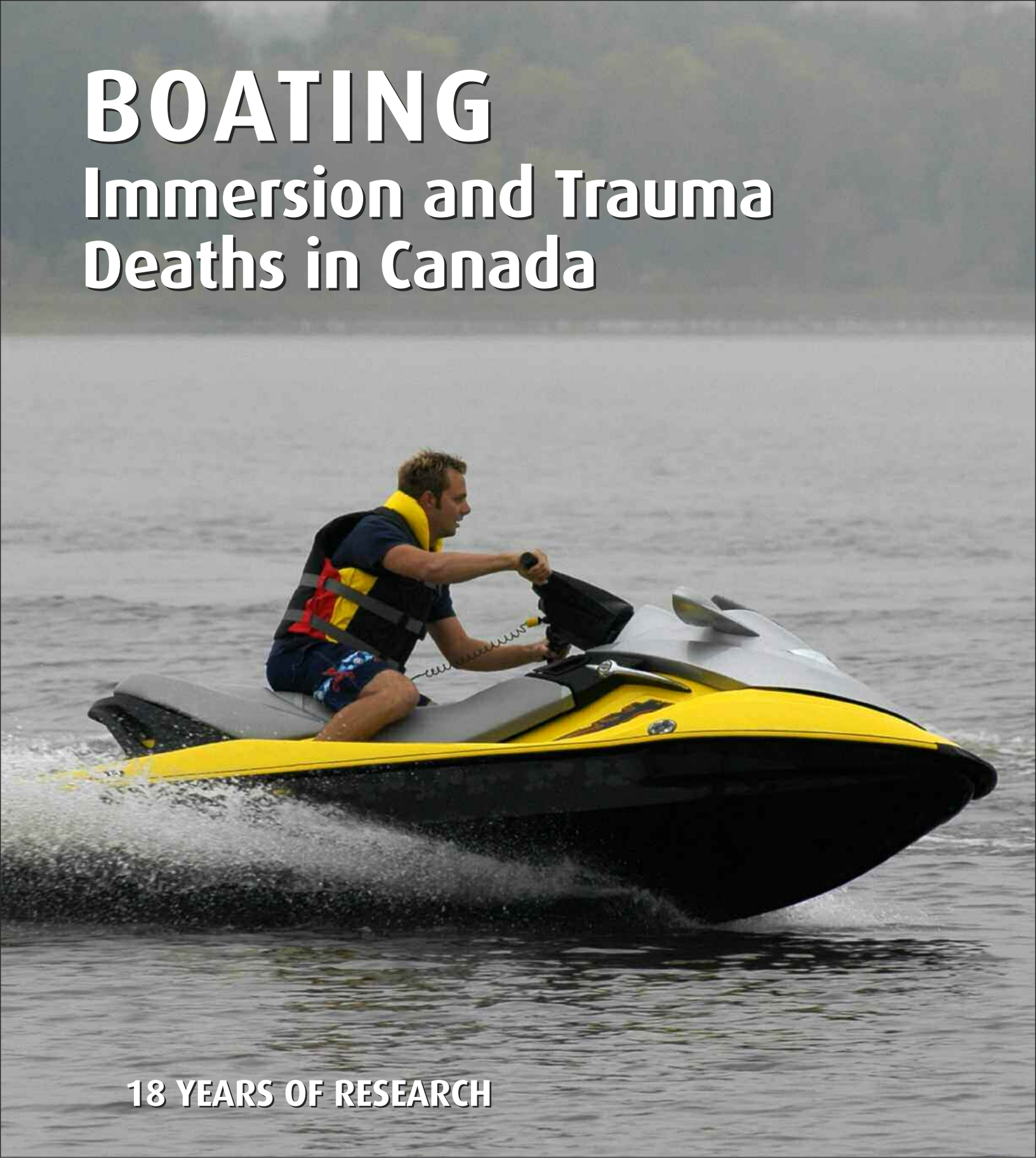
BOATING
Immersion and Trauma Deaths in Canada



18 YEARS OF RESEARCH

Transport Canada Transports Canada

OFFICE OF BOATING SAFETY
BUREAU DE LA SÉCURITÉ NAUTIQUE

CANADIAN RED CROSS
CROIX-ROUGE CANADIENNE

Boating Immersion and Trauma Deaths in Canada: 18 Years of Research

This recreational boating surveillance report was developed and written by Dr. Peter Barss in collaboration with the Canadian Red Cross. Peter Barss reviewed, coded, verified, and corrected data for each death, and coordinated the research. Sophie Lapointe and Clara Reinhardt were responsible for data management; Jane Hamilton, MSc. Epidemiology, for data analysis and tables; and Cait Beattie for review of data and figures. Shelley Dalke of the Canadian Red Cross provided the 2009-2010 media monitoring summary.

Data collectors included volunteers and staff of the Canadian Red Cross 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, the Lifesaving Society, and provincial coroners. The Canadian Red Cross supervised translation with the assistance of Cait Beattie.

Transport Canada sponsored and helped monitor progress of the current report and research for 2005-2008 data, together with reformulation and reanalysis of 1991-2004 data. Shelley Dalke of the Canadian Red Cross managed this project in collaboration with Myke Dwyer and Christine Payne of Transport Canada's Office of Boating Safety.

The National Search and Rescue Secretariat and the Canadian Red Cross funded data analysis and writing, as well as editing, design, and layout for the earlier 10-year modular report on which this 18-year report is based. Rosemary Hong, former coordinator for drowning research at the Canadian Red Cross, initiated the 10-year modular project that was a foundation for this report. Data management was supported in earlier years by the Canadian Red Cross and the Lifesaving Society, and Isabelle Masson made an important contribution to that process.

The Research Institute of the McGill University Health Centre provided administrative support for data management during the initial 15 years of the research. For the first six years, the National Drowning Report and related special interest reports were supported by The Injury Prevention Module of the Régie régionale de la santé et des services sociaux de Montréal-Centre, a member of the World Health Organization's Collaborating Centre for Injury Prevention and Safety Promotion.

This report has drawn upon the Canadian Red Cross 10-year research modules on boating and cold immersion deaths, which received the Canadian Marine Safety Award from Transport Canada in 2009. Many recommendations are the same, but there are additions based upon the current research, which incorporates an additional eight years of national data and reanalyses of the entire database.

Design and layout: Cait Beattie
Translation: Monique Edwards

This publication is available in English and French.

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While canoes, kayaks and sailing vessels were all necessary for various environments and activities, and continue to be popular with many Canadians, at present powered boats are more numerous. Powerboats are used for three main purposes: recreation, occupation, and activities of daily life, including travel and subsistence fishing and hunting. At present recreational activities, including fishing and powerboating, predominate.

The marine environment can be harsh to the unprepared boater, and so year after year about 40% of drowning deaths from immersion in Canada involve boaters, and boating is the leading cause of fatalities from immersion and other water-related injuries.

This report includes an overview of 18 years of research data on all deaths involving boats in Canada, with the main emphasis on recreational incidents. For the purposes of this report recreational and activities of daily life have been combined as recreational. This is justifiable in terms of international injury coding practices of the World Health Organisation and since the distinction between these categories is often unclear. The report focuses on activities and incidents associated with deaths, and on personal, equipment, and environmental risk factors. Readers with an interest in details of deaths associated with specific types of boats should also consult the 10-year modules on which this report was based, at the Canadian Red Cross website.

In the 10-year modules, according to files from all provincial and territorial coroners' and medical examiners' offices, there were 1,952 boating fatalities in Canada during 1991-2000, including 1,803 drownings, and 149 water-related non-drowning deaths resulting primarily from trauma (98) and hypothermia (51) (Canadian Red Cross 2009). After verification with coroners in several provinces, the data for this period were believed to include greater than 95% of all boating deaths. Boating accounted for 33% of drownings and 41% of non-drowning deaths. When land and air transport were excluded, boating represented 39% of drownings and 50% of other water-related fatalities.

