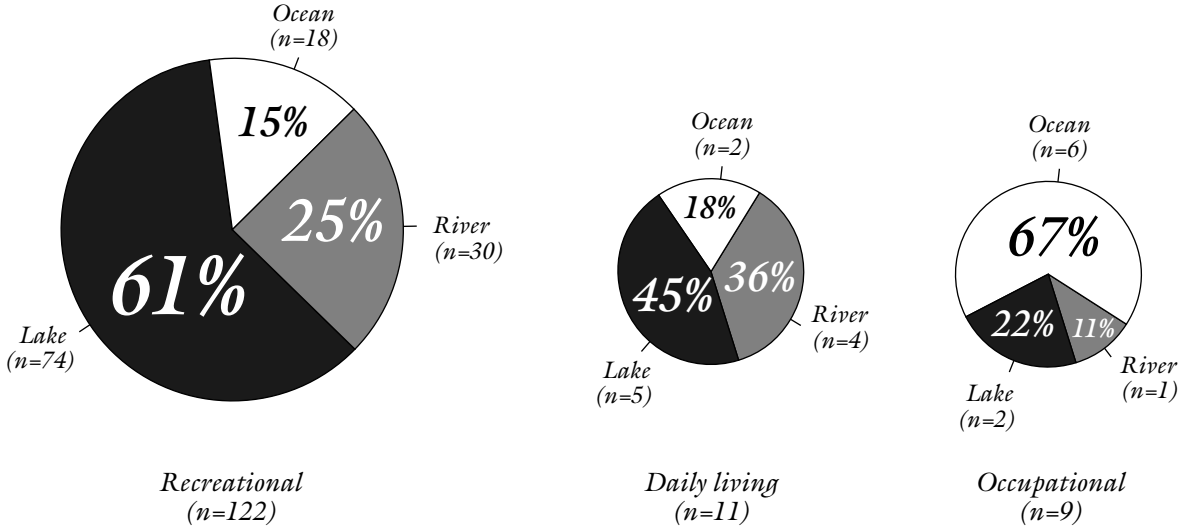
Figure 2.10 **BOATING DROWNINGS BY USE OF A FLOTATION DEVICE* & PURPOSE, CANADA 1999 (n=145)†**



** Personal flotation device or lifejacket † This figure excludes 3 victims who were attempting rescue ‡ Not fastened or inappropriate size*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

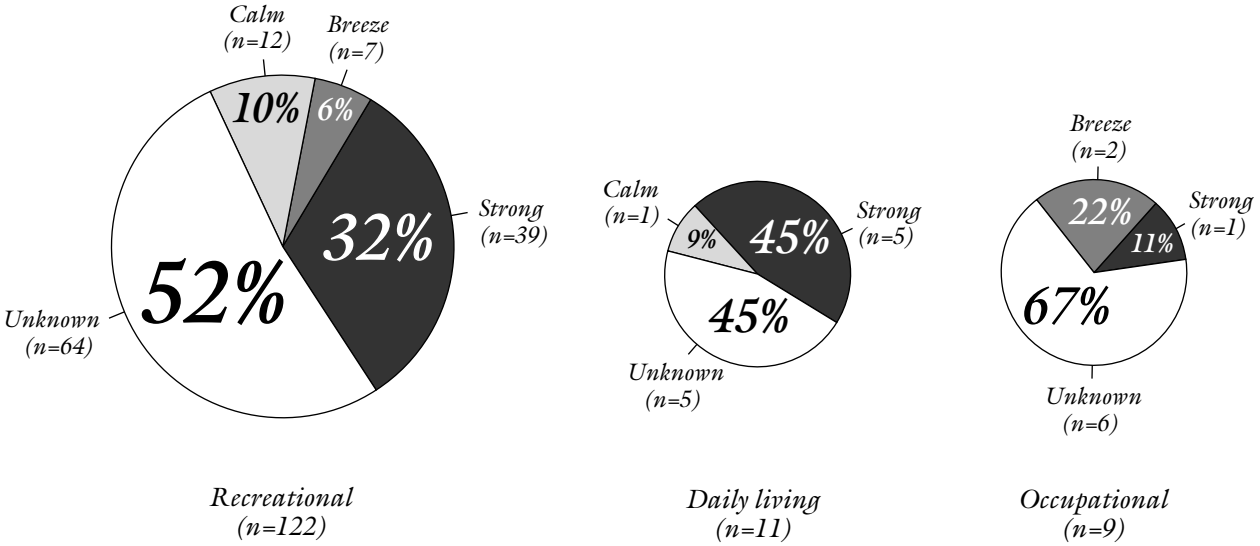
Figure 2.11 **BOATING DROWNINGS BY TYPE OF BODY OF WATER* & PURPOSE, CANADA 1999 (n=145)†**



** "Lake" includes pond & reservoir † This figure excludes 3 victims who were attempting rescue*

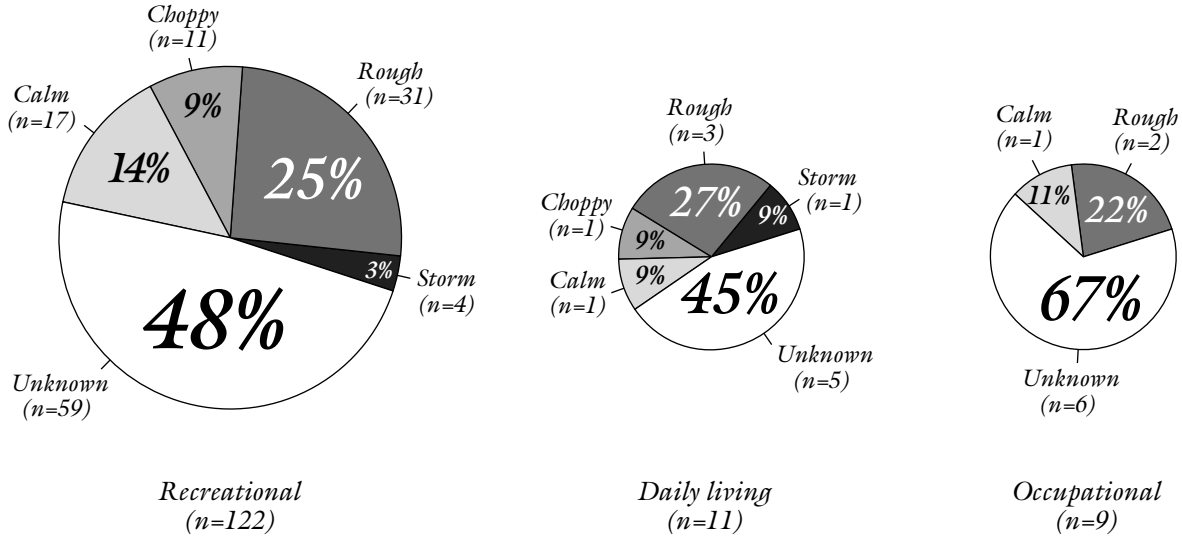
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.12 **BOATING DROWNINGS BY WIND CONDITIONS & PURPOSE, CANADA 1999 (n=145)***



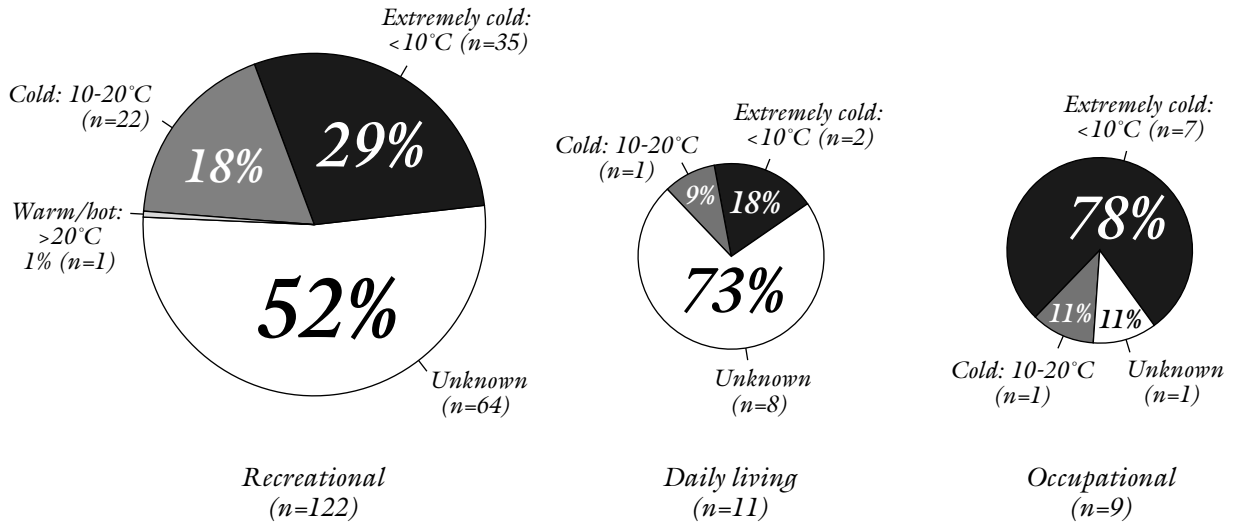
** This figure excludes 3 victims who were attempting rescue*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.13 **BOATING DROWNINGS BY WAVE CONDITIONS & PURPOSE, CANADA 1999 (n=145)***



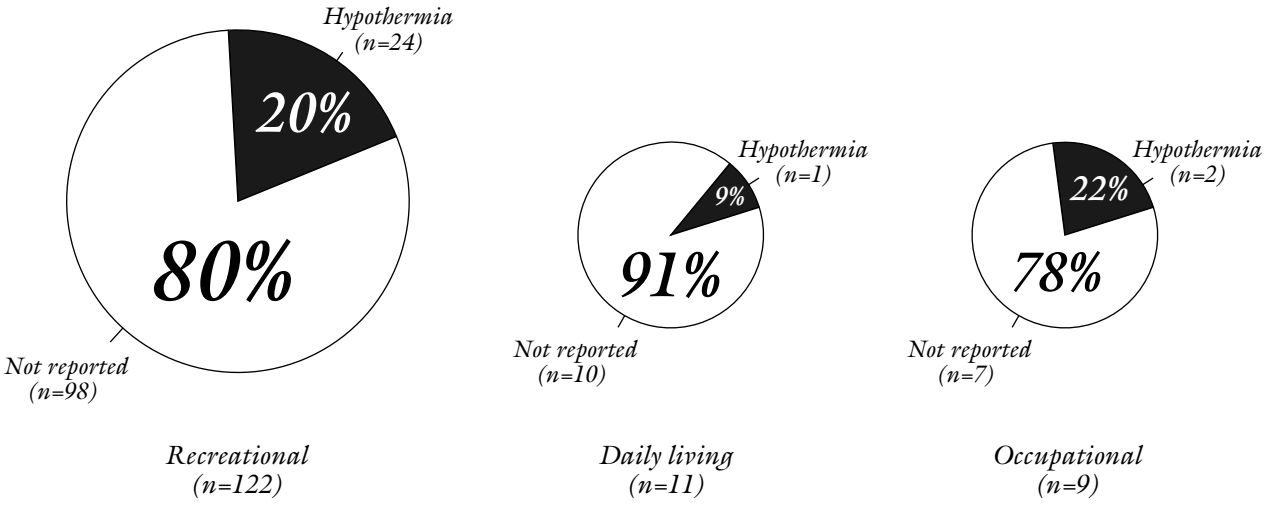
** This figure excludes 3 victims who were attempting rescue*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.14 **BOATING DROWNINGS BY WATER TEMPERATURE & PURPOSE, CANADA 1999 (n=145)***



** This figure excludes 3 victims who were attempting rescue*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

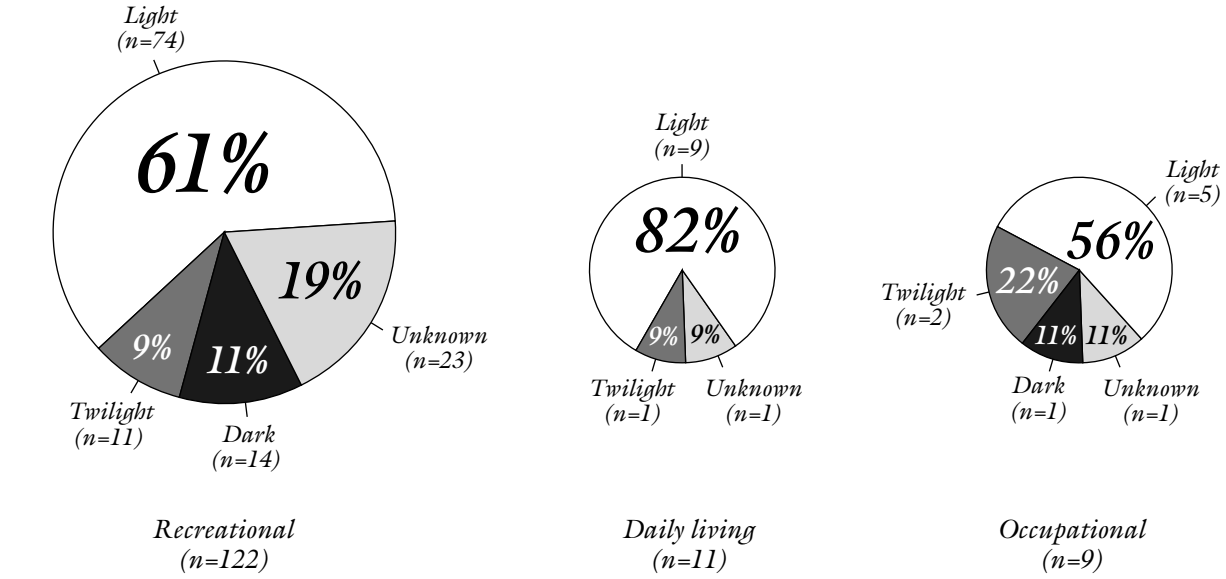
Figure 2.15 **BOATING DROWNINGS BY HYPOTHERMIA* & PURPOSE, CANADA 1999 (n=145)†**



** Includes only cases where hypothermia was reported by coroner as a contributing factor to drowning*
† This figure excludes 3 victims who were attempting rescue (all without hypothermia)

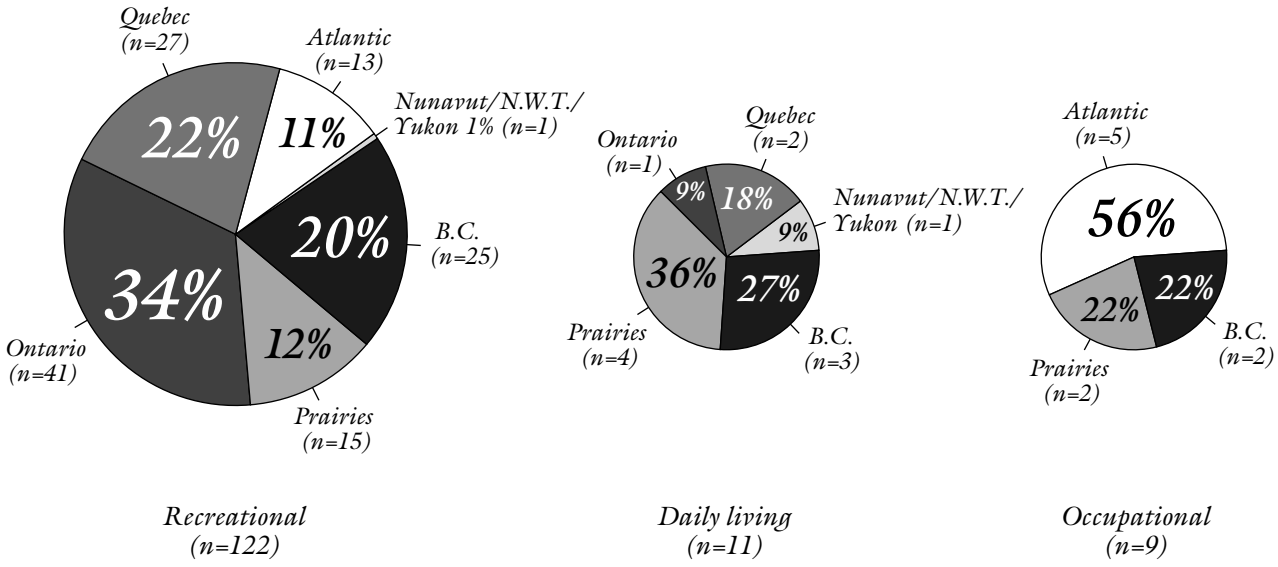
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.16 **BOATING DROWNINGS BY LIGHT CONDITIONS & PURPOSE, CANADA 1999 (n=145)***



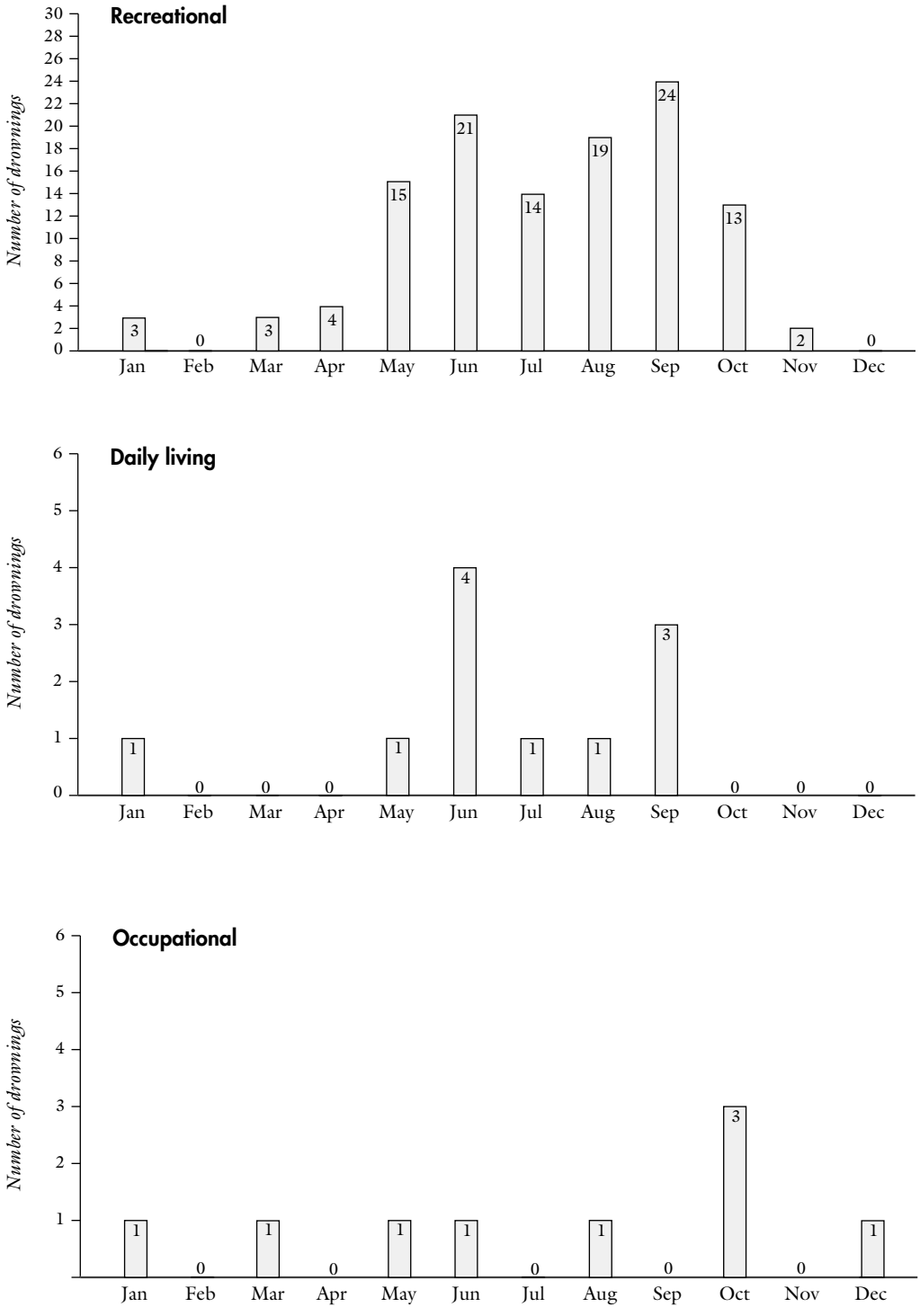
** This figure excludes 3 victims who were attempting rescue*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.17 **BOATING DROWNINGS BY REGION & PURPOSE, CANADA 1999 (n=145)***



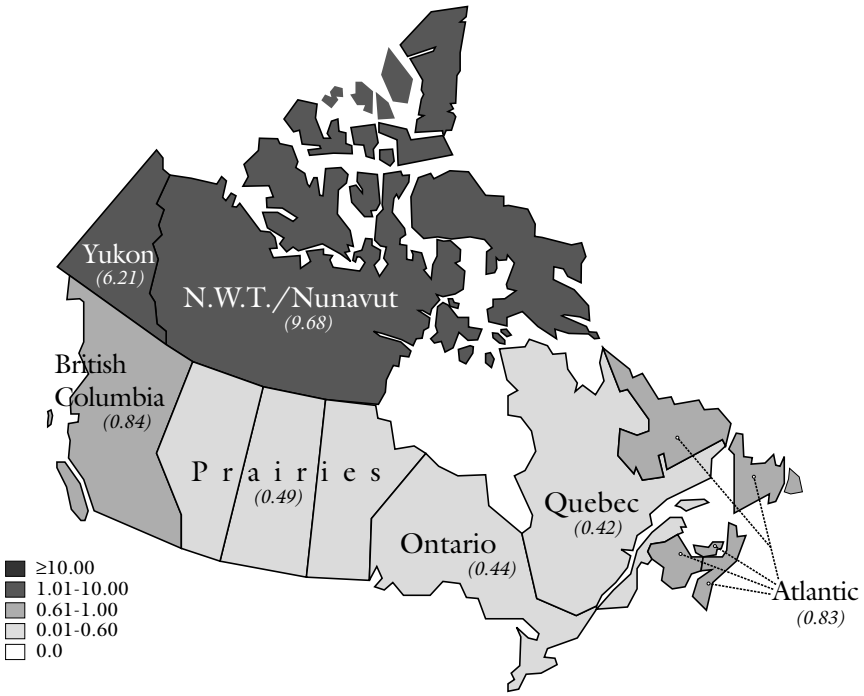
** This figure excludes 3 victims who were attempting rescue*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.18 **BOATING DROWNINGS BY MONTH & PURPOSE, CANADA 1999 (n=145)*†**



** This figure excludes 3 victims who were attempting rescue † Month unspecified for 4 recreational drownings*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

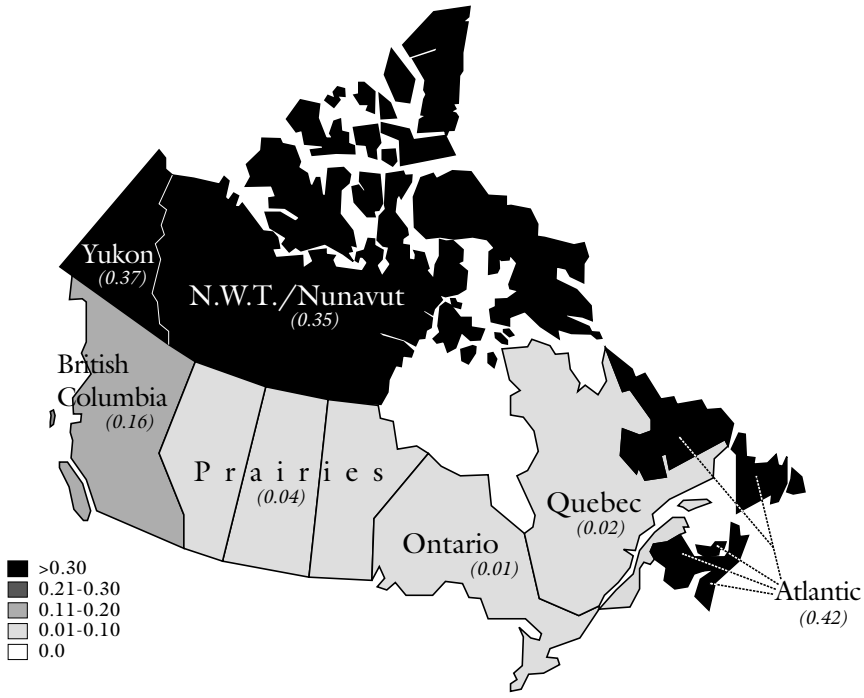
Figure 2.19 **RATE* OF RECREATIONAL AND DAILY LIVING† BOATING DROWNINGS BY REGION, CANADA 1991-1999 (n=1,442)‡**



** Average number of drownings per 100,000 population per year*
† Includes subsistence activities & boat travel as part of normal daily life ‡ Region unknown for 1 victim

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

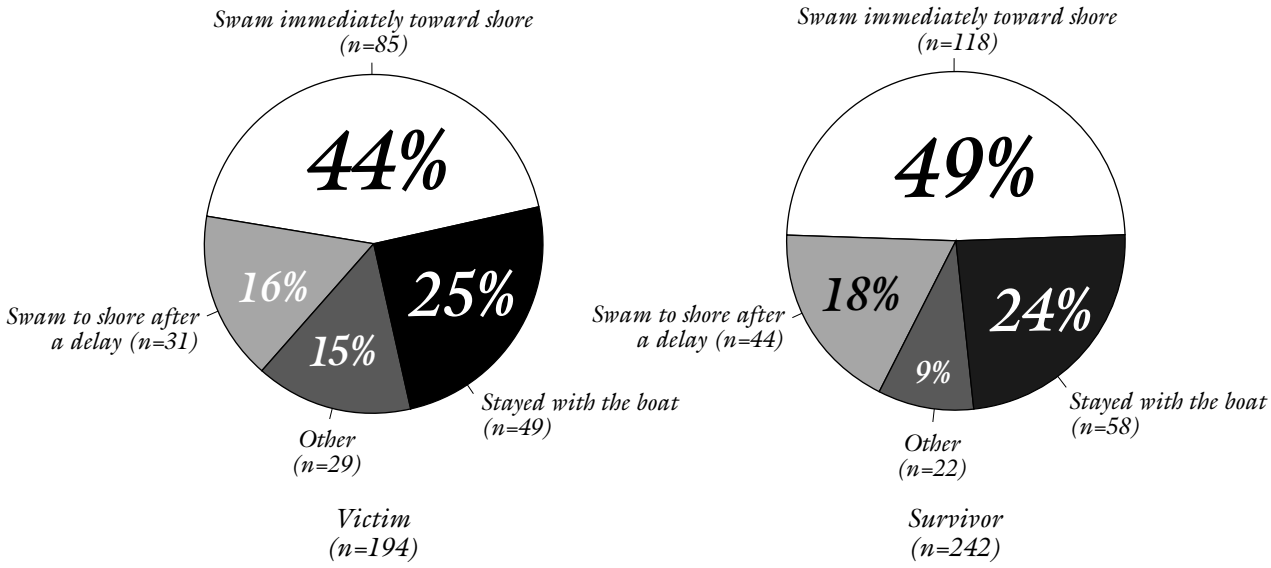
Figure 2.20 **RATE* OF OCCUPATIONAL BOATING DROWNINGS BY REGION, CANADA 1991-1999 (n=186)**



** Average number of drownings per 100,000 population per year*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.21 **BOATING DROWNINGS* AFTER CAPSIZING OR SWAMPING BY VICTIM'S OR SURVIVOR'S REACTION, CANADA 1994-1999 (n=100 INCIDENTS)†**



** Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings*
† This figure excludes incidents where staying by the boat was not an option (e.g. boat sank), or where the reaction of the victim/survivor is unknown

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 1996-2001

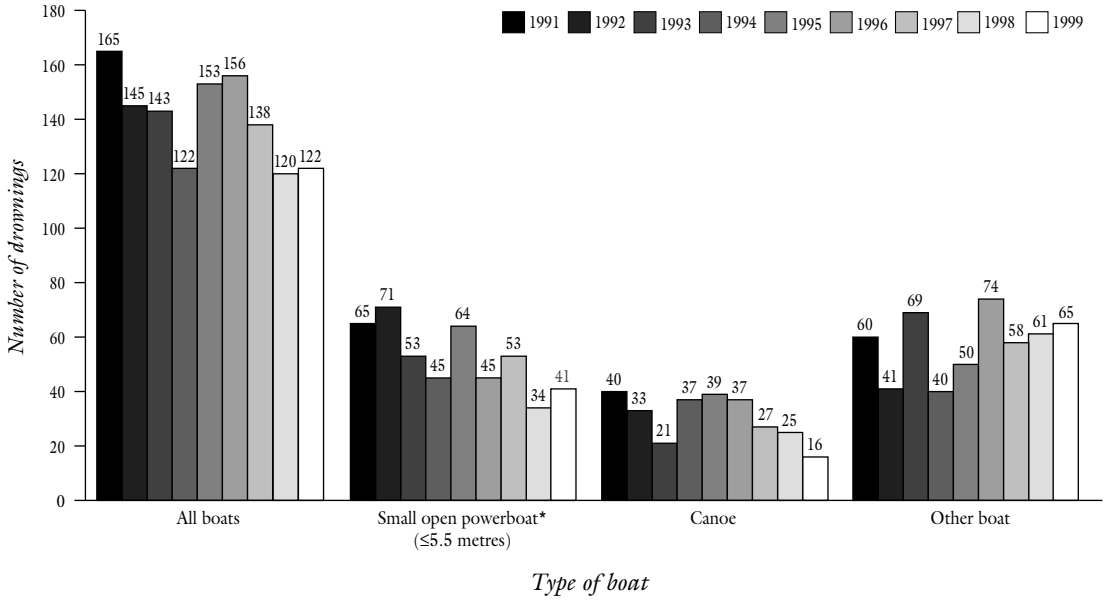
Table 2.1 **MULTIPLE-VICTIM INCIDENTS AS A PROPORTION* OF ALL BOATING INCIDENTS, WITH INCIDENCE RATES† BY PURPOSE OF ACTIVITY, CANADA 1999 (n=145)**

	Single-victim	Multiple-victim						All incidents	
Purpose of boating	Incidents No.	Incidents No.	%	Victims No.	%	Avg. no. deaths/incident	Multiple-victim incidents as % of all incidents	No.	Rate†
Recreational‡§	76	16	94	46	94	2.9	17	92	0.30
Daily living	9	1	6	2	4	2.0	10	10	0.03
Occupational	9	0	—	0	—	—	—	9	0.03
Other	0	0	—	0	—	—	—	0	0.00
Attempting rescue‡	2	1	6	1	2	1.0	33	3	0.01
Unknown	0	0	—	0	—	—	—	0	0.00
Total	96	17	100	49	100	2.9	15	113	0.37

** Percents total to 100% vertically in 3rd and 5th columns of figures and do not total for 7th column*
† Number of both single and multiple-victim incidents per 100,000 population per year
‡ Including 1 multiple-victim incident with 1 recreational & 1 attempted rescue death (counted once in total)
§ Including 1 multiple-victim incident with 7 drownings & 1 non-drowning injury death

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.22 **RECREATIONAL BOATING DROWNINGS BY TYPE OF BOAT & YEAR, CANADA 1991-1999 (n=1,264)**



** Includes open outboard motorboats and other open powered boats such as inflatables; excludes personal watercraft; the number of small powerboat drownings in 1998 was probably higher than 34, since the number of unspecified powerboat drownings in Quebec increased from 0 in 1997 to 12 in 1998*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

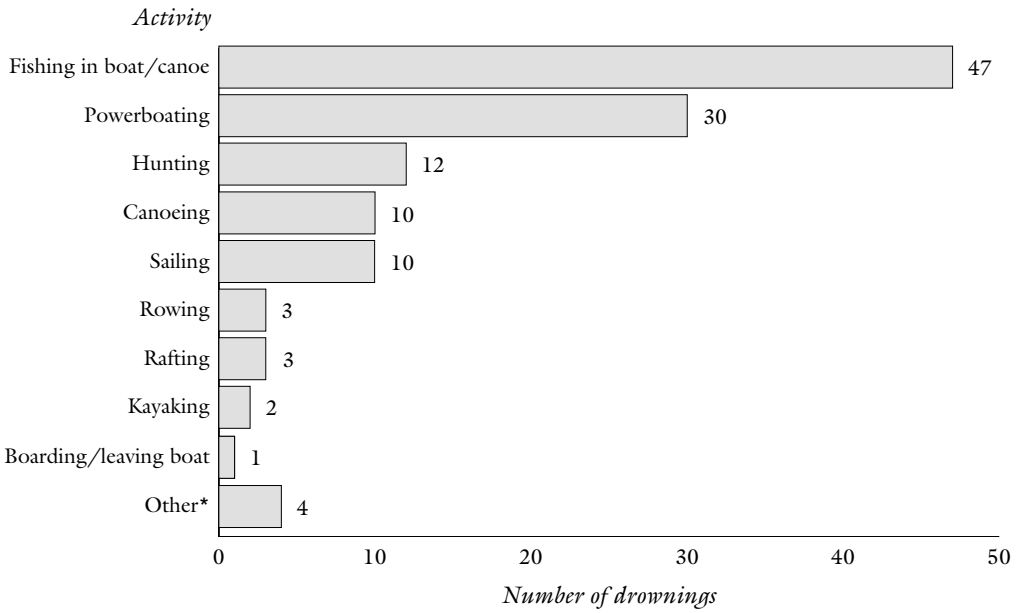
Table 2.2 **RECREATIONAL BOATING DROWNINGS BY INJURY INCIDENT & TYPE OF BOAT, CANADA 1999 (n=122)**

	Type of boat							
	Small powerboat* (≤5.5m)		Canoe		Other boat		Total	
Incident	No.	%	No.	%	No.	%	No.	%
Capsized	11	27	9	56	22	34	42	34
Swamped	4	10	2	13	10	15	16	13
Fell overboard	9	22	1	6	15	23	25	20
Jumped overboard†	0	0	0	0	5	8	5	4
Collision	0	0	0	0	7	11	7	6
Swimming to retrieve boat	0	0	0	0	2	3	2	2
Other‡	1	2	0	0	2	3	3	2
Unknown	16	39	4	25	2	3	22	18
Total	41	100	16	100	65	100	122	100

** Includes open outboard motorboats & other open powered boats such as inflatables; excludes personal watercraft*
† Including escaping onboard fire 3, & 1 each of pushing boat off shoal & swimming to shore for fuel
‡ Including 1 each of small powerboat swept away by hydroelectric dam, victim towed on tube, & large powerboat disintegrated

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

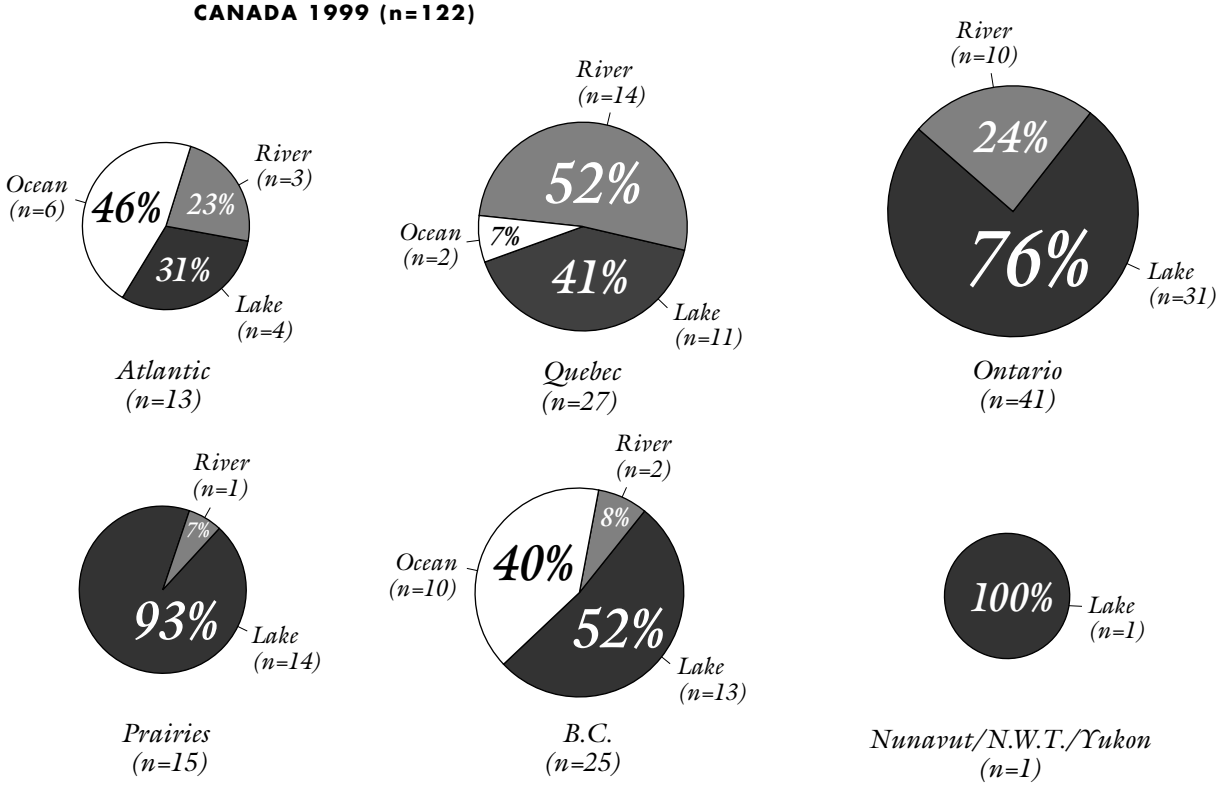
Figure 2.23 **RECREATIONAL BOATING DROWNINGS BY ACTIVITY, CANADA 1999 (n=122)**



** Including 1 each of being pulled by boat on tube, attempting to hold boat at dock, swimming to retrieve drifted boat, using unpowered inflatable craft*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.24 **RECREATIONAL BOATING DROWNINGS BY TYPE OF BODY OF WATER* & REGION, CANADA 1999 (n=122)**

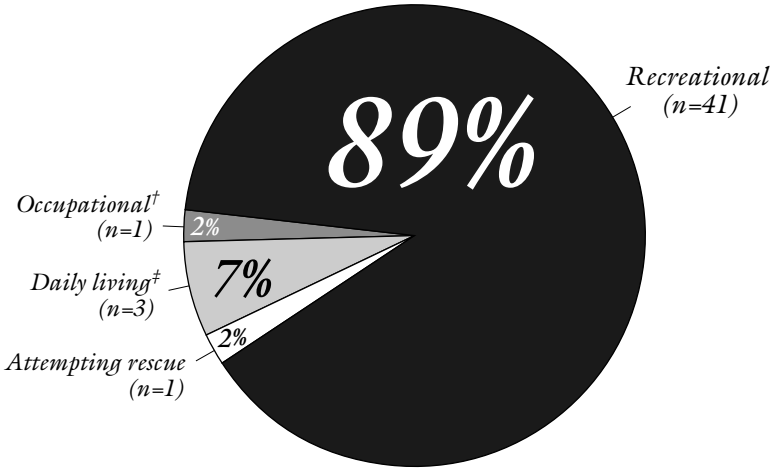


** "Lake" includes pond & reservoir*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

SMALL POWERBOAT (≤5.5 M) DROWNINGS

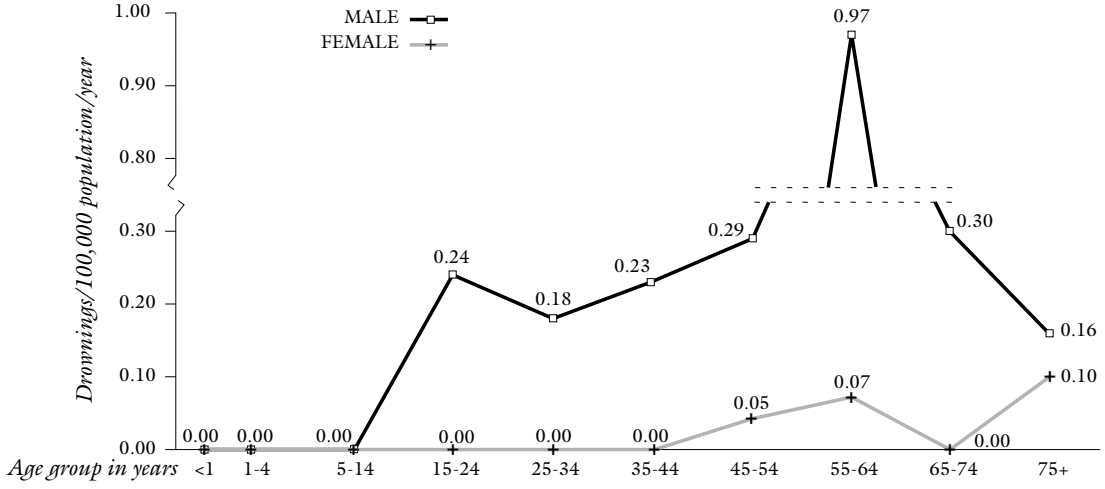
Figure 2.25 **SMALL POWERBOAT* (≤5.5m) DROWNINGS BY PURPOSE, CANADA 1999 (n=46)**



** Includes open outboard motorboats and other open powered boats such as inflatables; excludes personal watercraft*
† Including aquaculture 1 ‡ Including 1 each of boat travel, subsistence fishing, salvaging log

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.26 **RATE AND NUMBER OF RECREATIONAL SMALL POWERBOAT* (≤5.5m) DROWNINGS BY AGE & SEX, CANADA 1999 (n=41)**

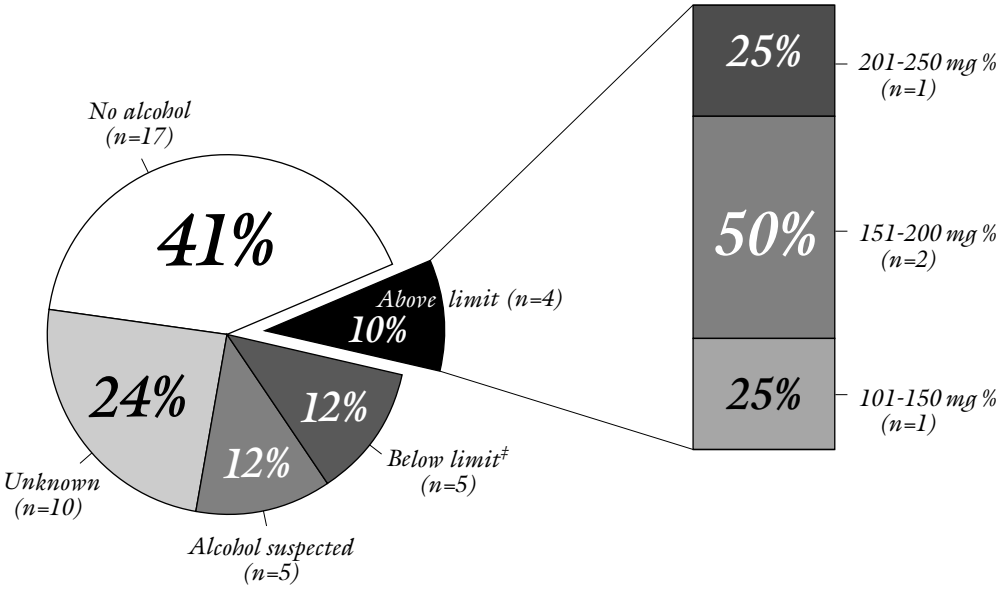


Number of drownings in age group

Male	0	0	0	5	4	6	6	13	3	1
Female	0	0	0	0	0	0	1	1	0	1

** Includes open outboard motorboats (37) & other open powered boats such as inflatables (4); excludes personal watercraft*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

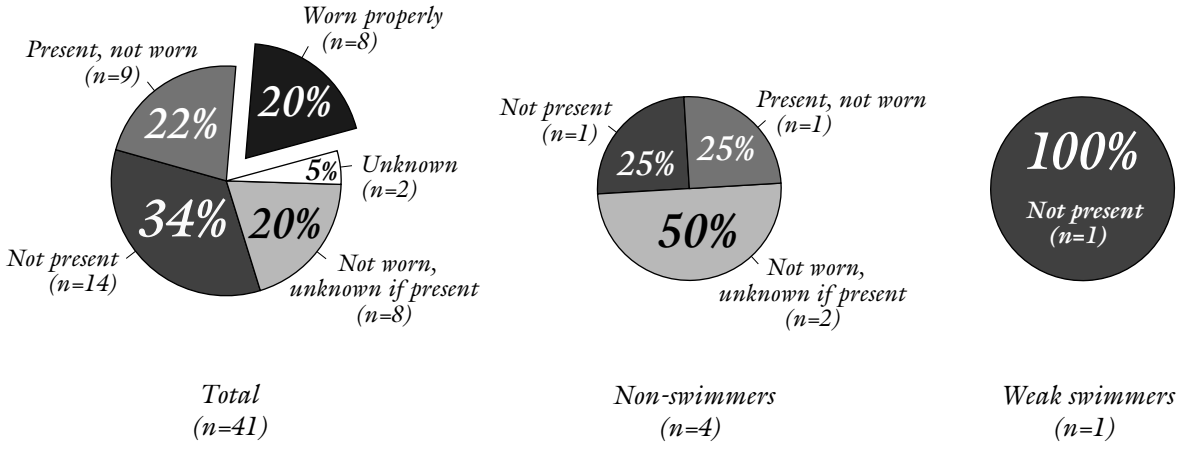
Figure 2.27 **BLOOD ALCOHOL LEVELS* FOR RECREATIONAL SMALL POWERBOAT† (≤5.5m) DROWNINGS, CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=41)**



** Legal limit is 80 mg %*
† Includes open outboard motorboats and other open powered boats such as inflatables; excludes personal watercraft
‡ 2 at 1-49 mg %, 3 at 50-80 mg %

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

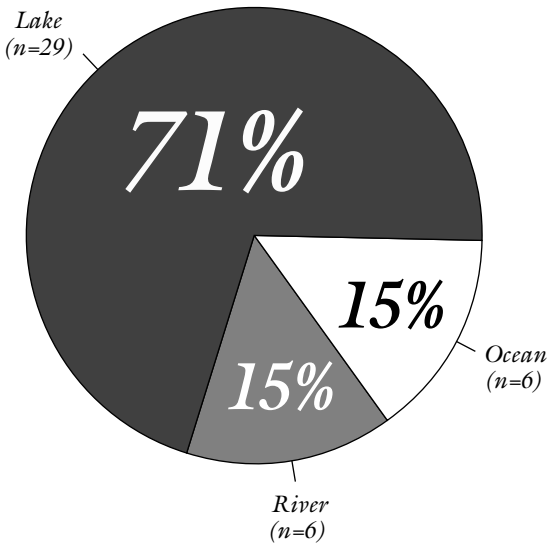
Figure 2.28 **RECREATIONAL SMALL POWERBOAT* (≤5.5m) DROWNINGS BY USE OF A FLOTATION DEVICE† & SWIMMING ABILITY, CANADA 1999 (n=41)**



** Includes open outboard motorboats and other open powered boats such as inflatables; excludes personal watercraft*
† Personal flotation device or lifejacket

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

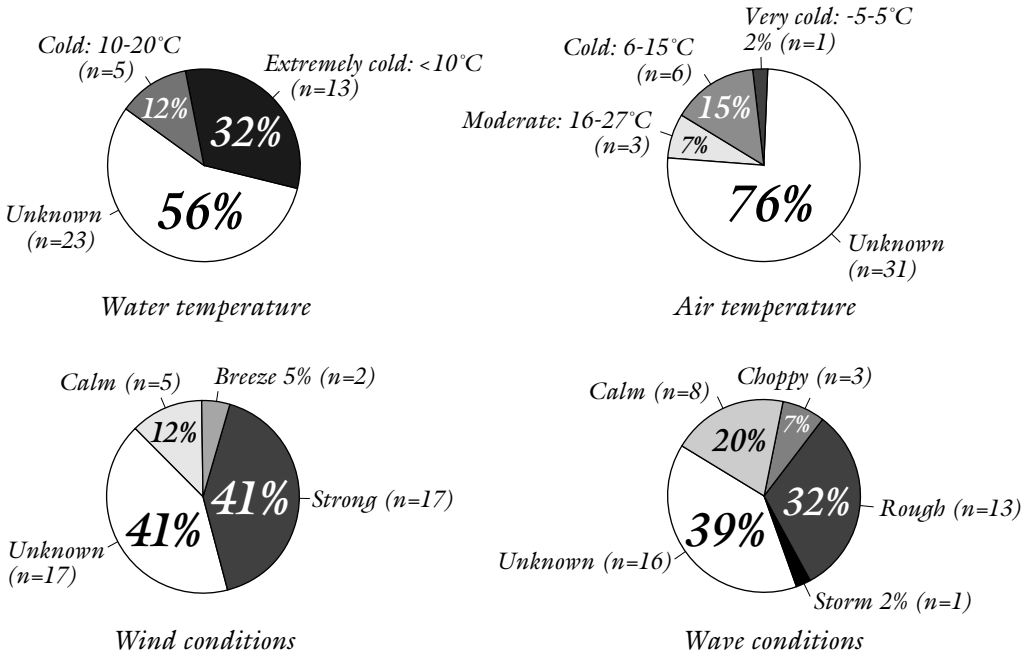
Figure 2.29 **RECREATIONAL SMALL POWERBOAT* (≤5.5m) DROWNINGS BY TYPE OF BODY OF WATER,† CANADA 1999 (n=41)**



** Includes open outboard motorboats and other open powered boats such as inflatables; excludes personal watercraft*
† "Lake" includes pond & reservoir

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

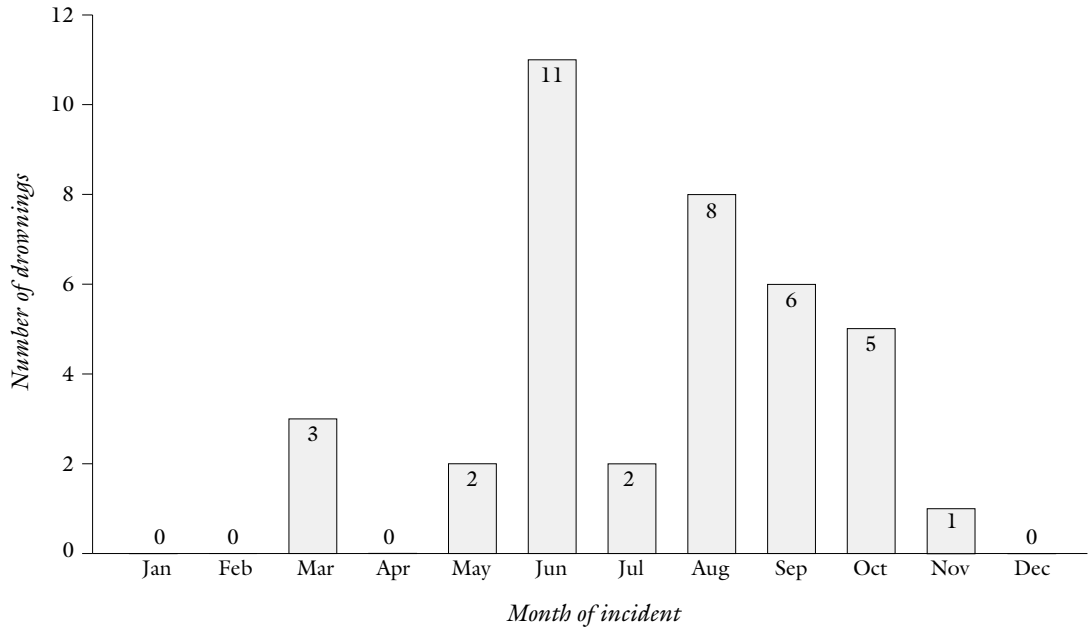
Figure 2.30 **RECREATIONAL SMALL POWERBOAT* (≤5.5m) DROWNINGS BY ENVIRONMENTAL RISK FACTORS, CANADA 1999 (n=41)**



** Includes open outboard motorboats and other open powered boats such as inflatables; excludes personal watercraft*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

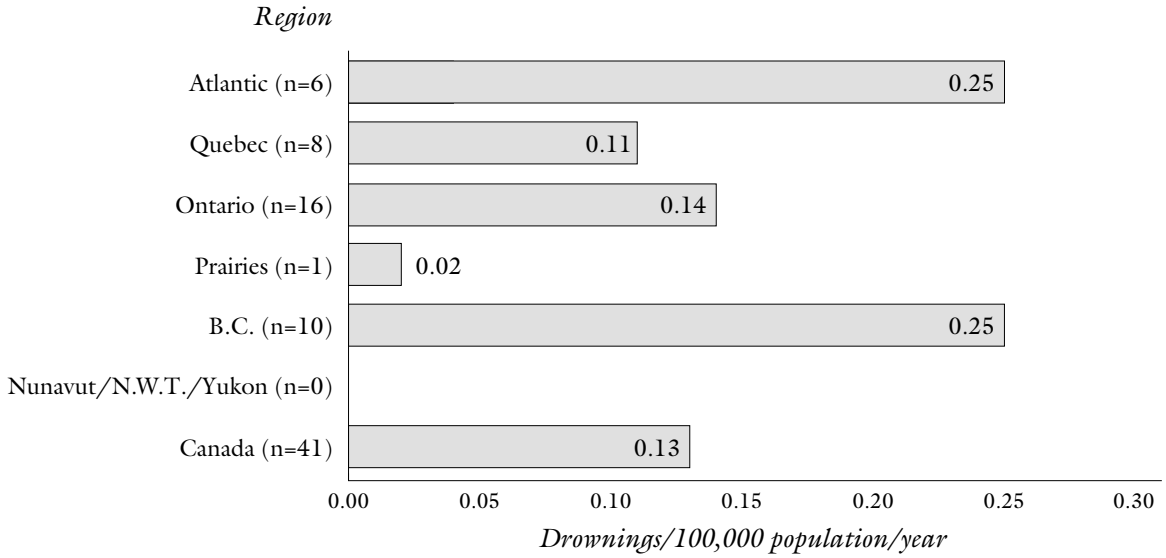
Figure 2.31 **RECREATIONAL SMALL POWERBOAT* (≤5.5m) DROWNINGS BY MONTH OF INCIDENT, CANADA 1999 (n=41)†**



** Includes open outboard motorboats and other open powered boats such as inflatables; excludes personal watercraft*
† Month unspecified for 3 drownings

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

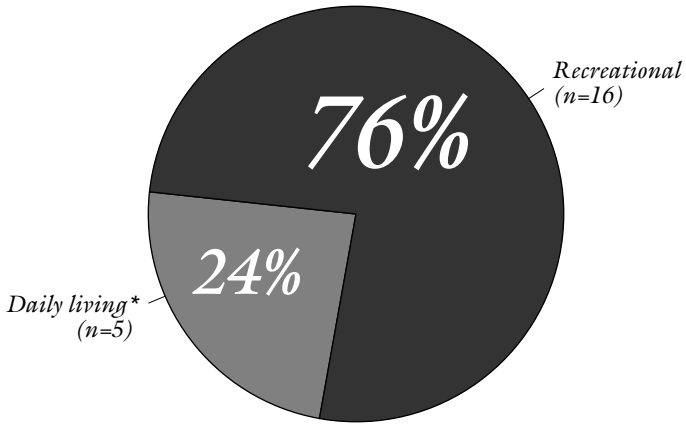
Figure 2.32 **RATE OF RECREATIONAL SMALL POWERBOAT* (≤5.5m) DROWNINGS BY REGION, CANADA 1999 (n=41)**



** Includes open outboard motorboats and other open powered boats such as inflatables; excludes personal watercraft*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

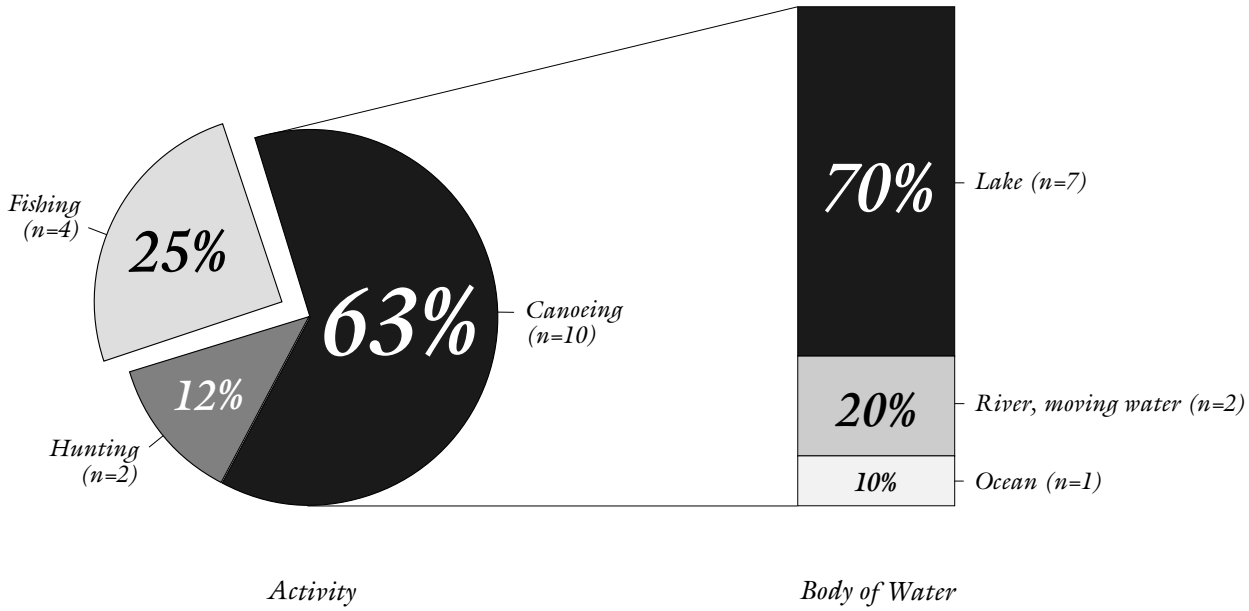
CANOEING DROWNINGS

Figure 2.33 **CANOEING DROWNINGS BY PURPOSE, CANADA 1999 (n=21)**



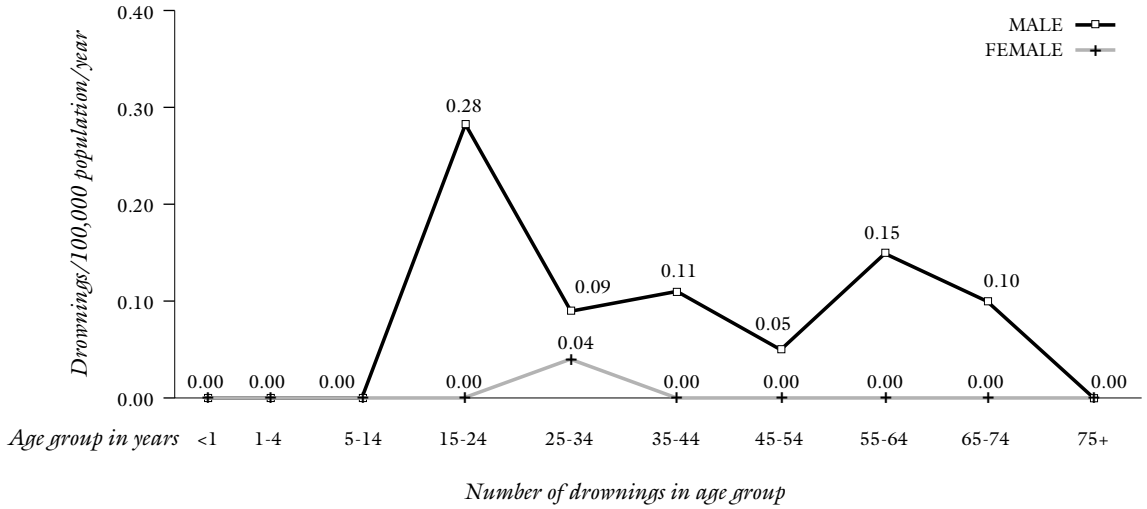
** Including subsistence fishing 4, boat travel 1*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.34 **RECREATIONAL CANOEING DROWNINGS BY ACTIVITY & TYPE OF BODY OF WATER, CANADA 1999 (n=16)**



Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.35 **RATE AND NUMBER OF RECREATIONAL CANOEING DROWNINGS BY AGE & SEX, CANADA 1999 (n=16)***

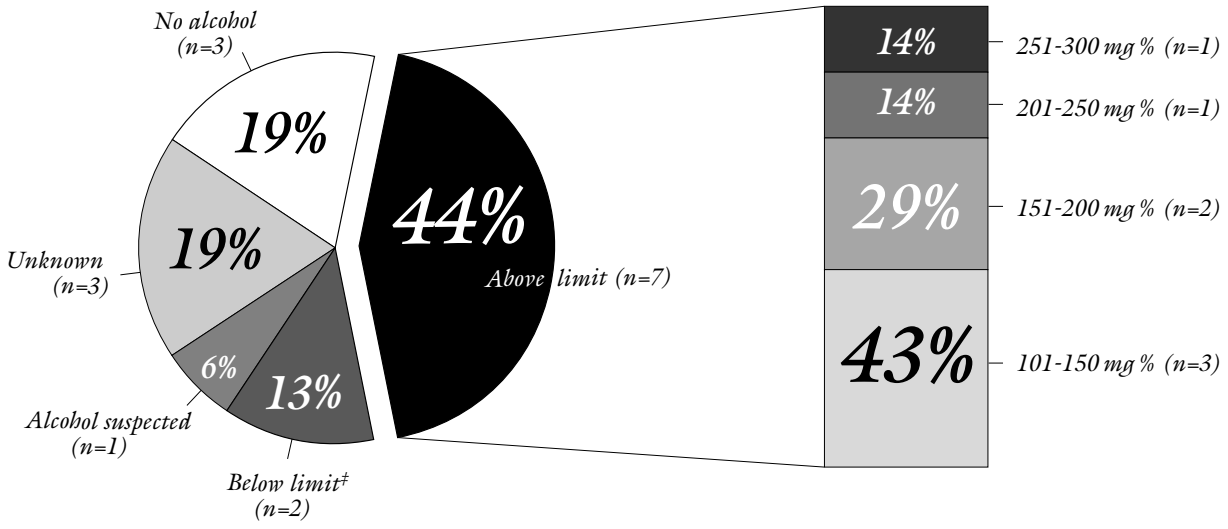


Number of drownings in age group

Male	0	0	0	6	2	3	1	2	1	0
Female	0	0	0	0	1	0	0	0	0	0

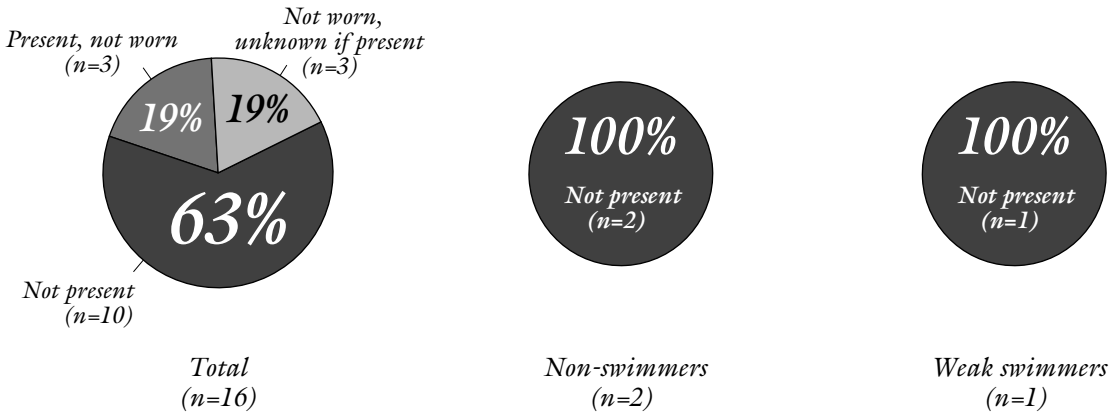
** Age unknown for 1 male victim, presumed adult*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.36 **BLOOD ALCOHOL LEVELS* FOR RECREATIONAL CANOEING DROWNINGS, CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=16)†**



** Legal limit is 80 mg % † Age unknown for 1 victim, presumed adult ‡ 2 at 50-80 mg %*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

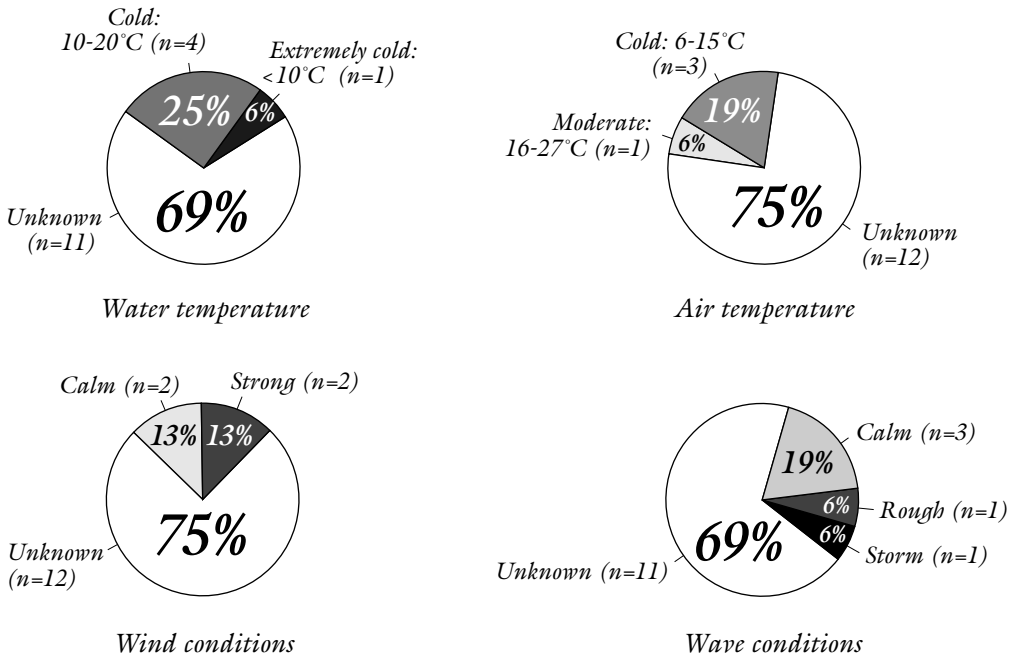
Figure 2.37 **RECREATIONAL CANOEING DROWNINGS BY USE OF A FLOTATION DEVICE* & SWIMMING ABILITY, CANADA 1999 (n=16)**



** Personal flotation device or lifejacket*

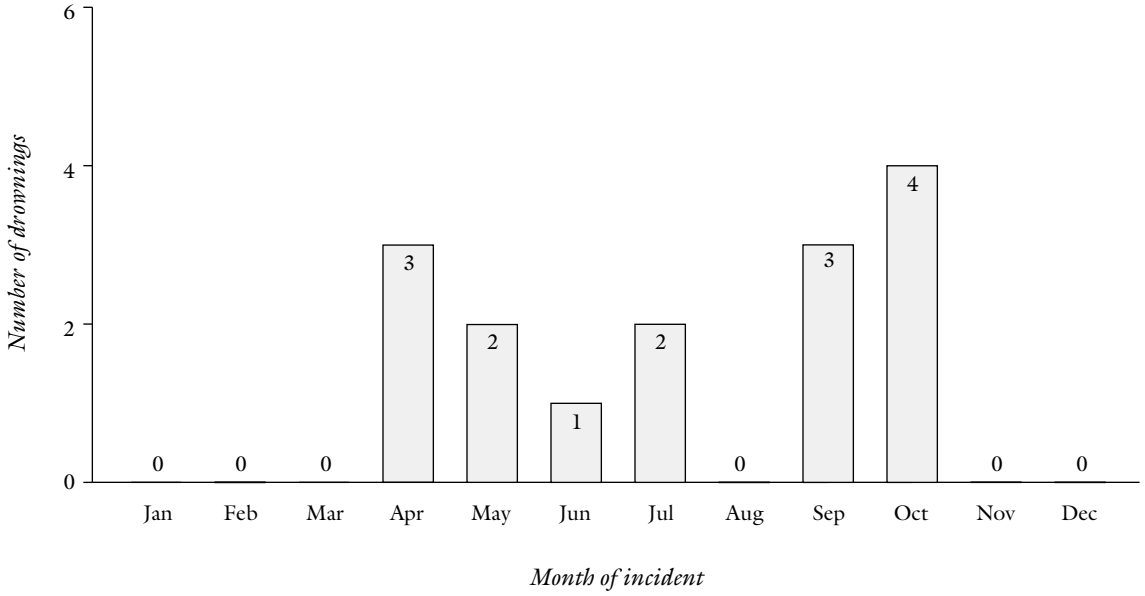
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.38 **RECREATIONAL CANOEING DROWNINGS BY ENVIRONMENTAL RISK FACTORS, CANADA 1999 (n=16)**



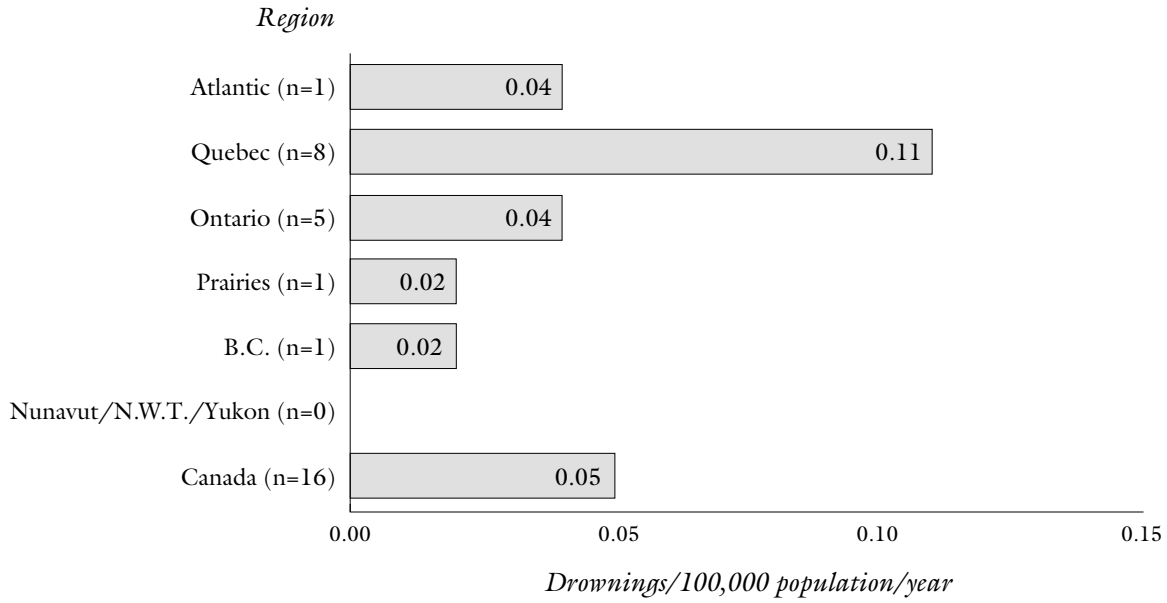
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.39 **RECREATIONAL CANOEING DROWNINGS BY MONTH OF INCIDENT, CANADA 1999 (n=16)***



** Month unspecified for 1 drowning*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

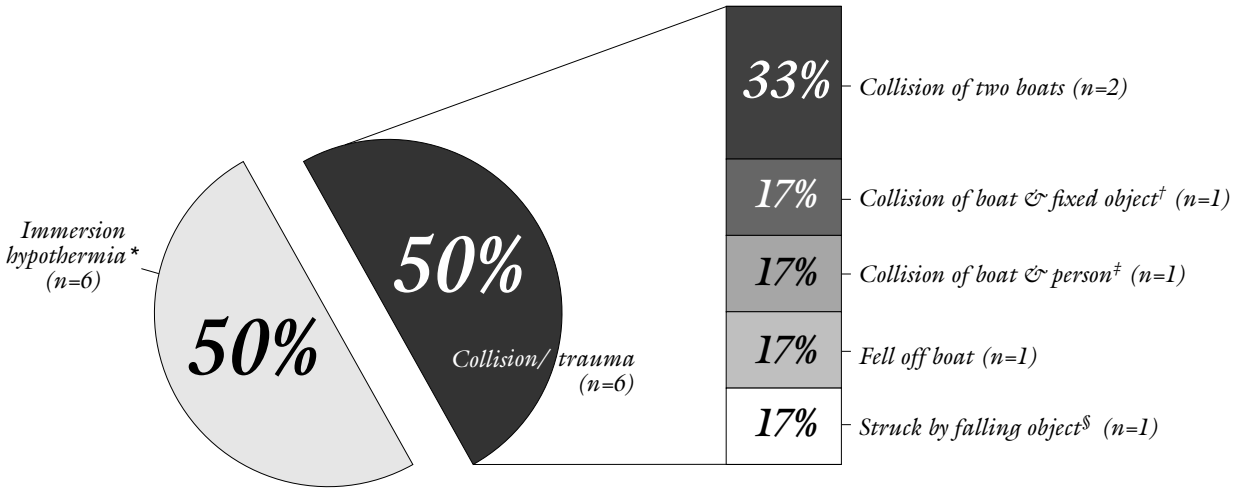
Figure 2.40 **RATE OF RECREATIONAL CANOEING DROWNINGS BY REGION, CANADA 1999 (n=16)**



Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

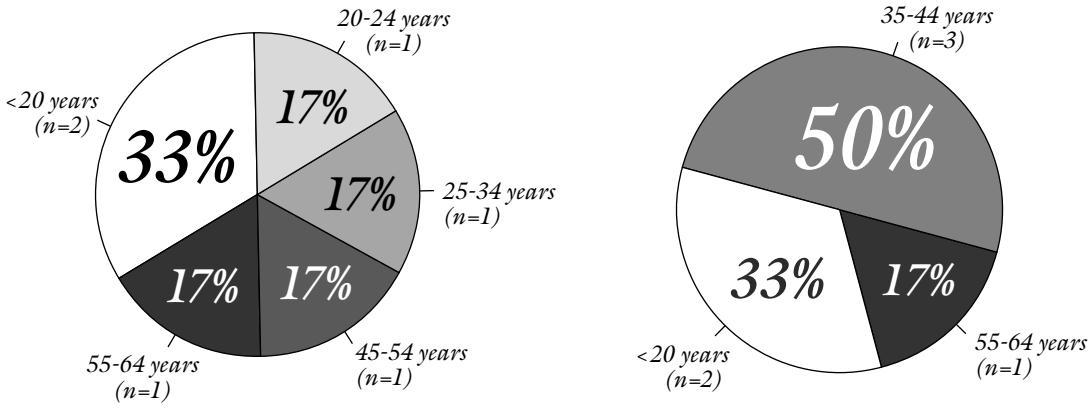
BOATING INJURY FATALITIES OTHER THAN DROWNINGS

Figure 2.41 **NON-DROWNING BOATING INJURY DEATHS BY TYPE OF INCIDENT, CANADA 1999 (n=12)**



** Excludes cases with drowning & hypothermia † Pillar of bridge ‡ Victim towed on tube, struck by a second boat § Fulcrum & rope*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

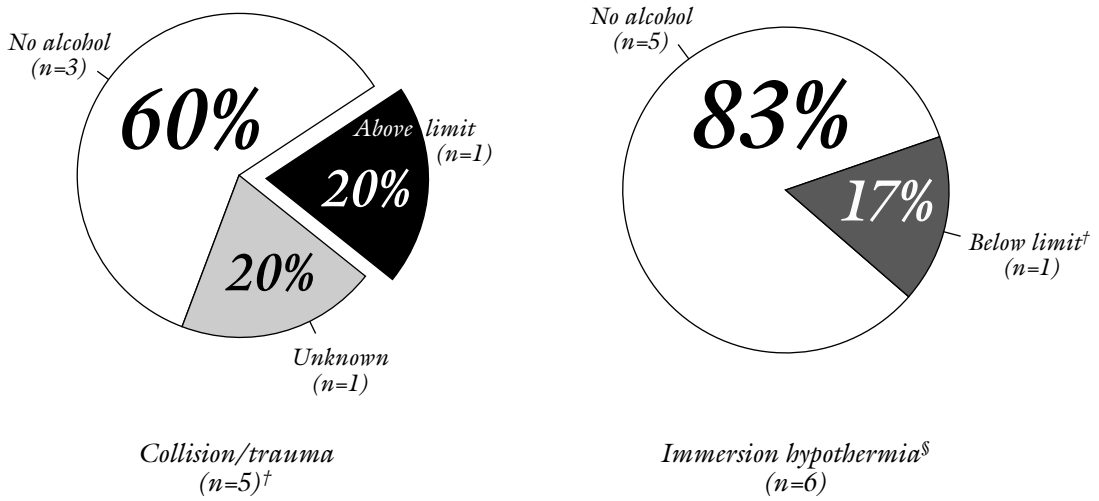
Figure 2.42 **NON-DROWNING BOATING INJURY DEATHS BY AGE, SEX & TYPE OF INCIDENT, CANADA 1999 (n=12)**



** Including collision of two boats 2, collision of boat & fixed object 1, collision of boat & person 1, fell off boat 1, struck by falling object 1*
† Excludes cases with drowning & hypothermia

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

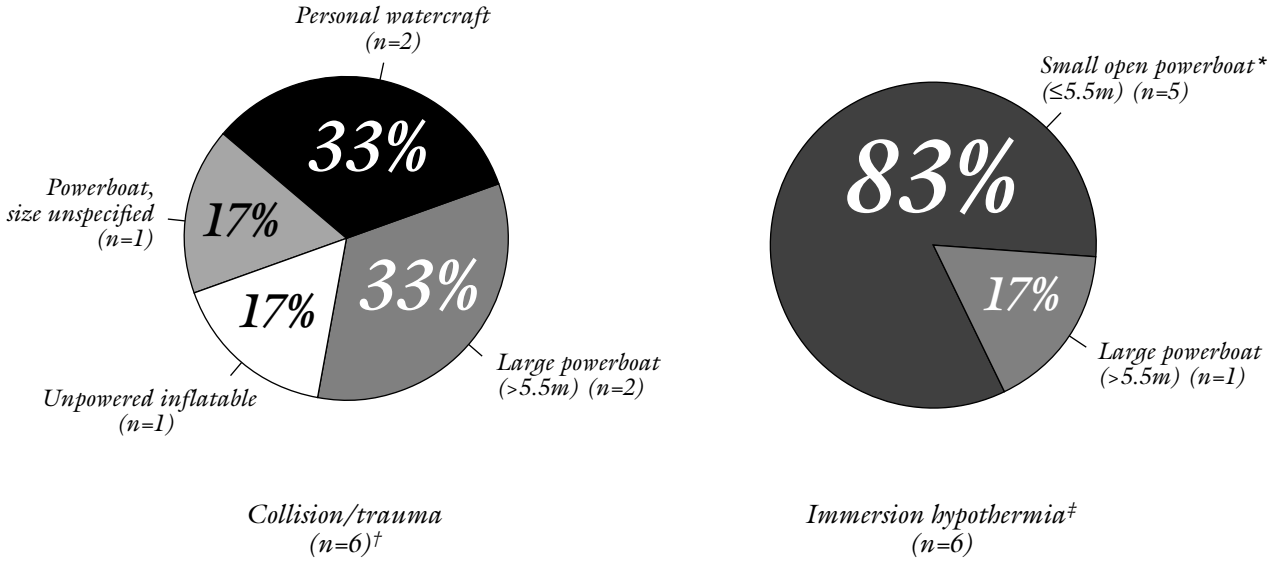
Figure 2.43 **NON-DROWNING BOATING INJURY DEATHS BY BLOOD ALCOHOL LEVEL* & TYPE OF INCIDENT, CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=11)**



** Legal limit is 80 mg %*
† Including collision of two boats 2, collision of boat & person 1, fell off boat 1, struck by falling object 1
‡ 1 at 1-49 mg % § Excludes cases with drowning & hypothermia

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

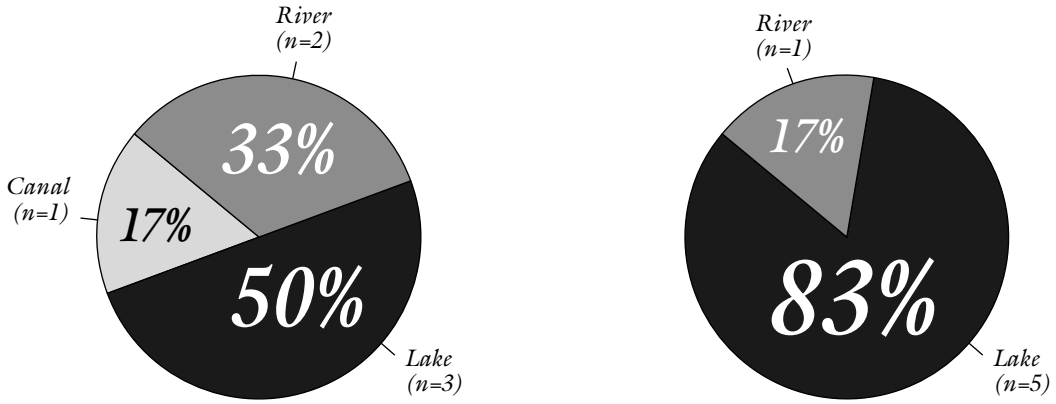
Figure 2.44 **NON-DROWNING BOATING INJURY DEATHS BY TYPE OF BOAT & TYPE OF INCIDENT, CANADA 1999 (n=12)**



** Includes open outboard motorboats and other open powered boats such as inflatables; excludes personal watercraft*
† Including collision of two boats 2, collision of boat & fixed object 1, collision of boat & person 1, fell off boat 1, struck by falling object 1
‡ Excludes cases with drowning & hypothermia

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.45 **NON-DROWNING BOATING INJURY DEATHS BY TYPE OF BODY OF WATER & TYPE OF INCIDENT, CANADA 1999 (n=12)**



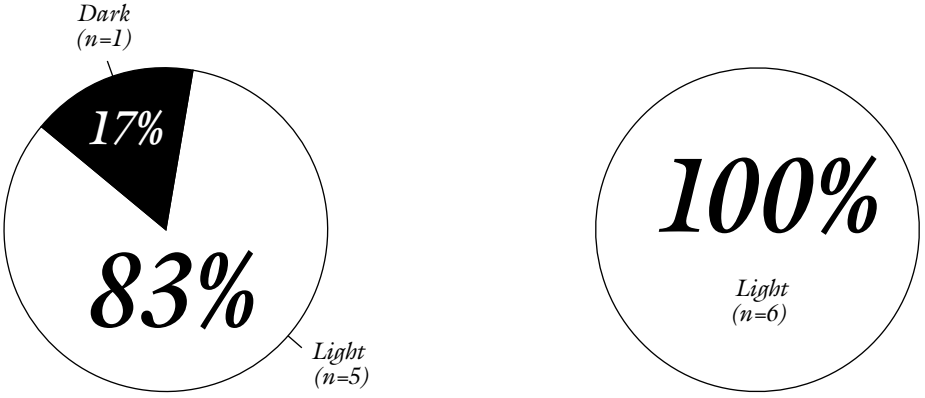
*Collision/trauma (n=6) **

Immersion hypothermia† (n=6)

** Including collision of two boats 2, collision of boat & fixed object 1, collision of boat & person 1, fell off boat 1, struck by falling object 1*
† Excludes cases with drowning & hypothermia

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.46 **NON-DROWNING BOATING INJURY DEATHS BY LIGHT CONDITIONS & TYPE OF INCIDENT, CANADA 1999 (n=12)**



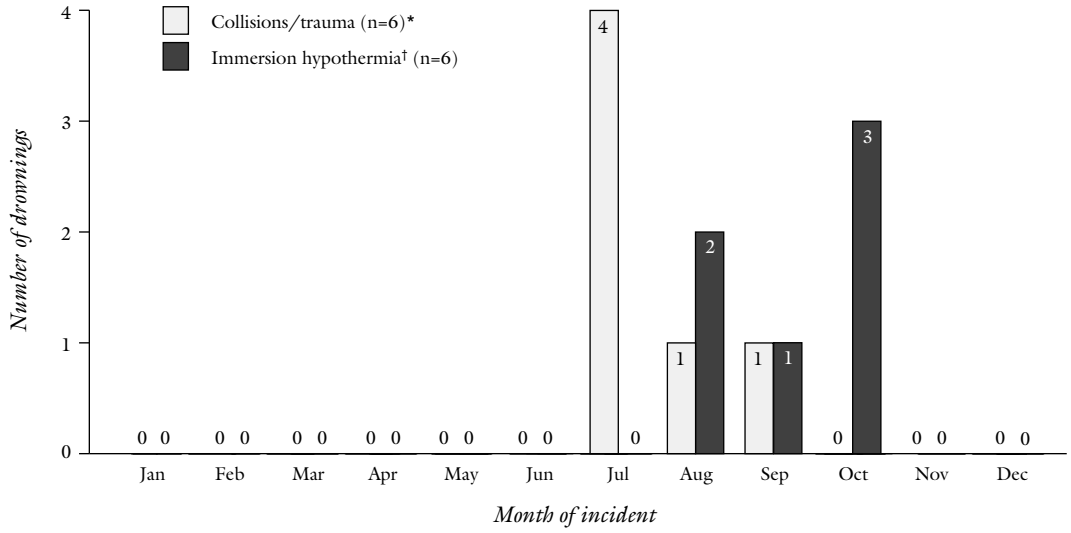
*Collision/trauma (n=6) **

Immersion hypothermia† (n=6)

** Including collision of two boats 2, collision of boat & fixed object 1, collision of boat & person 1, fell off boat 1, struck by falling object 1*
† Excludes cases with drowning & hypothermia

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

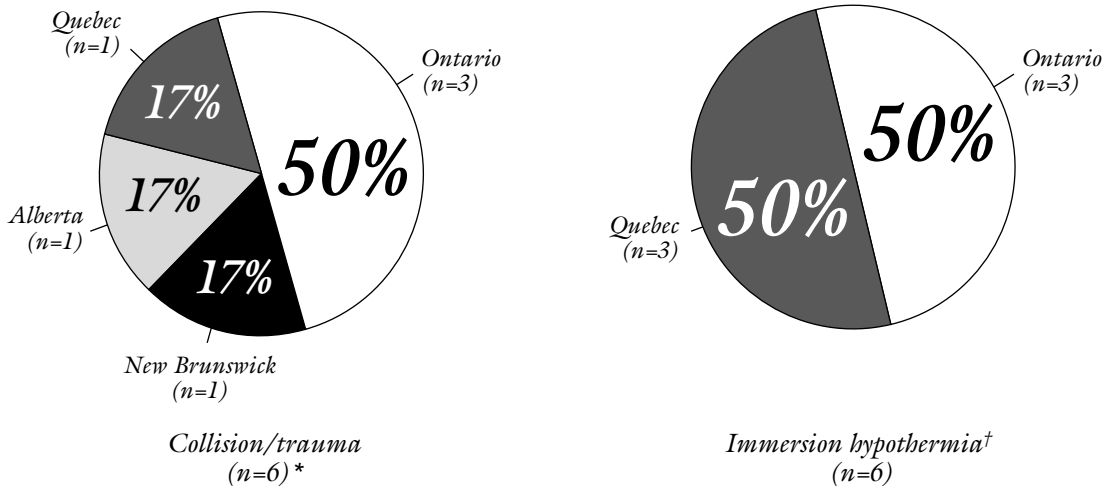
Figure 2.47 **NON-DROWNING BOATING INJURY DEATHS BY MONTH & TYPE OF INCIDENT, CANADA 1999 (n=12)**



** Including collision of two boats 2, collision of boat & fixed object 1, collision of boat & person 1, fell off boat 1, struck by falling object 1*
† Excludes cases with drowning & hypothermia

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 2.48 **NON-DROWNING BOATING INJURY DEATHS BY PROVINCE & TYPE OF INCIDENT, CANADA 1999 (n=12)**



** Including collision of two boats 2, collision of boat & fixed object 1, collision of boat & person 1, fell off boat 1, struck by falling object 1*
† Excludes cases with drowning & hypothermia

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Table 2.3 **WATER-RELATED INJURY FATALITIES OTHER THAN DROWNINGS* DURING BOATING ACTIVITIES, CANADA 1999 (n=12)**

Activity/incident	No.	%	Nature of Injury	No.	Type of boat	No.	Age	Sex M	Sex F	Alcohol mg%†	Alcohol No.
Collision											
Boat with another boat	2	17	Head injury	1	Large powerboat (>5.5 m)	1	28	2	0	98	1
				1	Personal watercraft	1	22			0	1
			Other risk factors:‡ dark, 180° turn, inexperienced boater, illegal drug, driving too close to another personal watercraft								
Boat with fixed object	1	8	Head injury	1	Personal watercraft	1	12	0	1	—	1
			Other risk factors:‡ pillar of bridge in water								
Other incidents											
Immersion in cold water	6	50	Hypothermia	5	Small open powerboat§ (≤5.5 m)	5	15, 16, 35, 40, 57	5	1	0	5
				1	Large powerboat (>5.5 m)	1	37			12	1
			Other risk factors:‡ engine failure, strong winds, capsized, rough water, prolonged immersion, transferring passengers in strong wind & current, not enough PFDs¶ in boat, PFD¶ not worn, PFD¶ improperly worn								
Fell out of boat	1	8	Head injury	1	Unpowered inflatable	1	62	1	0	0	1
			Other risk factors:‡ rafting in white water, capsized, no helmet, PFD¶ improperly worn, very cold water								
Struck by boat	1	8	Head & cervial spine injury	1	Powerboat, size unknown	1	15	0	1	unk.	1
			Other risk factors:‡ towed on tube								
Struck by rope	1	8	Head injury	1	Large powerboat (>5.5 m)	1	52	1	0	0	1
			Other risk factors:‡ marine shipping, steel fulcrum broke off and fell, victim struck by fulcrum rope, fell 20', hit head on steel railing								
Total	**12**	**100**				**12**		**9**	**3**		

** Primary cause of death was injury other than drowning, although drowning may have complicated another injury; in case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included here † Legal limit is 80 mg % ‡ Other factors that may have contributed to these incidents*
§ Includes open outboard motorboats & other open powered boats such as inflatables; excludes personal watercraft ¶ Personal flotation device or lifejacket

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

PART 3

DROWNINGS & OTHER INJURY FATALITIES DURING SWIMMING & OTHER AQUATIC ACTIVITIES

Aquatic activities such as swimming, wading, and playing in water represent the second most frequent category of drowning in Canada after boating and account for 25% of all drownings, excluding land and air transport. Aquatic drownings include only incidents where the victim had intended to be in the water, and hence falls into water are excluded. Swimming is the most frequent aquatic activity associated with drowning, followed by wading and/or playing in water.