Sadly, year after year boaters continue to remain unaware of or ignore fundamental yet simple principles of boating safety, and many die. Canadians who faithfully fasten their safety belts and avoid alcohol in the much less dangerous traffic environment embark onto the water without the protection of a properly worn flotation device, often in boats that are unsafe except in ideal conditions. Many boaters are weak swimmers or cannot swim at all. Although alcohol is ill advised while boating for both operators and passengers, purchasing and loading supplies of alcohol into the boat frequently takes priority over a visit to a reputable boating shop to ensure that the operator and all passengers are fitted with a safe and comfortable flotation device, appropriate to the nature of the boating activity.

Similarly, while many drivers assess weather and road conditions prior to travel by road, few verify marine weather and water temperatures before setting off in their boats. Boaters are also unable to easily access safety reviews of boats and flotation devices prior to purchase, including performance under adverse weather conditions such as wind, waves, and cold. Safety performance data for motor vehicles and for related safety equipment such as seat belts, airbags, and child restraints are available at various sources such as Transport Canada and the U.S. Insurance Institute for Highway Safety.

From the results of detailed epidemiologic studies, including this and earlier reports, it is evident that injuries such as drowning do not strike randomly as thunderbolts from the sky. While the exact moment of a tragic incident is not always predictable, usual combinations of circumstances are generally predictable and preventable.

In the belief that knowledge of the circumstances of water-related deaths offers a source of prevention for all boaters, this report on the circumstances of death for more than 3,000 Canadian boaters is provided as a guide to survival for decision makers, as well as future boaters, operators and passengers, since we all carry at least partial responsibility for our own security when we choose to step into a boat, be it at anchor, wharf or underway.

It is hoped that the wearing of an appropriate flotation device supplemented when necessary by protection against cold immersion, together with careful assessment of prevailing and predicted water temperatures, wind, waves, and darkness, will become a routine for all users of boats. No boater should embark on the waters without the specific training, safety equipment, safe boat, and swimming ability, all of which are essential for their chosen activity.

Decision makers carry a heavy burden of responsibility for the survival of boating populations, especially in Canada with so many vulnerable people at risk. Political leaders and their civil servants have a duty to act, ensuring that legislation and enforcement are ready and effective for the universal protection of all Canadians, including the naive, from their own folly during boating, with special attention to the need for all boaters to wear an appropriate flotation device.

It is astounding to note that in exposure to boating, where the most frequent injury incidents involve capsizing and falling overboard, non-swimmers and weak swimmers continue to boat without a flotation device, and drown as a result. No one should receive the death penalty for ignorance. Special attention should also be given to regulations governing the manufacture of small open boats to ensure that they are safe to operate even when sudden changes of wind and waves pose a threat to survival, and that they provide a reasonable safety platform and the possibility of self-rescue even when swamped or overturned.

This report has been prepared to provide an epidemiologic profile for prevention. Injury incidents are often multifactorial. Nevertheless, a favourable change in a single factor can be sufficient to tip the balance sufficiently away from danger in favour of safety to prevent an incident from occurring. This is pre-emptive action in the pre-event phase. The use of appropriate safety equipment or action can prevent injury even if an incident does occur; in this case, injury is aborted or reduced in the event phase. Finally, post-event phase activities such as rapid intervention with lifesaving, first aid, appropriate methods of rewarming, CPR, and so forth after an injury has occurred can minimize, stop, or reverse the progression of damage from any injuries sustained during the event phase.

The results are based upon annual data abstraction of information about each incident collected by thousands of coroners and police, and recorded in provincial and territorial coroners' files across Canada. The data required more than 20 years of dedicated work by voluntary Red Cross and other data collectors, guided by project managers and research professionals. Details of each incident were recorded in 15-page structured questionnaires and converted into electronic format for analysis. Each year's data collection, transformation into electronic format, and analysis require about two years' work. The analysis of 18 years of data has been much more complex than for a single year. Our hope is that this report will help to prevent fatalities and reduce economic losses due to immersion and trauma during recreational boating, an important activity for many Canadians.

STUDY POPULATION AND TIME PERIOD All drownings and other water-related injury deaths in Canada were monitored between 1 January 1991 and 31 December 2008. In the 2001 census, the total population of Canada was 30 million. Thus, boating deaths in 1991-2008 occurred on the background of about 540 million person years of potential exposure to risk for all ages in the Canadian population.

DEFINITIONS

IMMERSION DEATHS: DROWNING & IMMERSION HYPOTHERMIA For the purposes of this report, immersion death includes death by drowning and/or immersion hypothermia. An immersion death was classified as a drowning if drowning was included in the coroner's report, based upon the autopsy or other findings. The death was classified as hypothermia without drowning only if the coroner's report excluded drowning as among the causes of death based on lack of autopsy findings of drowning, and contained other supporting factors that exclude drowning, such as wearing of a flotation device. Reporting was done on all immersions as a single category because, as evident from the Canadian Red Cross 10-year module on cold immersion, cold is a factor in at least 38% of boating immersion deaths, and hypothermia is reported inconsistently due to lack of clear criteria for such a diagnosis, as well as lack of training in immersion death on the part of some coroners and police. Risk factors for both types of immersion death tend to be similar.

TRAUMA DEATHS As in the World Health Organisation's International Classification of Diseases, trauma deaths are reported as a separate category. Causes of death include blunt and penetrating trauma, mainly from external causes such as various types of collisions and falls. Types of injury include head and spinal injury, fractures, severe lacerations, and multiple injuries.

TYPES OF BOATS For the purposes of this report, ***powerboats*** are boats that are mainly propelled by a motor. ***Unpowered boats*** are not really unpowered, just not mainly powered by a motor. They are generally propelled by human or wind power, although larger sailboats do have a motor. The cut-off between ***small and large powerboats*** was 5.5 metres when surveillance reporting began in 1991. This has changed recently with some organizations, but the original classification has been retained. It is seldom that police or coroners record the exact length of boats. Hence the most frequent category of powerboat generally specified is small open fishing type boats, most of which are mass produced in aluminum for ease of transport, which is not necessarily conducive to safety in adverse conditions. Most of the powerboats reported only as unknown probably also fall into this category. Boats designated as ***personal watercraft (PWCs)*** by Transport Canada are referred to as jet skis in the World Health Organisation's International Classification of Diseases, 10th edition. Unpowered paddle boats or pedalos (French), also known as water cycles, are referred to as pedal boats in this report.

OTHER DEFINITIONS ***Boating*** refers to being in a boat, boarding or leaving a boat, falling from or jumping from a boat (to retrieve a person, animal, or object), and being towed by a boat (e.g. water-skier, tuber). Swimmers and waders struck by a boat or propeller are also included in the report. In accord with the World Health Organisation's 10th edition of the International Classification of Diseases (World Health Organisation, 2007), persons voluntarily swimming or diving from a boat are excluded from boating, as these are aquatic activities. For the purposes of this report, ***recreational boating*** includes activities of daily life, such as boat travel and subsistence fishing. ***Occupational boating*** refers to boating as part of professional life. ***Rescue*** refers to an attempt to rescue another person or an animal such as a dog. The term ***fishing*** was used when fishing was the main objective of the activity; fishing includes travelling to and from the fishing site. ***Powerboating*** refers to operating a powerboat, including a PWC, as an end in itself. ***Sailing, canoeing, kayaking, rafting, rowing,*** etc. refer to the activity rather than the type of boat (i.e. fishing from a canoe is categorized as fishing rather than canoeing.) ***Capsized*** means that the boat overturned. ***Swamped*** indicates that the boat took on water. ***Collision*** means that the boat

struck or was struck by another boat, or struck a fixed object (e.g. a rock, stump, or dock) or a person (e.g. swimmer, water-skier, tuber). ***Fell or thrown overboard (or was ejected)*** refers to an incident in which the person ended up in the water but the boat remained upright and intact (i.e. without capsizing, swamping or collision).