Drownings from aquatic activities are about 4 to 6 times more frequent among males than females. They account for about one-third of recreational drownings among both males and females. Aquatic activities tended to account for about 15% of recreational drownings among children 0-4 years old, although in 1999 there were no recreational aquatic drownings in this age group.For 15-24 year olds, aquatic drownings generally account for about 50%.

Many swimmers and waders underestimate the significant hazard of rivers with current (The Canadian Red Cross Society,1996b). Even in seemingly gently flowing rivers the power of current can be enormous; however, this power is frequently unapparent to inexperienced observers.

Teenage and young adult males are the highest risk group for swimming drownings, while toddlers and other young children are at special risk during wading. Alcohol is a frequent risk factor for males 25 years and older, while current appears to be a more significant factor for younger males and children. This difference suggests that knowledge of the hazards of current and how to cope with it may be acquired with experience, but that advancing age does not necessarily lead to greater prudence in the use of alcoholic beverages. Alcohol involvement is nearly twice as frequent as for boating drownings.

While non-swimmers and weak swimmers are at high risk for swimming and wading drownings, strong swimmers are also at risk. They may overestimate their capabilities and take unwise risks. Many swimming drownings occur in relatively shallow water and close to shore. The fact that at least a third of swimming drownings occur relatively close to shore indicates that even moderate swimming ability should be protective in such incidents.

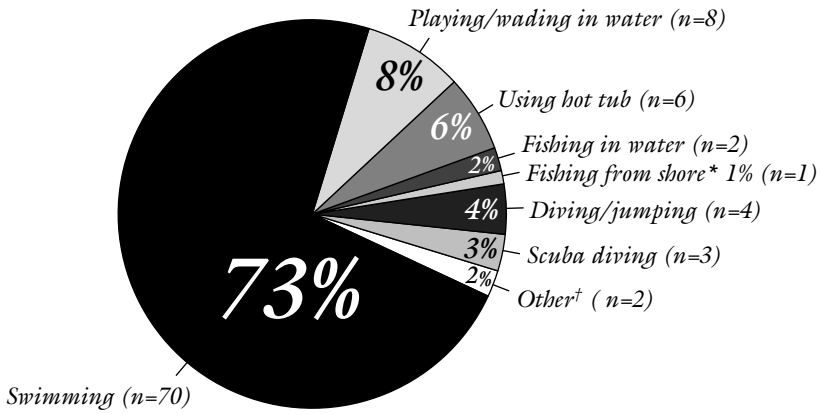
Unlike boating drownings, the vast majority of aquatic drownings occur during the warm months of June, July, and August. Swimming drowning rates are relatively constant across Canada.

The most frequent severe non-drowning injuries associated with aquatic activities are spinal cord injuries from diving into water. While the number of fatalities is relatively small compared with drownings, many victims survive with a permanent severe disability of tetraplegia.

For greater details on aquatic drownings in Canada, the reader may wish to consult the Special Research Report, *Drowning of Swimmers in Canada: Circumstances and Prevention* and the *Comprehensive Surveillance Report: National Drowning Report* (The Canadian Red Cross Society, 1994,1996b).

RECREATIONAL AQUATIC DROWNINGS

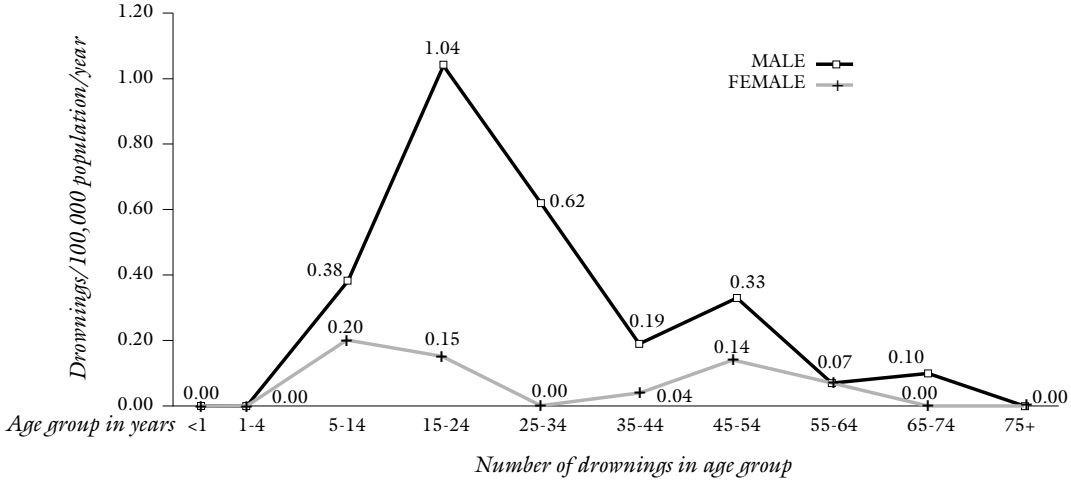
Figure 3.1 **RECREATIONAL AQUATIC DROWNINGS BY ACTIVITY, CANADA 1999 (n=96)**



** Victim entered water to retrieve dropped object † Including 1 each of snorkeling & hunting*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

RECREATIONAL SWIMMING DROWNINGS

Figure 3.2 **RATE AND NUMBER OF RECREATIONAL SWIMMING DROWNINGS BY AGE & SEX, CANADA 1999 (n=70)**

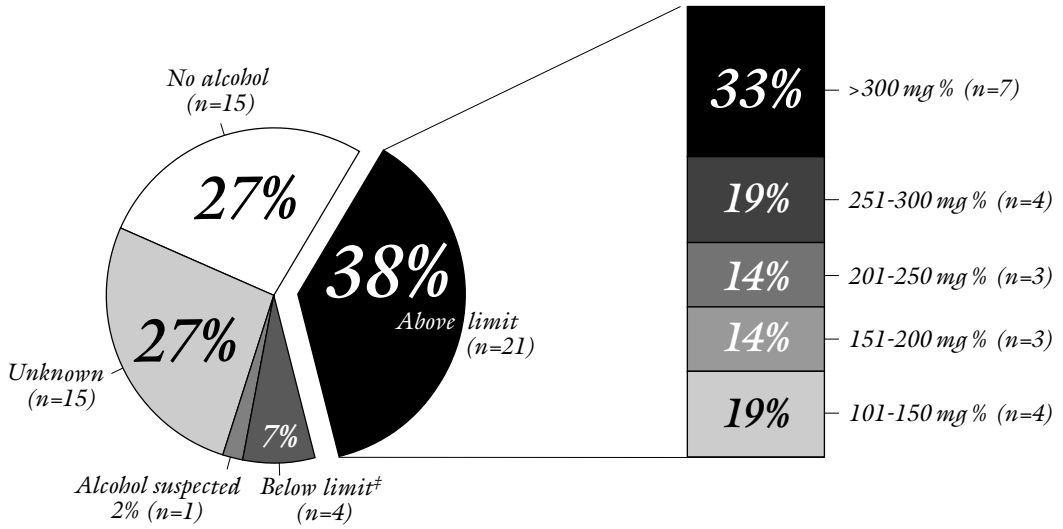


Number of drownings in age group

Male	0	0	8	22	14	5	7	1	1	0
Female	0	0	4	3	0	1	3	1	0	0

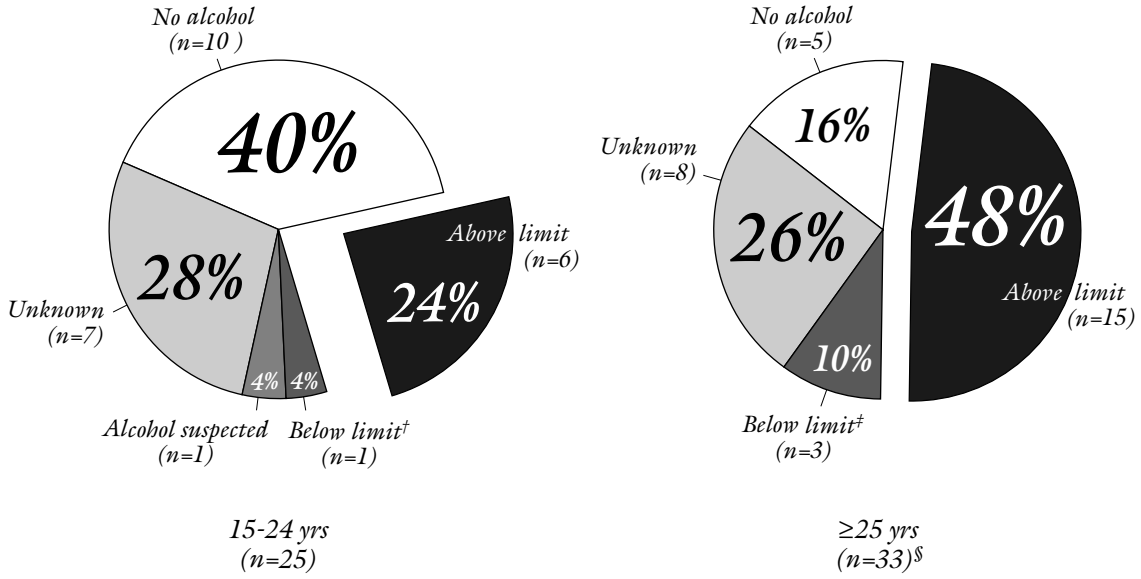
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 3.3a **BLOOD ALCOHOL LEVELS* FOR RECREATIONAL SWIMMING DROWNINGS, CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=58)†**



** Legal limit is 80 mg % † This figure excludes 2 victims; decomposition rendered blood alcohol unreliable ‡ 2 at 1-49 mg %, 2 at 50-80 mg %*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

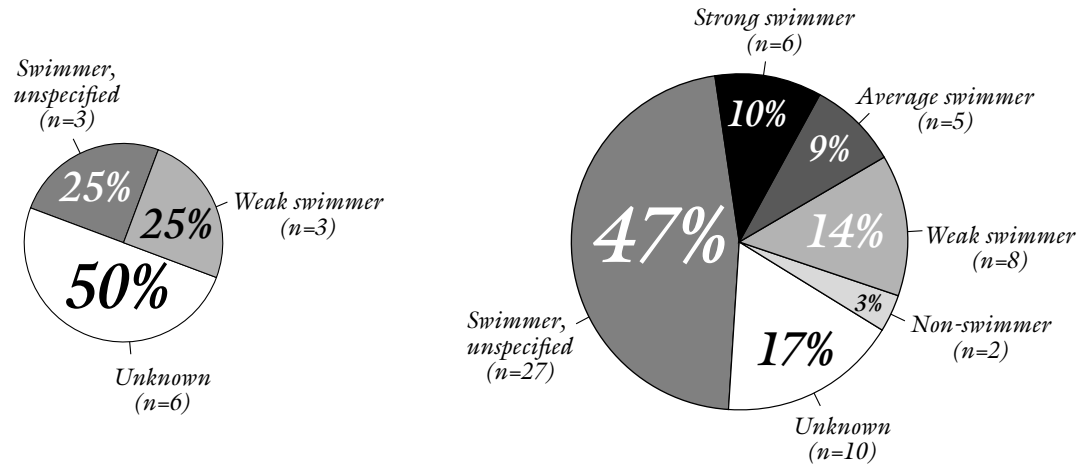
Figure 3.3b **BLOOD ALCOHOL LEVELS* FOR RECREATIONAL SWIMMING DROWNINGS BY AGE, CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=58)**



** Legal limit is 80 mg % † 1 at 1-49 mg % ‡ 1 at 1-49 mg %, 2 at 50-80 mg %*
§ This figure excludes 2 victims; decomposition rendered blood alcohol unreliable

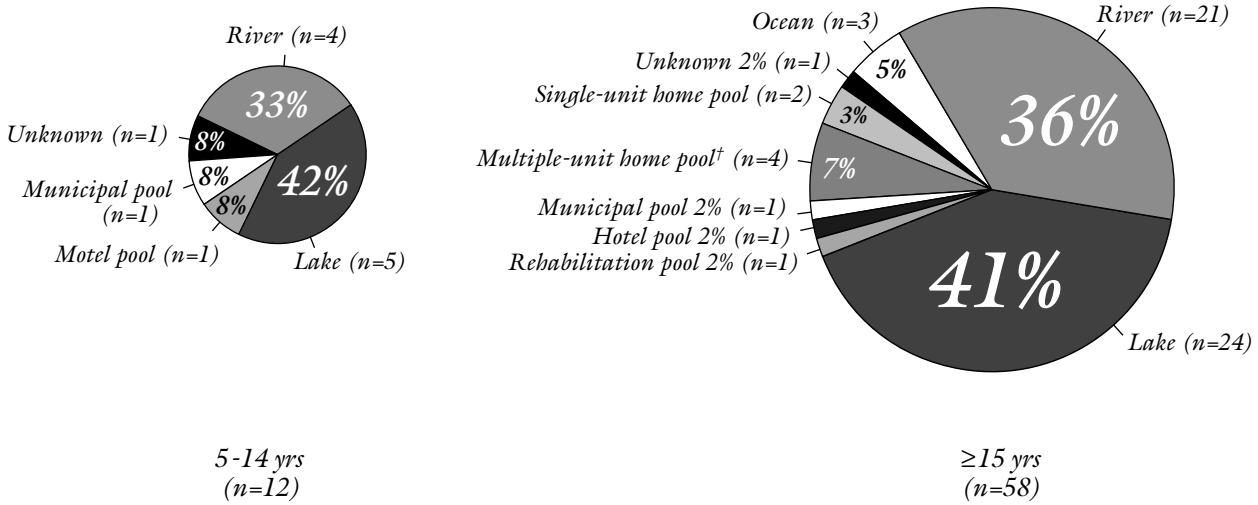
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 3.4 **RECREATIONAL SWIMMING DROWNINGS BY SWIMMING ABILITY & AGE, CANADA 1999 (n=70)**



Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

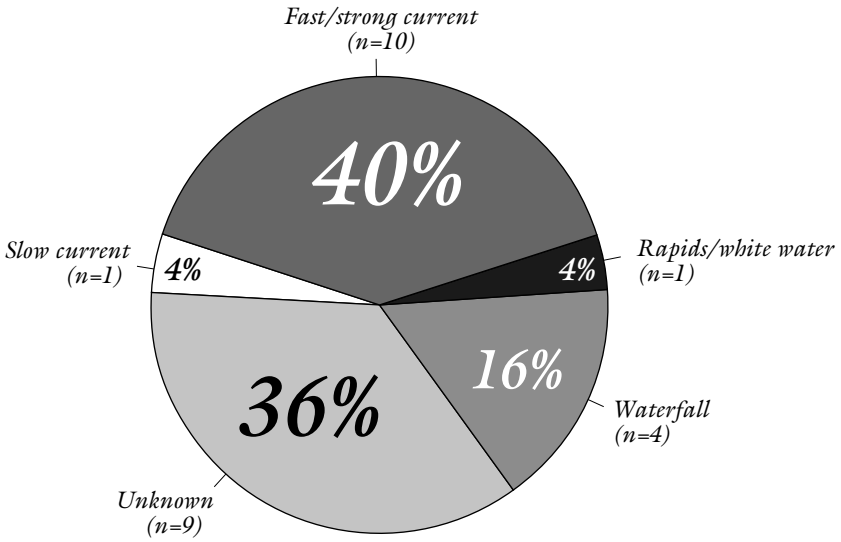
Figure 3.5 **RECREATIONAL SWIMMING DROWNINGS BY AGE & TYPE OF BODY OF WATER,* CANADA 1999 (n=70)**



** "Lake" includes pond & reservoir † Pool at an apartment building*

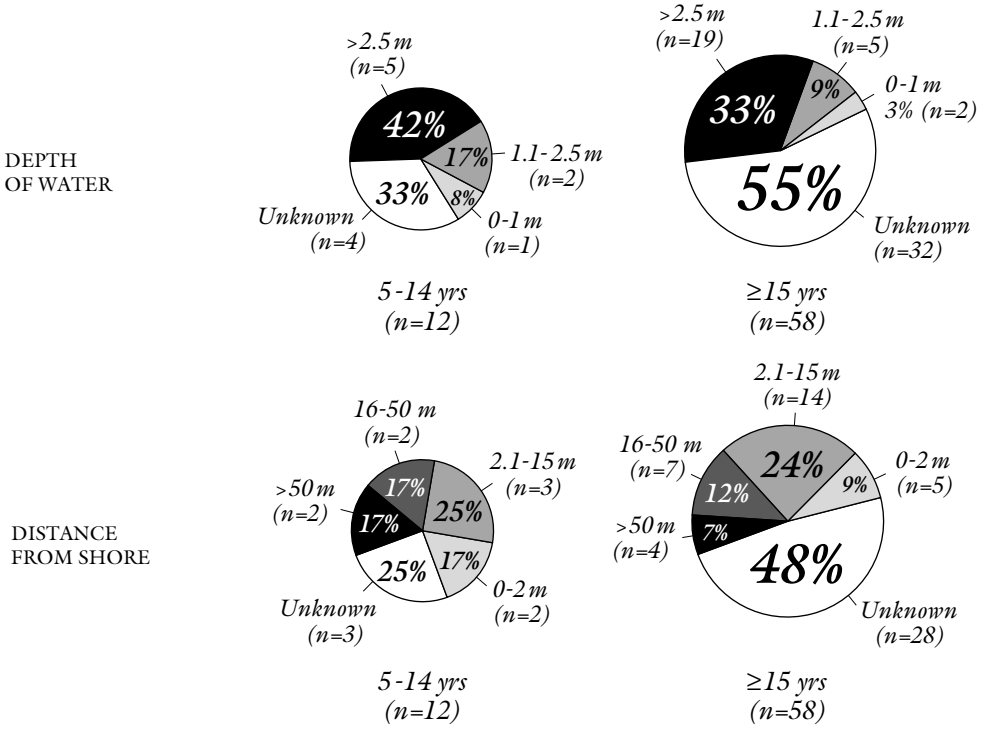
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 3.6 **RECREATIONAL SWIMMING DROWNINGS IN RIVERS BY WATER CURRENT, CANADA 1999 (n=25)**



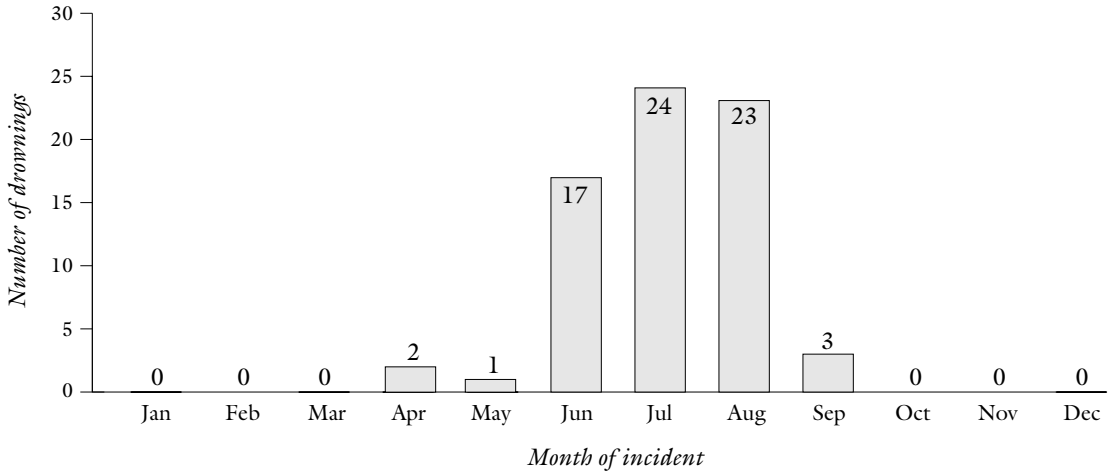
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 3.7 **RECREATIONAL SWIMMING DROWNINGS BY AGE AND BY DEPTH OF WATER & DISTANCE FROM SHORE,* CANADA 1999 (n=70)**



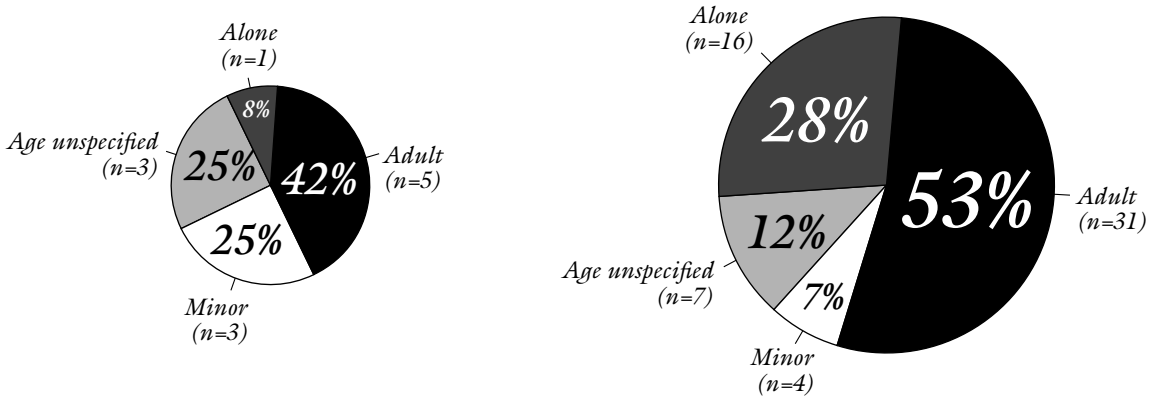
** Depth and distance in metres*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 3.8 **RECREATIONAL SWIMMING DROWNINGS BY MONTH OF INCIDENT, CANADA 1999 (n=70)**



Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

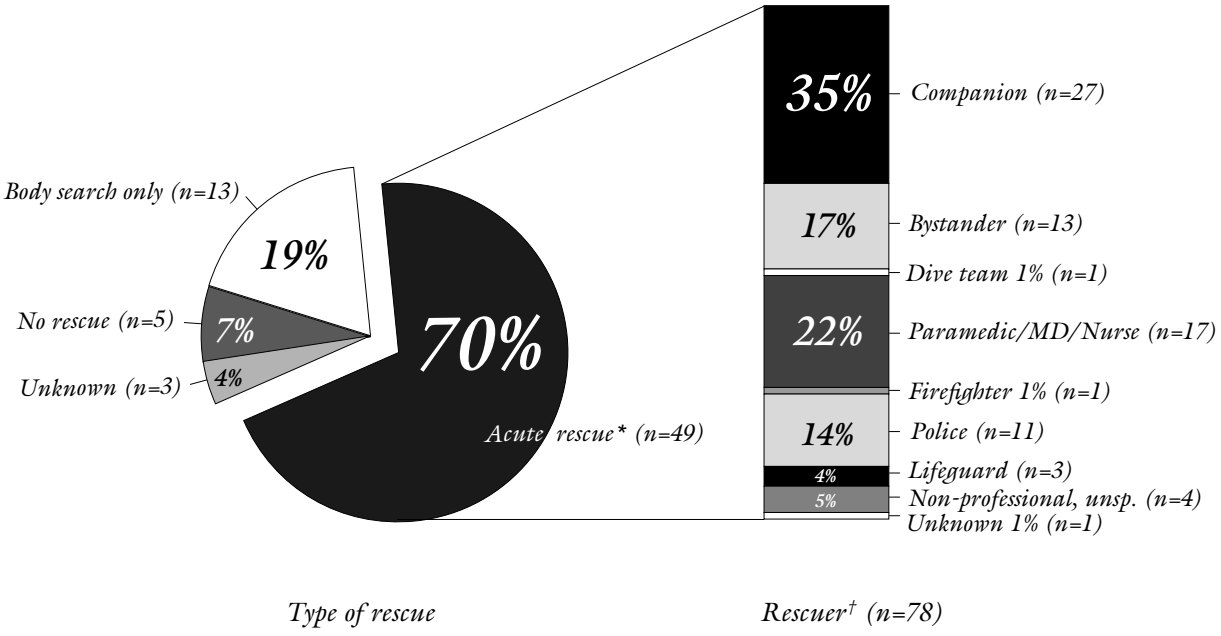
Figure 3.9 **RECREATIONAL SWIMMING DROWNINGS BY AGE OF VICTIMS & ACCOMPANYING PERSONS,* CANADA 1999 (n=70)**



** "Adult" indicates that victim was accompanied by adult(s); does not exclude presence of minor(s) (<18 years); "Minor" indicates presence of minor(s) only*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

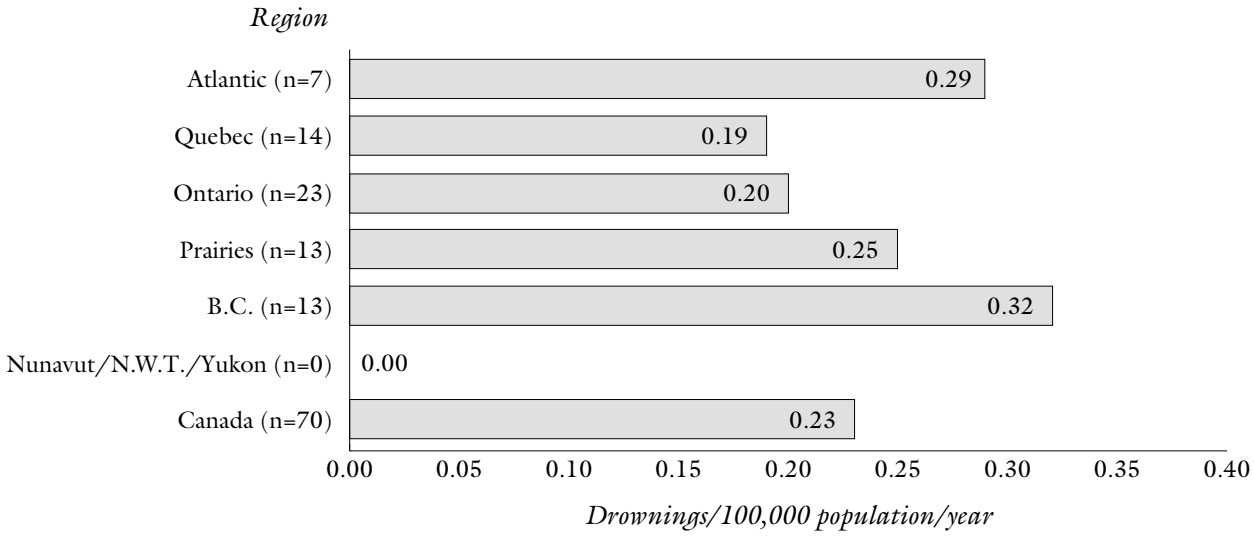
Figure 3.10 **RECREATIONAL SWIMMING DROWNINGS BY TYPE OF RESCUE & RESCUER, CANADA 1999 (n=70)**



** Includes cases with a subsequent body search*
† There was more than one rescuer for some drownings, thus there were more rescuers than victims

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 3.11 **RATE OF RECREATIONAL SWIMMING DROWNINGS BY REGION, CANADA 1999 (n=70)**



Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Table 3.1 **WATER-RELATED INJURY FATALITIES OTHER THAN DROWNINGS* DURING AQUATIC ACTIVITIES, CANADA 1999 (n=8)**

Activity/incident	No.	%	Nature of injury	No.	Age	Sex M	Sex F	Alcohol mg%†	Alcohol No.	Other risk factors‡
Scuba diving	5	62	Air embolism	5	22, 27, 28, 34, 47	3	2	0 Unk.	3 2	Ascending too rapidly, difficulty breathing at surface, problem with regulator, panicked at 50', cold/very cold water
Diving into water	3	38	Head injury	3	20, 24, 27	3	0	0 171 susp.	1 1 1	Dove into waterfall, dove into home swimming pool, marijuana/drug consumed or susp., dark, strong current, dangerous dive of 25'
Total	**8**	**100**				**6**	**2**			

** Primary cause of death was injury other than drowning, although drowning may have complicated another injury; in case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included here*
† Legal limit is 80 mg % ‡ Other factors that may have contributed to these incidents

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

PART 4

DROWNINGS & OTHER INJURY FATALITIES DURING BATHING

Drownings in the bathtub are an important category of drownings in Canada and account for about 6 to 10% of drownings, excluding land and air transport. Most occur during daily living activities such as bathing. Bathtubs and swimming pools represent the main drowning hazards in or near Canadian homes. There were about 1.5 times more drownings in bathtubs than in home swimming pools during 1991-1999. Drownings in bathtubs accounted for about 30% of drownings of females during 1991-1998, but only about 4% of drownings of males. In 1999, the proportion of drownings of females due to bathtubs has fallen to 18%, while females are becoming more represented among aquatic victims and even boating fatalities. Since the total number of all drownings is much higher among males, the actual number of bathtub deaths was only 1.5 times higher among females.

Deaths in the bathtub fall into three main categories:

- Individuals who drown while bathing immersed in the water. This appears to be the largest group;
- Individuals who are preparing to bathe and either fall into the bathtub or slip and fall in the bathtub;
- Persons who are in a bathroom for other reasons and fall into a bathtub containing water.

In the case of falls in the bath, death may occur from drowning, from head injury or from a combination of both. In some cases, it is unclear whether the victim was preparing to take a bath or was engaged in other activities. Finally, there are occasional deaths in the bathroom in locations other than the bathtub, such as toilets, laundry buckets, and hand basins.

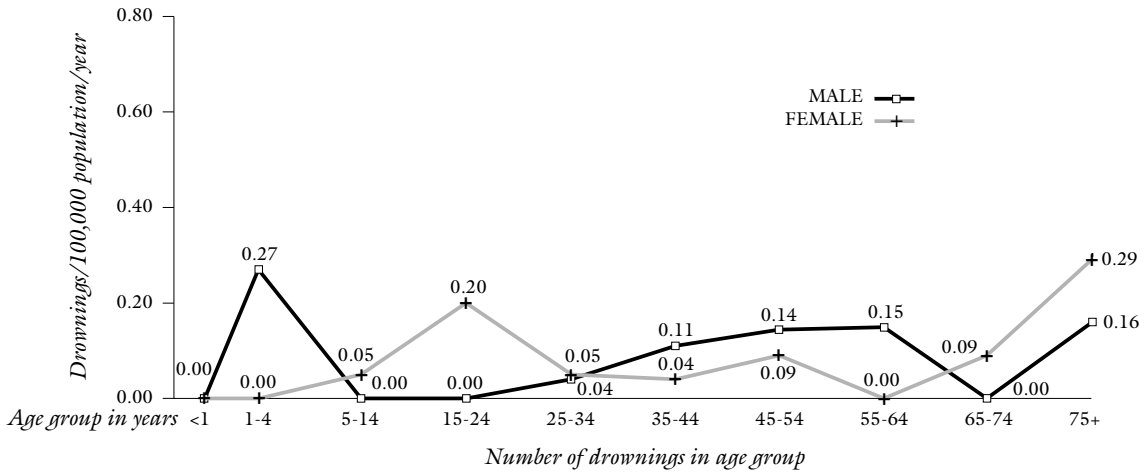
While there are certain similarities between the groups at risk from drowning in bathtubs and home pools, there are also differences that should be considered when planning interventions. These become apparent upon reviewing the age groups at risk in these two locations, and personal risk factors, especially epilepsy. It is clear that bathing infants in large adult bathtubs is hazardous, since infants are unsupported on a large slippery surface and can topple over and slip beneath the water at any time if the parent or caregiver is momentarily distracted. Hence, infant tubs should be purchased or supplied at the time of the birth of a first child. Infant bath seats or rings are hazardous and should not be used as a substitute for an infant tub (Brenner et al., 1995). Nevertheless, while infant bathtubs can help to reduce the risk, constant adult supervision is still essential. Elderly persons who are physically or mentally handicapped, as well as alcoholics, may not be able to use a bathtub safely by themselves, and other methods of bathing should be considered.

Because of the risk of seizures, persons with epilepsy need to shower and avoid ever being alone in or close to bodies of water such as bathtubs or pools. Further details of drownings among persons with epilepsy are included in Part 6.

While the highest rates of drowning in bathtubs are seen among infants and toddlers and the elderly, the majority of victims are people in the economically productive period of life between 15 to 54 years. While prevention of bathtub drownings among infants and toddlers needs to focus on use of child bathtubs and constant adult supervision, prevention among adults must focus on safe bathing practices for people with epilepsy.

While infants accounted for between 10 and 20% of drownings in bathtubs during 1991-1994, these have decreased to nearly zero since then. Hence, people with epilepsy are now the leading group to be addressed to help further reduce the toll of bathtub drownings.

Figure 4.1 **RATE AND NUMBER OF BATHTUB DROWNINGS BY AGE & SEX, CANADA 1999 (n=25)**

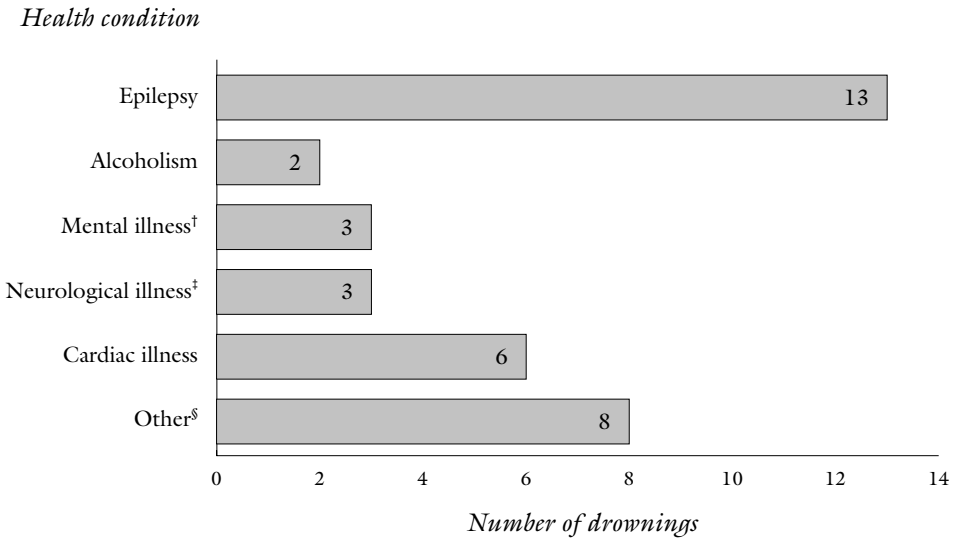


Number of drownings in age group

Male	0	2	0	0	1	3	3	2	0	1
Female	0	0	1	4	1	1	2	0	1	3

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

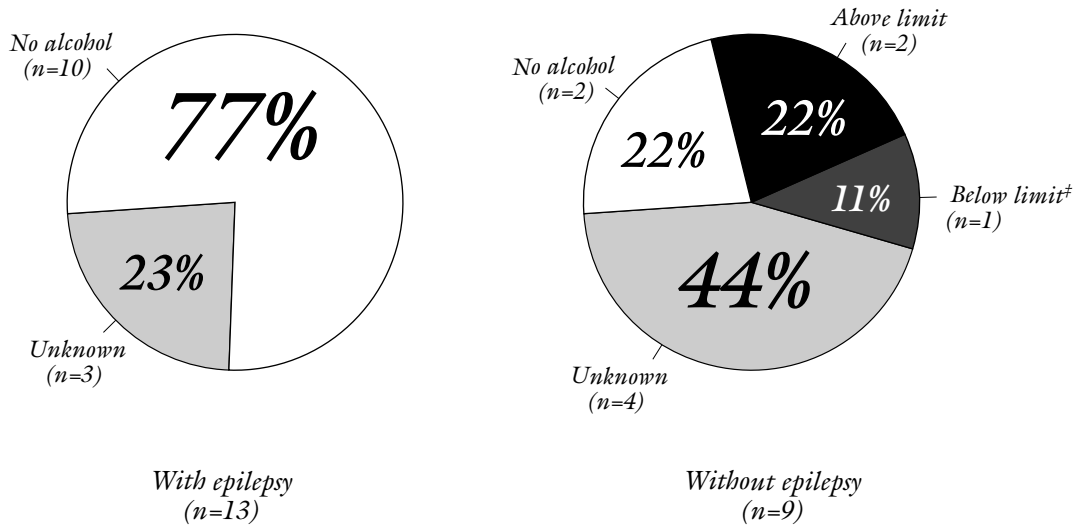
Figure 4.2 **HEALTH CONDITIONS* OF VICTIMS OF BATHTUB DROWNINGS, CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=22)**



** Includes conditions with possible effect on consciousness, alertness, or balance; victims may suffer from more than one condition*
† Including depression 2, schizophrenia 1
‡ Including 1 each of cerebral atrophy, ataxia, sleep apnea
§ Including diabetes 2, & 1 each of emphysema, pneumonia, asthma, chronic back pain, burns, renal failure

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 4.3 **BLOOD ALCOHOL LEVELS* FOR BATHTUB DROWNING VICTIMS WITH & WITHOUT EPILEPSY,† CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=22)**



** Legal limit is 80 mg % † See Part 6 for more information about epilepsy ‡ 1 at 50-80 mg %*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

PART 5

NON-AQUATIC DROWNINGS & OTHER INJURY FATALITIES INVOLVING FALLS INTO WATER

A non-aquatic drowning involves a victim who had not intended to be in the water, i.e., an unintentional fall into water. Such falls occur during recreational, daily living, and occupational activities. Most drownings from falls into water involve children or adults who are playing, walking, or fishing near water or on ice. Non-aquatic drownings account for 25% of drownings in Canada, excluding land and air transport.

It is informative to examine the circumstances of drownings from falls into different types of bodies of water by activity and by age group. For *recreational activities*, rivers and lakes are the most frequent location for non-aquatic drownings from falls into water, followed by home swimming pools. *Daily living and occupational incidents* most frequently involve rivers and lakes. Victims of falls during recreational activities in large bodies of water include both adults and children. Falls during daily living, occupational, and unknown activities affect mainly adults. Most drownings from falls *around the home* involve young children, mainly toddlers of 1-4 years of age, and home swimming pools are the most frequent body of water.

The risk groups for drownings from falls into swimming pools differ somewhat from those for most other bodies of water, in that nearly all of the victims from falls into swimming pools are *toddlers*. Toddlers are also the usual victims of drownings in other collections of water in and around the home. Since swimming pool drownings occur both from non-aquatic falls into water and from aquatic activities where the victim intended to be in the water, all pool drownings are discussed together in greater detail in Part 6 under special environments. Falls into water or through ice associated with travel on motorized vehicles such as snowmobiles are included in Part 7.

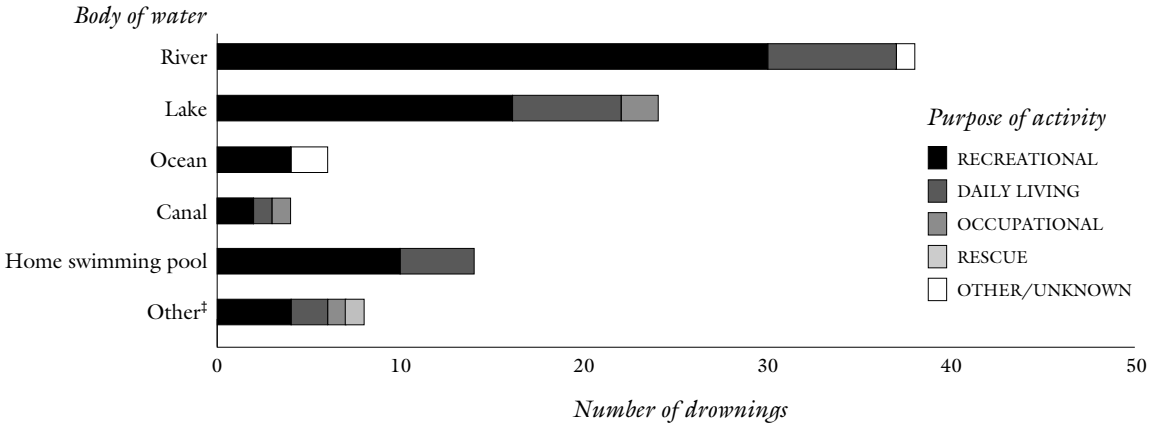
Drownings of *children* that result from falls into water are frequently associated with home swimming pools that lack a fence with a self-closing and self-latching gate. Many *adult* drownings from falls are associated with current, poor swimming ability, and/or impairment of brain function by alcohol or a chronic mental handicap.

Ice-related incidents take about 20% of victims of non-aquatic drowning. More than half of these incidents involved rivers, reinforcing the point that rivers can never be considered safe due to constantly moving water. February was the most frequent months for such incidents. This might be simply because more people are exposed to skating and other activities at this time of year, or possibly due to overconfidence in the solidity of ice during the coldest month.

A category of drownings where falls into water are probable but unproven are those drownings where it was unknown whether the death occurred during non-aquatic, aquatic, or boating activities. This category of “unknowns” can be suspected to include many unwitnessed falls into water during non-aquatic activities, as well as possible suicides.

Deaths from falls into bathtubs are discussed separately in Part 4, since it is not always clear whether the victim had intended to be in the water, and this intent is the basis for classification of an incident as aquatic or non-aquatic.