ETHNICITY Because of greater exposure among aboriginal peoples to boat travel, and communities or homes near the water, the proportion of victims among First Nations and Inuit peoples is provided. Aboriginal status was considered definite if the victim was classified as such in the coroner, police, or autopsy files by coroner, police, or pathologist. Probable aboriginal status was assigned if the address corresponded to a known reserve and if the family name was known to be aboriginal. The definition of aboriginal varies, but they probably represent at least three to four percent of the Canadian population. Since Ontario has not consistently facilitated reporting on aboriginal status, data are incomplete for the largest province for several years, affecting overall reporting. Hence the true proportion of aboriginal drowning is undoubtedly substantially greater than reported.

NATIONAL SURVEILLANCE DATABASE In the early 1990's, the Canadian Red Cross implemented a national drowning surveillance database. This was developed with the collaboration of public health injury prevention professionals, all provincial coroners, and other water-safety organizations including the Coast Guard and Lifesaving Society. The database was funded to provide a sound research basis for national water-safety programs, by monitoring the incidence and circumstances of all water-related injury deaths in Canada on an annual basis. It includes annual information from 1991 onwards (Canadian Red Cross, 2001). An epidemiologic profile of all water-related injury deaths is available (Red Cross 2003, 2005). The completeness of the database was affected during 2001-2008, as discussed below.

DATA COLLECTION The surveillance database relies upon annual structured reviews of the mandatory coroner and police reports for all water-related deaths. A questionnaire with 48 questions is used to obtain data on cause of death, activity and purpose of activity, along with personal, equipment, and environment risk factors. Project managers supervised volunteer data collectors in each province with the collaboration and joint management of the Red Cross and Lifesaving Society between 1991-2004. During 2002-2007, data collection was carried out and/or supervised by the Water Incident Research Alliance (WIRA). We believe this group closed out data collection earlier than in previous years, and they did shorten the data questionnaire. During 2001-2008, the proportion of estimated missing deaths rose significantly, as reported in the Results section. Missing data for available death files for questions relating to alcohol and other key issues were collected by the Canadian Red Cross from coroners so validity of blood alcohol could be assessed when recovery of the body was delayed. However, access to retrospectively collected death files missing from the surveillance database was not possible for most provinces. Hence while population-based incidence rates were calculated for the Canadian Red Cross 10-year modular reports for 1999-2000, this has not been done for the current report, and the number of deaths for 2001-2008 should be considered incomplete.

DATA VERIFICATION AND ANALYSIS All completed questionnaires are verified and corrected at the national level by a medically trained injury epidemiologist. Verification is highly structured and includes such issues as admissibility, completeness, internal consistency of responses, and consistency from year to year. Data entry is done with appropriate quality control, including double entry and compare. Data are analyzed annually, but for this report 18 years of data were used. Since coroners take a year or more to finalize all cases, and data collection and analysis nearly another year, reporting tends to lag behind the incidents by about two years. This is not of major consequence for prevention, since major trends usually occur slowly. Due to concern about missing deaths under new data collection policies during 2005-2006, each province and territory's coroner/medical examiner statistical staff were surveyed using a one-page structured questionnaire to assess the number of boating deaths in each jurisdiction. This was done to provide an estimate of incomplete data collection by year from 1991-2008.

In the early development years, the analytical work was considered research. In later years, it became a mix of surveillance and research. Detailed reports on new topics, such as the present report on recreational boating deaths, fall into this category. Hence it is possible to provide a sound basis for new programming. Recommendations have also been supported by periodic monitoring of the scientific literature on injury prevention in international databases.

RESULTS

As discussed in the Methods section, a number of deaths are missing from the database. Therefore, this report does not include population-based incidence rates.

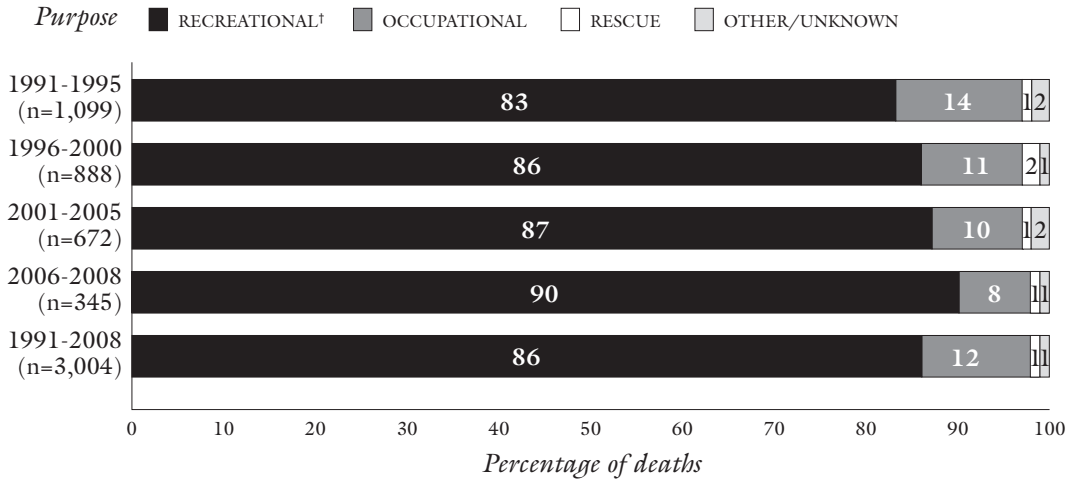
ESTIMATED TRENDS Using the method described on page 7, the proportion of deaths estimated to be missing from the database was 8% for 1991-95, 2% for 1996-2000, 18% for 2001-2005, and 17% for 2006-2008. When the numbers of deaths were corrected by these factors, there was an estimated 27% decline between 1991-1995 and 1996-2000, 16% between 1996-2000 and 2001-2005, and 19% between 2001-2005 and 2006-2008 (Table 1)*. These are estimates only, and for 2001-2008 the possibility of error is considerable since not all coroners were able to report the annual numbers of boating deaths in their province or territory.

OVERVIEW OF ALL BOATING FATALITIES

PURPOSE During 1991-2008, recreational activities, including activities of daily life, accounted for 86% of all boating fatalities, occupational activities for 12%, attempted rescue for 1%, and other or unknown activities for 1% (Table 2a).

TRENDS Between 1991-1995 and 2006-2008, the proportion of recreational fatalities increased from 83% to 90%, occupational fell from 14% to 8%, and attempted rescue remained constant at about 1% (Figure 1, Table 2a). Recreational boating accounted for 85% of immersion deaths, including drowning and immersion hypothermia (Table 2b) and 91% of boating trauma deaths (Table 2c).

Figure 1 **TRENDS IN BOATING FATALITIES* BY PURPOSE OF ACTIVITY, CANADA 1991-2008 (n=3,004)**



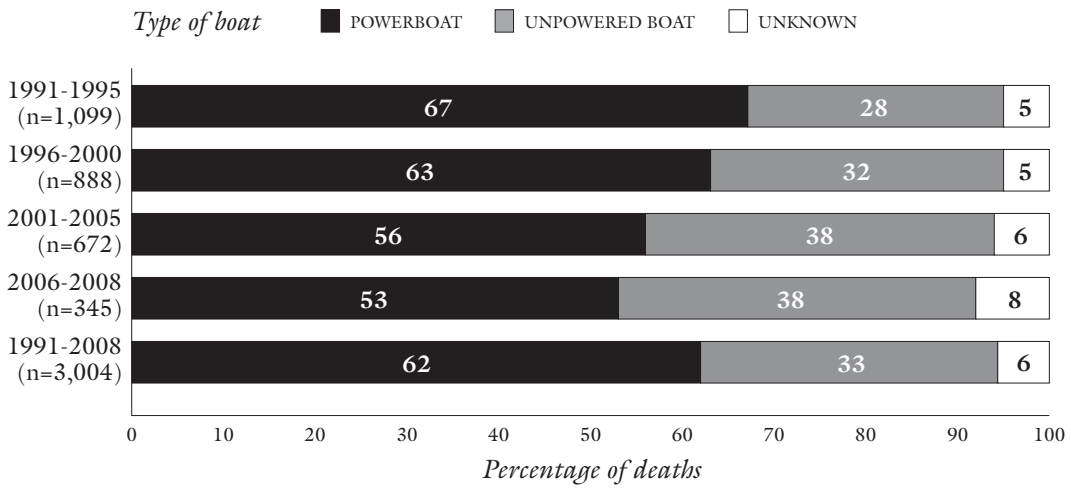
** Includes death from all causes: drowning, immersion hypothermia, and trauma † Includes boating during recreation and daily life*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

Note: Percentages have been rounded to the nearest whole number, and therefore may not always add up to 100.

All tables can be found at the end of the Results section, pp. 31-58.

TYPE OF BOAT 62% of boating fatalities involved powerboats and 33% unpowered boats; for the remainder it was unknown whether the boat was powered or unpowered (Table 4a). The trend showed a decreasing proportion of powerboats and an increasing proportion of unpowered boats (Figure 2).

Figure 2 **TRENDS IN BOATING FATALITIES* BY TYPE OF BOAT, CANADA 1991-2008 (n=3,004)**



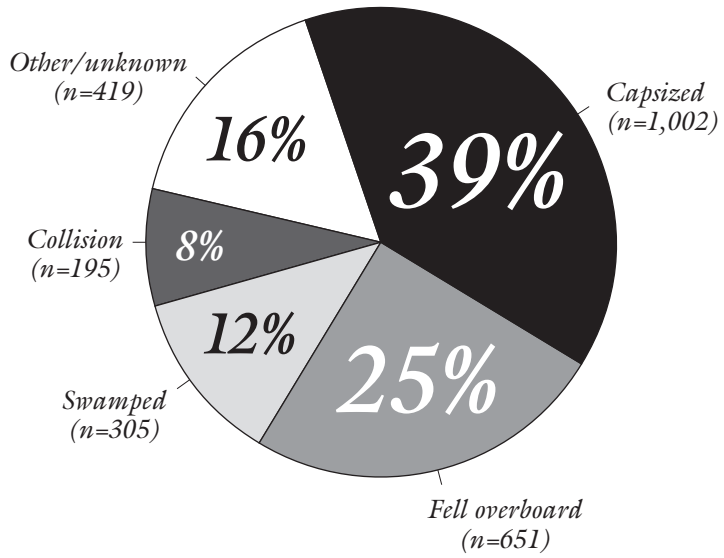
** Includes death from all causes: drowning, immersion hypothermia, and trauma*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

Except where otherwise specified, the remainder of this report deals only with recreational fatalities.

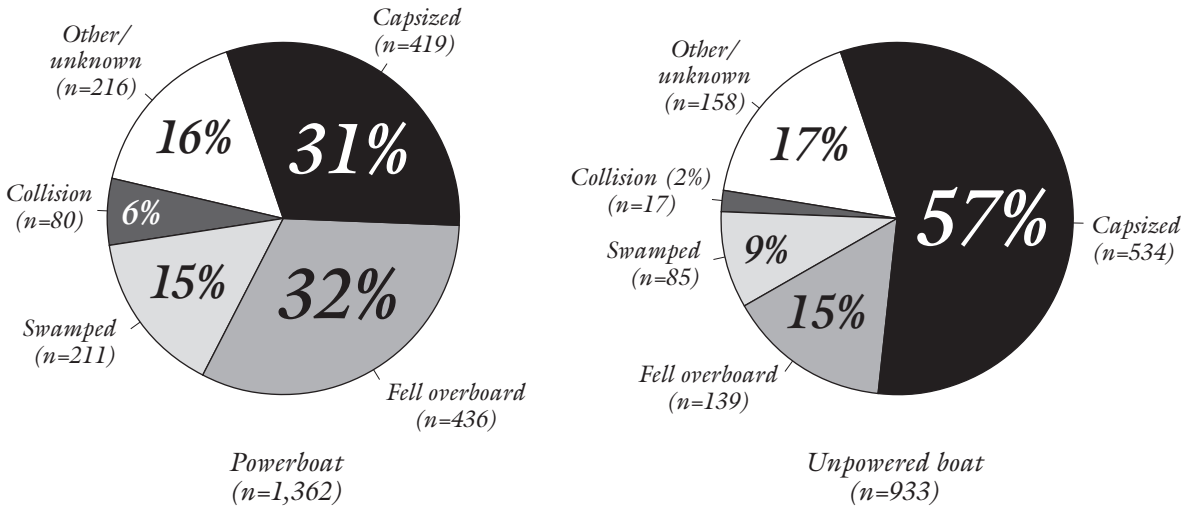
TYPE OF INCIDENT The most common type of incident for recreational fatalities, including both immersion and trauma deaths, was capsizing, at 39%, followed by falling overboard, swamping, and collision (Figure 3, Table 7a). For recreational immersion deaths (i.e. drowning and hypothermia), the proportion due to capsizing in unpowered boats, 57%, was almost double that in powerboats, 31%, while the proportion due to falling overboard was less than half, 15% versus 32% (Figure 4, Table 7b).

Figure 3 **RECREATIONAL BOATING* FATALITIES† BY TYPE OF INCIDENT, CANADA 1991-2008 (n=2,572)**



** Includes boating during recreation and daily life † Includes death from all causes: drowning, immersion hypothermia, and trauma*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