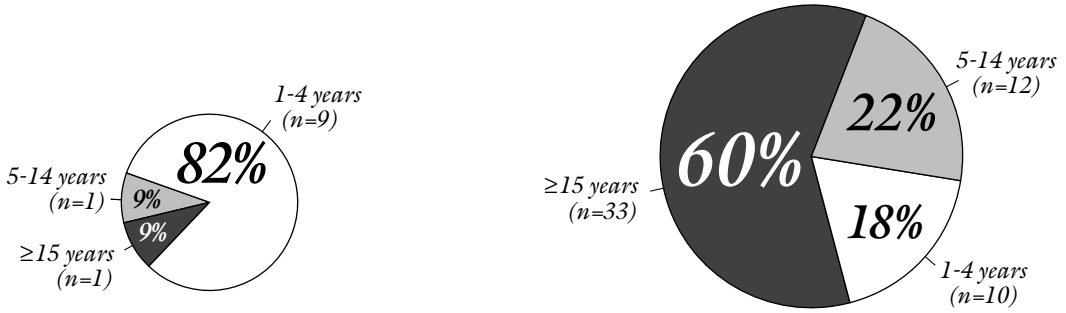
Figure 5.1 **DROWNINGS FROM FALLS INTO WATER DURING NON-AQUATIC ACTIVITIES BY PURPOSE OF ACTIVITY* & TYPE OF BODY OF WATER,† CANADA 1999 (n=94)**



** Recreation includes adult leisure activities and children's play; daily living includes activities such as non-recreational travel by foot*
†"Lake" includes pond & reservoir ‡ Including recreational 4 (1 each of motel pool, dam, rut, cattle watering trough); daily living 2 (ditch, shallow well); occupational 1 (excavation hole); & rescue 1 (dam)

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

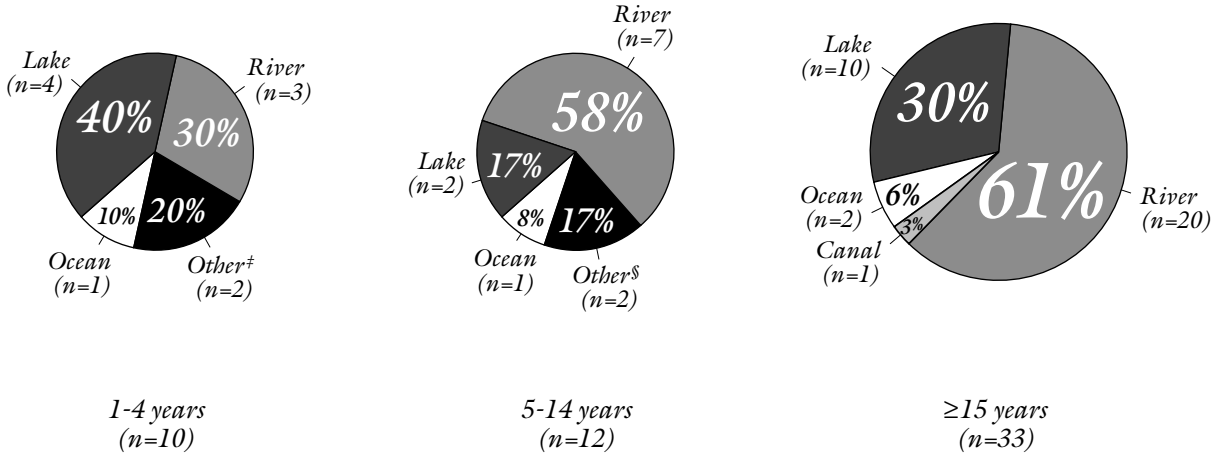
Figure 5.2 **DROWNINGS FROM FALLS INTO SWIMMING POOLS & ALL OTHER BODIES OF WATER* DURING NON-AQUATIC RECREATIONAL ACTIVITIES† BY AGE OF VICTIMS, CANADA 1999 (n=66)**



** See Figure 5.1 for information on types of bodies of water*
† Including, for victims ≥15 years: walking 22, fishing from shore 4, partying 2, & 1 each of ice fishing, cleaning fishing gear, hunting, cycling, skating, unknown; for victims <15 years: playing/walking 30, & 1 each of fishing from shore, cycling

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

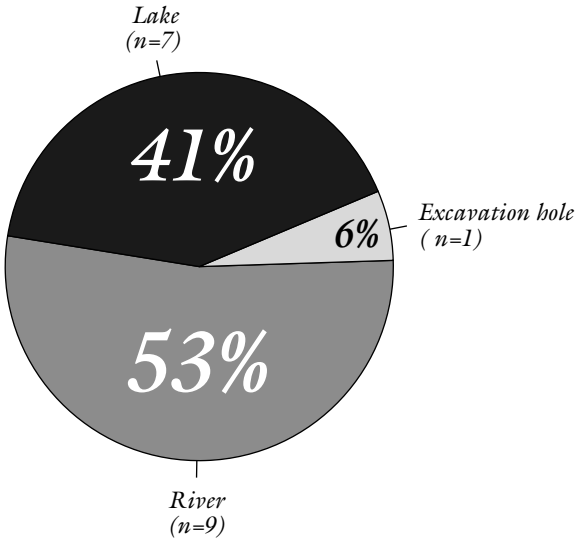
Figure 5.3 **DROWNINGS FROM FALLS INTO WATER OTHER THAN SWIMMING POOLS DURING NON-AQUATIC RECREATIONAL ACTIVITIES BY AGE* & TYPE OF BODY OF WATER,† CANADA 1999 (n=55)**



** There were no infant (<1 year) deaths from falls into water in 1999 † "Lake" includes pond & reservoir*
‡ Including rut & cattle watering trough § Including canal & dam

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

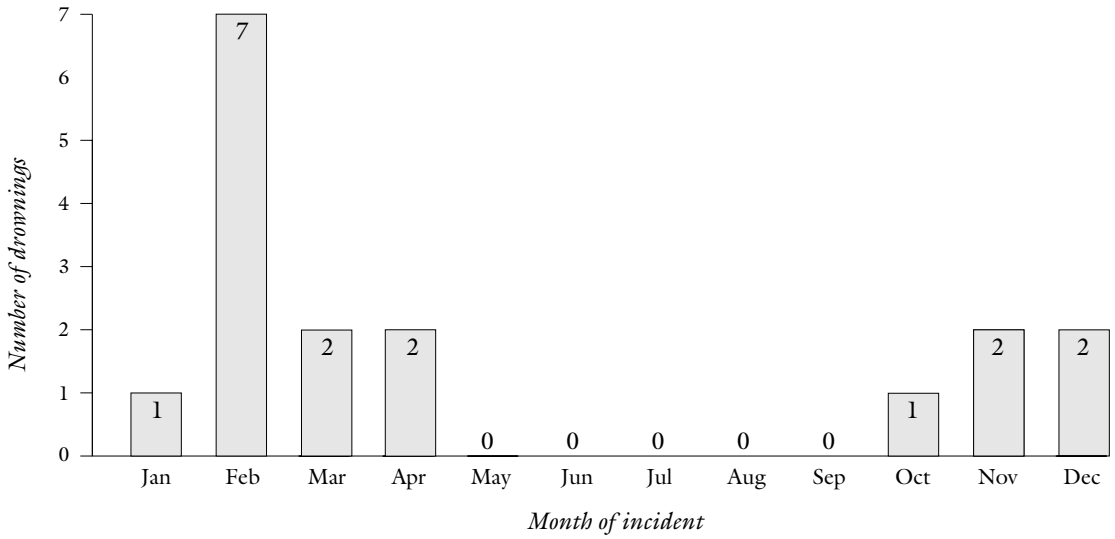
Figure 5.4 **NON-AQUATIC DROWNINGS* IN PRESENCE OF ICE BY TYPE OF BODY OF WATER, CANADA 1999 (n=17)†**



** Falls into water † For 94 non-aquatic drownings: ice present 17, no ice 71, & unknown 6*

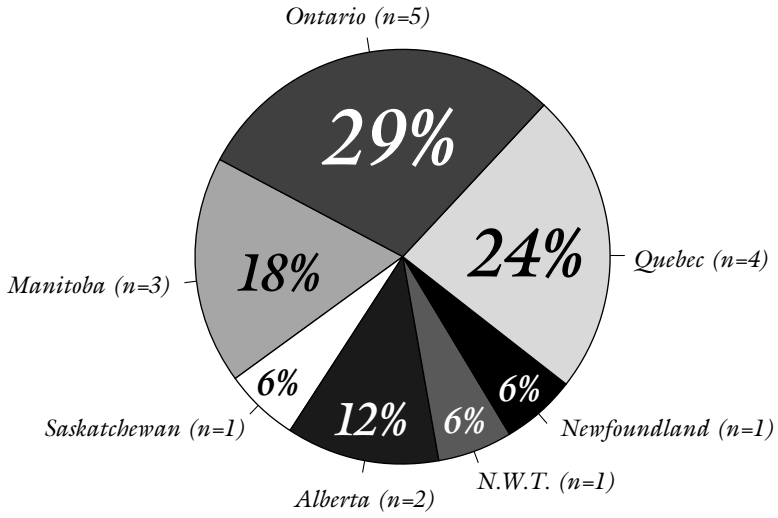
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 5.5 **NON-AQUATIC DROWNINGS* IN PRESENCE OF ICE BY MONTH OF INCIDENT, CANADA 1999 (n=17)†**



** Falls into water † For 94 non-aquatic drownings: ice present 17, no ice 71, & unknown 6*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 5.6 **NON-AQUATIC DROWNINGS* IN PRESENCE OF ICE BY REGION, CANADA 1999 (n=17)†**



** Falls into water † For 94 non-aquatic drownings: ice present 17, no ice 71, & unknown 6*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Table 5.1 **WATER-RELATED INJURY FATALITIES OTHER THAN DROWNINGS* DURING NON-AQUATIC ACTIVITIES,† CANADA 1999 (n=3)**

Activity/incident	No.	%	Nature of injury	No.	Age	Sex M	Sex F	Alcohol ‡ No.	Alcohol ‡ mg%	Other risk factors§
Walking/playing near water/on ice	3	100	Hypothermia	1	54	3	0	0	1	Fell off cliff, berry picking, sitting on cliff, walking in dark while partying
			Head injury	2	8, 18			127	1	
								—	1	
Total	**3**	**100**				**3**	**0**			

** Primary cause of death was injury other than drowning, although drowning may have complicated another injury; in case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included here*
† Excludes land & air transport drownings ‡ Legal limit is 80 mg% § Other factors that may have contributed to these incidents
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

PART 6

SPECIAL HIGH-RISK ENVIRONMENTS & POPULATION SUBGROUPS FOR DROWNING

This part of the report focuses on selected high-risk environments for drownings, as well as on certain subgroups of the population at special risk. *High-risk environments* include home swimming pools. *High-risk subgroups* of the population who are considered include: toddlers 1-4 years old and youth 15-19 years old; persons with seizure disorders such as epilepsy; fishers; and aboriginal peoples.

Since *home swimming pools* are the most important environmental hazard for toddlers, there is overlap between the study of drownings by high-risk environments and a consideration of toddlers as a special risk group. This section integrates swimming pool data from both non-aquatic falls and aquatic recreation. The unprotected single-unit home pool is the most important environmental hazard for toddlers of 1-4 years of age. Above ground pools are at least as frequent as inground pools for such incidents.

Pool drownings occur during both non-aquatic and aquatic activities. Most drownings in single-unit home pools result when toddlers playing nearby fall in, while the remainder occur during wading or playing in the pool. In contrast, the majority of drownings in other types of pools occur during swimming.

It is of great concern that the vast majority of child pool drownings involve pools that are not fitted with a self-closing and self-latching gate. The lack of effective national, provincial, municipal, and industry norms, regulations, and enforcement for home swimming pool safety remained alarming throughout the 1990's. While most pool drownings occur during warmer months, unenclosed pools are a year-long hazard as indicated by occasional incidents during fall, winter, and spring.

Adult drownings in pools tend to be associated with alcohol consumption and poor swimming ability. Noteworthy is that the majority of both child and adult pool victims are alone at the time of the incident. Readers interested in greater detail on the prevention of toddler drownings in swimming pools should consult the *Special Research Report on Drownings Among 1 to 4 Year Old Children in Canada* (The Canadian Red Cross Society, 1994a) and the section on drowning from falls into water in Part 5 of this report.

Toddlers are at risk not only in swimming pools but also in other bodies of water such as lakes and rivers, especially when cottages are situated close to the water. Youth 15-19 years old are at high risk during swimming; incidents also occur during wading, canoeing, other boating, and bathing (epilepsy). Infants less than 1 year old are mainly at risk when left alone or with another child in an adult bathtub.

While persons with *epilepsy* are at particular risk in or near bathtubs due to the frequency of exposure to this hazard, they are also at risk in any activity in or near other bodies of water. Most victims with epilepsy are in their economically productive years, between 15 and 54. The reader may also wish to refer to Part 4 on drowning during bathing.

Fishers are at risk in boats, along the shore and docks, and on the ice. Nearly all fishers who drown in boats are 15 and older, ranging up to 75 years and older. As for other boaters, non-wearing of a flotation device is associated with nearly all deaths of fishers using boats. Small open powerboats are the main source of such deaths. Fishers who drown while wading, walking on ice, or who fall in are also rarely wearing a flotation device. Alcohol and cold are other risk factors. Many fishing drownings occur in the spring and fall, with hypothermia a complicating factor. Boating drowning is covered in greater detail in Part 2.

Drownings are among the leading two causes of injury death in many *aboriginal communities* in Canada. In some locations, the number of drownings exceeds road traffic deaths, especially when *snowmobile*

drownings are included with other drownings. Drowning rates among aboriginal peoples are as much as 10 times higher than among other Canadians, and the main victims are adult males and toddlers (Damestoy, 1994). Nevertheless, drowning rates of female aboriginals often exceed those for non-aboriginal males.

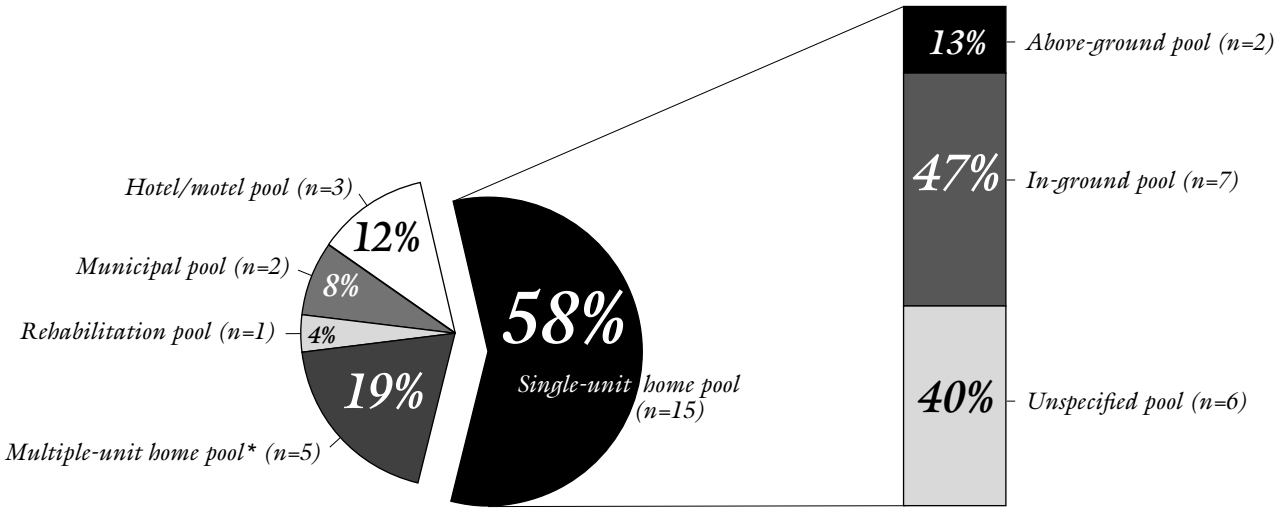
Adults are at risk while boating, snowmobiling, and while on the ice. Toddlers are at risk from falls into open bodies of water and in boats. Many aboriginal drownings still occur during subsistence activities, although recreational activities are becoming more frequent than subsistence in some communities. Alcohol tends to be involved in about 50% of aboriginal drownings of individuals 15 years and older; the concentration of alcohol in the blood in such incidents is often extremely high. While most incidents still occur in natural bodies of water such as rivers and lakes, other sites such as bathtubs and swimming pools are becoming more frequent in all adult groups.

Among many rural people, not only aboriginals, travel by boat and over ice and snow occurs throughout the year. When immersions do occur, hypothermia is a frequent complication. In rural regions, death rates from various injuries are often comparable between aboriginals and non-aboriginals. (Damestoy, 1994). Hazardous activities in hostile environments tend to be frequent in both ethnic groups.

Careful review of the circumstances of drownings among aboriginals reveals certain differences from the Canadian average. These differences should be considered in planning prevention strategies for aboriginal populations who live in remote northern environments. Nevertheless, the general principles of injury prevention are often similar, especially for populations who live in remote and/or northern locations. Since less than 5% of aboriginal drowning victims are found wearing a flotation device, it is evident that non-wearing of a flotation device is even more frequent among aboriginal boaters than in the general population; in most incidents no flotation devices are present even in the boat.

SWIMMING POOL DROWNINGS

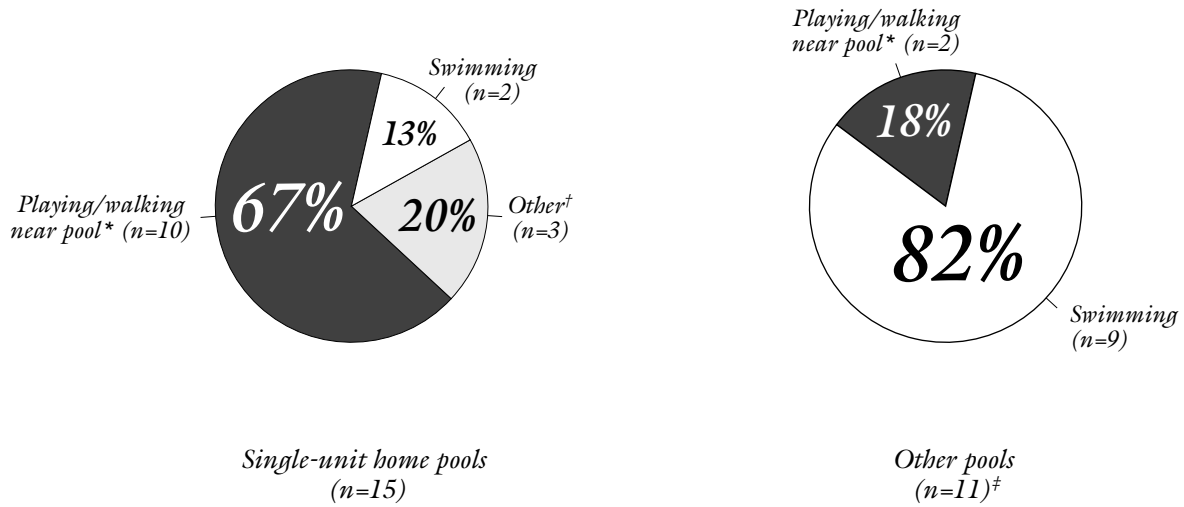
Figure 6.1 **SWIMMING POOL DROWNINGS BY TYPE OF POOL, CANADA 1999 (n=26)**



** Pool at an apartment building*

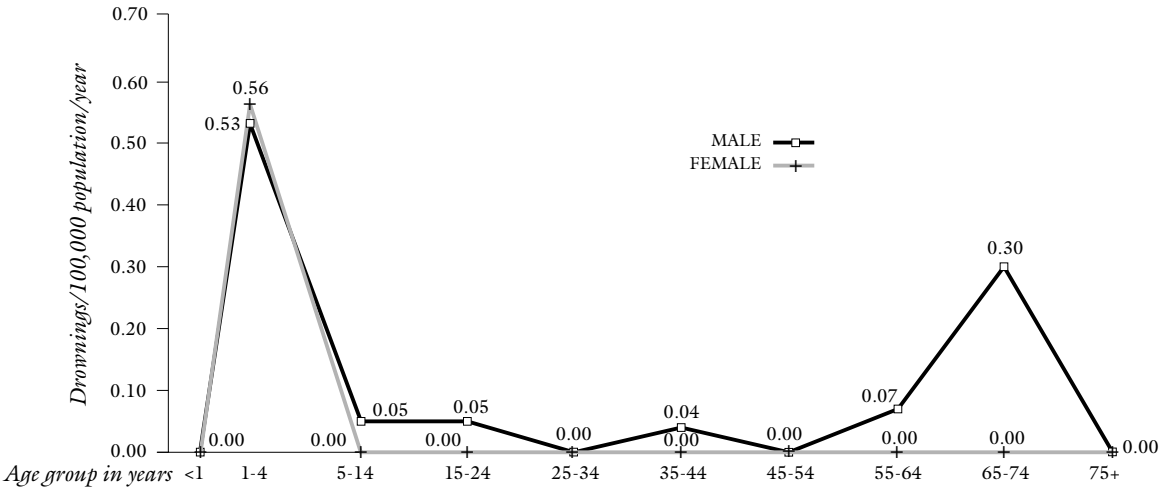
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.2 **SWIMMING POOL DROWNINGS BY ACTIVITY & TYPE OF POOL, CANADA 1999 (n=26)**



** Victims fell into pool † Including cleaning pool 2, cutting grass around pool 1*
‡ Including multiple-unit home pool 5, hotel/motel pool 3, municipal pool 2, rehabilitation pool 1
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.3 **RATE AND NUMBER OF DROWNINGS IN SINGLE-UNIT HOME POOLS BY AGE & SEX, CANADA 1999 (n=15)**

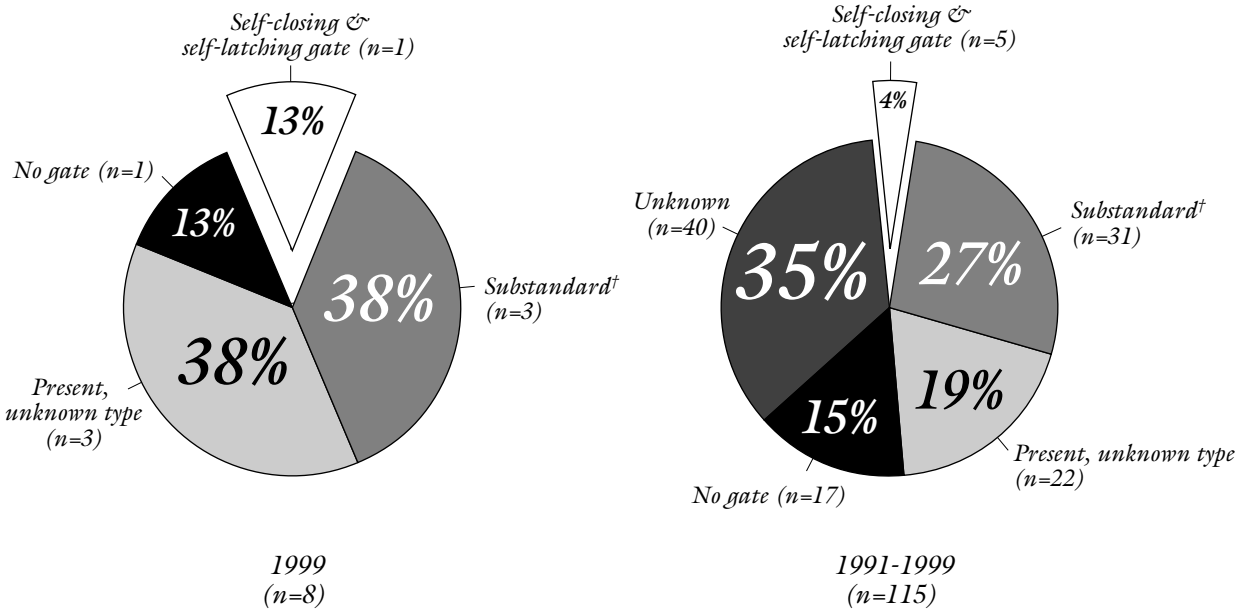


Number of drownings in age group

Male	0	4	1	1	0	1	0	1	3	0
Female	0	4	0	0	0	0	0	0	0	0

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

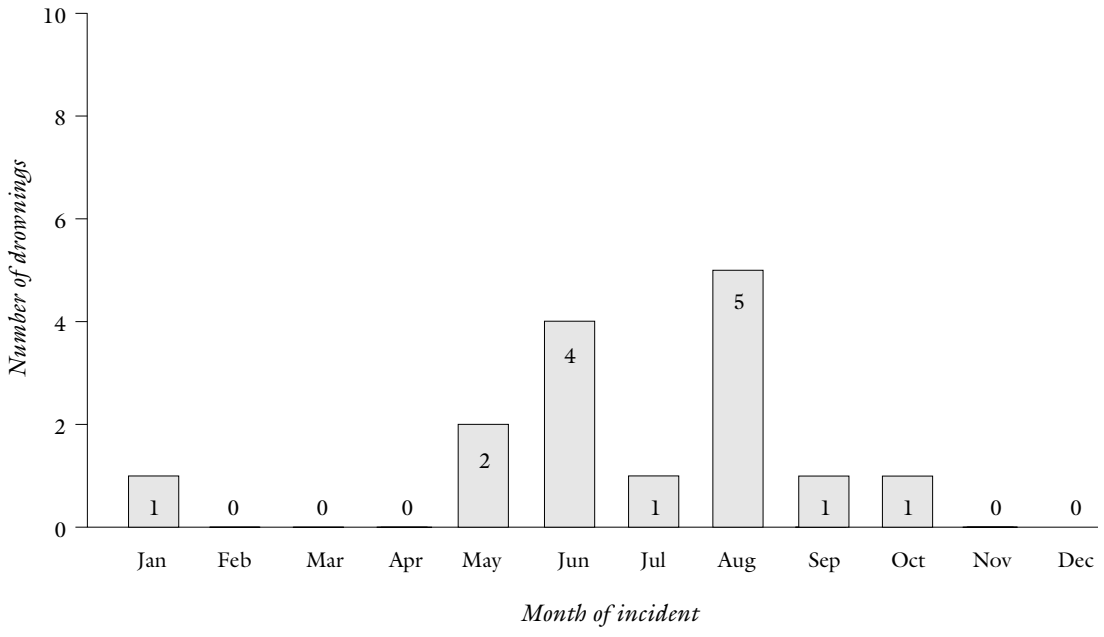
Figure 6.4 **SINGLE-UNIT HOME SWIMMING POOL DROWNINGS OF TODDLERS* BY GATE, CANADA 1999 & 1991-1999**



** Toddlers are 1-4 years old † Gates present, none were both self-closing & self-latching*

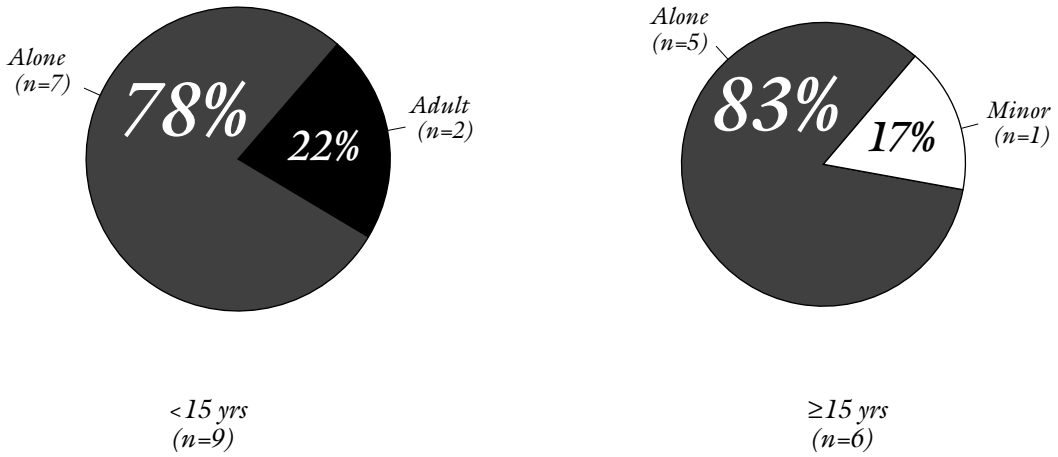
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.5 **SINGLE-UNIT HOME SWIMMING POOL DROWNINGS BY MONTH OF INCIDENT, CANADA 1999 (n=15)**



Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

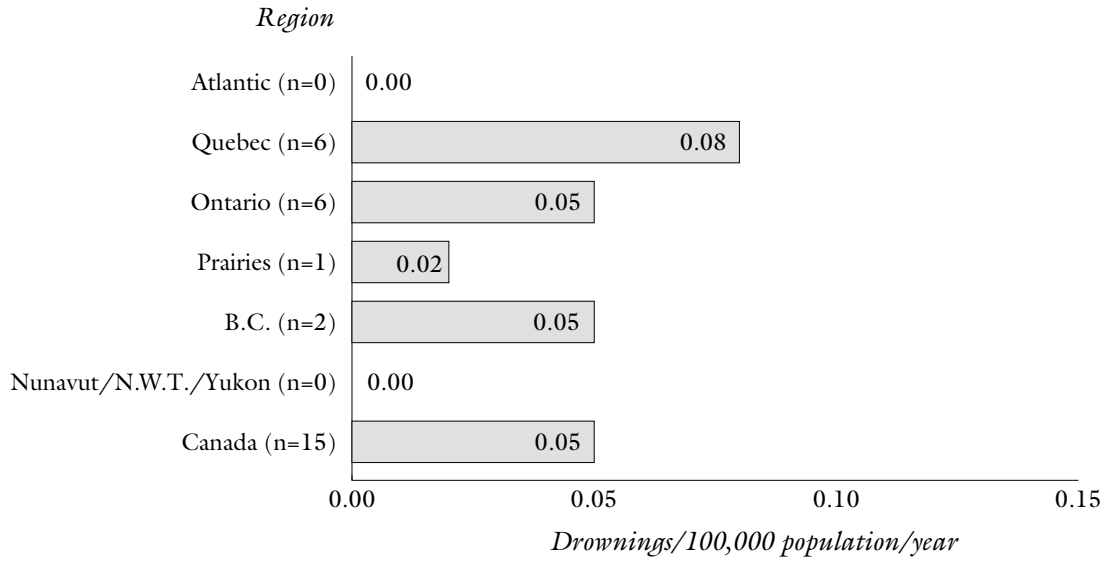
Figure 6.6 **SINGLE-UNIT HOME SWIMMING POOL DROWNINGS BY AGE OF VICTIMS & ACCOMPANYING PERSONS,* CANADA 1999 (n=15)**



** "Adult" indicates that victim was accompanied by adult(s); does not exclude presence of minor(s) (<18 years); "Minor" indicates presence of minor(s) only*

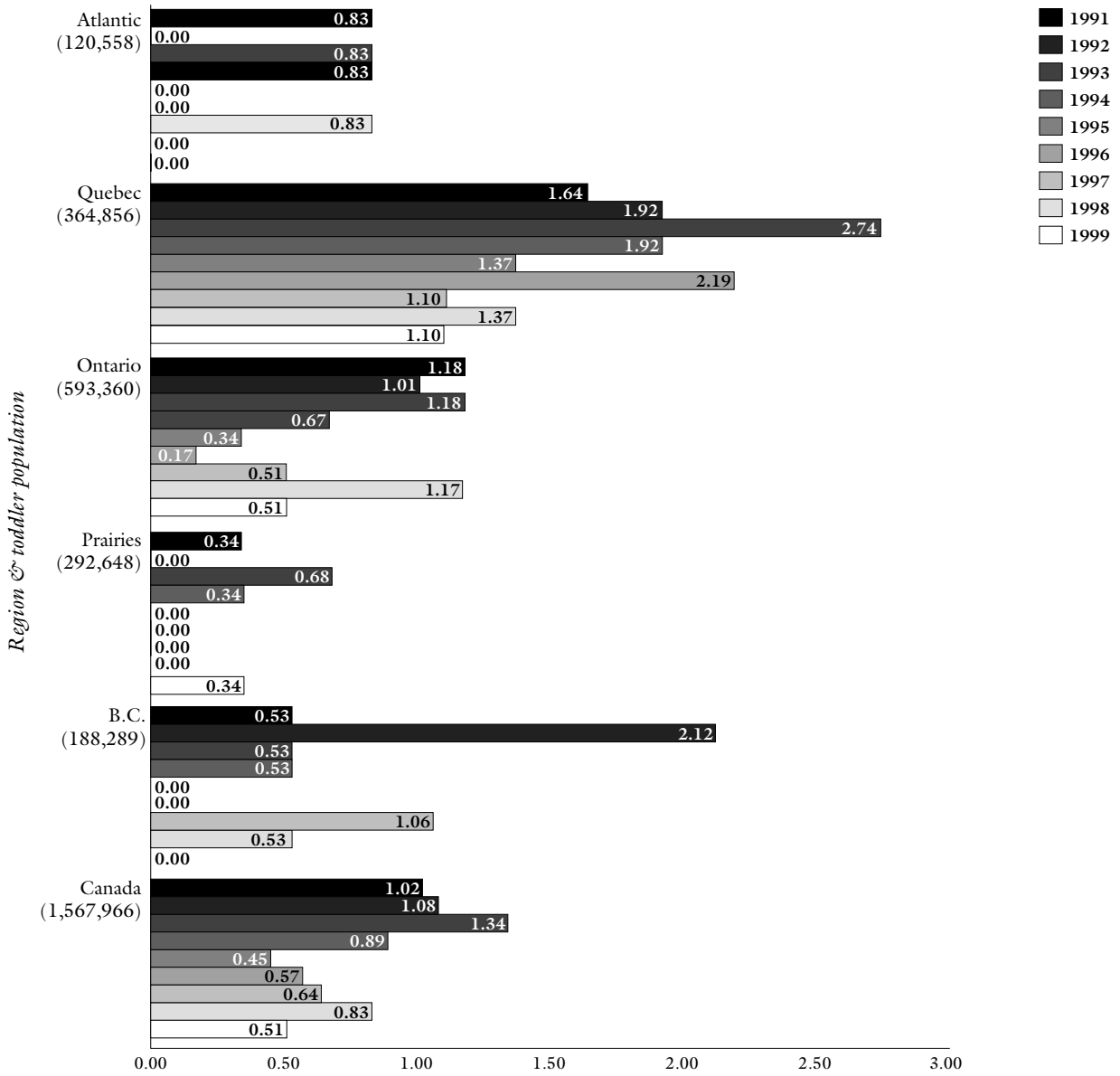
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.7 **RATE OF SINGLE-UNIT HOME SWIMMING POOL DROWNINGS BY REGION, CANADA 1999 (n=15)**



Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.8 **RATE AND NUMBER OF SINGLE-UNIT HOME SWIMMING POOL DROWNINGS OF TODDLERS* BY REGION† & YEAR, CANADA 1991-1999**



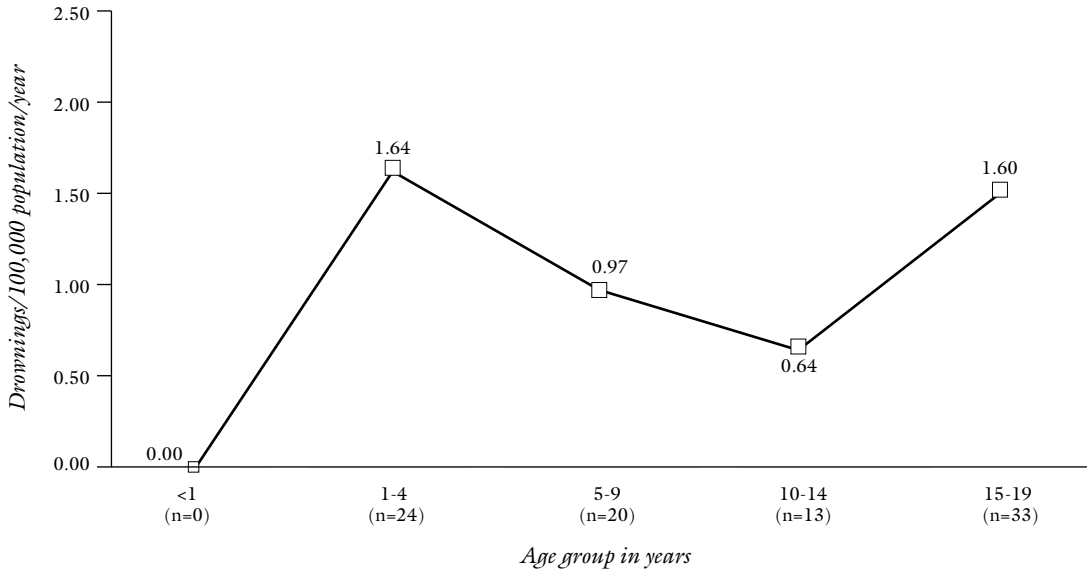
Number of drownings

	Atlantic	%	Quebec	%	Ontario	%	Prairies	%	B.C.	%	Canada	%
1991	1	6	6	38	7	44	1	6	1	6	16	100
1992	0	0	7	41	6	35	0	0	4	24	17	100
1993	1	5	10	48	7	33	2	10	1	5	21	100
1994	1	7	7	50	4	29	1	7	1	7	14	100
1995	0	0	5	71	2	29	0	0	0	0	7	100
1996	0	0	8	89	1	11	0	0	0	0	9	100
1997	1	10	4	40	3	30	0	0	2	20	10	100
1998	0	0	5	38	7	54	0	0	1	8	13	100
1999	0	0	4	50	3	38	1	13	0	0	8	100
Total	4	3	56	49	40	35	5	4	10	9	115	100

** Toddlers are 1-4 years old † There were no home pool toddler drownings in Nunavut, N.W.T. or Yukon (toddler population 8,256) in 1991-1999*
‡ Denominators used for rates were averages of 1991 & 1996 census data; Canadian toddler population was 1,551,560 in 1991 and 1,584,371 in 1996

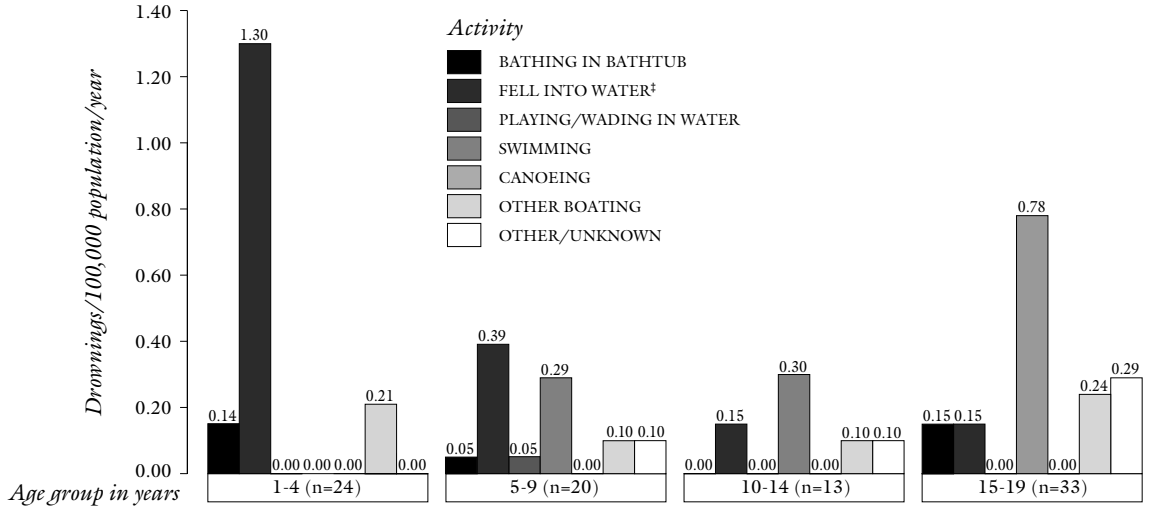
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.9 **RATE OF CHILD AND YOUTH DROWNINGS* BY AGE, CANADA 1999 (n=90)**



** Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.10 **RATE AND NUMBER OF CHILD AND YOUTH DROWNINGS* BY AGE & ACTIVITY, CANADA 1999 (n=90)†**



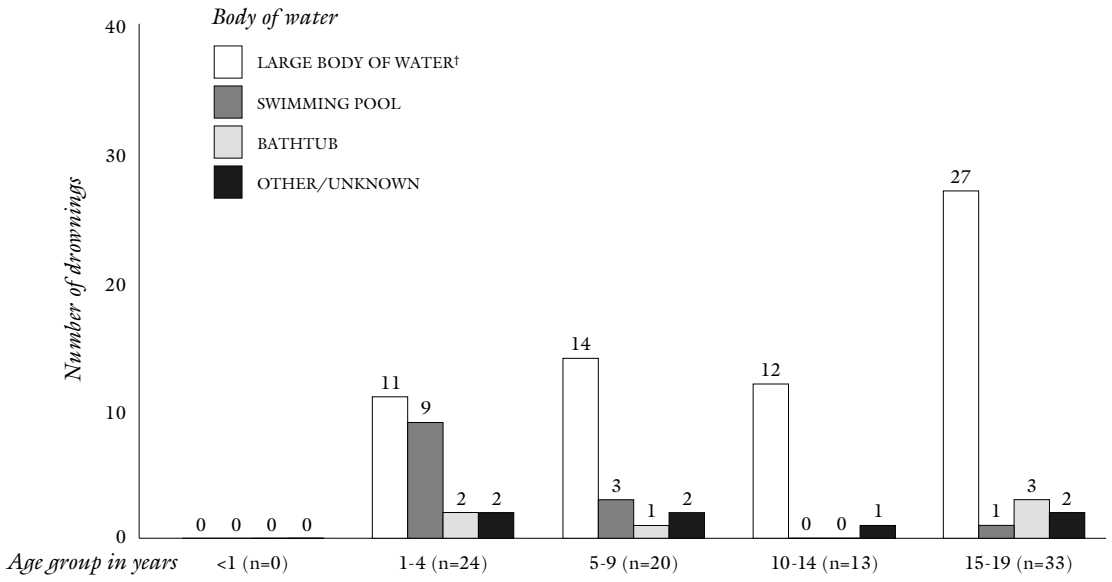
Number of drownings in age group

Bathing in bathtub	2	1	0	3
Fell into water	19	8	3	3
Playing/wading	0	1	0	0
Swimming	0	6	6	16
Canoeing	0	0	0	0
Other boating	3	2	2	5
Other/unknown	0	2	2	6

** Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings*
† There were no infant (< 1 year old) drownings in 1999 ‡ Fell in while playing or walking near water

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

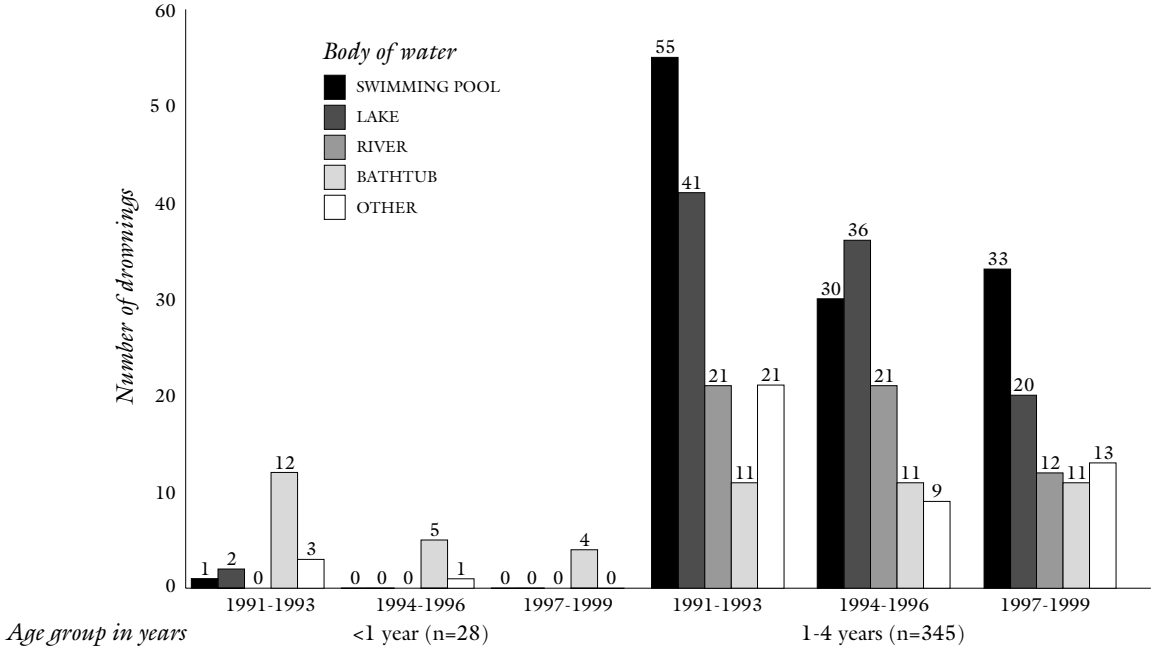
Figure 6.11 **CHILD AND YOUTH DROWNINGS* BY AGE & TYPE OF BODY OF WATER, CANADA 1999 (n=90)**



** Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings*
† Includes ocean, river, lake, reservoir & pond

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

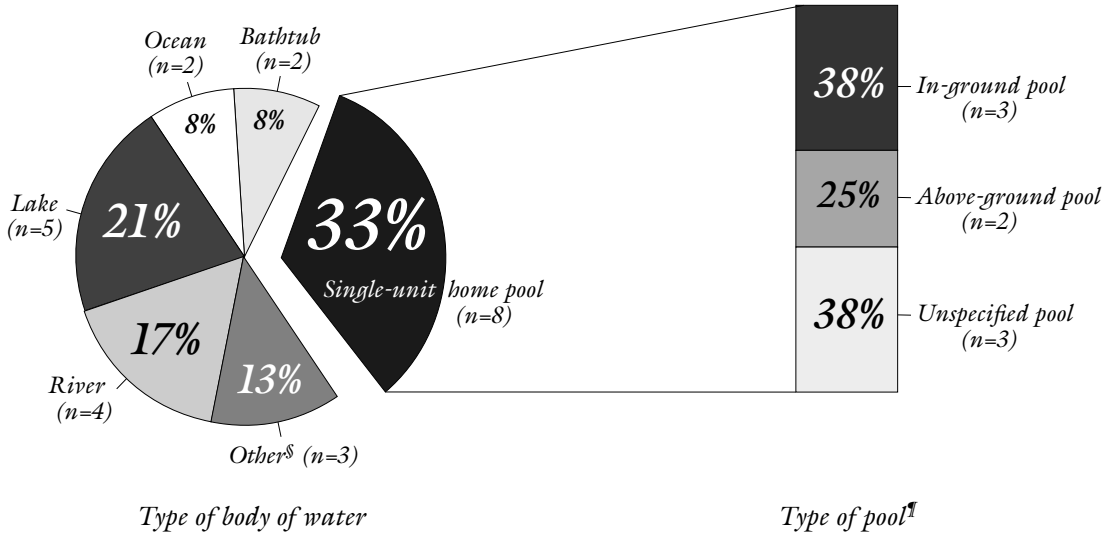
Figure 6.12 **INFANT AND TODDLER* DROWNINGS BY AGE GROUP AND BY TYPE OF BODY OF WATER, CANADA 1991-1999 (n=373)**



** Infant are <1 year old; toddlers are 1-4 years old*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

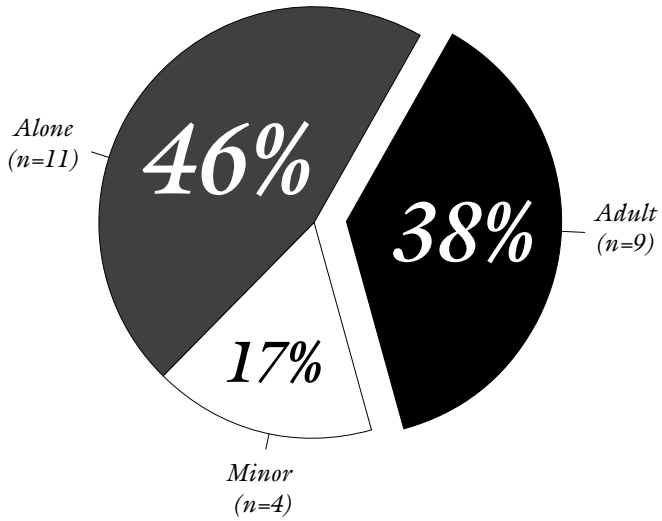
Figure 6.13 **INFANT AND TODDLER DROWNINGS* BY TYPE OF BODY OF WATER,† CANADA 1999 (n=24)‡**



** Excludes land & air transport drownings † "Lake" includes pond & reservoir*
‡ There were no infant (<1 year old) drownings in 1999; toddlers are 1-4 years old
§ Including 1 each of multiple-unit home pool, rut, cattle watering trough
¶ For information on gates, and pool drowning rates by region, see Figures 6.4 and 6.8

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

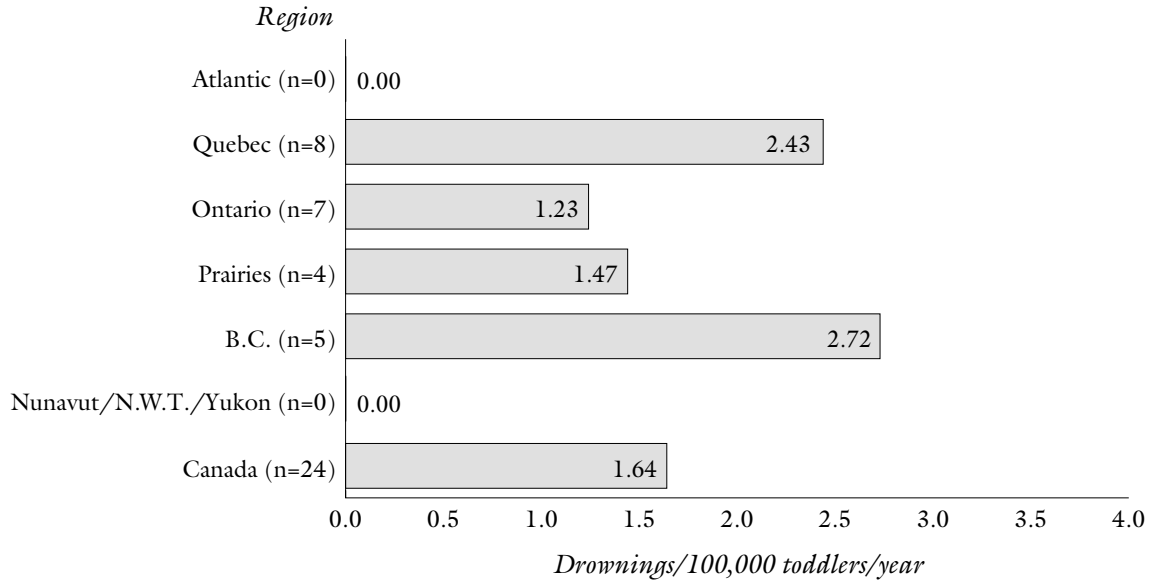
Figure 6.14 **INFANT AND TODDLER DROWNINGS* BY ACCOMPANYING PERSON(S),† CANADA 1999 (n=24)‡**



** Excludes land & air transport drownings*
† "Adult" indicates that victim was accompanied by adult(s); does not exclude presence of minors (<18 years); "Minor" indicates presence of minor(s) only ‡ There were no infant (<1 year old) drownings in 1999; toddlers are 1-4 years old

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

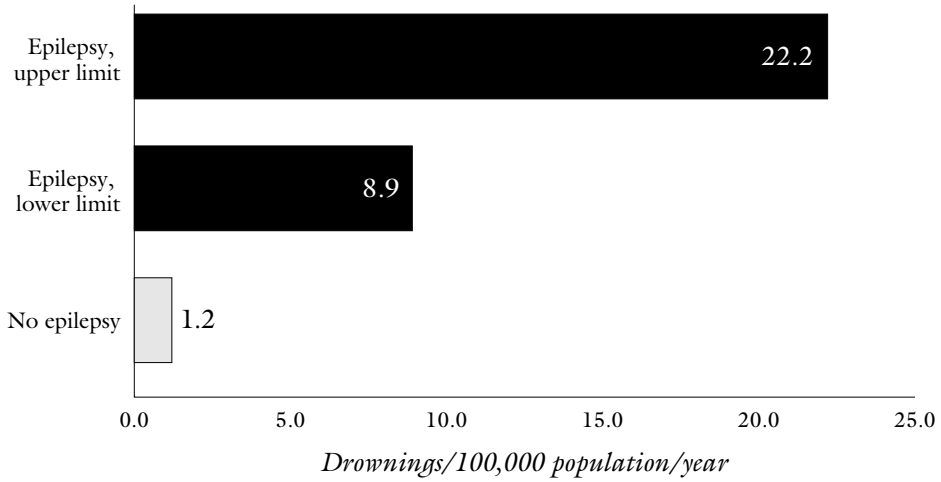
Figure 6.15 **RATE OF TODDLER* DROWNINGS† BY REGION, CANADA 1999 (n=24)**



** Toddlers are 1-4 years old † Excludes land & air transport drownings*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

DROWNINGS OF PERSONS WITH EPILEPSY

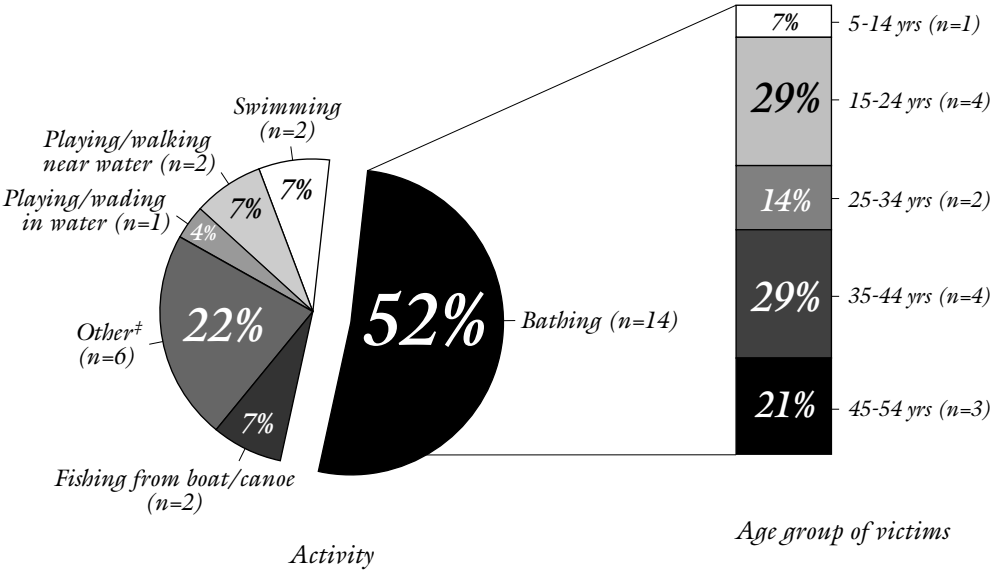
Figure 6.16 **ESTIMATED RATE* OF DROWNINGS† FOR PERSONS WITH & WITHOUT EPILEPSY, CANADA 1999 (n=405; 27 WITH EPILEPSY, 378 WITHOUT EPILEPSY)**



** Lower limit is based on a prevalence estimate for epilepsy of 400/100,000 population and upper limit on a prevalence of 1,000/100,000 population (prevalence estimates from Shorvon, Lancet 1990;336:93-96), thus population of Canadians with epilepsy is estimated to range between 122,000 and 305,000, and without epilepsy between 30.2 and 30.4 million*
† Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

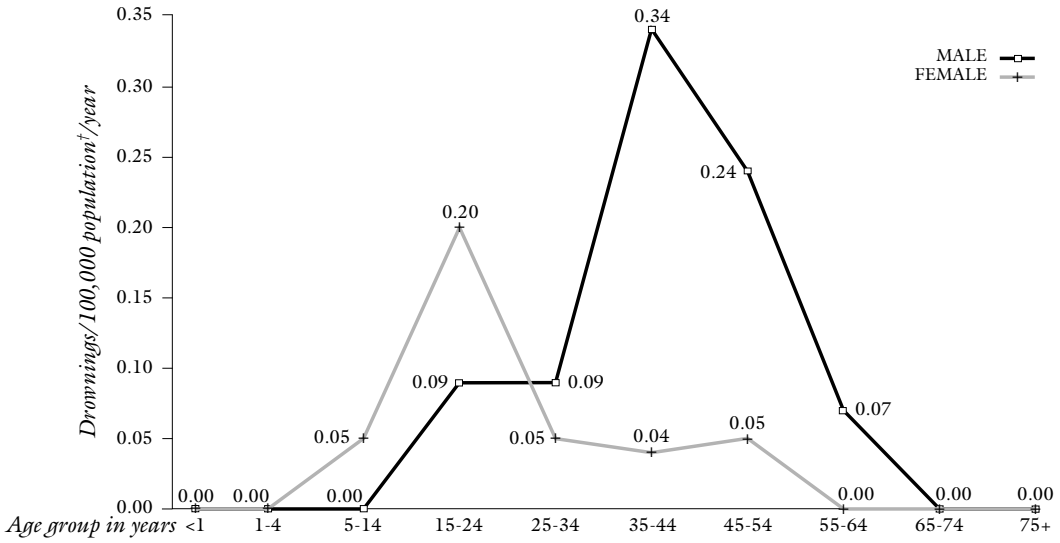
Figure 6.17 **DROWNINGS* OF PERSONS WITH EPILEPSY BY ACTIVITY, CANADA 1999 (n=27)†**



** Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings*
† At least 22 drownings occurred during seizures; seizure was not reported for the other 5
‡ Including 1 each of rowing, mowing lawn, hunting, cleaning a caribou, & unknown 2

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.18 **RATE AND NUMBER OF DROWNINGS* OF PERSONS WITH EPILEPSY BY AGE & SEX, CANADA 1999 (n=27)**



Number of drownings in age group

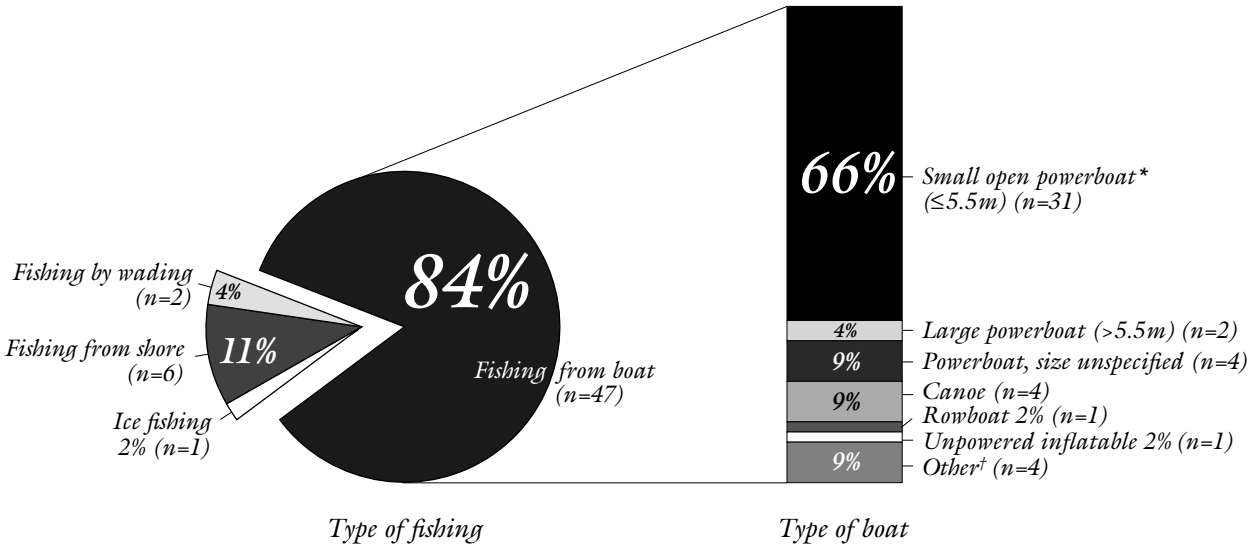
Male	0	0	0	2	2	9	5	1	0	0
Female	0	0	1	4	1	1	1	0	0	0

** Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings*
† Population includes all Canadians with and without epilepsy

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

DROWNINGS OF RECREATIONAL FISHERS

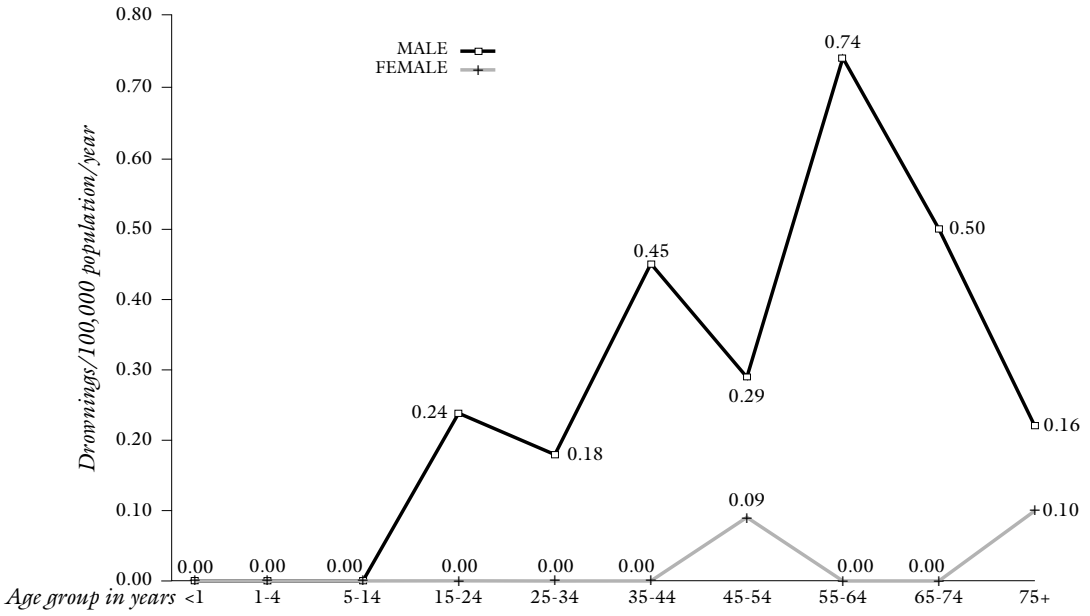
Figure 6.19 **RECREATIONAL FISHING DROWNINGS BY TYPE OF FISHING & TYPE OF BOAT, CANADA 1999 (n=56)**



** Includes open outboard motor boats & other open powered boats such as inflatables; excludes personal watercraft*
† Including unspecified aluminium boat 1, & unknown 3

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.20 **RATE AND NUMBER OF DROWNINGS FOR RECREATIONAL FISHING IN BOATS BY AGE & SEX, CANADA 1999 (n=47)***



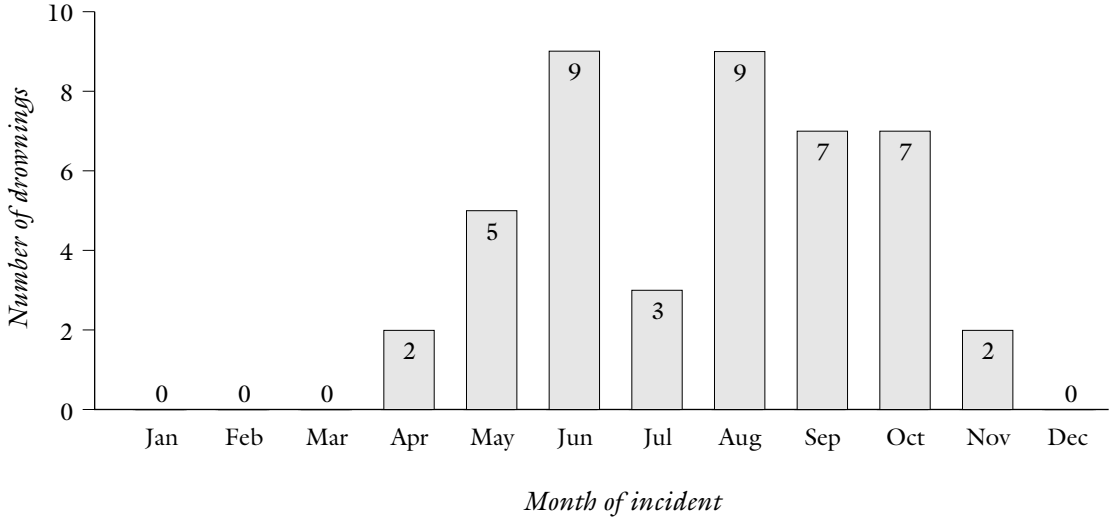
Number of drownings in age group

Male	0	0	0	5	4	12	6	10	5	1
Female	0	0	0	0	0	0	2	0	0	1

** Age unknown for 1 male victim, presumed adult*

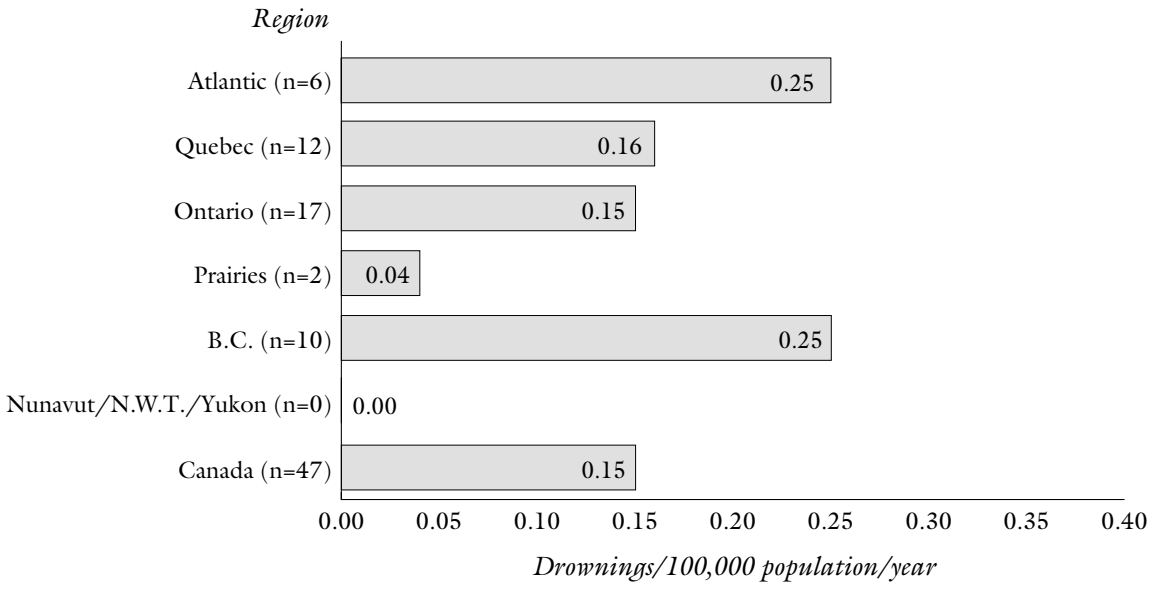
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.21 **RECREATIONAL FISHING DROWNINGS INVOLVING BOATING BY MONTH OF INCIDENT, CANADA 1999 (n=47)***



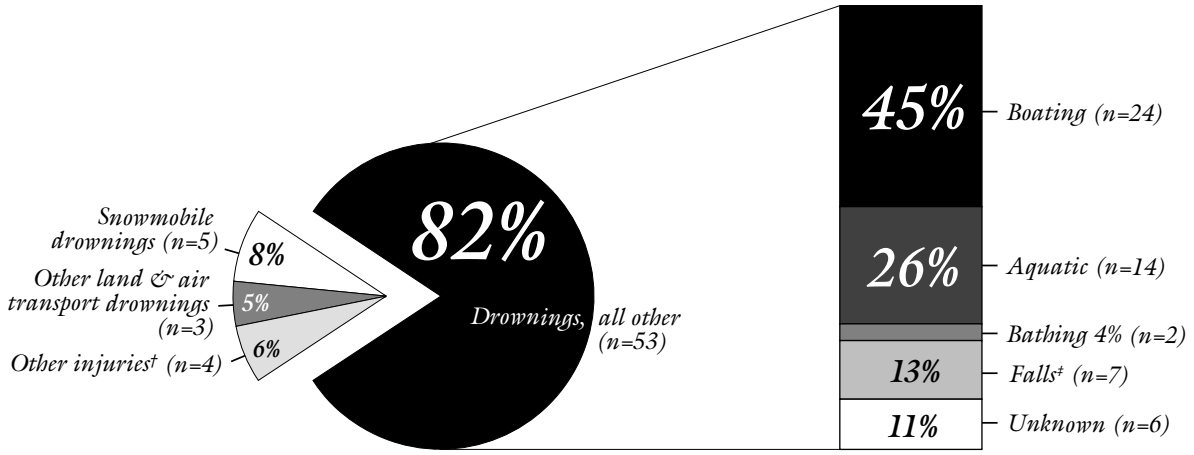
** Month unspecified for 3 drownings*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.22 **RATE OF DROWNINGS FOR RECREATIONAL FISHING IN BOATS BY REGION, CANADA 1999 (n=47)**



Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

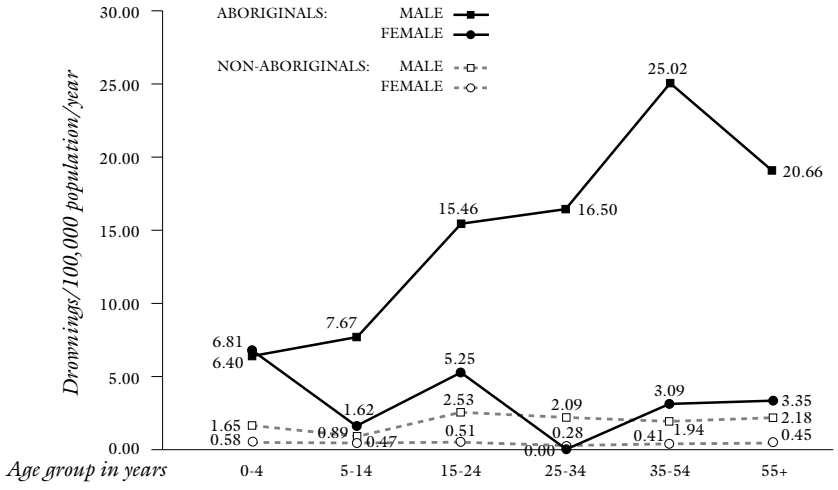
Figure 6.23 **WATER-RELATED DEATHS OF ABORIGINALS* BY TYPE OF INJURY & ACTIVITY, CANADA 1999 (n=65)**



** Includes definite & probable aboriginals (First Nations, Inuit & Metis)*
† Includes all injuries other than drownings
‡ Falls into water during non-aquatic activities such as walking or playing near water or on ice

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.24 **RATE* OF DROWNINGS† FOR ABORIGINALS‡ AND NON-ABORIGINALS§ BY AGE & SEX, CANADA 1999 (n=405; 53 ABORIGINALS, 352 NON-ABORIGINALS)¶**



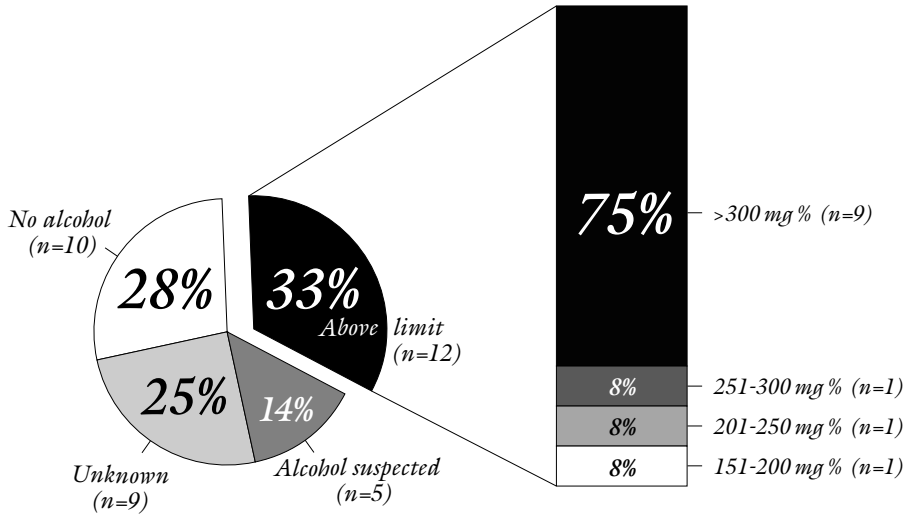
Number of drownings in age group

Aboriginal males	2	5	9	9	14	5
Aboriginal females	2	1	3	0	2	1
Non-aboriginal males	15	18	52	46	91	64
Non-aboriginal females	5	9	10	6	19	16

** Rates for aboriginals were calculated based on registered First Nations & Inuit populations and rates for non-aboriginals, on all others*
† Includes recreational, occupational & daily living drownings (E910, E830, E832); excludes land & air transport drownings
‡ Includes definite & probable aboriginals (First Nations, Inuit & Metis) § Non-aboriginals include those of unspecified ethnicity
¶ Age unknown for 1 non-aboriginal male; sex unknown for 2 non-aboriginal victims, imputed male

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

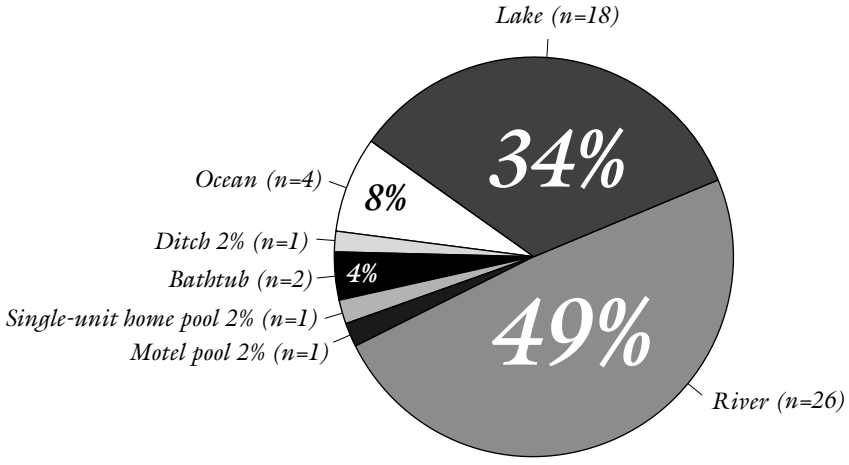
Figure 6.25 **BLOOD ALCOHOL LEVELS* FOR DROWNINGS† OF ABORIGINALS,‡ CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=43)§**



** Legal limit is 80 mg % † Excludes snowmobile & other land and air transport drownings*
‡ Includes definite & probable aboriginals (First Nations, Inuit & Metis)
§ This figure excludes 7 victims; decomposition rendered blood alcohol unreliable

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

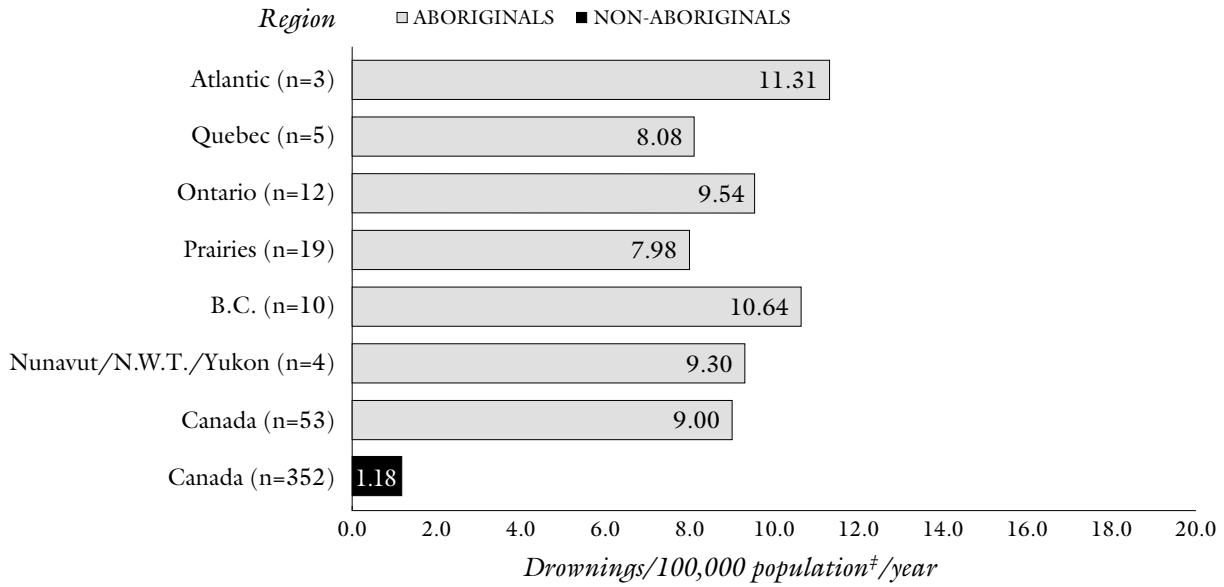
Figure 6.26 **DROWNINGS* OF ABORIGINALS† BY TYPE OF BODY OF WATER,‡ CANADA 1999 (n=53)**



** Excludes snowmobile & other land and air transport drownings*
† Includes definite & probable aboriginals (First Nations, Inuit & Metis)
‡ "Lake" includes pond & reservoir

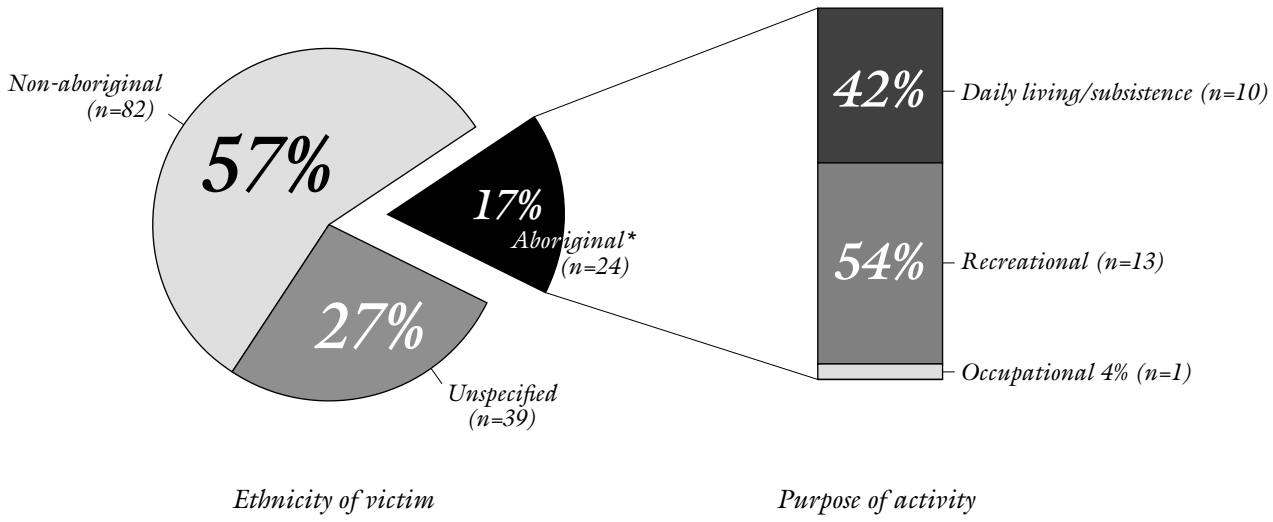
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.27 **RATE OF DROWNINGS* FOR ABORIGINALS† BY REGION, CANADA 1999 (n=53)**



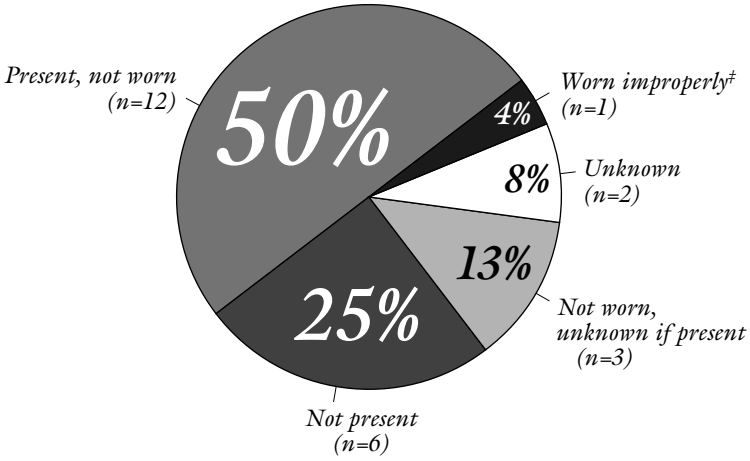
** Excludes snowmobile & other land & air transport drownings*
† Includes definite & probable aboriginals (First Nations, Inuit & Metis)
‡ Rates for aboriginals were calculated based on registered First Nations & Inuit populations and rates for non-aboriginals, on all others
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.28 **BOATING DROWNINGS BY ETHNICITY AND PURPOSE, CANADA 1999 (n=145)**



** Includes definite & probable aboriginals (First Nations, Inuit & Metis)*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 6.29 **BOATING DROWNINGS OF ABORIGINALS* BY USE OF FLOTATION DEVICE,† CANADA 1999 (n=24)**



** Includes definite & probable aboriginals (First Nations, Inuit & Metis)*
† Personal flotation device or lifejacket ‡ Not fastened or inappropriate size

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

PART 7

DROWNINGS & OTHER WATER-RELATED INJURIES DURING LAND & AIR TRANSPORT

Most *land and air transport drownings* involve either travel off-road over ice by snowmobiles or on-road over bridges and highways by cars and other motor vehicles. Land and air transport drownings account for 15% of all drownings in Canada.

Drownings are a frequent cause of death among snowmobilers in Canada. Most snowmobile drownings result from recreational or daily living travel, with only an occasional occupational death. Nearly all victims are adult males, and about one-third are aboriginal peoples. Most drownings occur when a snowmobile goes through an open hole in the ice on a lake or river, especially at night when visibility is poor. Visibility is also affected by blowing snow. Alcohol is a factor in about 56% of deaths. High speed and inadequate lighting systems are suspected but unproven risk factors. Multiple-victim incidents are frequent and rescuers also appear to be at risk.

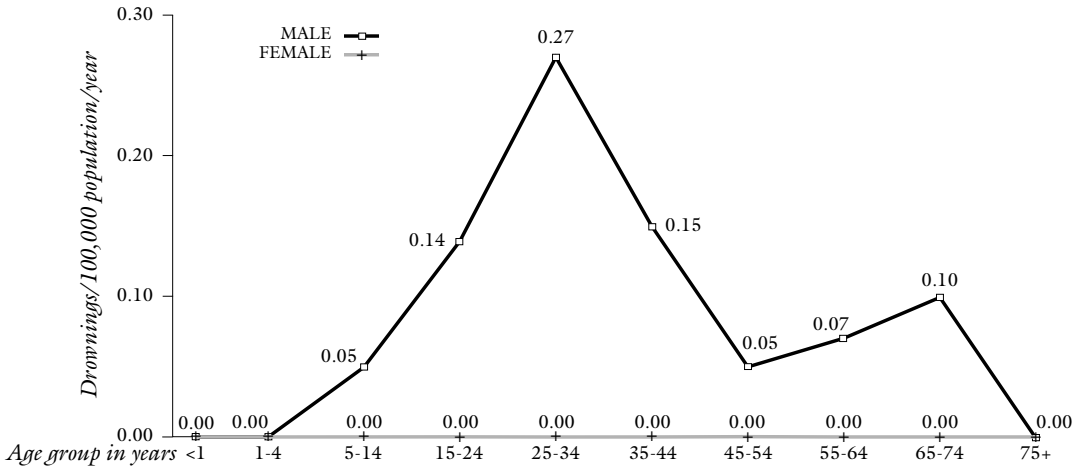
While nearly half of all snowmobile drownings occur in Ontario, the highest rates occur in Nunavut, the Northwest Territories, and Yukon, followed by Newfoundland. Rates in the northern territories are nearly 20 times higher than the Canadian average. Although most snowmobile drownings occur during February to March, in the North some incidents occur as later as June or July.

Seat belts, padded dashboards, energy-absorbing bumpers, and speed limits are mandatory for on-road vehicles; however, comprehensive legislation remains to be developed for issues critical to snowmobile safety. These include mandatory use of flotation/hypothermia suits for travel over ice, speed governors, lighting systems adequate for the top speed of the snowmobile, effective measures to limit alcohol consumption by operators of off-road vehicles, flotation systems for snowmobiles, and rescue throw bags as safety equipment.

Victims of drownings involving *on-road vehicles* tend to be about two-thirds male and one-third female, mainly adults with a small number of child passengers. The proportion of females is higher than for most other activities associated with drowning. Rivers are the most frequent body of water, and bridges with inadequate barriers are associated with many of these incidents in certain provinces. Darkness, alcohol, and slippery road surfaces due to snow, ice, or rain are other frequent risk factors.