Figure 4 **RECREATIONAL BOATING* IMMERSION DEATHS† BY TYPE OF BOAT AND TYPE OF INCIDENT, CANADA 1991-2008 (n=2,436)‡**

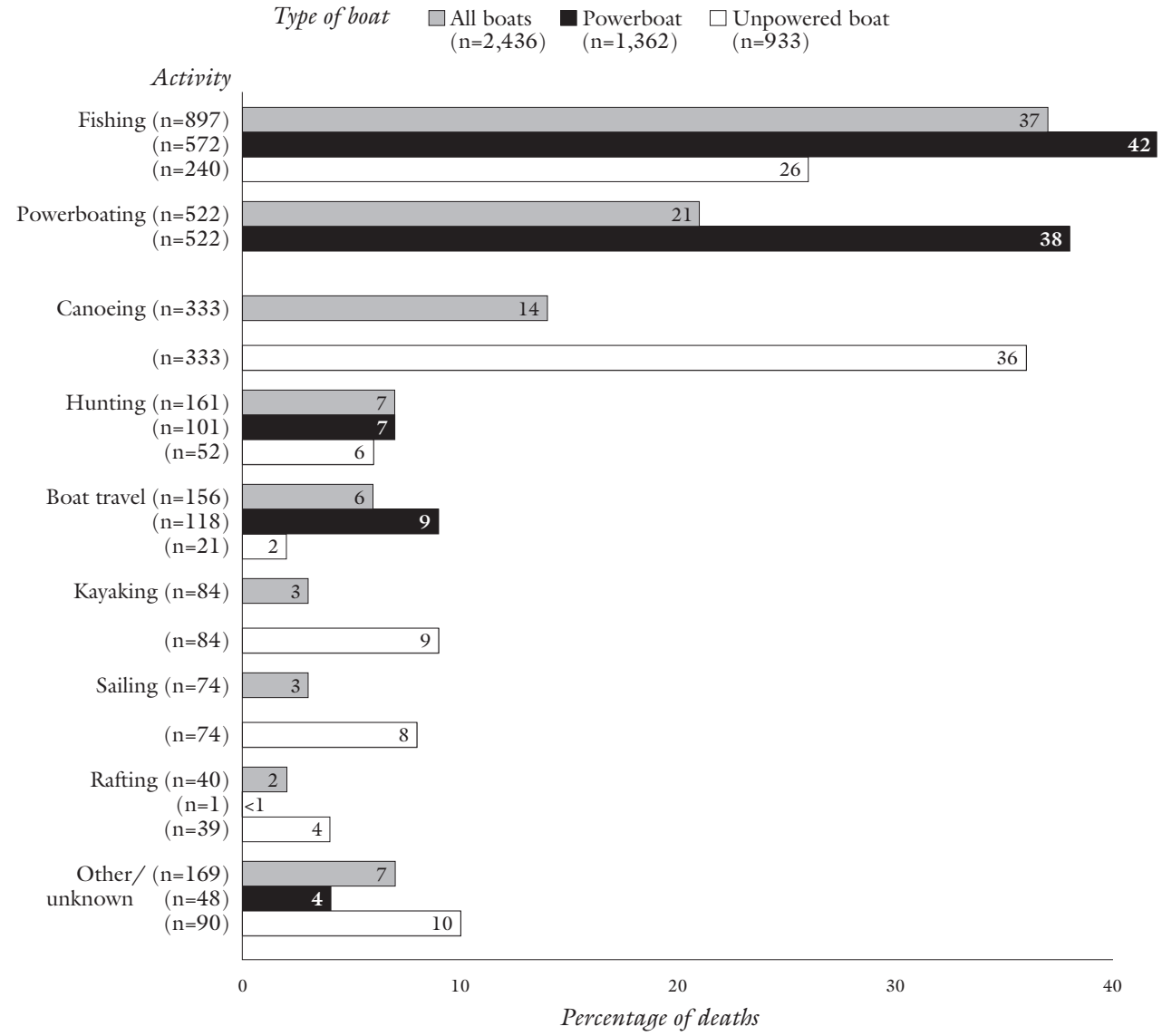


** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ This figure excludes 141 cases where it was unknown if the boat was powered or unpowered

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

TYPE OF ACTIVITY Most immersion deaths occurred during fishing, powerboating, and canoeing (Figure 5, Table 2b), while 76% of trauma deaths occurred during powerboating, including being towed by a powerboat, such as on a tube or water-skis (Table 2c).

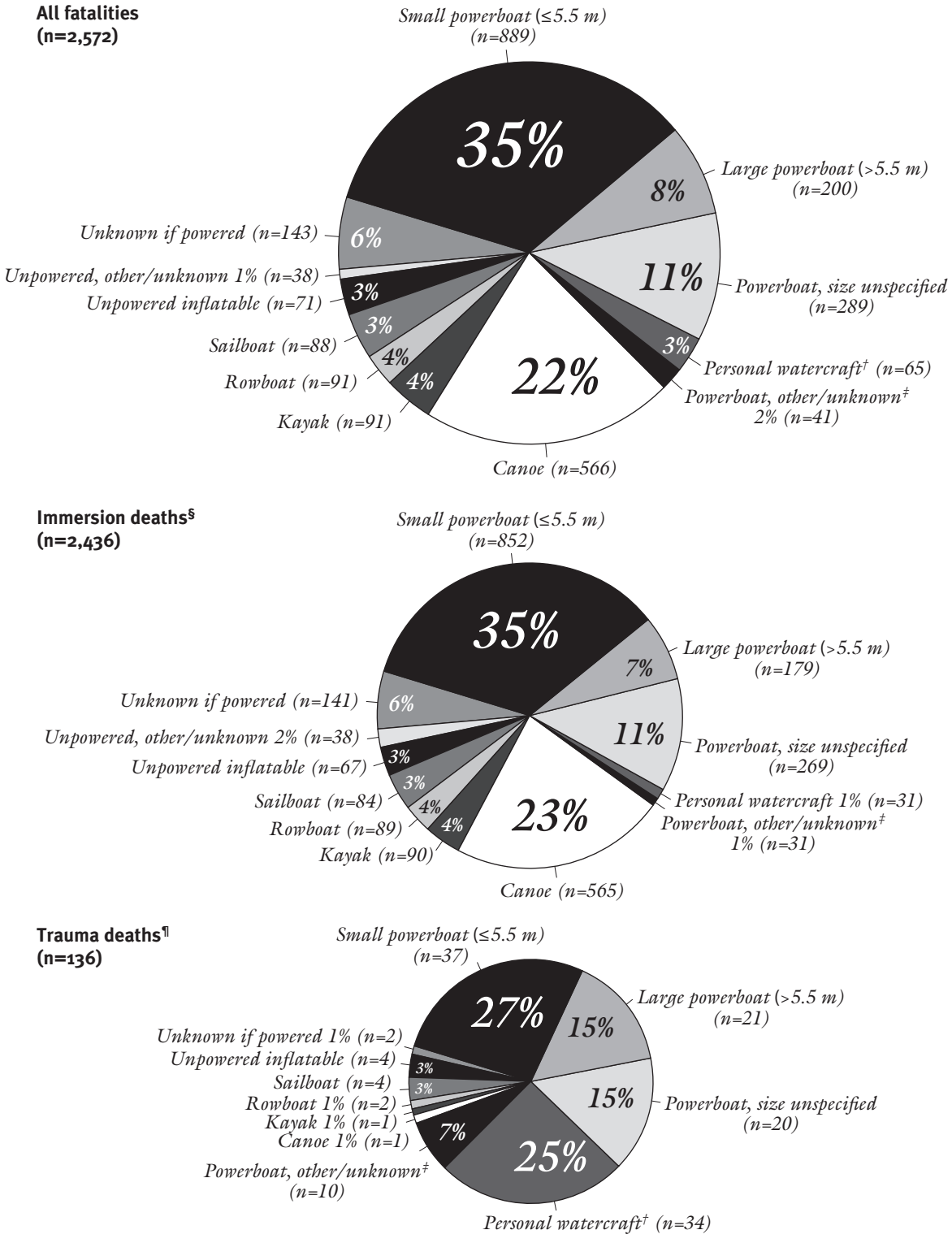
Figure 5 **RECREATIONAL BOATING* IMMERSION DEATHS† BY ACTIVITY, CANADA 1991-2008 (n=2,436)**



** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

TYPE OF BOAT 58% of all recreational fatalities were associated with powerboats and 37% with unpowered boats; for 6% it was unknown whether the boat was powered or unpowered. The most frequent categories of boat involved in immersion deaths were small open fishing type boats and canoes, while for trauma deaths personal watercraft (PWCs), large powerboats, and small open fishing type boats prevailed (Figure 6, Table 3b).