SNOWMOBILE DROWNINGS

Figure 7.1 **RATE AND NUMBER OF SNOWMOBILE DROWNINGS BY AGE & SEX, CANADA 1999 (n=17)***



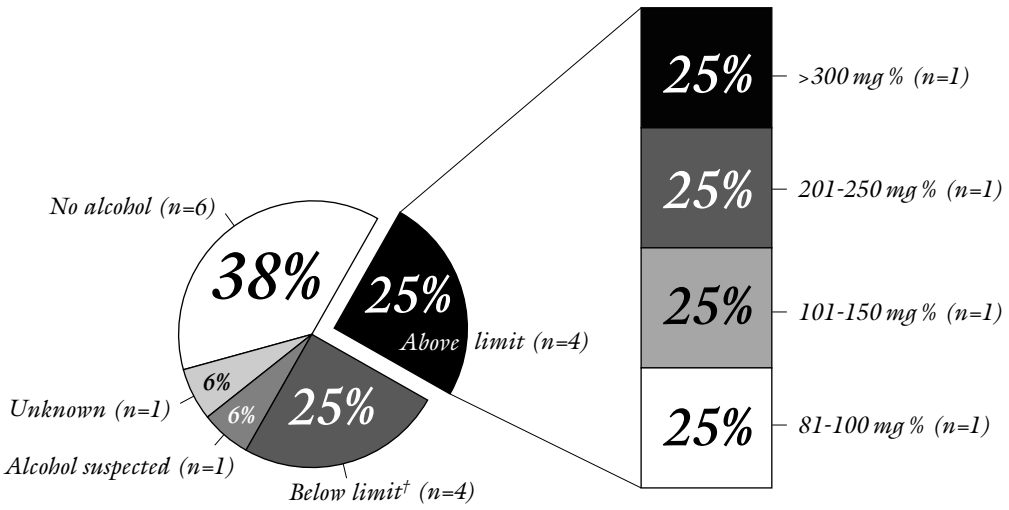
Number of drownings in age group

Male	0	0	1	3	6	4	1	1	1	0
Female	0	0	0	0	0	0	0	0	0	0

** Including recreational 11, daily living 6*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

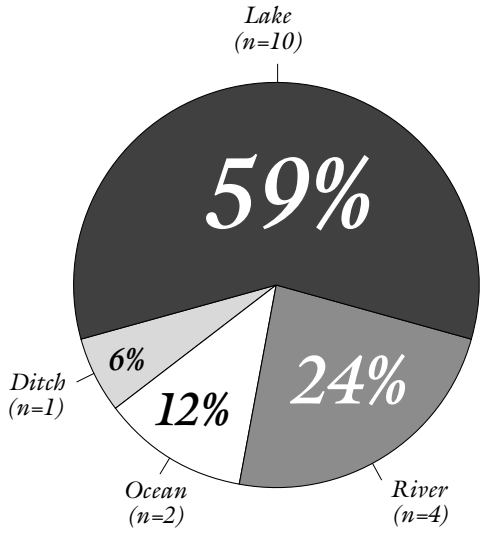
Figure 7.2 **BLOOD ALCOHOL LEVELS* FOR SNOWMOBILE DROWNINGS, CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=16)**



** Legal limit is 80 mg % † 1 at 1-49 mg %, 3 at 50-80 mg %*

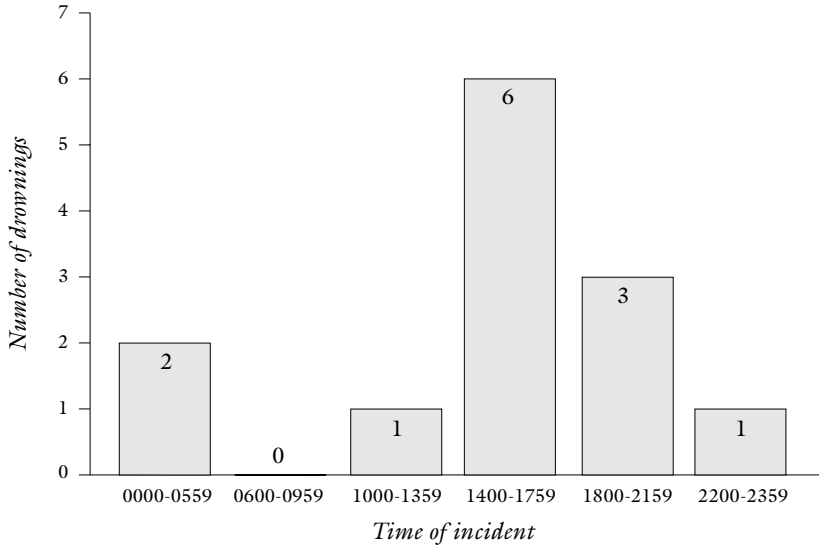
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 7.3 **SNOWMOBILE DROWNINGS BY TYPE OF BODY OF WATER, CANADA 1999 (n=17)**



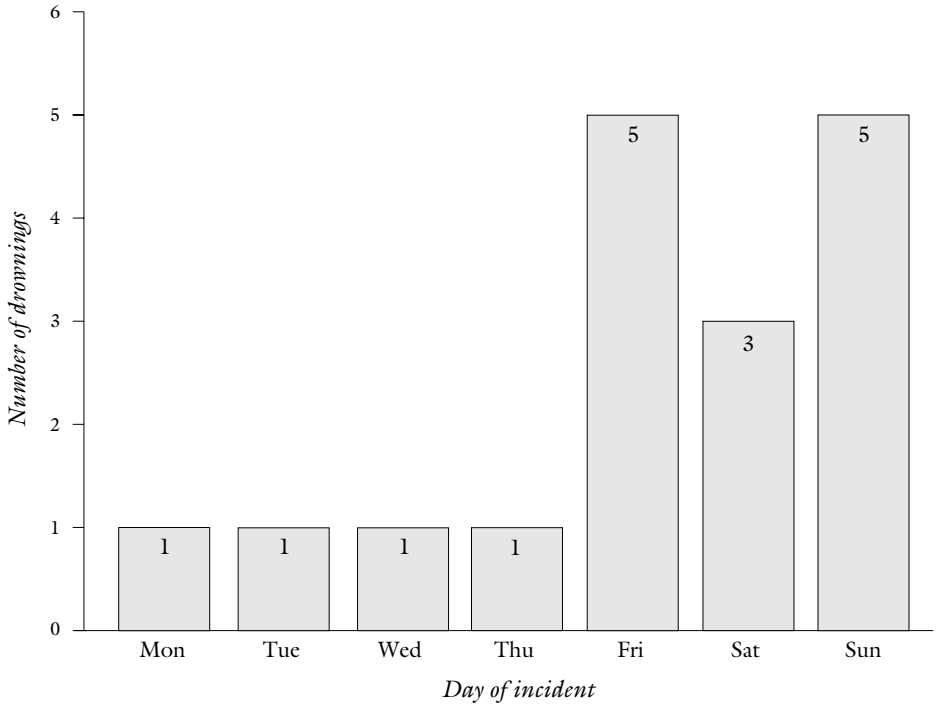
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 7.4a **SNOWMOBILE DROWNINGS BY TIME OF INCIDENT, CANADA 1999 (n=17)***



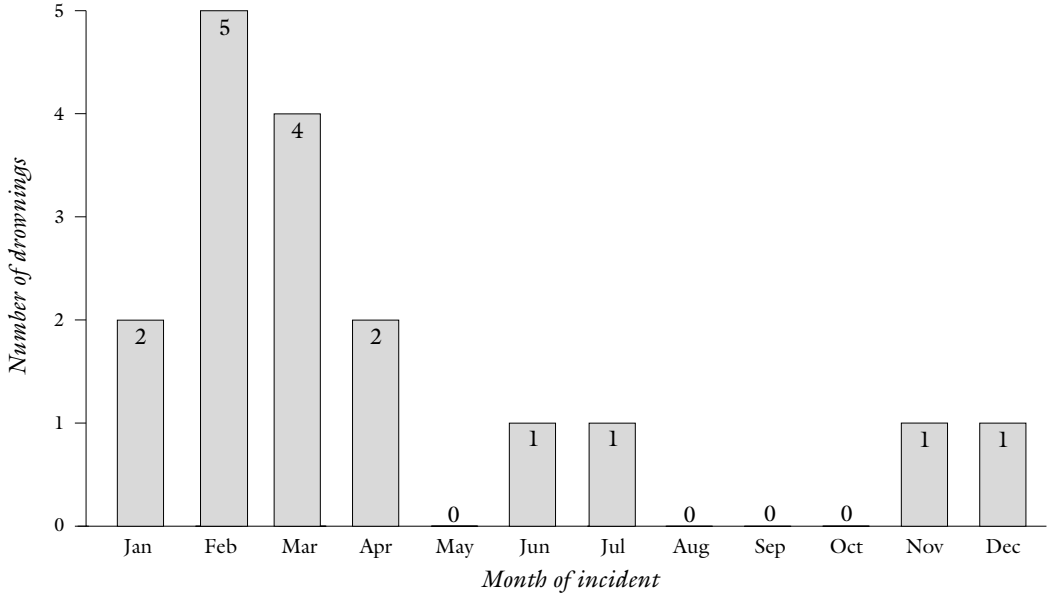
**Time unspecified for 4 drownings; light conditions: dark 3, light 1; for the other 13: dark 6, twilight 3, light 4*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 7.4b **SNOWMOBILE DROWNINGS BY DAY OF INCIDENT, CANADA 1999 (n=17)**



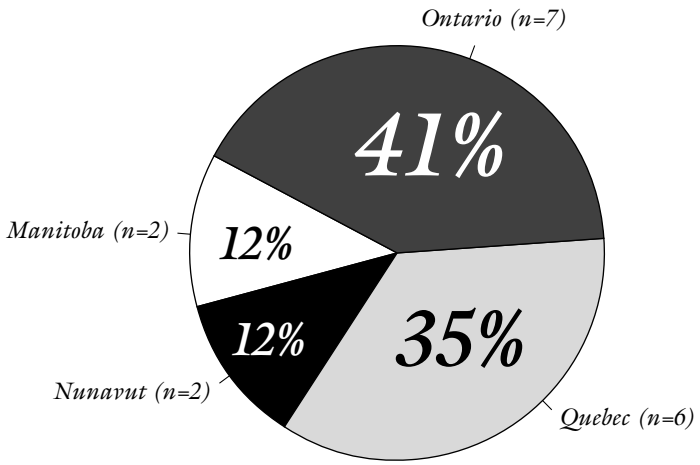
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 7.4c **SNOWMOBILE DROWNINGS BY MONTH OF INCIDENT, CANADA 1999 (n=17)**



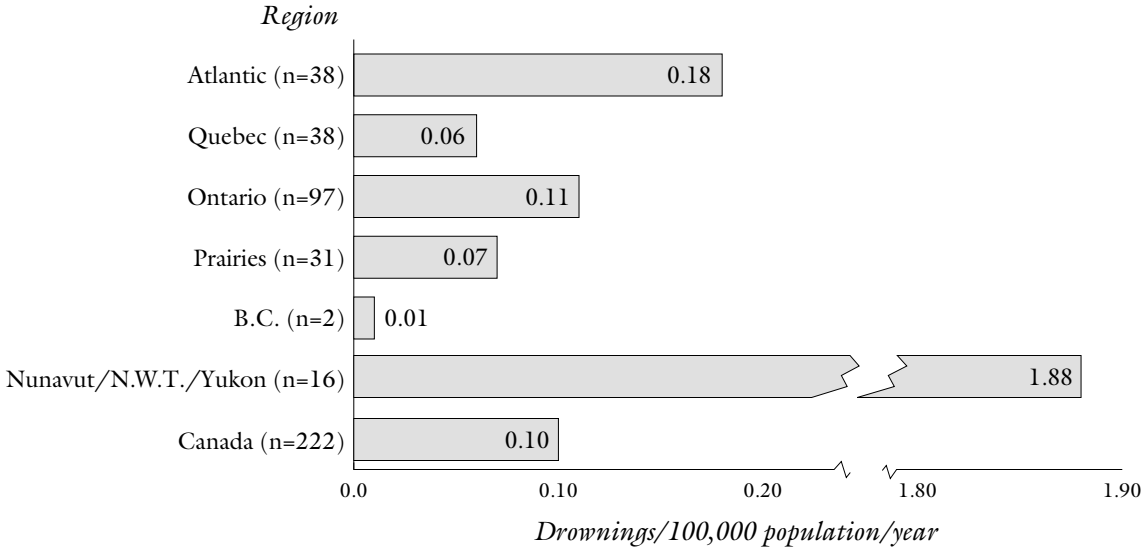
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 7.5 **SNOWMOBILE DROWNINGS BY REGION, CANADA 1999 (n=17)**



Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 7.6 **RATE* OF SNOWMOBILE DROWNINGS BY REGION, CANADA 1991-1999 (n=222)**

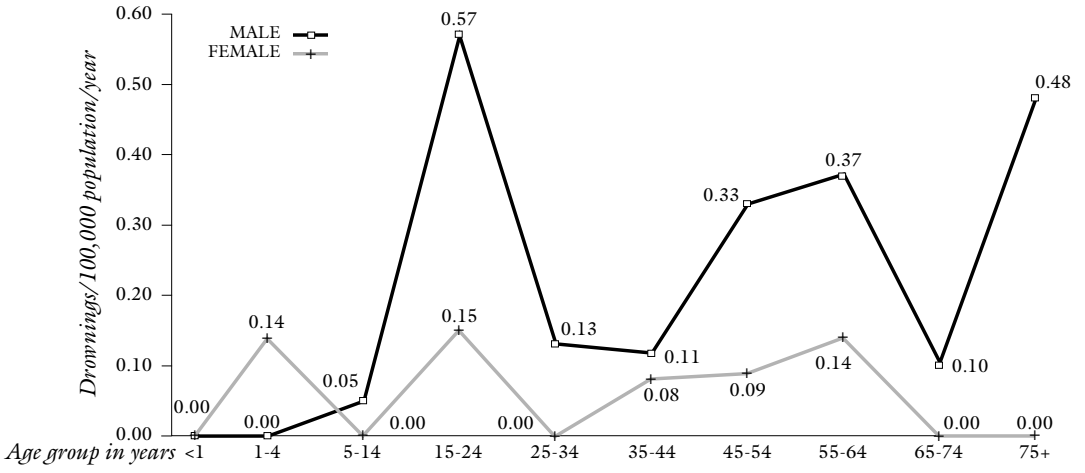


** Because of the small number of incidents in a single year by region, and random variation from year to year, rates are presented for the nine-year period*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

ROAD TRAFFIC DROWNINGS

Figure 7.7 **RATE AND NUMBER OF ROAD TRAFFIC DROWNINGS BY AGE & SEX, CANADA 1999 (n=45)**

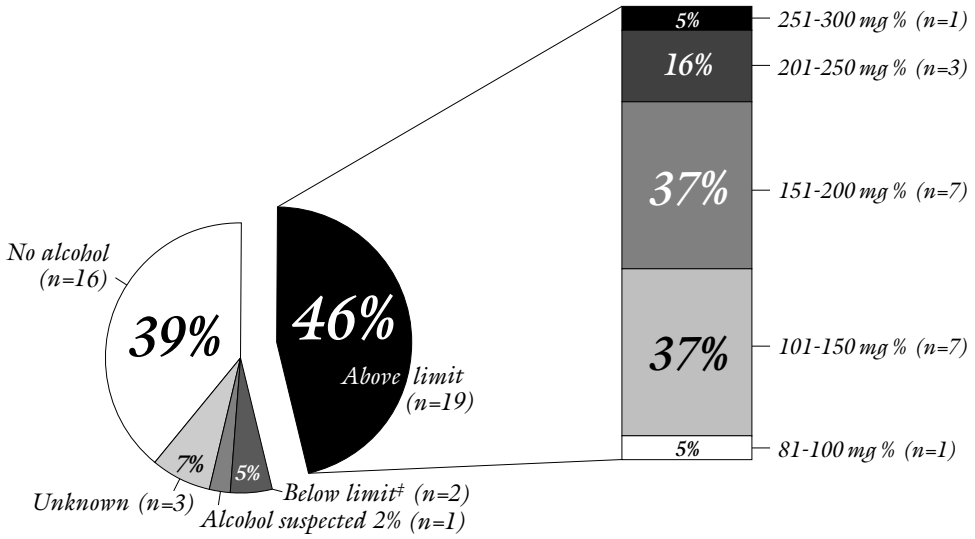


Number of drownings in age group

Male	0	0	1	12	3	3	7	5	1	3
Female	0	1	0	3	0	2	2	2	0	0

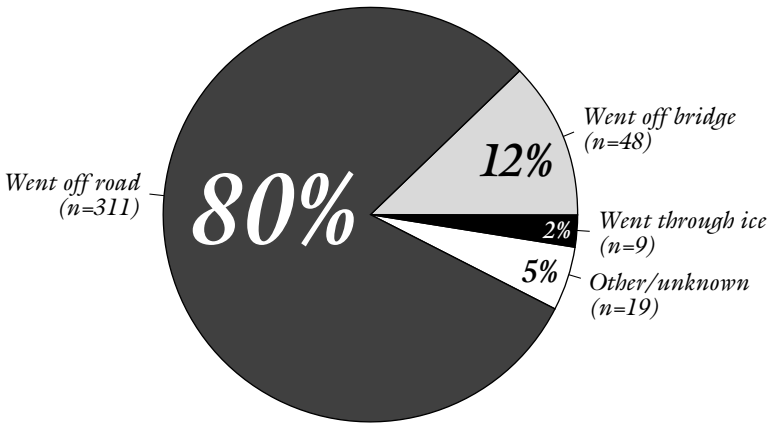
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 7.8 **BLOOD ALCOHOL LEVELS* FOR ROAD TRAFFIC DROWNINGS, CANADA 1999 (VICTIMS ≥15 YEARS OF AGE; n=43)†**



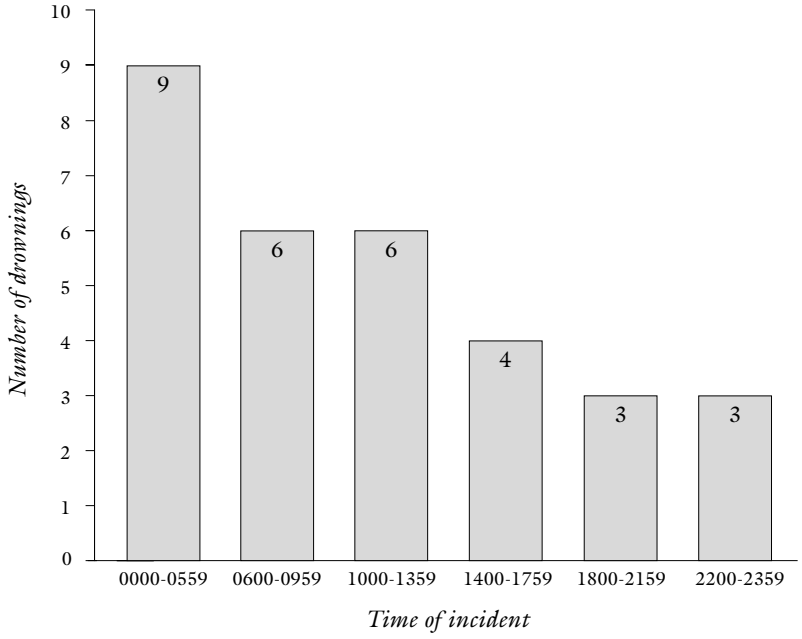
** Legal limit is 80 mg % † This figure excludes 2 victims; decomposition rendered blood alcohol unreliable ‡ 1 at 1-49 mg %, 1 at 50-80 mg %*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 7.9 **ROAD TRAFFIC DROWNINGS BY TYPE OF INCIDENT, CANADA 1991-1999 (n=387)**



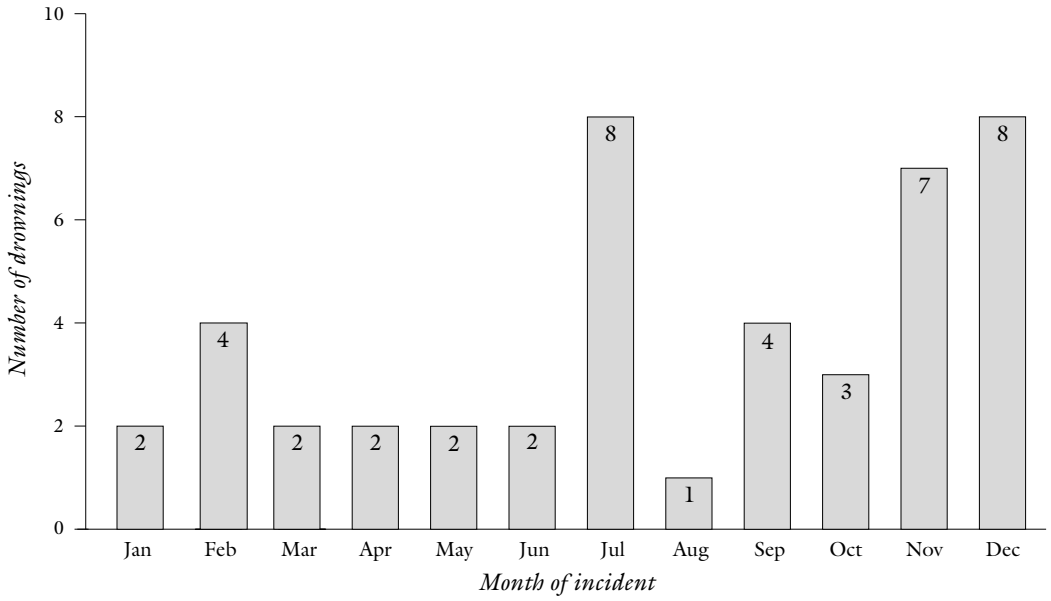
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 7.10a **ROAD TRAFFIC DROWNINGS BY TIME OF INCIDENT, CANADA 1999 (n=45)***



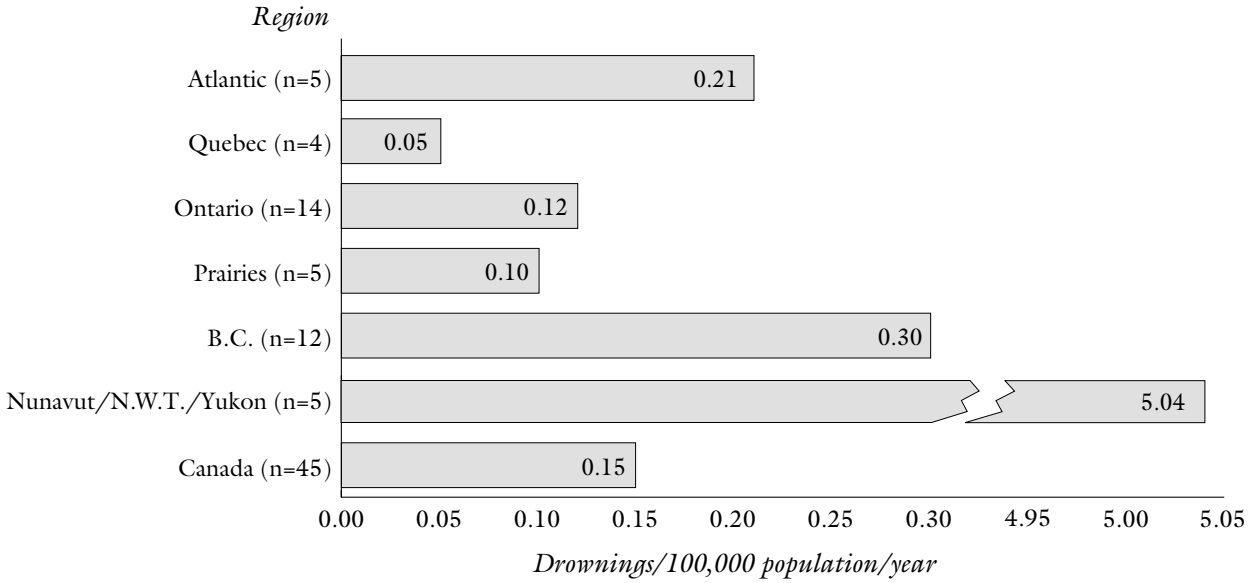
** Time unspecified for14 drownings; light conditions: dark 5, twilight 1, light 3, unknown 5; for the other 31: dark 12, twilight 5, light 14*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 7.10b **ROAD TRAFFIC DROWNINGS BY MONTH OF INCIDENT, CANADA 1999 (n=45)**



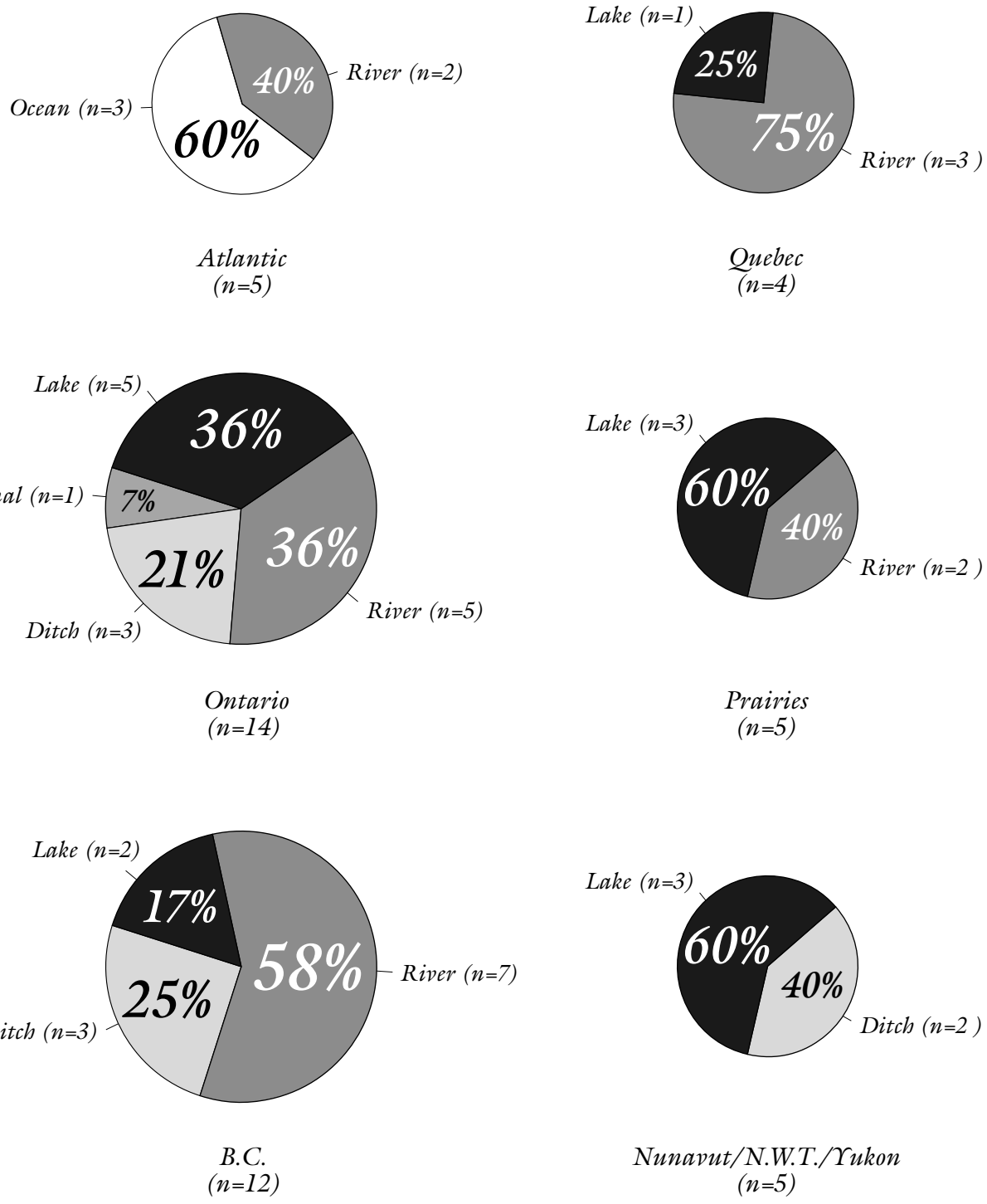
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 7.11 **RATE AND NUMBER OF ROAD TRAFFIC DROWNINGS BY REGION, CANADA 1999 (n=45)**



Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Figure 7.12 **ROAD TRAFFIC DROWNINGS BY REGION & TYPE OF BODY OF WATER,* CANADA 1999 (n=45)**



** "Lake" includes pond & reservoir*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Table 7.1 **WATER-RELATED INJURY FATALITIES OTHER THAN DROWNINGS* DURING LAND & AIR TRANSPORT, CANADA 1999 (n=9)**

Activity/incident	No.	%	Nature of injury	No.	Age	Sex M	Sex F	Alcohol mg%†	Alcohol No.	Other risk factors‡
Snowmobile										
Off-road incident, travelling on ocean or lake	5	56	Hypothermia	5	20, 24, 33, 51, 64	3	2	0 27 86 Unk.	1 1 1 2	Thin ice or open water, dark, non-swimmer, alone, left trail, fell through ice
On-road motor vehicle										
On-road incident, left road	1	11	Head injury	1	21	1	0	60	1	Slippery surface, fog, drizzle, probably fell asleep, dark, no seatbelt
All-terrain vehicle										
Off-road incident	1	11	Hypothermia	1	45	1	0	0	1	Thin ice, prolonged immersion
Helicopter										
Crash	1	11	Head injury	1	24	1	0	0	1	Twilight, fog, engine failed, pinned beneath wreckage, fast/strong current, cold air
Float plane										
Crash	1	11	Spinal injury	1	44	0	1	Unk.	1	Strong winds at take off, inexperienced pilot (had training same day as crash)
Total	**9**	**100**				**6**	**3**			

** Primary cause of death was injury other than drowning, although drowning may have complicated another injury; in case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included here*
† Legal limit is 80 mg % ‡ Other factors that may have contributed to these incidents

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

DISCUSSION AND RECOMMENDATIONS

The first section of the discussion provides a brief review of the results of surveillance of water-related fatalities for 1999, as well as trends for 1991-1999. Since this is intended to be a visual report, the user should not rely on the summary text, but should review the graphics and tables that pertain to his/her own specific interests. For each activity, the data are structured by personal, equipment, and environmental risk factors, as well as by time factors, rescue, and differences by regions of Canada. The first three types of risk factors correspond to one axis of the Haddon injury matrix, which is widely used for development of comprehensive approaches to injury prevention.

Information about modern principles of injury control as applied to water-related injury deaths, followed by a structured approach to prevention at all levels of society can be found in earlier publications (The Canadian Red Cross Society, 1998, 1997, 1996a, 1994a, 1994b). The Haddon injury matrix is useful for developing a comprehensive array of interventions, while the World Health Organization's Ottawa Charter f or Health Promotion is helpful for deciding at what level of society interventions can be most successfully applied in a coordinated approach. For prevention of specific subcategories of drowning by activity or population high-risk groups, such as boating, swimming, or toddlers, the reader may also wish to refer to other special research reports published by The Canadian Red Cross Society (1994-1998). Detailed information for boating, for provinces and territories, by age and sex, and trends from 1991-1999 are included in the annexes at the end of the report.

OVERVIEW OF SURVEILLANCE FINDINGS FOR 1999 & TRENDS DURING 1991-1999

CIRCUMSTANCES AND INCIDENCE OF DROWNING AND NEAR DROWNING AMONG SUBGROUPS OF THE CANADIAN POPULATION, IN SPECIAL ENVIRONMENTS, & BY REGION

During 1991-1999, all drownings from boating, aquatic activities, falls into water, and bathing accounted for about 80% of water-related deaths, drownings associated with land and air transport for 15%, and injuries other than drownings for 5%.

MALES & FEMALES Drowning has been about 6 times more frequent among males than females, although in 1999 this ratio decreased to 4.5. Males accounted for 82% of victims (see Annex 3, and Table 1.1). For water-related fatalities from injuries other than drowning, 75% of victims were males.

During 1999, drowning rates were high among males at all ages from 1 to 4 and 15 to 75 years of age and older (see Figure 1.2). For hospitalizations from near drowning, the ratio of females to males is much higher than for drowning deaths. In 1999 there was 1 female hospitalized for every 2.1 males.

For drownings other than those related to land and air transport, among males boating accounted for 40%, aquatic activities 27%, falls into water 22%, bathing in a bathtub 4%, and unknown 7%. Among females, aquatic activities accounted for 31%, falls into water for 27%, bathing 18%, boating 16%, and unknown 8%.

ADULTS For all persons 25 years of age and older, boating accounted for 56% of all recreational drownings, excluding land and air transport (see Annex 3). With the improvement in toddler drowning rates between 1995-1999, males 15-74 years old now have the highest drowning rates. While the rate of hospitalization for near drowning is much lower among adults than small children, the average duration of hospitalization is much longer for adults.

CHILDREN For children and youth 0-19 years old, 37% of drownings involved 15-19 year old youth, 27% 1-4 year old toddlers, 22% 5-9 year olds, 14% 10-14 year olds, and 0% infants. Infants tend to drown while being bathed in bathtubs, toddlers by falling into swimming pools and natural bodies of water, 5-9 year olds by falling into water, swimming, and wading, 10-14 year olds by falling into water and swimming, and 15-19 year olds while swimming and boating. While infant and toddler drownings mainly occur in or

around the home, drownings of older children and youth tend to occur in large bodies of water such as lakes and rivers.

It is thus apparent that home safety is an important consideration for prevention of infant and toddler drownings. During 1999, home swimming pools accounted for 38% of toddler drownings and bathtubs 8%. Boating accounted for only 12% of all drownings of children between 0 and 14 years, and for 15% of drownings of youth 15-19 years old. For older children, activities and locations away from the home need to be targeted.

Among male toddlers, the average rate of *hospitalization for near drowning*, excluding in-hospital deaths, was 6.8 per 100,000 toddlers per year during the five-year period 1994-1999. For female toddlers, the 1994-1999 rate was 4.9. In comparison, the drowning death rate of male toddlers was 2.27 in 1999, and of females 0.98.

Although the time periods are not exactly the same ***for deaths and hospitalizations***, there were about 3 survivors of hospitalization for near drowning for each death from drowning among male toddlers in Canada. Among female toddlers, there were 5 survivors of hospitalization for each death. Thus while small boys are at higher risk of both drowning and near drowning, girls have a higher risk of near drowning than expected from their drowning rate. Perhaps girls tend to drown more frequently than boys in or around the home. Hence resuscitation of girls may be more rapid, such that they survive to reach hospital and to be discharged alive. This requires further study.

As discussed below under trends, Quebec has a special drowning problem with its large numbers of home pools, and Quebec has accounted for about half of pool drownings in Canada for the past nine years. In other provinces, swimming pool drownings of toddlers have become relatively uncommon. Ontario had managed to improve its home pool drownings to an average of 2 toddlers per year for 1994-1997. Unfortunately, in 1998, 7 Ontario toddlers drowned in pools, but this decreased to 3 deaths during 1999. 1998 was the only year since 1991 when Ontario had more pool drownings than Quebec.

The overall rate of near drowning for all ages in Quebec is the lowest in Canada. For infants and toddlers, however, the near drowning rate in Quebec is higher than in Ontario and slightly higher than the Canadian average (Dandavino, 2002). The higher than average rate of near drownings among 1-4 year olds in Quebec is probably a result of the large number of home pools without self-closing and self-latching gates.

EPILEPSY Canadians with epilepsy continue to have rates of drowning estimated to lie somewhere between 7 and 18 times greater than for other Canadians. Because most victims are relatively young adults, the average economic loss per death associated with these drownings is very high. In 1999, 96% of victims were 15 years and older and 93% between the ages of 15 and 54. Bathtubs were the site of 52% of drownings of people with epilepsy. Swimming and activities near water such as walking and fishing were the other main hazardous activities for people with epilepsy.

ABORIGINALS In 1999, at least 13% of drownings in Canada occurred among aboriginal peoples; this figure excludes land and air transport. The drowning rate for aboriginals was 8 times higher than for other Canadians (9.0/100,000 population versus 1.2). This underestimates the true total for aboriginals, because in some provinces coroners do not routinely report aboriginal ethnicity of injury victims.

Boating accounted for 45% of drownings among aboriginals, aquatic activities for 26%, falls into water for 13%, bathing for 4%, and unknown 11%. Aboriginals accounted for 24% of drownings for snowmobiling, 17% for boating, 12% for aquatic activities, 8% for bathtubs, 7% for falls into water, and 6% for land and air transport other than snowmobile. Drowning of aboriginal toddlers represented 17% of the total of Canadian toddler drownings for 1999. Since aboriginals constitute about 3% of the population, they are over represented in most categories of drowning.

Alcohol was associated with at least 50% of drownings of aboriginal persons 15 years and older, as compared with about 40% for individuals of other or unspecified ethnicity. The wearing of flotation devices is even less frequent among aboriginal peoples than other Canadians, and no aboriginal boating drowning victim in 1999 or 1998 was properly wearing a flotation device. This compared with 10% for all boaters.

SWIMMING POOLS During 1991-1999, the number of toddler drownings in home pools per year was 16, 17, 21, 14, 7, 9, 10, 13, and 8 respectively. During 1991 to 1999, only 4% (5 of 115) toddler home pool victims were reported to have drowned in pools with a self-closing and self-latching gate. During the four most recent years from 1996 to 1999, only one toddler drowning occurred in a pool reported to be equipped with an automatic self-closing and self-latching gate.

BATHTUBS Bathtub drownings accounted for 6% of drownings other than land and air transport. There were 25 drownings in bathtubs during 1999, as compared with 20 in home or apartment swimming pools. Adults and children 5-64 years old with epilepsy comprised 56% of bathtub victims, and toddlers another 8%. Many of the other victims suffered from another health condition affecting mental alertness, or were elderly. Prior to 1995, several infants drowned each year in bathtubs in Canada, but since 1995 infant bathtub drowning have averaged less than one per year. *Young adults with epilepsy are now the main high-risk group to be targeted for prevention of bathtub drowning in Canada.*

DIFFERENCES BY REGION The Atlantic region and British Columbia had drowning rates 1.3 and 1.6 times greater than the national average respectively. The Prairies and Quebec had rates similar to the national average and Ontario below the national average. The northern territories, including Nunavut, the Northwest Territories, and the Yukon had a combined rate 4.5 times the national average. For near drownings during 1994-1999, British Columbia and the northern territories had hospitalization rates greater than the national average.

CIRCUMSTANCES OF DROWNINGS ASSOCIATED WITH SPECIFIC ACTIVITIES

BOATING There were an average of 186 boating drownings per year during 1991-1999. For 1999, the number of deaths was 145, which is the lowest during the period. In 1999, small open powerboats and canoes continue to be the most frequent source of boating drownings.

Blood alcohol levels above the legal limit were found in 21% of all recreational boating victims, and below the limit or suspected in another 16%. Given a proportion of unknowns, alcohol appears to have been a factor in at least 40% of boating drownings in Canada during 1999. While alcohol was associated with at least 30% of small powerboat drownings, more than 60% of canoeing drownings involved alcohol. The involvement of alcohol in boating collisions and propeller injuries was 20%.

About 10% of all boaters, 0% of aboriginal boaters, and 0% of occupational boaters were wearing a flotation device when they drowned. There has been no change in the proportion of victims who were wearing a flotation device between 1991-1999. Not a single canoeing drowning victim during 1999 was wearing a flotation device. Probably because of the low rate of wearing of a flotation device by boating victims, 57% of rescues of drowned boaters consist only of a search for the body. In only 30% of rescues for drowned boaters had there been a search for a potentially survivable victim.

Environmental factors such as strong winds, rough waves, and extremely cold water are associated with at least 30% of boating drownings. Other circumstances include personal and equipment factors. These include inappropriate behaviour such as standing up, abrupt turns, overloading, and collisions, and unsafe equipment such as an poorly designed or inappropriate boat, engine failure, and engines that keep running when the operator falls out of the boat. As for seasonal factors, the period for recreational boating drowning extends from May until October.

Among both victims and survivors, only about 25% stayed with the boat, while the remainder swam for shore immediately or after a delay. These data indicate that boaters need to be cognizant of the relative risks of swimming to shore as compared with hanging onto the boat, and adapt their response to the prevailing conditions. This would include assessing the probability of a rapid rescue before hypothermia becomes too advanced to allow either swimming or hanging onto the boat. Although the data are incomplete to assess swimming ability or wearing of a flotation device among survivors, it is evident that wearing of a flotation device and good swimming ability would be helpful assets for survival in either scenario, i.e., swimming or trying to hang on to the boat.

Although the number of deaths from boating collisions is small compared with the number of drownings, such incidents attract considerable publicity. While there has been no significant increase in the total number of collisions, personal watercraft had accounted for a greater proportion of the total during 1994-1997, with about 4 collisions per year involving these boats. During 1998 and 1999, there were 2 incidents per year involving personal watercraft. Further observation should confirm if this is a significant downward trend.

FISHING During 1999, 84% of recreational fishing drownings involved fishers in boats, mainly small open powerboats. Males 15 to 75 plus years, especially 35 to 65, were the main victims. Fishing is the most frequent activity associated with boating drownings, including 39% of recreational boating drownings, 55% of daily living boating drownings, and 55% of occupational boating drownings.

AQUATIC ACTIVITIES As in previous years, 15-24 year old males had the highest rate of swimming drownings, followed by 25-34 year olds. For all ages 15 years and older, alcohol was a frequent risk factor and was reported in 47% of aquatic drownings. Among the high-risk group of 15-24 year olds, alcohol was associated with at least 28% of deaths, as compared with at least 58% of victims 25 years of age and older. Rivers with their strong currents are a frequent risk factor, especially for younger swimmers between 5 and 24 years.

An acute rescue for a potentially survivable victim was attempted for 70% of swimming drowning victims. More than 50% of such rescues were initiated by a companion or bystander. Clearly rescue training, good swimming ability, and judgment are essential both to improve the success rate of rescues and to avoid death of the rescuer. During 1991-1999, an average of 4 Canadians per year died while attempting rescue of a swimmer or wader, 3 during attempted rescue of boaters, and 3 of individuals who fell into water.

Unfortunately swimming ability is still unspecified in a majority of coroners' and police reports of drownings. Where it was specified, about half of the victims between 5-14 years and 15 and older were weak swimmers or non-swimmers.

FALLS INTO WATER Rivers, lakes, and home swimming pools were the most frequent locations for drownings from falls into water during non-aquatic activities such as walking or playing near water or on ice. For 1-4 year old toddlers, swimming pools, rivers, and lakes were the most frequent types of body of water, with pools accounting for 50% of the total in this age group. For 5-14 year olds and for persons 15 years of age and older, rivers and lakes were the sites of most incidents, with rivers accounting for 60% of the total. This indicates that for parents, grandparents, and other caregivers of toddlers, it is important to provide automatic protection for home pools, and, for cottage holidays, to choose a cottage that is not immediately adjacent to a lake or river.

Many older children and adults, both swimmers and non-swimmers, appear to be unaware of the danger and enormous power of current, which poses a potential hazard for anyone walking near water or wading. At least 77% of all victims of falls into water, including both children and adults, were alone or accompanied only by a minor when the incident occurred. At least 18% of drownings from falls into water involved ice, nearly all on rivers and lakes. February was the most frequent month. This is an important point for prevention, since intuitively one might have suspected fall or spring months to be most frequent. Perhaps there is a false sense of security about the strength of the ice in the coldest month. Although swimming ability is frequently not reported by police and coroners, where it is, the majority of victims of falls into water over 5 years of age are non-swimmers.

SNOWMOBILING During 1991-1999, the average number of snowmobile drownings per year was 25. The number in 1999 was 17, less than average, while in 1998 there were 28 fatalities. Alcohol was associated with 56% of snowmobile drownings. Incidents occurred most frequently in lakes, followed by rivers and oceans. 24% occurred between 6 pm and 6 am, i.e., during darkness or twilight, and nearly all of the other incidents occurred after 2 pm, when darkness may also have been a factor. For the period 1991-1999, the Atlantic region, mainly due to Newfoundland, has had a snowmobile drowning rate nearly twice the Canadian average; however in 1999, there were no incidents in the Atlantic region. The highest rate of snowmobile drownings is in the Nunavut, Northwest Territories and Yukon region, with a rate 19 times the Canadian average. Nevertheless, 44% of all snowmobile drownings have occurred in Ontario.

On-Road Motor Vehicle Travel The highest rates of road traffic drownings were in the Atlantic region and British Columbia, with nearly half of incidents in rivers. Alcohol was a factor in at least 50% of incidents. For Canada, 42% of all incidents occurred in rivers, while in Quebec and British Columbia the proportion involving rivers was even higher.

CIRCUMSTANCES OF MULTIPLE-VICTIM DROWNING INCIDENTS

The most frequent activity associated with multiple-victim drowning incidents was boating, which accounted for 55%. One-third of boating victims drowned in multiple-victim incidents. There were 2.9 victims per incident in the multiple-victim boating incidents. For activities with many multiple-victim incidents, it is helpful to examine trends by rates of incidents, as well as by rates or numbers of victims (see example under the next section called "Trends").

HOSPITALIZATIONS FOR NEAR DROWNING

Details of non-fatal hospitalizations for near drowning have been monitored during 1994 to 1999. The highest rates are among toddlers and infants. Nevertheless, we know from earlier analyses that the duration of hospitalization, and presumably the average severity, is greater among older victims. The average number of hospitalized survivors of near drowning per year during 1994-1999 was 355. During the same period, the average number of fatal drownings per year was 534. There was also an average of 43 non-survivors per year of hospitalization for near drowning, but all or at least most of these victims should have been investigated by coroners and included with the deaths.

Thus the *ratio of fatal drownings to survivors of hospitalization for near drowning in Canada is 1.5 to 1, that is to say that there is an average of about 1.5 drownings for each near drowning.* This ratio is quite different than some earlier reports from the United States, which described several near drownings for each drowning. Such differences between countries might be observed if only small children were considered in one of the two countries. In illustration, *if we consider only Canadian infants and toddlers during 1999, there were 4.2 survivors of near drownings for each drowning.* During 1991-1994, prior to the marked improvement in drowning rates among small children observed since 1995, the ratio was closer to 2 near drownings for each drowning among infants and toddlers. The improvement in near drowning has been much less than for drowning.

The average proportion of survivors of near drowning due to boating was 17% during 1994-1999. However, the true proportion attributable to boating could be as much as double this figure, since as for vital statistics, physicians often fail to mention that drownings occur during boating and such cases are then misclassified as non-boating incidents.

The regional rates for near drowning tend to be similar to or slightly less than the regional drowning rates, with the exception of Quebec. In Quebec, the rate of survivors of hospitalization for near drowning is significantly less than the drowning rate. The reasons for this difference are unknown, and could be related to reporting issues in Quebec hospitals, differences in rescue and resuscitation, or other factors.

RELATIVE IMPORTANCE OF DROWNINGS COMPARED WITH OTHER INJURIES

Among 15 to 24 year olds, drowning is the second most frequent cause of unintentional injury death after road traffic injury. For all ages, the four leading causes of unintentional injury death are traffic injuries, falls, poisoning, and drowning. Drowning used to be more frequent than poisoning as a cause of death. During the past several years, there has been some improvement in drowning rates, while unintentional overdoses of cocaine and other illegal drugs have remained frequent since the mid 1980's, especially among 25 to 44 year olds.

TRENDS

TODDLER AND INFANT DROWNINGS *The most encouraging medium-term trend in the 1990's was a 40% decline in drownings of 1-4 year old toddlers and 80% in infants less than 1 year old in Canada between the periods 1991-94 and 1995-99. The improvement has now been sustained for 5 years.* There is less than a 1 in 1000 probability that this magnitude of decrease in incidence rates of toddler and infant drowning occurred by chance alone. The dramatic change corresponds with the release of The Canadian Red Cross Society's special research report on toddler and infant drowning in 1994 and the extensive research-based revision of the national swimming and water safety programs and promotional/education campaigns across Canada. The latter incorporated programming based upon modern principles of injury prevention. Further investigation into the factors associated with this promising trend is ongoing.

Between 1991-1999, the annual rates of drownings per 100,000 toddlers were 3.0, 3.2, 3.1, 2.8, 1.6, 2.3, 1.8, 2.3, and 1.6 respectively. *Among infants, drownings virtually disappeared during 1995-1999.* Infant drownings mainly occur in adult bathtubs; the average number fell from 6 per year to 1 per year between 1991-94 and 1995-99. Between 1991-1999, the numbers of infant drownings were 5, 6, 6, 5, 0, 1, 2, 2, and 0 respectively.

Toddlers drown mainly in swimming pools, lakes, rivers, and to a lesser extend, bathtubs. Among toddlers, there were an average of 4 bathtub drownings per year during the three periods of 1991-1993, 1994-1996, and 1997-1999. During these same three periods, there were an average of 18, 10, and 11 pool drownings, 14, 12, and 7 lake drownings, and 7, 7, and 4 river drownings. There thus appear to be significantly improved trends in pool and lake drownings of toddlers during the latter half of 1991-1999, while there was no improvement in bathtub drownings in this age group.

Nevertheless, *there is still room for further improvement in toddler pool drowning rates.* Only 1 of 31 toddler swimming pool drownings in Canada during 1997-1999 and 5 of 115 during 1991-1999 were reported in a pool with a self-closing and self-latching gate. If all home pools were equipped with this simple and inexpensive device, nearly all toddler pool drownings and about one-third of all toddler drownings could be eliminated.

During 1991-1996, aboriginal toddlers and infants accounted for about one-third of drownings of all 0-4 year olds. During 1997 they represented only 11% of the national total, in 1998, 24%, and in 1999, 17%. It is unclear whether this change reflects a greater improvement among aboriginal toddlers than others, or whether it resulted from less complete recording of aboriginal status by data collectors or other staff during 1997-1999 as compared with the extra efforts for completeness made for complete reporting on aboriginals during 1991-1996.

Although the overall rate of toddler drowning in Quebec is close to the national average, Quebec has not shared to the same extent in the national decline in toddler pool drowning and continues to have the highest rate in Canada. During 1991-1999, Quebec, which accounts for 24% of Canada's population of toddlers, had 49% of the toddler pool drownings. Nevertheless, some encouragement can be taken from the fact that the pool drowning rate in Quebec appears to have improved somewhat since 1997, lagging by a couple of years the sharp downward trend first seen in Ontario in 1995. The high rate in Quebec reflects in part the large number of above-ground pools in Quebec that have been fitted with a terrace that leads into the living area of the house, which frequently also serves as a play area for children. Unfortunately, the model regulation for municipalities still does not include the key element of a self-closing and self-latching gate, and less than 10% of pools in one large region are fitted with such devices (Sergerie et al., 1997). If the toddler pool drowning problem in Quebec could be solved, the Quebec provincial toddler drowning rate would be the best in Canada, instead of only average.

DROWNINGS OF MALES AND FEMALES In previous years, the male to female ratio was about 5 to 1. In 1999, the ratio was 4.6 to 1, with 386 male and 84 female drownings. During 1999, there was a greater proportion of drowning victims who were female, as compared with previous years during 1991-1998. The reasons for this may become clearer over time if the trend is sustained, but may reflect changing patterns of activity, alcohol consumption, and other risk-taking behaviour for the two sexes.

BOATING DROWNINGS The number of boating drownings in Canada during 1999 was 145, which is 24% less than the 1991-1998 average of 191 per year and the lowest *since the national surveillance system began in 1991.* This is an encouraging change that will need to be confirmed by ongoing monitoring.

For boating, the reporting of drowning rates by incident rather than by victim smoothes out fluctuations that result from occasional incidents with several victims. Although less striking than the improvement in infant and toddlers drownings, there is a modestly favourable trend in the rate of fatal boating drowning incidents during the period 1993-1999, with 5.2, 5.3, 5.3, 5.1, 4.7, 4.7, and 3.7 incidents per million population respectively in each of the seven years. This trend will be an important one to monitor if a legal requirement for wearing of flotation device by users of small powerboats and canoes becomes a reality. Implementation and enforcement of such legislation would be expected to eliminate most boating drownings in Canada. The average number of victims per boating incident was 2.9 in 1999.

It is also important to develop better reporting of incidence rates based upon the numbers of different types of boats and average annual hours of exposure to boating activity. This may best be done by collaboration with Statistics Canada household surveys.

There is the suggestion of a positive trend in the overall number of fatal boating collisions during 1998-1999, since the average number of collisions was 8 per year during 1991-1997 and 4 per year during 1998-1999. Further observation will be required to verify whether this improvement is statistically significant. During 1996-1999, personal watercraft accounted for 57% (13/23) of all collisions between two boats and of a boat with a fixed object, as compared with 11% (3/28) during 1991-1995. Users of personal watercraft are also at increased risk of propeller injury from other boats, with 3 fatalities during 1991-1999, accounting for 38% of all victims of propeller injuries.

INTERPRETATION OF TRENDS

In comparing data from year to year, it is essential to avoid over-interpreting the significance of changes that may simply be a result of random fluctuation or of a single multiple-victim incident with several victims. With nine years of carefully collected and verified data for Canada, including data on multiple-victim incidents, it is now becoming possible to verify medium-term trends in specific subcategories of drownings. For example, the downward trends in toddler and infant drownings described above were found to be highly significant using statistical testing (Chi-square for trend and chi-square comparing before and after periods for toddler drownings gave a p value of <0.001). This result tells us that there is less than a 1 in 1000 probability that the observed downward trend was due to random variation. Verified surveillance data also provide an objective measure of outcome, and not simply process, for prevention programs. While process measures of evaluation such as knowledge, attitudes and practices are useful indicators of immediate change, in order to prove that a program is effective, such improvements must be followed by a positive and sustained trend in outcomes such as drowning, for the targeted activity or risk group. Positive trends are encouraging and can stimulate allocating additional resources for effective countermeasures. On the other hand, lack of improvement in outcome for specific risk groups, activities, or regions provide direction for new initiatives.

IMPLEMENTING PREVENTION OF DROWNINGS: KEY RECOMMENDATIONS FOR 2001 AND BEYOND

Injury countermeasures may be general or specific.

Alcohol is a substance that is associated with most types of water-related injuries. Interventions to render the use of alcohol on or near the water illegal and socially unacceptable would fall into the category of *general countermeasures.* This would protect nearly all high-risk groups including recreational boaters, adult male swimmers over 25 years of age, and snowmobilers. Children would also benefit, since caregivers would be required to be sober and alert, at least in waterfront situations.

For boaters, it is essential that both operators and passengers be protected by regulations and enforcement. Passengers are equally at risk of falling overboard when the boat is underway or stationary, and during

capsizing or swamping (Ciraulo et al, 2000; Logan et al., 1999; Howland et al., 1996). A simple standardized sobriety test for boaters has been developed for administration on the water (McKnight et al., 1999). Failure in this three-point test correlates well with blood alcohol levels above 100 mg %, and is reported to be useful to help decide who needs to be taken ashore for further testing.

Current evidence suggests that swimming ability and water safety training may be protective against drowning for persons 5 years of age and older (The Canadian Red Cross Society, 1996b). If this finding can be confirmed by further research, programs that provide such capabilities would be another example of a general countermeasure to protect boaters, swimmers, waders, people who fall into water, rescuers, and others.

Sustained downward trends since 1995 in toddler and infant drownings suggest that research based community water safety training programs and promotional/education campaigns introduced in 1995 across Canada for caregivers and children are having a positive impact. Unlike previous training, new programs are research-based and focus on key modifiable risk factors in Canada for prevention of drownings among toddlers and infants. The involvement of caregivers is now a key component of such programs, because there is greater awareness that infants and toddlers cannot be relied upon to recognize hazards and protect themselves.

Specific countermeasures consist of interventions that address a specific subcategory of injury and/or a targeted high-risk population. Examples would be a law to require wearing of a flotation device by users of small boats, or a regulation to require that all home pools be fitted with a self-closing and self-latching gate. The first example would target mainly adult male boaters, and the second, toddlers who live in, visit, or reside near houses with swimming pools.

Specific countermeasures need to address issues such as:

- Low rates of wearing of flotation devices while boating, especially by adult males;
- Low rates of wearing of flotation hypothermia protective garments while boating when low water temperature is a factor, especially during fishing, and during snowmobiling on ice;
- The absence of mandatory self-closing and self-latching gates to prevent toddler drownings in all home swimming pools, especially in Quebec;
- The risk of river currents for 15-24 year old swimmers;
- Alternative bathing practices to eliminate the risk of bathtub drownings for persons with epilepsy;
- The risk of current in rivers and at the outlet of lakes for children and adults who walk or play on ice.

There has been significant progress towards prevention of infant and toddler drownings in Canada during 1991-1999. For the largest high-risk group for drownings, male youth and adults, progress has been less striking.

There has been an improvement in bathtub drownings from an average of 45 per year during 1991-1995 to 32 per year during 1996-1999. Some but not all of this improvement is attributable to the decline in infant drownings already discussed. The largest remaining risk group for bathtub drowning is people with epilepsy, and special effort will be needed to better inform such individuals, their families, and their health providers.

Another category where definite improvement has become evident is boating drownings, with a decrease from an average of 199 drownings per year during 1991-1995 to 170 during 1996-1999. Part of this decrease was probably attributable to decreased exposure to occupational and subsistence fishing and boat travel, rather than specific interventions. The average number of recreational boating drownings per year during 1991-1995 was 146, and during 1996-1999, 134.

Injury countermeasures can be categorized as passive or active. *Passive or automatic measures provide a safe person-friendly environment or equipment by eliminating hazards.* Safety-based design of homes and boats provides passive protection. In illustration, a swimming pool gate that is both self-closing and self-latching provides automatic protection that reduces the need to rely entirely on constant active vigilance by a child's

parents. In contrast, active measures tend to require people to be constantly vigilant for their own or their family's safety whenever they are near a potential hazard. This also requires that people be aware at all times of all the hazards in their environment, even when they are tired or otherwise preoccupied.

Exhorting people to watch their children every moment while at the beach or other waterfronts is commendable and essential. Nevertheless, in and around the home it is impractical for caregivers to be constantly vigilant, since there are many tasks of daily life and other hazards that also demand attention. Hence safe home design is essential to ensure that there are no life-threatening hazards in the house or yard.

While education alone is insufficient to provide sustained prevention of injuries (Munro et al., 1995), education can be useful when supported and sustained by other countermeasures. These include effective and carefully targeted national, provincial, and municipal regulatory activity, including good building codes and municipal enforcement of these codes. Research-based education of decision-makers and trainers is also essential.

The importance of evaluating all new programs is that while some programs are found to be ineffective, others may actually produce the reverse effect of what was expected. Boaters in North Carolina, United States, who had received boating safety education, used alcohol more than persons without any education (Glover et al., 1995). Another study in the US found that boaters with formal training failed to wear flotation devices as often as those without such training, and were equally or more likely to use alcohol while boating (Bell et al., 2000).

Safety education and safety campaigns are rarely properly evaluated either before or after their widespread introduction. When they are, such interventions have sometimes been found to have a negative impact on behaviour and/or injury. The precise reasons for this require further study.

Sometimes such programs increase the number of people who participate in an activity and thereby increase the exposure to risk. This occurred with driver education programs in schools for teenagers in the United States. After the programs were introduced, more children started to drive right away at 16 years of age and more died. Any possible positive impact of the program was overshadowed by the fact of putting more children at risk of death on the road at this vulnerable age.

Other researchers have suggested that after certain types of courses, participants or caregivers may have a false sense of security about certain hazardous activities. While safety training for small children might be useful, it would be harmful if parents relied upon it to protect children in this vulnerable age group. An example would be water safety or swimming programs for toddlers that did not involve caregivers. Similarly, while it is probably useful to inform children under 10 about risks of traffic, it is still dangerous to let them walk to school at this age without adult supervision.

In other cases, it may be that both of these factors affect the risk of injury after education. After a gun safety or scuba diving course, the participant may be encouraged to buy a gun or scuba gear, and they are then more likely to use them with all the associated hazardous exposures. People are often injured during training, and they may also have a false sense of security having taken the course.

This is not to say that it is useless to provide training. Clearly, appropriate training and education can increase safety and enjoyment of new or favoured activities. What is essential is to include an adequate budget and time for evaluation and piloting of the impact on a small scale of all new programs prior to introduction on a larger scale. This may include evaluation of process objectives since as wearing of a flotation device during the pilot and evaluation of more uncommon outcomes such as decreases in boater drowning, after widespread adoption of the new course or training.

It is also essential that training and educational programs for injury prevention be based upon good research and surveillance data, and on scientific evaluation. This is increasingly required for all new and existing medical treatments and prevention programs, so called 'evidence-based medicine'.

Even for successful programs, evaluation clarifies the need for other coordinated strategies such as intervention. In illustration, a US educational program for boaters succeeded in raising wearing rates for

flotation devices from 20% to 30%, and this was rightly considered successful (Tresor et al., 1997). Nevertheless, it is also clear from these data that the majority of boaters were still unprotected after the programs and that regulation would be needed to protect the majority.

Surveillance and control of negative advertising is also essential. Popular movies often portray unsafe behaviour. In a review of the 25 most popular movies, it was observed that only 17% of 82 boaters wore personal flotation devices (Pelletier et al., 2000).

Another key issue in the success of prevention programs is the issue of cultural perceptions concerning the preventability of injuries. This can vary widely from one ethnic group and injury to another. A national survey in the United States reported that for all respondents, they believed that 67% of drownings were preventable (Girasek 2001). Such a population should be receptive to prevention programs, whereas in another culture the receptivity might be much less favourable.

In order to succeed, intervention programs for 2001 and beyond need to be carefully selected on the basis of major determinants of drowning, including key high risk populations, activities, equipment, and environments. Furthermore, all intervention programs must be regularly evaluated on the basis of measurable changes in Knowledge, Attitudes, Practices (KAP), and outcomes. Outcome measures include decreased deaths and hospitalizations among well-defined populations. A process measure of a practice would be the percent of users of small powerboats observed to be wearing a flotation device. Effective programs can be supported for national application, while ineffective programs should be dropped or modified.

The following activities, risk groups, and preventive strategies are recommended for action on the basis of trends analyzed during the nine-year period since the Canadian Surveillance System for Water-Related Fatalities began effective national reporting.

BY ACTIVITY

BOATING Boating, mainly recreational, continues to be the leading source of drowning in Canada, accounting for 40% of drownings. This situation differs from many other countries. In illustration, in Australia during 1992-1997, the non-boating unintentional drowning rate was 5 times greater than the rate of boating drowning, 1.44/100,000 population/year as compared with 0.29 (Mackie, 1999). In Canada our average boating drowning rate was 0.61/100,000 population per year during 1991-1999, versus 0.96 for non-boating, excluding land and air transport. Thus the Canadian ratio of all non-boating drownings to boating was only 1.6. Our recreational boating drowning rate is about twice that for the United States, where they had 783 deaths in 1994 (Logan et al., 1999).

The vast majority of boating victims in Canada are males between 15 and 74 years old. Most incidents involve small boats, including open powerboats, canoes, and others. Educational strategies alone have still not persuaded most boaters, especially at-risk males in small boats, to wear a flotation device. About 90% of drowning victims are found not wearing a personal flotation device (PFD) or a lifejacket, while for aboriginal boaters the figure is close to 100%. Studies of live boaters on the water have shown especially low wearing rates of only about 20% among users of motorboats in both Canada (Masson and Barss, 1996) and the United States (Quan et al., 1998).

It is frequently impossible for a boater to find and put on a device once immersed in water for several reasons:

- A majority of incidents involve falls into water, capsizing or swamping;
- Wind, waves, cold water, and darkness are frequent;
- In a not insignificant number of cases, there is no engine kill mechanism or it has been inactivated. When a solo operator falls in, the boat continues on its way.

Current legislation and local rules that require only carrying, not wearing, of a flotation device are insufficient to incite people to wear flotation at all times while boating. Unfortunately, many boaters do

not respect even the minimal regulatory countermeasure that simply requires the presence of appropriate flotation devices in the boat. If wearing of a flotation device were required, non-intrusive enforcement would be simpler, cheaper, and faster since compliance could be verified from a distance by direct view or with binoculars, rather than by stopping of boats to inspect their flotation devices.

The following elements should be included in a comprehensive approach to the prevention of boating-related fatalities:

- *Lobbying for legislation to improve boating safety;* for example, a new regulation requiring the wearing of a flotation device by all occupants of small open boats, canoes, and kayaks. While there are many naysayers for such regulatory activity, the fact is that similar regulations for automobile seatbelts have been enormously effective. While many adults are content to promote wearing of a flotation device for children, but not for themselves, the fact remains that child boating victims are rare. For such a regulation to have measurable impact, youth and adult males must be the key target group for legislation and enforcement.
- *Encouraging mandatory use of hypothermia protective garments in high risk activities*, such as spring and fall fishing and hunting or travel on large bodies of water under adverse conditions. Many fishing trips take place during spring when water temperatures are very low and supplementary protection is needed.
- *Developing better educational and promotional strategies to encourage the wearing of flotation devices while boating;* e.g. behavior-change research for high-risk groups, used in targeted marketing campaigns, partnerships/collaborative effort among organizations involved in water safety and injury prevention. To date, such strategies have not been very successful for the average boater. Safety-oriented club outings for canoeing and kayaking may be an exception.
- *Improving existing flotation device design to maximize safety, accessibility, comfort, temperature control and performance during vigorous activity.* While currently available flotation devices are far superior to cumbersome older models, the industry must continue its efforts to improve design in order to minimize objections to continuous wear. The marketing of flotation devices could be greatly improved. An appropriate variety of comfortable and appealing flotation devices that are suitable for vigorous activity such as canoeing should be available at affordable prices at major outlets and not only in specialty stores. Advertising should emphasize the need for continuous wearing, as well as both comfort and safety with the right device for each type of boating activity. Boaters (and fishers who use waders) should be aware of the risk of wearing rubber boots on or near the water, and always wear a flotation device when they are in a boat or the water with boots.
- *Implementing and regularly reevaluating appropriately targeted swimming and boating safety training programs.* Boating safety programs for primary school children were found to be ineffective (Leslie, 1990), probably because few children at this age are actively engaged in such activity. Better-targeted programs for high-risk youth and adult male boaters of all ages might be more productive. Nevertheless, careful assessment of Knowledge, Attitudes, and Practices following all new programs is needed, as well as ongoing surveillance of outcomes such as boating drowning rates in target groups.
- *Enforcing existing regulations limiting consumption of alcohol during boating*. Many boaters continue to transport and consume large quantities of alcohol. Alcohol continues to be involved in about one-third of boating drownings.
- *Creating safer user-friendly boating environments and well-trained employees in waterfront municipalities, marinas and parks.* Parks and rental staff should be provided with specific training and certification to competently advise boaters on appropriate routes and safety equipment, as well as the need for including bad weather layover days into planning for longer trips. Coast Guard and marine police should be trained to target their advice and enforcement so as to concentrate on key issues, such as wearing of flotation devices by all occupants of small boats.

- *Mandating our provinces, municipalities, and communities to collaborate in developing and evaluating appropriate regulations and enforcement to improve boating safety.* This is essential because many bodies of water are not included in the Coast Guard's mandate for patrolling. While some provincial police departments have a marine division, this is not universal.
- *Developing more effective engine kill mechanisms* is needed in order to halt the engine when an operator falls in. Data show that each year several boaters drown when they fall in and their boat continues on without them. It should be made impossible to disable such controls; however, they should be comfortable and non-obtrusive or users will devise means of bypassing them. Further development in this area could be encouraged by appropriate regulatory activity in the manufacturing and building codes.
- *Developing regulations to ensure that personal watercraft users wear both helmets and a flotation device at all times.* In collisions of personal watercraft, 54% of victims were ejected from the boat, and hence were at risk for both head injury and drowning (Jones, 1999). Head and limb injuries are the most frequent non-fatal injuries associated with collisions of personal watercraft (Jones, 2000). Head protection would appear to be especially important for rental users, since many have no experience.
- *Inclusion of protective guards on propellers* would help protect water-skiers, swimmers, and personal watercraft users who fall off their boat from death, amputations, and other severe propeller injuries (Jones, 2000; MMWR, 1998; Hargarten et al., 1994; Mann, 1980).
- *Improving the success of search and rescue for missions on water.* The probability of finding the subject(s) of a search and rescue mission alive is reported to be much lower for missions on water than on land. In one US study in Oregon, the chance of being rescued alive in a water incident was only 50%, which was 7.5 times less as compared with land (Scorvo et al., 2001). In order to improve the success rate for missions on water, it is essential to get to the incident site quickly, since during sustained immersion in water victims will become rapidly lose heat, become hypothermic and die. If all boaters traveling in a single boat or under adverse or remote conditions carried a personal locator beacon in a special pouch on the rear of their flotation device, search and rescue services could be alerted quickly enough of two key variables, including first, the existence of an emergency and second, the correct location. This would cut the response time and improve the success rate of locating the victims alive.

SWIMMING & WADING There was no sustained improvement in drowning associated with swimming and wading in Canada during 1991-1999. Although Red Cross instruction in swimming and water safety is available in almost all communities in Canada, toddlers, children, youths, and adults from the most vulnerable groups do not always participate in the available programs.

Mandatory testing of swimming ability is now a requirement at school entry in some Australian states. Policy makers in Canada should seriously consider the introduction of such testing. Swimming training needs to be provided for all children who are unable to complete an appropriate test.

Children from certain subgroups of the population are often unable to access swimming training. In Australia, it was found that 95% of all children could swim by the age of 11; however, in lower socio-economic levels, only 75% could swim (Nixon et al., 1979). Similarly, in the United States, the risk of drowning in a swimming pool was 15 times greater among black male children 5 to 19 years old than among white children (Brenner et al., 1995). Nevertheless, an encouraging study indicates that well-designed curriculum-based programs for elementary children from disadvantaged backgrounds may be helpful. Children with the lowest baseline scores on safety knowledge and behaviour for various injuries, including drowning, had the greatest improvement in scores from the program (Gresham et al, 2001).

While training should be available for all children, by emphasizing the need to pass a test special emphasis would be directed to more intensive teaching of children of low-income families, immigrants, or other isolated subgroups of the population in order to bring them up to a reasonable standard. Such children might otherwise not receive such training. However, testing of all children should ensure that schools would have to arrange suitable training so that everyone is qualified. Children and caregivers who had had no previous access to swimming and water safety training would probably need more time and attention than those who had already received it.

Fast river currents and alcohol are two major risk factors for swimmers. Safety training for teenagers should emphasis suitable strategies for avoiding and coping with the hazardous situation of river currents. About one-third of swimmers who drown are impaired by alcohol. Hence the feasibility of controls to limit alcohol consumption by swimmers should be assessed, especially for those between 25 and 44 years old. Education also needs to target young males between about 20 and 40.

Both swimmers and boaters need to be aware of the extreme danger of entrapment in recirculating hydraulics at the base of even small dams. Dams need to be made safer by known technical advances (Stairs and Brown, 1998), and access blocked.

DROWNINGS ON OFF-ROAD VEHICLES The issues around snowmobile drownings resemble those for boating, since both involve travel on water/ice. As long as people continue to take risks by travelling at high speed over ice after dark, flotation and protection against hypothermia will be key to prevention of fatalities. Wearing of a flotation garment that also protects against hypothermia should be the norm and mandatory for travel over ice by snowmobile. Mandatory testing with licensing or certification to ensure driver knowledge and competency for current high-speed machines should be introduced, as it is for motorcycles and boats. A special training module for travel on ice could be helpful. There are also design and engineering issues to be resolved. At current top speeds, it is unclear whether existing design of headlights and brakes allow sufficient time to see a hole in the ice in time to stop the machine safely. Newfoundland, Quebec, Ontario, Nunavut, and the Northwest Territories are key regions for prevention of snowmobile drownings.

DROWNINGS IN ON-ROAD VEHICLES Clearly preventable are drownings that result from unsafe barriers on bridges. Most of these drownings occur in regions with a hilly terrain and large numbers of rivers. Quebec and British Columbia are priority regions for prevention by improved legislation for bridge design, and for targeting improvements to existing high-risk areas.

BY SPECIAL HIGH-RISK GROUPS

TODDLERS Sustained attention to four key subcategories could further cut the number of drownings of vulnerable 1-4 year old children in Canada by at least half. These subcategories include pool drownings in Quebec and Ontario, lake drownings in Ontario, bathtub drownings across the country, and drownings of aboriginal toddlers in natural bodies of water.

Virtually no drownings of Quebec and other Canadian toddlers have occurred in pools fitted with automatically self-closing and self-latching gates during 1991-1999. Similar results were found in the state of Victoria, Australia between 1992-1997 (Blum and Shield, 2000). Other studies have confirmed the value of appropriate fencing (Thompson and Rivara, 2000). Isolation as opposed to perimeter fencing is more effective, since otherwise a child can obtain access to the pool via the home. Pool fencing ordinances are only effective, however, if building codes, enforcement, and operation and maintenance by pool owners are effective (Morgenstern et al., 2000).

Hence, the first recommendation includes development, implementation, and enforcement by Quebec provincial and municipal authorities of a model provincial regulation that mandates effective self-closing and self-latching gates for all home pools, especially for above-ground pools with a terrace joining the pool to the home. This will require updating of the municipal norm to include not simply fencing, but also a self-closing and latching device for the gate. If there is direct access to the pool from the home, a similar protective mechanism is needed for doors and low windows that open into the pool area. There was a recent working group in Quebec dedicated to exactly this task, but their recommendations are awaiting approval and implementation by decision-makers. Professionals who work in federal consumer safety also have a role to play in formulating national norms for pool safety.

Insurance vendors can also help in prevention. All home insurance policies should clearly identify whether a pool of any kind is present, and if so, whether it is fitted with a functioning self-closing and self-latching gate. National and provincial building codes may also need to be revised.

Pool vendors should be playing a much greater role in safety. Many large vendors offer an extraordinary variety of pool accessories, with the only exception being safety equipment. Just as automobile

manufacturers were required to supply *all* automobiles with safety equipment*, and not only as an option* for the rich or the safety conscious, *pool vendors should be required to supply pools with essential safety equipment* and ensure that it is installed before the pool is filled. Provision of safety information and equipment by pool vendors needs to be made mandatory. Purchasers of pools should also be required to sign that they have been advised of risks, and that they have been offered a fence with a self-closing and self-latching gate mechanism prior to installation.

Pool vendors should not be allowed to install a pool without also installing a self-closing and self-latching gate. They could be allowed to subcontract this, but should not fill the pool and hand it over to the owner until the area is safe for children occupying the home of the owner and the children of neighbours.

Finally, use of adult bathtubs by younger toddlers (and infants) must be considered a hazardous activity and other safer alternatives considered when designing bathrooms. Otherwise, constant uninterrupted supervision by a parent or other caregiver is essential. Such supervision cannot be replaced by the presence of other slightly older children. A small attractive warning label could be required for all new adult bathtubs, and also be provided to parents in water safety programs and at maternity wards.

YOUTH AND YOUNG ADULTS While drowning rates are lower among 5-14 years olds than toddlers, age-specific rates rise to another peak again at 15-24 years. Unlike younger children, youth and young adults are at significant drowning risk during both swimming and boating. Even university students, who might be expected to be in a more favourable category for risk-taking than the general population, demonstrate high-risk behaviours that put them at significant risk for several of the leading health problems. In the United States, a college risk-behaviour survey found that 30% of students who had gone swimming or boating during the 12 months preceding the survey had consumed alcohol during the activity (MMWR, 1997). Many youth and young adults swim in rivers with current, even near waterfalls and dams, and appear to be uninformed regarding the force of current and the level of risk associated with such locations. Special approaches are needed to reach and to communicate risk for this vulnerable age group.

ABORIGINAL PEOPLES The major target groups in preventing aboriginal drownings are toddlers and adult males. A key to prevention in all aboriginal risk groups would include a major shift in perception of drowning as unacceptable and avoidable, rather than as an inevitable hazard of daily life. For toddlers, the central issue is how to prevent drowning in large natural bodies of water, as well as smaller man-made collections near homes.

For aboriginal adults, wearing of a flotation device at all times while boating and snowmobiling should be a welcome regulatory activity that would make wearing of a flotation device mandatory for all occupants of small boats (Hughes, Sawyer, Barss, Macintyre, 1997).

Nevertheless, community workshops with elders and others will undoubtedly be needed to allow aboriginal peoples the opportunity to reconsider their perception of the preventability of hazards associated with activities that are considered to be "traditional." All aboriginal people, and indeed all Canadians, need to be more fully aware of the tremendous risk of consuming alcohol on, in, or near the water. Model programs developed by the US Indian Health Service and Tribal Governments are reported to have been successful in drowning prevention (Pediatrics, 1999). Essential features of such programs included attention to local sovereignty, as well as unique cultural aspects of health care and communication. Training courses vary from a half-day to a year (Smith et al., 2000).

Fatalistic attitudes towards injury appear to be gradually changing in many countries. In the United States, a national telephone survey revealed that respondents believed that 67% of drownings were preventable (Girasek, 2001). When all Canadians, including indigenous peoples, are convinced that at least 90% of drownings are preventable, truly effective prevention could become a reality and not only a vision.

PERSONS WITH EPILEPSY There has been no improvement in the number of persons with epilepsy who drown each year in Canada during 1991-1999. There were 26 victims during 1996, 24 in 1997, 15 in 1998, and 27 in 1999. This number of preventable deaths is unacceptable, more so because most victims are otherwise healthy young adults between 15-54 years of age. Hence, in economic terms, these deaths represent a substantial loss. Since half of these drownings occur in home bathtubs, the message is clear.

Bathing alone in a standard bathtub for an individual with a seizure disorder is a high-risk activity, whereas taking a shower is much safer. All health workers and families of affected persons should be warned about this hazard on every possible occasion, and information about drowning in bathtubs and other bodies of water, together with other injury risks, should be included in all educational material for new patients. The bathtub warning labels noted above for infants and toddlers could also include a few words about people with epilepsy for similar purposes.

EMERGING PRIORITIES

DIVING INJURIES IN HOME POOLS Although there are relatively few deaths reported from diving, there are about 60 hospitalizations per year in Canada for spinal cord injuries from diving, i.e., about 2 per million population per year. All or nearly all victims of spinal cord injuries from diving develop tetraplegia (Schmitt and Gerner, 2001). Tetraplegia is paralysis of all four limbs from cervical spinal cord injury. This is a devastating injury that cripples for life.

In some countries, diving is now the leading cause of sports-related injury, even at incidence rates somewhat less than we see in Canada (Katoh et al., 1996, Schwarz et al., 2001)

Although hospitalizations for such injuries are not included in the database of the Canadian Surveillance System for Water-Related Fatalities, prevention needs to be highlighted. The author of this report has studied such injuries with one of his students (Djerrari, 1999).

Diving victims are overwhelmingly young males. Lifetime maintenance costs about $4 million for a 20-year old. Most victims were unaware at the time of their injury of the risk of tetraplegia associated with diving head-first into water. This would provide support to the recommendation of Ontario groups who have advocated mandatory inclusion of diving safety in the school curriculum (Bhide et al., 2000). Nevertheless, any injury prevention measure such as the educational videos proposed by the authors should be carefully evaluated for effectiveness.

In the United States, nearly half of spinal cord injuries from diving occurred during parties and during the victim's first visit to that pool (DeVivo and Sekar, 1997). Nearly all occurred in residential pools and most resulted from ordinary dives.

The injury pattern of untrained casual divers appears to be quite different from that for competitive divers. Injuries of competitive divers are more frequently associated with the entry phase of back and reverse dives from platforms. In competitive divers, the wrist, shoulder, and lumbar spine are the most frequent sites for injury (Rubin 1999).

The research in Quebec has shown that common designs of home pools as currently sold, even with diving boards, put tall divers at risk since the deep ends of most pools are both too shallow and too short. The mass and height of adult males puts them at special risk. Divers strike the ascending slope of in-ground pools. Although most injuries occur at relatively shallow depths, such injuries also affect people who dive into depths of 8 and 9 feet in 30-foot long pools, but strike the ascending slope where the water is much shallower.

Although diving is supposed to be prohibited in above-ground pools, spinal cord injuries continue to occur in such pools. Current warning labels are not much larger than a postage stamp, and too small to be visible under most conditions. Diving safety labels for pools need to be much larger and brighter than for bathtubs and whirlpools, since during parties adults may be standing on a deck well above the edge of the pool, often under conditions of low light levels and limited visibility.

Safer feet-first alternative methods of water entry should be encouraged. Where diving is taught, it is essential that safe diving skills be included in the curriculum (Blitvitch et al., 2000, 1999; Blankensby et al., 1997). Safety practices were reported to include learning to steer up to the surface, head protection with the arms, and only diving when absolutely necessary.

UNDERWATER DIVING Diving with scuba or other gas sources has been qualified as a high-risk sport, with about 3 to 9 deaths per 100,000 divers per year in the United States (Spira 1999). It is stated that about 60% of deaths of divers occurs from drowning and most of the other from pulmonary illnesses.

In Canada, we see each year in the surveillance data on average about 3 or 4 diving deaths from drowning, 4 from air embolism, and 1 from various other causes such as nitrogen narcosis. Some of these deaths occur from panic, rapid ascent, and the resulting barotrauma in inexperienced divers, or dangerous occupational dives among casual sport divers completely untrained for such activity.

Nevertheless, careful review of coroners' enquiries not infrequently reveals extreme risk-taking in experienced divers or instructors. Such individuals would have been expected to know better than to subject their own lives or lives of their students to a risk that frequently appeared to be out of all proportion to the potential pleasure to be derived from such dives, which often involved extreme depth and poor visibility. In fact, extreme divers and their companions would do well to obtain skilled assessment of not only their physical health, but also the psychological (Hunt, 1996).

WHIRLPOOLS/HOT TUBS These devices have become more prevalent, and drownings associated with them took 8 lives during 1996, 4 during 1997, 3 in 1998, and 6 during 1999. Building codes and design standards should include adequate enclosure of such devices to protect children, as for home pools. Another issue to be addressed is how best to design the suction intakes so that they cannot entrap a child or frail adult beneath the surface. Mandatory education of owners prior to purchase about the potential hazards and safeguards of these devices might be helpful. As for pools, vendors are unlikely to provide and emphasize safety information unless it is mandatory to do so. As for bathtubs and pools, appropriate safety warning labeling should be required.

PERSONAL WATERCRAFT These powerful boats have caused considerable controversy because of their high speed, noise, and intrusiveness in rural environments. Nevertheless, there have been few drownings associated with their use; for example, there was only 1 during 1996, 3 in 1997, 4 in 1998, and 2 in 1999, and an average of 2 per year during 1991-1999. On average, personal watercraft accounted for 1.4% of recreational boating drownings during 1991-1999. A small survey in British Columbia indicated that users of personal watercraft more frequently wear a personal flotation device than other boaters (Barss and Masson, 1996). Nevertheless, there are published reports of severe non-fatal injuries among users of such boats (Swinburn, 1996, Hamman, 1993). Since about half of personal watercraft users have been reported ejected from the boat during a collision (Jones, 1999), they are at high risk of propeller injuries from other boats. All outboard motors should be equipped with propeller guards. This safety device, available from outboard motor manufacturers, should be sold as a mandatory safety protection device at the time of purchase. Propeller injuries tend to cause laceration of major arteries, which are followed by rapid death from hemorrhage and shock (MMWR, 1998).

The overall number of trauma deaths from boating collisions from all types of boats averaged 6 deaths per year during 1991-1999. There were an average of 6.3 collisions per year during 1991-1993, 8.7 in 1994-1996, and 5.3 in 1997-1999. If we consider only 1998-1999, the average was 4.0 per year. The number of collision deaths attributed to personal watercraft was 2 in 1995, 5 in 1996, 4 in 1997, 2 in 1998, and 2 in 1999. There was a larger than expected number of deaths from personal watercraft during 1995-1997, which appears to have led to an increase in the number of deaths in boating collisions during that period. Although the numbers are small and these trends need to be confirmed by further observation, there may have been improvement in 1998-1999. Nevertheless, while personal watercraft account for only 1% of boating drownings, they still account for about 50% of trauma deaths from boating collisions. Hopefully new regulations and enforcement for competency of boating that were introduced in 1999 will be helpful in reducing deaths and other fatalities associated with boating collisions. As for motorcycles, which have a high death rate, special licensing requirements are needed for operators of high-speed boats.

CARBON MONOXIDE POISONING IN ENCLOSED BOATS Recreational boaters who use large older boats with enclosed cabins and powered by a gasoline motor have been found to be at increased risk of carbon monoxide poisoning in the United States (Silvers and Hampson, 1995). It is recommended that such boats be fitted with a carbon monoxide detector. Some incidents are fatal, and many more are hospitalized. Of 512

patients treated for unintentional carbon monoxide poisoning in a single US hospital, 8% resulted from recreational boating. Such incidents also occur in Canada, but a systematic review has not been published.

DROWNING AMONG TRAVELERS AND IMMIGRANTS Coroners normally report on drownings within their geographic boundaries. Hence Canadian tourists who drown abroad are not usually included in the annual drowning reporting. Nevertheless, it is important for Canadians to be aware that the two leading causes of death among travelers are now traffic injuries and drowning, not exotic infectious diseases. Tourists may participate in potentially hazardous activities in unfamiliar locations and climate. Appropriate safety equipment may be unavailable and guides or boat operators are not always properly trained. For economic reasons, tourists may be allowed to join group activities for which they are not adequately prepared, trained, or equipped. Alcohol may be abused. Medical examinations to detect disqualifying health conditions such as asthma may be neglected by diving instructors in low-income countries.

In Australia, overseas tourists comprised 25% of all scuba drownings, 18% of surf and ocean drownings, and 5% of all non-boating drownings (Mackie, 1999). In Denmark, foreigners were reported to be at 3 to 4 times greater risk of drowning than Danes (Lindholm and Steensberg, 2000). Even more frequent than deaths among visitors are hospitalizations for water-related injuries. In Australia, in the state of Queensland alone during 1996-1998, there were 296 overseas visitors admitted to hospital for water-related injuries, with an average of two admissions per visitor (Wilks and Coory, 2000). Decompression illness associated with use of diving equipment accounted for 55% of the conditions treated and drowning and non-fatal submersion for 15%.

Immigrants may be at higher risk of death from injury, including drowning both in their new country and while on holiday in their country of origin. In illustration, Turkish and Moroccan child immigrants in Holland had a risk of injury, including drowning, double that of native Dutch children (Schulpen et al., 2001). For these immigrant children, it was found that 25% had died while on holiday in their country of origin.

Hence while travelers and immigrants should not neglect their immunizations, they should also immunize themselves against injury by verifying their fitness before leaving for potentially hazardous activities, and take a well-fitting flotation device with them that is appropriate for projected boating activities. This is especially important in low-income countries where travel in overloaded boats may be especially hazardous and safety equipment unavailable.

DROWNING IN FARM PONDS OR DUGOUTS Most years in Canada, one or more children drown in dugouts or other farm ponds, especially in western Canada. Incidents occur by falls into dugouts or falls through ice. Hutterite colonies appear to be at special risk. In Australia, drowning is the most common fatal farm-related injury among children from 0 to 9 years of age (Mitchell et al., 2001). Appropriate regulations and other interventions are needed for drowning prevention on farms to protect young children of farmers.

DROWNING ASSOCIATED WITH 'ECSTASY' INTOXICATION Ecstasy or PCP has become a popular drug at parties such as 'raves' among the young. During the past several years, a number of drownings in the Canadian surveillance data have been associated with this drug. The victim is usually a young person who enters the water in an intoxicated state. Their histories and statements to survivors or other witnesses prior to death suggest that the victims believed they could do almost anything, even while intoxicated in the water after dark.