Figure 6 **RECREATIONAL BOATING* FATALITIES BY NATURE OF INJURY AND TYPE OF BOAT, CANADA 1991-2008 (n=2,572)**



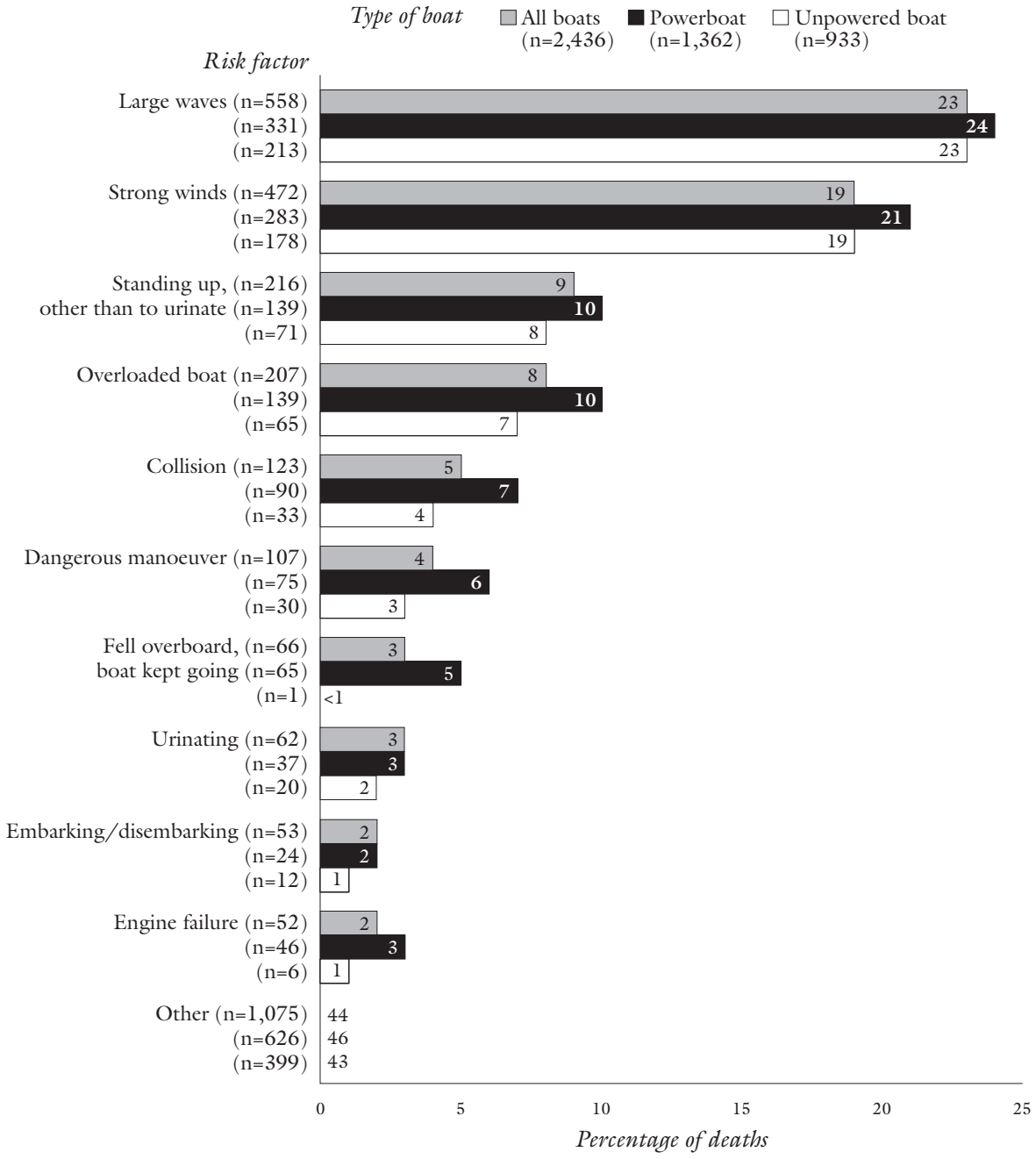
** Includes boating during recreation and daily life † Included being towed by a personal watercraft (trauma 3)*
‡ Included being towed by a powerboat (immersion 7, trauma 9)
§ Includes drownings and immersion hypothermia deaths ¶ Includes all other injury fatalities

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

There were 2,436 immersion deaths, including drowning and immersion hypothermia, accounting for 95% of recreational boating fatalities during 1991-2008.

RISK FACTORS Frequent risk factors included rough water, strong winds, standing up in craft, overloading, collisions, and dangerous manoeuvers such as turning abruptly. At least 5% of powerboaters died after they fell in and the boat continued on without them, possibly due to lack of a dead man's engine cutoff, or non-use even when present (Figure 7, Table 8). Such boats were often observed circling empty by bystanders on

Figure 7 **RECREATIONAL BOATING* IMMERSION DEATHS† BY VARIOUS CONTRIBUTING RISK FACTORS‡ AND BY TYPE OF BOAT, CANADA 1991-2008 (n=2,436)§**



** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ There may be more than one contributing risk factor per incident § Contributing risk factors were unknown in 650 cases (315, 279)

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

shore. This was a risk factor described for 6.0% of powerboat deaths during 1991-2008; however there was a trend from 0% of powerboat deaths in 1991-1995, 3.7% in 1996-2000, 7.6% in 2001-2005, and 12.5% in 2006-2008 ($p<0.001$; ignoring the first period $p=0.001$, chi-square for trend). If it is considered that such incidents mainly involve small or unknown size powerboats, then the percents for the four periods become 0%, 5.0%, 10.5%, and 16.7%.

PERSONAL FACTORS

AGE & SEX Persons between 15 and 74 years old accounted for 94% of recreational boating immersion deaths, and 93% were males. Children less than 15 years old accounted for only 3% of deaths. The proportion of fatalities by 10-year age groups was similar for ages 15 to 54. However, the proportion of fatalities for unpowered boaters was double that for powerboats among males 15-24 years-old (Table 9a).

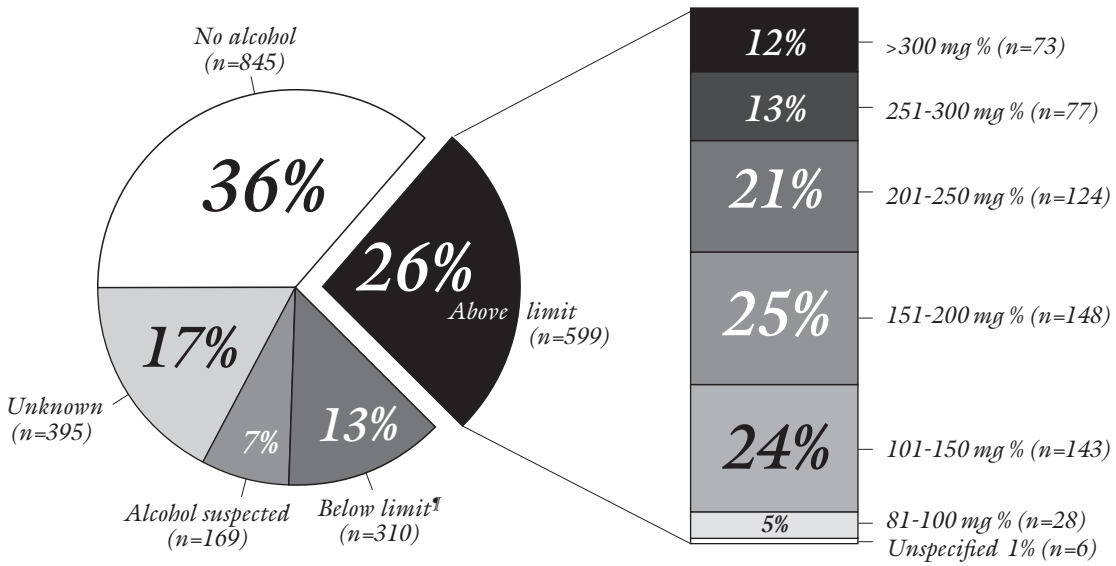
ALCOHOL & ILLEGAL DRUGS Alcohol was present or suspected in 46% of recreational boating immersion deaths for victims 15 years of age and older, with 17% unknown (Figure 8, Table 9b). If deaths with alcohol classified as unknown are excluded, alcohol would be present or suspected for 56%, and so the true figure may lie between 46% and 56%, possibly close to or exceeding 50%. There was greater involvement of alcohol among powerboat victims (Figure 9). Illegal drugs were present or suspected in 7% of deaths of persons 15 and older (Table 9b). When unknowns were excluded (48%), this rose to 14%, so the true figure could lie between these values.

SWIMMING ABILITY This was unknown for 66%; 52% of the remainder were weak or non-swimmers (Table 9a).

BOATING EXPERIENCE This was unknown for 67%, while 66% of the remainder were reported as experienced boaters and 34% as occasional or inexperienced boaters (Table 9a).

ETHNICITY Although aboriginals account for about 4% of the Canadian population, at least 15% of immersion victims were aboriginal, possibly more since ethnicity was unreported for many victims (27%), especially in Ontario since 1996 (Table 9a).

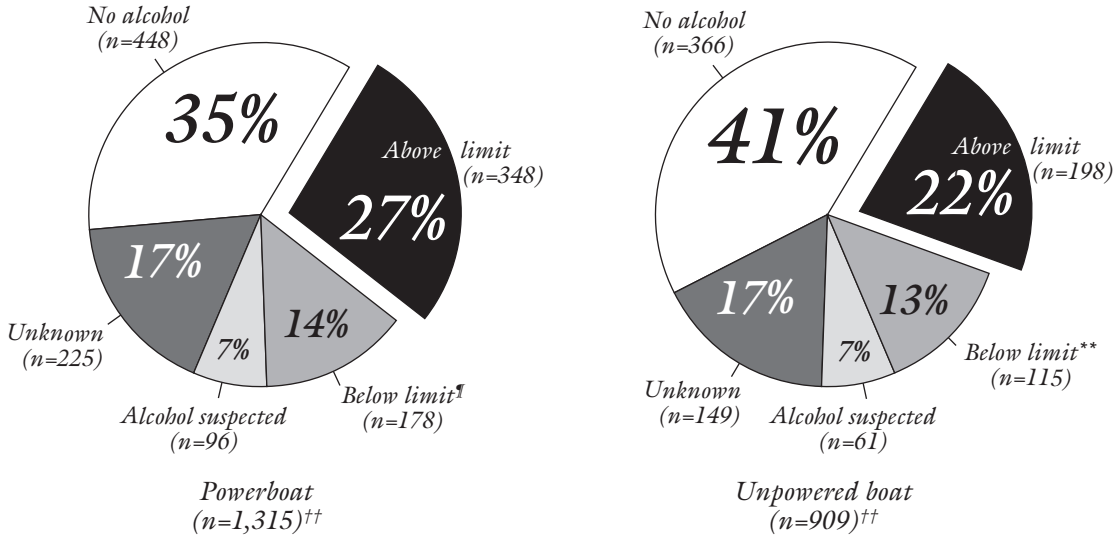
Figure 8 **BLOOD ALCOHOL LEVELS* FOR IMMERSION DEATHS† DURING RECREATIONAL BOATING,‡ CANADA 1991-2008 (VICTIMS ≥15 YEARS OF AGE; n=2,363)§**



** "Limit" refers to federal legal limit of 80 mg%; some provinces have lower limits*
† Includes drownings and immersion hypothermia deaths ‡ Includes boating during recreation and daily life
§ This figure excludes 45 victims; decomposition rendered blood alcohol unreliable
¶ 117 at 1-49 mg %, 83 at 50-80 mg %, 110 unspecified

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

Figure 9 **BLOOD ALCOHOL LEVELS* FOR IMMERSION DEATHS† DURING RECREATIONAL BOATING‡ BY TYPE OF BOAT, CANADA 1991-2008 (VICTIMS ≥15 YEARS OF AGE; n=2,363)§**



** "Limit" refers to federal legal limit of 80 mg%; some provinces have lower limits*
† Includes drownings and immersion hypothermia deaths ‡ Includes boating during recreation and daily life
§ This figure excludes 134 cases where it was unknown if the boat was powered or unpowered
*¶ 73 at 1-49 mg %, 44 at 50-80 mg %, 61 unspecified ** 39 at 1-49 mg %, 35 at 50-80 mg %, 41 unspecified*
†† Charts exclude 40 victims (20, 20); decomposition rendered blood alcohol unreliable

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

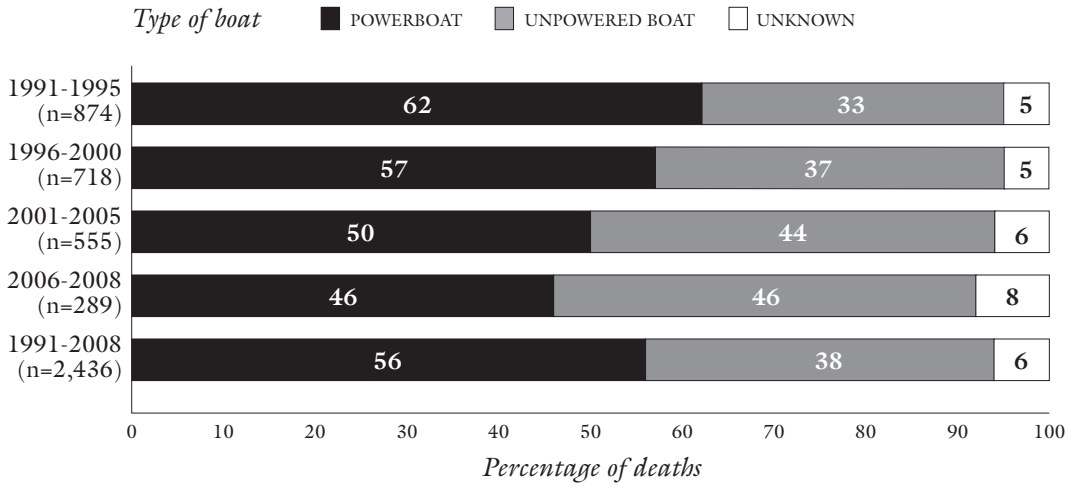
EQUIPMENT FACTORS

TYPE OF BOAT 56% of immersion deaths were associated with powerboats and 38% with unpowered boats; for 6% it was unknown whether the boat was powered or not (Table 10a). There has been a trend to decreased proportional involvement of powerboats and increased involvement of unpowered boats during 1991-2008 (Figure 10). For powerboat immersion deaths, 63% involved small powerboats including inflatables, and all other types 13% each or less. The actual proportion may have been close to 80%, since many unknown powerboats and unknown-if-powered boats were probably small powerboats. For unpowered boats, 61% of immersion deaths involved canoes, with all other types 10% each or less (Table 4b).

FLOTATION Only 12% of immersion victims were reported to be correctly wearing a flotation device, including 10% of powered boaters and 16% of unpowered boaters. The low proportion of victims wearing a flotation device was stable throughout the period 1991-2008 (Figures 11-13, Table 10a). The proportion of unknowns has decreased from 23% during 1991-95, to 13% during 1996-2005, to 9% during 2005-2008, suggesting police and coroners may be paying greater attention to this essential item of safety equipment. These data cannot address trends in the wearing behaviour of boaters who do not become victims, which could have improved. Field surveys can address this.