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Annex 1a

SUMMARY OF NUMBERS AND PERCENTS* FOR WATER-RELATED INJURY FATALITIES, CANADA 1991-1999 (n=5,429)

	1991		1992		1993		1994		1995		1996		1997		1998		1999		1991-1999	AVERAGE	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		No.	%
DROWNINGS (E910, E830, E832) (excludes land & air transport)	**558**	**86**	**491**	**80**	**499**	**75**	**497**	**79**	**502**	**79**	**483**	**78**	**445**	**78**	**423**	**77**	**405**	**81**	**4,303**	**478**	**79**
Boating	**209**	**37**	**214**	**44**	**191**	**38**	**186**	**37**	**197**	**39**	**185**	**38**	**176**	**40**	**172**	**41**	**145**	**36**	**1,675**	**186**	**39**
Recreational	165	79	145	68	143	75	122	66	153	78	156	84	138	78	120	70	122		1,264	140	75
Daily living	17	8	45	21	19	10	29	16	15	8	10	5	11	6	21	12	11		178	20	11
Occupational	23	11	15	7	22	12	32	17	22	11	14	8	23	13	26	15	9		186	21	11
Rescue	0	0	2	1	6	3	1	1	5	3	1	1	2	1	3	2	3		23	3	2
Other/unknown	4	2	7	3	1	1	2	1	2	1	4	2	2	1	2	1	0		24	3	1
Aquatic activities	**147**	**26**	**110**	**22**	**114**	**23**	**109**	**22**	**135**	**27**	**131**	**27**	**103**	**23**	**117**	**28**	**113**	**28**	**1,079**	**135**	**25**
Recreational	143	97	105	95	108	95	101	93	128	95	120	92	90	87	106	91	96	85	997	111	82
♦ Swimming	101		79		74		75		81		76		61		72		70		689	77	
– Home swimming pool	5		5		7		3		1		9		6		10		2		48	5	
– Other swimming pool	7		7		7		6		10		4		9		4		9		63	7	
– Other body of water	89		67		60		66		70		63		46		58		59		578	64	
♦ Playing/wading in water	29		18		20		12		26		11		12		18		8		154	17	
♦ Other	12		8		14		14		21		33		17		15		18		152	17	
♦ Unknown	1		0		0		0		0		0		0		1		0		2	0	
Daily living	1	1	0	0	2	2	1	1	0	0	1	1	1	1	0	0	0	0	6	1	0
Occupational	2	1	2	2	2	2	3	3	2	1	5	4	1	1	1	1	3	3	21	2	2
Rescue	1	1	1	1	1	1	3	3	5	4	5	4	6	6	5	4	13	12	40	4	3
Other	0	0	1	1	1	1	0	0	0	0	0	0	3	3	2	2	1	1	8	1	1
Unknown	0	0	1	1	0	0	1	1	0	0	0	0	2	2	3	3	0	0	7	1	1
Using bathtub	**50**	**9**	**36**	**7**	**48**	**10**	**45**	**9**	**45**	**9**	**41**	**8**	**34**	**8**	**27**	**6**	**25**	**6**	**351**	**39**	**8**
Non-aquatic activities (falls into water)	**133**	**24**	**115**	**23**	**132**	**26**	**126**	**25**	**111**	**22**	**107**	**22**	**104**	**23**	**91**	**22**	**94**	**23**	**1,013**	**113**	**24**
Recreational	96	72	87	76	88	67	84	67	60	54	53	50	78	75	61	67	66	70	673	75	66
♦ Swimming pool	13		16		22		14		8		12		10		11		11		117	13	
♦ Other body of water	83		71		66		70		52		41		68		50		55		556	62	
Daily living	18	14	17	15	32	24	28	22	26	23	39	36	14	13	21	23	20	21	215	24	21
♦ Walking near water or on ice	11		12		27		16		18		28		9		16		9		146	16	
♦ Other	3		3		4		12		8		11		5		4		11		61	7	
♦ Unknown	4		2		1		0		0		0		0		1		0		8	1	
Occupational	5	4	1	1	5	4	3	2	0	0	3	3	3	3	3	3	4	4	27	3	3
Rescue	0	0	1	1	2	2	4	3	5	5	5	5	3	3	4	4	1	1	25	3	2
Other	4	3	0	0	1	1	1	1	0	0	2	2	3	3	0	0	0	0	11	1	1
Unknown	10	8	9	8	4	3	6	5	20	18	5	5	3	3	2	2	3	3	62	7	6
Unknown activities	**19**	**3**	**16**	**3**	**14**	**3**	**31**	**6**	**14**	**3**	**19**	**4**	**28**	**6**	**16**	**4**	**28**	**7**	**185**	**21**	**4**
LAND & AIR TRANSPORT DROWNINGS	**68**	**10**	**96**	**16**	**122**	**18**	**100**	**16**	**83**	**13**	**91**	**15**	**81**	**14**	**94**	**17**	**66**	**13**	**801**	**100**	**15**
On-road motor vehicle†	37	54	46	48	75	61	72	72	44	53	49	54	52	64	52	55	45	68	472	52	59
Snowmobile	24	35	40	42	31	25	14	14	28	34	24	26	16	20	28	30	17	26	222	25	25
All-terrain vehicle	0	0	4	4	2	2	3	3	5	6	3	3	2	2	7	7	0	0	26	3	3
Other off-road vehicle	3	4	4	4	5	4	6	6	2	2	6	7	3	4	5	5	2	3	36	4	4
Aircraft	4	6	2	2	6	5	5	5	4	5	9	10	8	10	2	2	2	3	42	5	5
Unknown	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
NON-DROWNING FATALITIES‡	**24**	**4**	**23**	**4**	**40**	**6**	**31**	**5**	**50**	**8**	**49**	**8**	**41**	**7**	**35**	**6**	**32**	**6**	**325**	**36**	**6**
TOTAL	**650**	**12**	**610**	**11**	**661**	**12**	**628**	**12**	**635**	**12**	**623**	**11**	**567**	**10**	**552**	**10**	**503**	**9**	**5,429**	**603**	**100**

** Values in light shaded areas refer to dark shaded totals above; values in unshaded areas relate to shaded areas above † Includes both on-road & off-road incidents involving cars or trucks*
‡ For details, see Annex 1b; primary cause of death was injury other than drowning, although drowning may have complicated another injury; in case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included here; for all years, 1991-1999, 40 deaths were occupational, including 15 boating fatalities

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 1993-2001

Annex 1b

SUMMARY OF NUMBER AND PERCENTS* FOR NON-DROWNING INJURY FATALITIES BY ACTIVITY, CANADA 1991-1999 (n=325)

	1991		1992		1993		1994		1995		1996		1997		1998		1999		1991-1999	AVERAGE	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		No.	%
NON-DROWNING FATALITIES†	**24**	**100**	**23**	**100**	**40**	**100**	**31**	**100**	**50**	**100**	**49**	**100**	**41**	**100**	**35**	**100**	**32**	**100**	**325**	**41**	**100**
Boating‡	**12**	**50**	**11**	**48**	**18**	**45**	**13**	**42**	**15**	**30**	**20**	**41**	**16**	**39**	**15**	**43**	**12**	**38**	**132**	**17**	**41**
Aquatic activities	**6**	**25**	**10**	**43**	**6**	**15**	**8**	**26**	**11**	**22**	**11**	**22**	**9**	**22**	**7**	**20**	**8**	**25**	**76**	**10**	**23**
Scuba diving, air embolism	1		4		3		4		5		7		2		2		5		33	4	
Scuba diving, other	0		1		2		2		0		1		1		0		0		7	1	
Diving into water, head/spinal injury	5		1		1		2		5		2		3		2		3		24	3	
Diving into water, other/unsp. injury	0		3		0		0		1		1		1		0		0		6	1	
Jumping into water	0		1		0		0		0		0		2		1		0		4	1	
Other	0		0		0		0		0		0		0		2		0		2	0	
Non-aquatic activities (falls into water)	**4**	**17**	**1**	**4**	**7**	**18**	**7**	**23**	**10**	**20**	**8**	**16**	**4**	**10**	**9**	**26**	**3**	**9**	**53**	**7**	**16**
Land & air transport	**2**	**8**	**1**	**4**	**5**	**13**	**3**	**10**	**14**	**28**	**7**	**14**	**12**	**29**	**4**	**11**	**9**	**28**	**57**	**7**	**18**
On-road vehicle§	0		1		0		3		4		4		4		2		1		19	2	
Snowmobile	2		0		0		0		1		2		1		1		5		12	2	
All-terrain vehicle	0		0		0		0		0		0		0		1		1		2	0	
Other off-road vehicle	0		0		3		0		0		1		0		0		0		4	1	
Aircraft	0		0		2		0		9		0		7		0		2		20	3	
Other/unknown activities	**0**	**0**	**0**	**0**	**4**	**10**	**0**	**0**	**0**	**0**	**3**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**1**	**2**

** Values in light shaded areas refer to dark shaded totals above; values in unshaded areas relate to light shaded areas above*
† Primary cause of death was injury other than drowning, although drowning may have complicated another injury; in case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included here; for all years, 1991-1999, 40 deaths were occupational, including 15 boating fatalities
‡ See Annex 1d for details of boating fatalities § Includes both on-road and off-road incidents involving cars or trucks

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 1993-2001

Annex 1c

SUMMARY OF NUMBERS AND PERCENTS* FOR WATER-RELATED INJURY FATALITIES DURING BOATING AND OTHER MAJOR ACTIVITIES, CANADA 1991-1999 (n=5,429)

	1991		1992		1993		1994		1995		1996		1997		1998		1999		1991-1999	AVERAGE	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		No.	%
DROWNINGS (E910, E830, E832) (excludes land & air transport)	**558**	**86**	**491**	**80**	**499**	**75**	**497**	**79**	**502**	**79**	**483**	**78**	**445**	**78**	**423**	**77**	**405**	**81**	**4,303**	**478**	**79**
Boating	**209**	**37**	**214**	**44**	**191**	**38**	**186**	**37**	**197**	**39**	**185**	**38**	**176**	**40**	**172**	**41**	**145**	**36**	**1,675**	**186**	**39**
Recreational	165	79	145	68	143	75	122	66	153	78	156	84	138	78	120	70	122	84	1,264	140	75
Powerboat	84	51	97	67	91	64	64	52	88	58	75	48	80	58	70	58	76	62	725	81	57
♦ Small open powerboat† (≤5.5m)	65	77	71	73	53	58	45	70	64	73	45	60	53	66	34‡	49	41	54	471	52	65
♦ Large powerboat (>5.5m)	5	6	13	13	16	18	6	9	4	5	4	5	9	11	8	11	15	20	80	9	11
♦ Personal watercraft	1	1	4	4	4	4	0	0	2	2	1	1	3	4	4	6	2	3	21	2	3
♦ Powerboat, size unspecified	13	15	9	9	18	20	13	20	18	20	25	33	15	19	24	34	18	24	153	16	21
Unpowered boat	66	40	44	30	41	29	50	41	55	36	74	47	50	36	45	38	37	30	462	51	37
♦ Canoe	40	61	33	75	21	51	37	74	39	71	37	50	27	54	25	56	16	43	275	31	60
♦ Kayak	6	9	4	9	5	12	3	6	1	2	4	5	3	6	4	9	2	5	32	4	7
♦ Rowboat	7	11	0	0	6	15	3	6	9	16	10	14	8	16	5	11	4	11	52	6	11
♦ Inflatable	3	5	2	5	2	5	4	8	2	4	6	8	7	14	3	7	5	14	34	4	7
♦ Sailboat/sailboard	10	15	4	9	6	15	1	2	2	4	12	16	3	6	6	13	10	27	54	6	12
♦ Other	0	0	1	2	1	2	2	4	2	4	5	7	2	4	2	4	0	0	15	1	3
Unknown boat	15	9	4	3	11	8	8	7	10	7	7	4	8	6	5	4	9	7	77	9	6
Daily living	17	8	45	21	19	10	29	16	15	8	10	5	11	6	21	12	11	8	178	20	11
♦ Small open powerboat† (≤5.5m)	6	35	24	53	3	16	10	34	7	47	4	40	8	73	4	19	3	27	69	8	39
♦ Large powerboat (>5.5m)	8	47	4	9	3	16	8	28	0	0	1	10	0	0	7	33	0	0	31	3	17
♦ Powerboat, size unspecified	0	0	6	13	5	26	3	10	1	7	3	30	0	0	3	14	0	0	21	2	12
♦ Canoe	2	12	6	13	6	32	1	3	5	33	0	0	2	18	5	24	5	45	32	4	18
♦ Other unpowered	1	6	2	4	1	5	2	7	1	7	1	10	1	9	1	5	1	9	11	1	6
♦ Unknown boat	0	0	3	7	1	5	5	17	1	7	1	10	0	0	1	5	2	18	14	2	8
Occupational	23	11	15	7	22	12	32	17	22	11	14	8	23	13	26	15	9	6	186	21	11
♦ Small open powerboat† (≤5.5m)	7	30	7	47	2	9	5	16	4	18	4	29	6	26	4	15	1	11	40	4	22
♦ Large powerboat (>5.5m)	12	52	4	27	12	55	23	72	16	73	7	50	12	52	18	69	6	67	110	12	59
♦ Powerboat, size unspecified	0	0	0	0	3	14	1	3	0	0	3	21	3	13	2	8	2	22	14	2	8
♦ Unpowered boat	1	4	2	13	1	5	2	6	1	5	0	0	2	9	1	4	0	0	10	1	5
♦ Other/unknown boat	3	13	2	13	4	18	1	3	1	5	0	0	0	0	1	4	0	0	12	1	6
Rescue	0	0	2	1	6	3	1	1	5	3	1	1	2	1	3	2	3	2	23	3	1
Other/unknown	4	2	7	3	1	1	2	1	2	1	4	2	2	1	2	1	0	0	24	3	1
Aquatic activities	**147**	**26**	**110**	**22**	**114**	**23**	**109**	**22**	**135**	**27**	**131**	**27**	**103**	**23**	**117**	**28**	**113**	**28**	**1,079**	**120**	**25**
Using bathtub	**50**	**9**	**36**	**7**	**48**	**10**	**45**	**9**	**45**	**9**	**41**	**8**	**34**	**8**	**27**	**6**	**25**	**6**	**351**	**39**	**8**
Non-aquatic activities – falls into water	**133**	**24**	**115**	**23**	**132**	**26**	**126**	**25**	**111**	**22**	**107**	**22**	**104**	**23**	**91**	**22**	**94**	**23**	**1,013**	**113**	**24**
Unknown activities	**19**	**3**	**16**	**3**	**14**	**3**	**31**	**6**	**14**	**3**	**19**	**4**	**28**	**6**	**16**	**4**	**28**	**7**	**185**	**21**	**4**
LAND & AIR TRANSPORT DROWNINGS	**68**	**10**	**96**	**16**	**122**	**18**	**100**	**16**	**83**	**13**	**91**	**15**	**81**	**14**	**94**	**17**	**66**	**13**	**801**	**89**	**15**
NON-DROWNING FATALITIES§	**24**	**4**	**23**	**4**	**40**	**6**	**31**	**5**	**50**	**8**	**49**	**8**	**41**	**7**	**35**	**6**	**32**	**6**	**325**	**36**	**6**
Boating¶	12	50	11	48	18	45	13	42	15	30	20	41	16	39	15	43	12	38	132	15	41
All other causes	12	50	12	52	22	55	18	58	35	70	29	59	25	61	20	57	20	63	193	21	59
TOTAL	**650**	**12**	**610**	**11**	**661**	**12**	**628**	**12**	**635**	**12**	**623**	**11**	**567**	**10**	**552**	**10**	**503**	**9**	**5,429**	**603**	**100**

** Values in light shaded areas refer to dark shaded totals above; values in unshaded areas relate to shaded areas above † Includes open outboard motorboats & other open powered boats such as inflatables; excludes personal watercraft*
‡ The true number of small powerboat drownings in 1998 was probably higher than 34, since the number of unspecified powerboat drownings in Quebec increased from 0 in 1997 to 12 in 1998
§ Primary cause of death was injury other than drowning, although drowning may have complicated another injury; in case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included here; for all years, 1991-1999, 40 deaths were occupational, including 15 boating fatalities ¶ See Annex 1d for details of boating fatalities

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 1993-2001

Annex 1d

SUMMARY OF NUMBERS AND PERCENTS* FOR NON-DROWNING FATALITIES DURING BOATING, CANADA 1991-1999 (n=132)

	1991		1992		1993		1994		1995		1996		1997		1998		1999		1991-1999	AVERAGE	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		No.	%
DROWNINGS	**209**	**95**	**214**	**95**	**191**	**91**	**186**	**93**	**197**	**93**	**185**	**90**	**176**	**92**	**172**	**92**	**145**	**92**	**1675**	**162**	**93**
NON-DROWNING FATALITIES†	**12**	**5**	**11**	**5**	**18**	**9**	**13**	**7**	**15**	**7**	**20**	**10**	**16**	**8**	**15**	**8**	**12**	**8**	**132**	**13**	**7**
Collision between boats	2		1		4		4		5		4		6		2		2		30	3	
Small open powerboat‡ (≤5.5m)	0		1		1		4		0		0		3		1		0				
Large powerboat (>5.5m)	0		0		0		0		3		0		0		0		1				
Powerboat, size unspecified	0		0		3		0		0		0		0		0		0				
Personal watercraft	1		0		0		0		2		4		3		1		1				
Canoe	1		0		0		0		0		0		0		0		0				
Collision of boat with fixed object	1		0		4		4		3		4		2		2		1		21	2	
Small open powerboat‡ (≤5.5m)	0		0		2		3		1		2		1		0		0				
Large powerboat (>5.5m)	0		0		1		1		2		1		0		0		0				
Powerboat, size unspecified	1		0		1		0		0		0		0		1		0				
Personal watercraft	0		0		0		0		0		1		1		1		1				
Collision, other	1		0		0		1		0		1		0		0		1		4	0	
Powerboat, size unspecified	1		0		0		1		0		0		0		0		1				
Inner tube	0		0		0		0		0		1		0		0		0				
Collision, unspecified	3		2		1		0		0		0		0		0		0		6	1	
Small open powerboat‡ (≤5.5m)	0		1		1		0		0		0		0		0		0				
Large powerboat (>5.5m)	2		0		0		0		0		0		0		0		0				
Powerboat, size unspecified	0		1		0		0		0		0		0		0		0				
Personal watercraft	1		0		0		0		0		0		0		0		0				
Immersion hypothermia	2		6		7		2		5		6		5		6		6		45	5	
Small open powerboat‡ (≤5.5m)	0		4		5		2		3		4		1		1		5				
Large powerboat (>5.5m)	0		1		0		0		0		0		3		0		1				
Personal watercraft	0		0		1		0		0		0		0		0		0				
Canoe	0		1		0		0		2		2		1		2		0				
Kayak	0		0		0		0		0		0		0		2		0				
Unpowered inflatable	1		0		0		0		0		0		0		0		0				
Sailboat, size unspecified	0		0		0		0		0		0		0		1		0				
Unknown	1		0		1		0		0		0		0		0		0				
Fell/thrown overboard	1		2		1		1		1		2		0		2		1		11	1	
Small open powerboat‡ (≤5.5m)	0		0		0		0		0		1		0		0		0				
Large powerboat (>5.5m)	0		0		1		0		1		0		0		1		0				
Powerboat, size unspecified	0		2		0		0		0		0		0		1		0				
Other	1		0		0		1		0		1		0		0		1				
Propeller injury	1		0		1		0		1		2		1		2		0		8	1	
Small open powerboat‡ (≤5.5m)	1		0		0		0		1		0		0		1		0				
Large powerboat (>5.5m)	0		0		0		0		0		0		0		0		0				
Powerboat, size unspecified	0		0		0		0		0		2		0		0		0				
Personal watercraft	0		0		1		0		0		0		1		1		0				
Other	1		0		0		1		0		1		2		1		1		7	1	
Small open powerboat‡ (≤5.5m)	0		0		0		0		0		0		1		0		0				
Large powerboat (>5.5m)	0		0		0		0		0		0		1		0		1				
Personal watercraft	0		0		0		1		0		0		0		0		0				
Unpowered inflatable	1		0		0		0		0		0		0		0		0				
Sailboard	0		0		0		0		0		1		0		1		0				
TOTAL	**221**	**12**	**225**	**12**	**209**	**12**	**199**	**11**	**212**	**12**	**205**	**11**	**192**	**11**	**187**	**10**	**157**	**9**	**1,807**	**201**	**100**

** Values in light shaded areas refer to dark shaded totals above; values in unshaded areas relate to light shaded areas above † Primary cause of death was injury other than drowning, although drowning may have complicated another injury; in case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included here; for all years, 1991-1999, 13 deaths were occupational*

‡ Includes open outboard motorboats & other open powered boats such as inflatables; excludes personal watercraft

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 1993-2001

Annex 2a

SUMMARY OF NUMBERS AND PERCENTS* FOR WATER-RELATED INJURY FATALITIES BY PROVINCE AND TERRITORY, CANADA 1999 (n=503)

	NFLD		NS		PEI		NB		QC		ONT		MAN		SASK		ALTA		BC		NUNAVUT		NWT		YUKON		CANADA	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
DROWNINGS (E910, E830, E832) (excludes land & air transport)	**8**	**62**	**20**	**74**	**3**	**100**	**11**	**85**	**93**	**82**	**112**	**79**	**22**	**85**	**16**	**80**	**29**	**91**	**85**	**83**	**2**	**50**	**4**	**57**	**0**	**0**	**405**	**81**
Boating	**4**	**50**	**10**	**50**	**2**	**67**	**2**	**18**	**29**	**31**	**43**	**38**	**11**	**50**	**7**	**44**	**4**	**14**	**31**	**36**	**0**	**0**	**2**	**50**	**0**	**0**	**145**	**36**
Recreational	3	75	8	80	0	0	2	100	27	93	41	95	7	64	4	57	4	100	25	81	0	0	1	50	0	0	122	84
Daily living	0	0	0	0	0	0	0	0	2	7	1	2	2	18	2	29	0	0	3	10	0	0	1	50	0	0	11	8
Occupational	1	25	2	20	2	100	0	0	0	0	0	0	2	18	0	0	0	0	2	6	0	0	0	0	0	0	9	6
Rescue	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	14	0	0	1	3	0	0	0	0	0	0	3	2
Other/unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aquatic activities	**2**	**25**	**7**	**35**	**0**	**0**	**5**	**45**	**22**	**24**	**32**	**29**	**2**	**9**	**4**	**25**	**13**	**45**	**24**	**28**	**1**	**50**	**1**	**25**	**0**	**0**	**113**	**28**
Recreational	2	100	4	57	0	0	4	80	17	77	27	84	2	100	4	100	13	100	22	92	0	0	1	100	0	0	96	85
♦ Swimming	1		3		0		3		14		23		2		3		8		13		0		0		0		70	
– Home swimming pool	0		0		0		0		1		1		0		0		0		0		0		0		0		2	
– Other swimming pool	0		0		0		0		1		4		0		0		2		2		0		0		0		9	
– Other body of water	1		3		0		3		12		18		2		3		6		11		0		0		0		59	
♦ Playing/wading in water	0		1		0		1		1		1		0		1		2		0		0		1		0		8	
♦ Other	1		0		0		0		2		3		0		0		3		9		0		0		0		18	
Daily Living	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Occupational	0	0	0	0	0	0	0	0	2	9	0	0	0	0	0	0	0	0	0	0	1	100	0	0	0	0	3	3
Rescue	0	0	3	43	0	0	0	0	3	14	5	16	0	0	0	0	0	0	2	8	0	0	0	0	0	0	13	12
Other/unknown	0	0	0	0	0	0	1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Using bathtub	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**8**	**11**	**10**	**1**	**5**	**2**	**13**	**2**	**7**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**25**	**6**
Non-aquatic activities (falls into water)	**2**	**25**	**2**	**10**	**1**	**33**	**3**	**27**	**28**	**30**	**24**	**21**	**5**	**23**	**1**	**6**	**7**	**24**	**20**	**24**	**0**	**0**	**1**	**25**	**0**	**0**	**94**	**23**
Recreational	2	100	1	50	0	0	3	100	25	89	16	67	3	60	1	100	5	71	10	50	0	0	0	0	0	0	66	70
♦ Swimming pool	0		0		0		0		4		4		1		0		0		2		0		0		0		11	
♦ Other body of water	2		1		0		3		21		12		2		1		5		8		0		0		0		55	
Daily living	0	0	1	50	0	0	0	0	3	11	6	25	0	0	0	0	1	14	9	45	0	0	0	0	0	0	20	21
♦ Walking near water or on ice	0		1		0		0		2		3		0		0		0		3		0		0		0		9	
♦ Other/unknown	0		0		0		0		1		3		0		0		1		6		0		0		0		11	
Occupational	0	0	0	0	0	0	0	0	0	0	1	4	2	40	0	0	0	0	0	0	0	0	1	100	0	0	4	4
Rescue	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14	1	5	0	0	0	0	0	0	3	3
Unknown activities	**0**	**0**	**1**	**5**	**0**	**0**	**1**	**9**	**7**	**8**	**2**	**2**	**3**	**14**	**2**	**13**	**3**	**10**	**8**	**9**	**1**	**50**	**0**	**0**	**0**	**0**	**28**	**7**
LAND & AIR TRANSPORT DROWNINGS	**2**	**15**	**2**	**7**	**0**	**0**	**1**	**8**	**11**	**10**	**21**	**15**	**2**	**8**	**4**	**20**	**2**	**6**	**14**	**14**	**2**	**50**	**3**	**43**	**2**	**100**	**66**	**13**
On-road motor vehicle, on-road incident	1	50	2	100	0	0	0	0	3	27	11	52	0	0	3	75	2	100	11	79	0	0	3	100	2	100	38	58
On-road motor vehicle, off-road incident	1	50	0	0	0	0	1	100	1	9	3	14	0	0	0	0	0	0	1	7	0	0	0	0	0	0	7	11
Snowmobile†	0	0	0	0	0	0	0	0	6	55	7	33	2	100	0	0	0	0	0	0	2	100	0	0	0	0	17	26
All-terrain vehicle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other off-road vehicle	0	0	0	0	0	0	0	0	1	9	0	0	0	0	1	25	0	0	0	0	0	0	0	0	0	0	2	3
Aircraft	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	14	0	0	0	0	0	0	2	3
NON-DROWNING FATALITIES‡	**3**	**23**	**5**	**19**	**0**	**0**	**1**	**8**	**9**	**8**	**8**	**6**	**2**	**8**	**0**	**0**	**1**	**3**	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**32**	**6**
Boating§	0	0	0	0	0	0	1	100	4	44	6	75	0	0	0	0	1	100	0	0	0	0	0	0	0	0	12	38
Scuba diving; air embolism	0	0	3	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	67	0	0	0	0	0	0	5	16
Scuba diving; other injury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diving into water; head/spinal injuries	0	0	0	0	0	0	0	0	2	22	1	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	9
Diving into water;other/unspecified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jumping into water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other aquatic activity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Falls into water	2	67	1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	9
Snowmobile, hypothermia¶	1	33	0	0	0	0	0	0	1	11	1	13	2	100	0	0	0	0	0	0	0	0	0	0	0	0	5	16
On-road vehicle,on-road incident	0	0	1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3
ATV	0	0	0	0	0	0	0	0	1	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3
Aircrash	0	0	0	0	0	0	0	0	1	11	0	0	0	0	0	0	0	0	1	33	0	0	0	0	0	0	2	6
TOTAL	**13**	**3**	**27**	**5**	**3**	**1**	**13**	**3**	**113**	**22**	**141**	**28**	**26**	**5**	**20**	**4**	**32**	**6**	**102**	**20**	**4**	**1**	**7**	**1**	**2**	**0**	**503**	**100**

** Values in light shaded areas refer to dark shaded totals above; values in unshaded areas relate to light shaded areas above; bottom row percent are proportion of national totals at right*
† 1 incident was on-road (snowmobile fell into ditch) ‡ Primary cause of death was injury other than drowning, although drowning may have complicated another injury; in case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included here § See Annex 1d for details of boating fatalities ¶ Snowmobile crashes are not included here

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Annex 2b

SUMMARY OF NUMBERS AND PERCENTS* FOR WATER-RELATED INJURY FATALITIES DURING BOATING, BY PROVINCE AND TERRITORY, CANADA 1999 (n=157)

	NFLD		NS		PEI		NB		QC		ONT		MAN		SASK		ALTA		BC		NUNAVUT		NWT		YUKON		CANADA	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
DROWNINGS	**4**	**100**	**10**	**100**	**2**	**100**	**2**	**100**	**29**	**100**	**43**	**100**	**11**	**100**	**7**	**100**	**4**	**100**	**31**	**100**	**0**	**0**	**2**	**100**	**0**	**0**	**145**	**92**
Recreational	**3**	**75**	**8**	**80**	**0**	**0**	**2**	**100**	**27**	**93**	**41**	**95**	**7**	**64**	**4**	**57**	**4**	**100**	**25**	**81**	**0**	**0**	**1**	**50**	**0**	**0**	**122**	**84**
Powerboat	3	100	5	63	0	0	1	50	14	52	28	68	4	57	2	50	4	100	14	56	0	0	1	0	0	0	76	62
♦ Small open powerboat† (≤5.5m)	3		3		0		0		8		16		0		0		1		10		0		0		0		41	
♦ Large powerboat (>5.5m)	0		1		0		0		1		9		0		0		0		3		0		1		0		15	
♦ Personal watercraft	0		0		0		0		0		0		0		0		2		0		0		0		0		2	
♦ Powerboat, size unspecified	0		1		0		1		5		3		4		2		1		1		0		0		0		18	
Unpowered boat	0	0	1	13	0	0	1	50	12	44	10	24	3	43	1	25	0	0	9	36	0	0	0	0	0	0	37	30
♦ Canoe	0		0		0		1		8		5		0		1		0		1		0		0		0		16	
♦ Kayak	0		0		0		0		1		0		0		0		0		1		0		0		0		2	
♦ Rowboat	0		0		0		0		2		1		0		0		0		1		0		0		0		4	
♦ Inflatable	0		0		0		0		1		2		0		0		0		2		0		0		0		5	
♦ Sailboat/sailboard	0		1		0		0		0		2		3		0		0		4		0		0		0		10	
♦ Other	0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Unknown boat	0		2		0		0		1		3		0		1		0		2		0		0		0		9	
Daily living	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**7**	**1**	**2**	**2**	**18**	**2**	**29**	**0**	**0**	**3**	**10**	**0**	**0**	**1**	**50**	**0**	**0**	**11**	**8**
Small open powerboat† (≤5.5m)	0		0		0		0		0		0		0		0		0		2		0		1		0		3	
Large powerboat (>5.5m)	0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Powerboat, size unspecified	0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Canoe	0		0		0		0		0		1		2		2		0		0		0		0		0		5	
Rowboat	0		0		0		0		0		0		0		0		0		1		0		0		0		1	
Unknown boat	0		0		0		0		2		0		0		0		0		0		0		0		0		2	
Occupational	**1**	**25**	**2**	**20**	**2**	**100**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**18**	**0**	**0**	**0**	**0**	**2**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**6**
Small open powerboat† (≤5.5m)	0		1		0		0		0		0		0		0		0		0		0		0		0		1	
Large powerboat (>5.5m)	1		0		2		0		0		0		1		0		0		2		0		0		0		6	
Powerboat, size unspecified	0		1		0		0		0		0		1		0		0		0		0		0		0		2	
Canoe	0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Unknown boat	0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Rescue	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**0**	**0**	**1**	**14**	**0**	**0**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**
Other/unknown	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
NON-DROWNING FATALITIES‡	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**33**	**4**	**12**	**6**	**12**	**0**	**0**	**0**	**0**	**1**	**20**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	**8**
Collision between boats	0	0	0	0	0	0	0	0	1	25	1	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	17
♦ Large powerboat (>5.5m)	0		0		0		0		0		1		0		0		0		0		0		0		0		1	
♦ Personal watercraft	0		0		0		0		1		0		0		0		0		0		0		0		0		1	
Collision of boat with fixed object	0	0	0	0	0	0	1	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8
♦ Powerboat, size unspecified	0		0		0		0		0		0		0		0		0		0		0		0		0		0	
♦ Personal watercraft	0		0		0		1		0		0		0		0		0		0		0		0		0		1	
Collision, other	0	0	0	0	0	0	0	0	0	0	1	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8
♦ Powerboat, size unspecified	0		0		0		0		0		1		0		0		0		0		0		0		0		1	
Immersion hypothermia	0	0	0	0	0	0	0	0	3	75	3	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	50
♦ Small open powerboat† (≤5.5m)	0		0		0		0		3		2		0		0		0		0		0		0		0		5	
♦ Large powerboat (>5.5m)	0		0		0		0		0	0	1		0		0		0		0		0		0		0		1	8
♦ Kayak	0		0		0		0		0		0		0		0		0		0		0		0		0		0	
♦ Sailboat, size unspecified	0		0		0		0		0		0		0		0		0		0	0	0	0	0	0	0		0	
Propeller injury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0		0		0	0	0	0
♦ Small open powerboat† (≤5.5m)	0		0		0		0		0		0		0		0		0		0		0		0		0		0	
♦ Personal watercraft	0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Fell off boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	8
♦ Large powerboat (>5.5m)	0		0		0		0		0		0		0		0		0		0		0		0		0		0	
♦ Unpowered, inflatable	0		0		0		0		0		0		0		0		1		0		0		0		0		1	
Rope struck victim	0	0	0	0	0	0	0	0	0	0	1	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8
♦ Large powerboat (>5.5m)	0		0		0		0		0		1		0		0		0		0		0		0		0		1	
TOTAL	**4**	**3**	**10**	**6**	**2**	**1**	**3**	**2**	**33**	**21**	**49**	**31**	**11**	**7**	**7**	**4**	**5**	**3**	**31**	**20**	**0**	**0**	**2**	**1**	**0**	**0**	**157**	**100**

** Values in light shaded areas refer to dark shaded totals above; values in unshaded areas relate to shaded areas above; bottom row percent are proportion of national totals at right*

† Includes open outboard motorboats & other open powered boats such as inflatables; excludes personal watercraft

‡ Primary cause of death was injury other than drowning, although drowning may have complicated another injury; in case of hypothermia, only hypothermia deaths reportedly uncomplicated by drowning are included here

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Annex 3

PROPORTION* OF ALL DROWNINGS† BY TYPE AND PURPOSE OF ACTIVITY, BY AGE AND SEX, CANADA 1999 (n=471)

BOTH SEXES

	Total		0-14		15-24		25-44		45-64		65+		Unknown	
TYPE OF ACTIVITY	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Recreational	**284**	**60**	**51**	**85**	**54**	**58**	**90**	**59**	**58**	**52**	**30**	**57**	**1**	**0**
Boating	122	43	6	12	15	28	45	50	39	67	16	53	1	0
Aquatic	96	34	13	25	30	56	32	36	14	24	7	23	0	0
♦ Swimming	70		12		25		20		12		1		0	
♦ Playing/wading	8		1		1		4		0		2		0	
♦ Other	18		0		4		8		2		4		0	
Falls into water	66	23	32	63	9	17	13	14	5	9	7	23	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non recreational‡	**121**	**26**	**6**	**10**	**20**	**22**	**44**	**29**	**33**	**30**	**18**	**34**	**0**	**0**
Boating	23	19	1	17	3	15	9	20	9	27	1	6	0	0
Aquatic	17	14	2	33	5	25	7	16	3	9	0	0	0	0
Bathing	25	21	3	50	4	20	6	14	7	21	5	28	0	0
Falls into water	28	23	0	0	3	15	10	23	8	24	7	39	0	0
Unknown	28	23	0	0	5	25	12	27	6	18	5	28	0	0
Land & air transport	**66**	**14**	**3**	**5**	**19**	**20**	**19**	**12**	**20**	**18**	**5**	**9**	**0**	**0**
TOTAL	**471**	**100**	**60**	**100**	**93**	**100**	**153**	**100**	**111**	**100**	**53**	**100**	**1**	**0**

MALE

	Total		0-14		15-24		25-44		45-64		65+		Unknown	
TYPE OF ACTIVITY	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Recreational	**237**	**61**	**35**	**83**	**49**	**64**	**78**	**58**	**49**	**54**	**25**	**61**	**1**	**0**
Boating§	110	46	5	14	14	29	40	51	35	71	15	60	1	0
Aquatic	77	32	8	23	27	55	28	36	10	20	4	16	0	0
♦ Swimming	58		8		22		19		8		1		0	
♦ Playing/wading	6		0		1		4		0		1		0	
♦ Other	13		0		4		5		2		2		0	
Fall into water§	50	21	22	63	8	16	10	13	4	8	6	24	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non recreational‡	**94**	**24**	**5**	**12**	**12**	**16**	**40**	**30**	**26**	**29**	**11**	**27**	**0**	**0**
Boating	23	24	1	20	3	25	9	23	9	35	1	9	0	0
Aquatic	13	14	2	40	2	17	7	18	2	8	0	0	0	0
Bathing	12	13	2	40	0	0	4	10	5	19	1	9	0	0
Falls into water	24	26	0	0	3	25	8	20	6	23	7	64	0	0
Unknown	22	23	0	0	4	33	12	30	4	15	2	18	0	0
Land & air transport	**56**	**14**	**2**	**5**	**16**	**21**	**17**	**13**	**16**	**18**	**5**	**12**	**0**	**0**
TOTAL	**387**	**100**	**42**	**100**	**77**	**100**	**135**	**100**	**91**	**100**	**41**	**100**	**1**	**0**

FEMALE

	Total		0-14		15-24		25-44		45-64		65+		Unknown	
TYPE OF ACTIVITY	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Recreational	**47**	**56**	**16**	**89**	**5**	**31**	**12**	**67**	**9**	**45**	**5**	**42**	**0**	**0**
Boating	12	26	1	6	1	20	5	42	4	44	1	20	0	0
Aquatic	19	40	5	31	3	60	4	33	4	44	3	60	0	0
♦ Swimming	12		4		3		1		4		0		0	
♦ Playing/wading	2		1		0		0		0		1		0	
♦ Other	5		0		0		3		0		2		0	
Falls into water	16	34	10	63	1	20	3	25	1	11	1	20	0	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non recreational‡	**27**	**32**	**1**	**6**	**8**	**50**	**4**	**22**	**7**	**35**	**7**	**58**	**0**	**0**
Boating	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aquatic	4	15	0	0	3	38	0	0	1	14	0	0	0	0
Bathing	13	48	1	100	4	50	2	50	2	29	4	57	0	0
Falls into water	4	15	0	0	0	0	2	50	2	29	0	0	0	0
Unknown	6	22	0	0	1	13	0	0	2	29	3	43	0	0
Land & air transport	**10**	**12**	**1**	**6**	**3**	**19**	**2**	**11**	**4**	**20**	**0**	**0**	**0**	**0**
TOTAL	**84**	**100**	**18**	**100**	**16**	**100**	**18**	**100**	**20**	**100**	**12**	**100**	**0**	**0**

** Values in light shaded areas refer to dark shaded totals above; values in unshaded areas relate to light shaded areas above*
† Codes are E910, E830, E832 (WHO 1977)
‡ Non recreational drownings include occupational, daily living, rescue, other and unknown incidents
§ Sex unknown for 2 victims, imputed male (2-year-old, 36-year-old)

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2001

Annex 4

POPULATION BY AGE AND SEX, BY PROVINCE AND TERRITORY, CANADA 1999

AGE/REGION	NFLD	NS	PEI	NB	QC	ONT	MAN	SASK	ALTA	BC	YUKON	NWT	NUNAVUT	CANADA
BOTH SEXES														
<1	5,490	10,304	1,638	8,182	82,336	141,974	15,131	13,581	39,375	45,995	413	708	697	365,824
1-4	21,962	41,214	6,552	32,727	329,343	567,894	60,526	54,325	157,498	183,982	1,650	2,834	2,788	1,463,295
5-14	69,496	123,066	19,772	97,079	924,472	1,562,061	166,396	157,920	435,411	513,386	4,678	7,795	6,714	2,061,663
15-24	81,514	126,807	19,737	104,330	984,902	1,506,278	158,351	153,225	438,555	532,622	4,193	6,373	4,761	2,061,886
25-34	78,657	133,378	18,510	109,811	1,023,539	1,727,377	159,804	132,988	458,587	592,126	4,758	7,524	4,749	4,451,808
35-44	90,857	159,811	22,050	127,389	1,292,777	1,987,339	183,017	160,324	531,431	698,365	6,133	7,567	3,297	5,270,357
45-54	81,859	133,716	19,151	109,311	1,071,123	1,552,908	148,268	123,227	383,109	575,930	4,813	4,865	2,286	4,210,566
55-64	49,052	87,684	12,275	68,514	710,812	1,026,630	96,443	83,475	226,460	361,869	2,397	2,250	1,069	2,728,930
65-74	35,071	65,822	9,577	52,210	539,358	819,772	79,693	74,775	167,898	283,563	1,056	1,107	496	2,130,398
75+	27,042	57,989	8,718	45,416	386,728	621,575	75,880	73,940	126,365	235,262	542	583	182	1,660,222
TOTAL	541,000	939,791	137,980	754,969	7,345,390	11,513,808	1,143,509	1,027,780	2,964,689	4,023,100	30,633	41,606	27,039	30,491,294
MALE														
<1	2,774	5,301	872	4,252	42,106	72,739	7,736	6,919	20,287	23,661	221	362	370	187,599
1-4	11,094	21,202	3,489	17,009	168,423	290,954	30,943	27,677	81,149	94,644	884	1,447	1,478	750,394
5-14	35,610	63,189	10,078	49,705	472,616	802,547	85,491	80,867	223,679	263,861	2,414	3,918	3,442	1,056,735
15-24	41,615	64,368	9,948	53,512	505,121	770,062	81,023	78,900	226,269	271,819	2,235	3,382	2,394	1,058,431
25-34	38,957	65,967	9,262	55,558	523,694	865,730	81,889	66,945	236,331	298,252	2,333	3,785	2,486	2,251,189
35-44	44,736	79,395	10,869	63,968	652,921	991,412	92,510	80,917	270,418	349,503	3,068	3,930	1,823	2,645,470
45-54	40,948	66,545	9,485	54,700	532,516	767,717	74,085	62,690	195,940	288,539	2,606	2,660	1,271	2,099,702
55-64	24,669	43,330	6,092	34,018	346,478	503,401	47,713	41,281	113,756	179,991	1,298	1,216	560	1,343,803
65-74	16,839	30,354	4,533	24,143	244,196	382,343	37,245	35,489	81,162	136,949	606	567	271	994,697
75+	10,743	21,284	3,239	17,119	136,459	234,011	28,705	29,280	49,002	92,045	212	284	109	622,492
TOTAL	267,985	460,935	67,867	373,984	3,624,530	5,680,916	567,340	510,965	1,497,993	1,999,264	15,877	21,551	14,204	15,103,411
FEMALE														
<1	2,717	5,003	766	3,930	40,230	69,235	7,396	6,662	19,087	22,334	192	347	327	178,225
1-4	10,867	20,012	3,063	15,718	160,920	276,940	29,582	26,648	76,350	89,338	766	1,386	1,310	712,901
5-14	33,886	59,877	9,694	47,374	451,856	759,514	80,905	77,053	211,732	249,525	2,264	3,877	3,272	1,004,928
15-24	39,899	62,439	9,789	50,818	479,781	736,216	77,328	74,325	212,286	260,803	1,958	2,991	2,367	1,003,455
25-34	39,700	67,411	9,248	54,253	499,845	861,647	77,915	66,043	222,256	293,874	2,425	3,739	2,263	2,200,619
35-44	46,121	80,416	11,181	63,421	639,856	995,927	90,507	79,407	261,013	348,862	3,065	3,637	1,474	2,624,887
45-54	40,911	67,171	9,666	54,611	538,607	785,191	74,183	60,537	187,169	287,391	2,207	2,205	1,015	2,110,864
55-64	24,383	44,354	6,183	34,496	364,334	523,229	48,730	42,194	112,704	181,878	1,099	1,034	509	1,385,127
65-74	18,232	35,468	5,044	28,067	295,162	437,429	42,448	39,286	86,736	146,614	450	540	225	1,135,701
75+	16,299	36,705	5,479	28,297	250,269	387,564	47,175	44,660	77,363	143,217	330	299	73	1,037,730
TOTAL	273,015	478,856	70,113	380,985	3,720,860	5,832,892	576,169	516,815	1,466,696	2,023,836	14,756	20,055	12,835	15,387,883

Source: Statistics Canada, 1999 estimated population

THE FUNDAMENTAL PRINCIPLES OF THE INTERNATIONAL RED CROSS AND RED CRESCENT MOVEMENT

Humanity

The International Red Cross and Red Crescent Movement, born of a desire to bring assistance without discrimination to the wounded on the battlefield, endeavours, in its international and national capacity, to prevent and alleviate human suffering wherever it may be found. Its purpose is to protect life and health and to ensure respect for the human being. It promotes mutual understanding, friendship, cooperation and lasting peace amongst all peoples.

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Neutrality

In order to continue to enjoy the confidence of all, the Movement may not take sides in hostilities or engage at any time in controversies of a political, racial, religious or ideological nature.

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The Movement is independent. The National Societies, while auxiliaries in the humanitarian services of their governments and subject to the laws of their respective countries, must always maintain their autonomy so that they may be able at all times to act in accordance with the principles of the Movement.

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It is a voluntary relief movement not prompted in any manner by a desire for gain.

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CANADIAN RED CROSS
NATIONAL DROWNING REPORT

2001 VISUAL SURVEILLANCE REPORT – AN ANALYSIS OF THE CIRCUMSTANCES OF DROWNINGS AND OTHER WATER-RELATED INJURY FATALITIES IN CANADA FOR **1999**

FEEDBACK FORM

The Canadian Red Cross Water Safety Services would appreciate receiving your feedback regarding the National Drowning Report. Any feedback you can provide will assist us in our future research and in reporting the findings.

CONTENT	YES	NO	COMMENTS
A. Were the following topics useful? (Check as many as apply)			
1. Overview of Drownings and Other Water-Related Injury Fatalities, & of Hospitalisations for Near Drownings			
2. Drownings & Other Water-Related Injury Fatalities during Boating			
3. Drownings & Other Injury Fatalities during Swimming & Other Aquatic Activities			
4. Drownings & Other Injury Fatalities during Bathing			
5. Non-Aquatic Drownings & Other Injury Fatalities involving Falls into Water			
6. Special High-Risk Environments & Population Subgroups for Drowning			
7. Drownings & Other Water-Related Injury Fatalities during Land & Air Transport			
8. Discussion & Recommendations			
8.1 Overview of Surveillance Findings for 1999 and Trends during 1991-1999			
8.2 Implementing Prevention of Drownings: Key Recommendations for 2001 and Beyond			
B. Were the recommendations appropriate?			

PRESENTATION OF THE REPORT	YES	NO	COMMENTS
C. Was the information well-presented?			
1. Writing			
2. Level of detail			
3. Layout			
4. Figures (i.e. graphics, tables & annexes)			
5. Amount of text vs figures			
COMMENTS:			

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