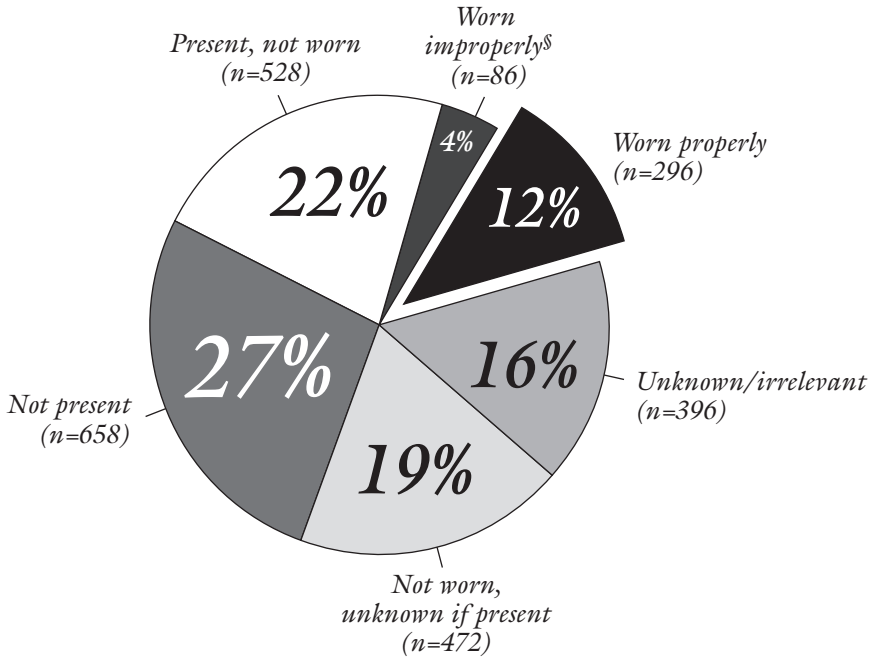
FLOTATION BY REGION Proper wearing of a flotation device among victims varied by region: territories 21% (unknown 14%), B.C. 17% (unknown 20%), Quebec 14% (unknown 12%), Atlantic 12% (unknown 11%), Prairies 10% (unknown 11%), Ontario 8% (unknown 19%) (Table 10b).

Figure 10 **TRENDS IN RECREATIONAL BOATING* IMMERSION DEATHS† BY TYPE OF BOAT, CANADA 1991-2008 (n=2,436)**



** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

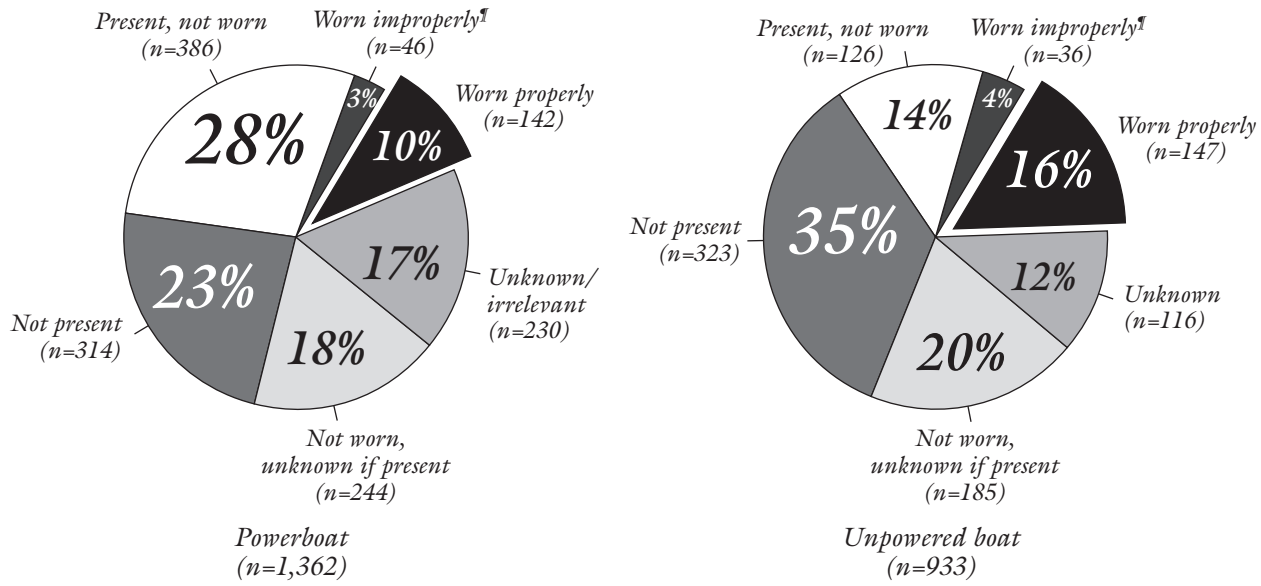
Figure 11 **RECREATIONAL BOATING* IMMERSION DEATHS† BY USE OF A FLOTATION DEVICE,‡ CANADA 1991-2008 (n=2,436)**



** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ Personal flotation device (PFD) or lifejacket § Not fastened or inappropriate size

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

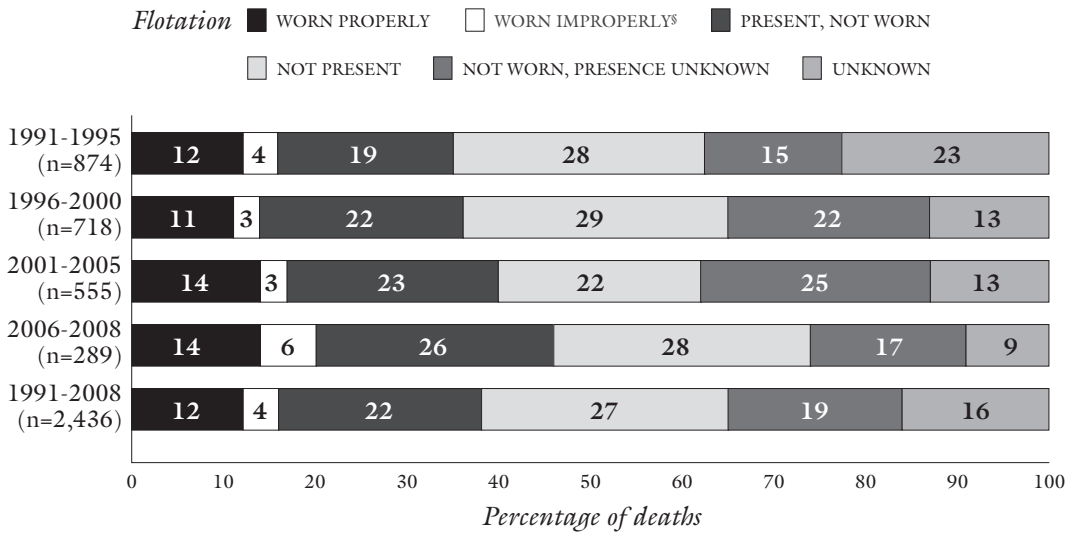
Figure 12 **RECREATIONAL BOATING* IMMERSION DEATHS† BY TYPE OF BOAT AND USE OF A FLOTATION DEVICE,‡ CANADA 1991-2008 (n=2,436)§**



** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ Personal flotation device (PFD) or lifejacket § This figure excludes 141 cases where it was unknown if the boat was powered or unpowered
¶ Not fastened or inappropriate size

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

Figure 13 **TRENDS IN RECREATIONAL BOATING* IMMERSION DEATHS† BY USE OF A FLOTATION DEVICE,‡ CANADA 1991-2008 (n=2,436)**



** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ Personal flotation device (PFD) or lifejacket § Not fastened or inappropriate size

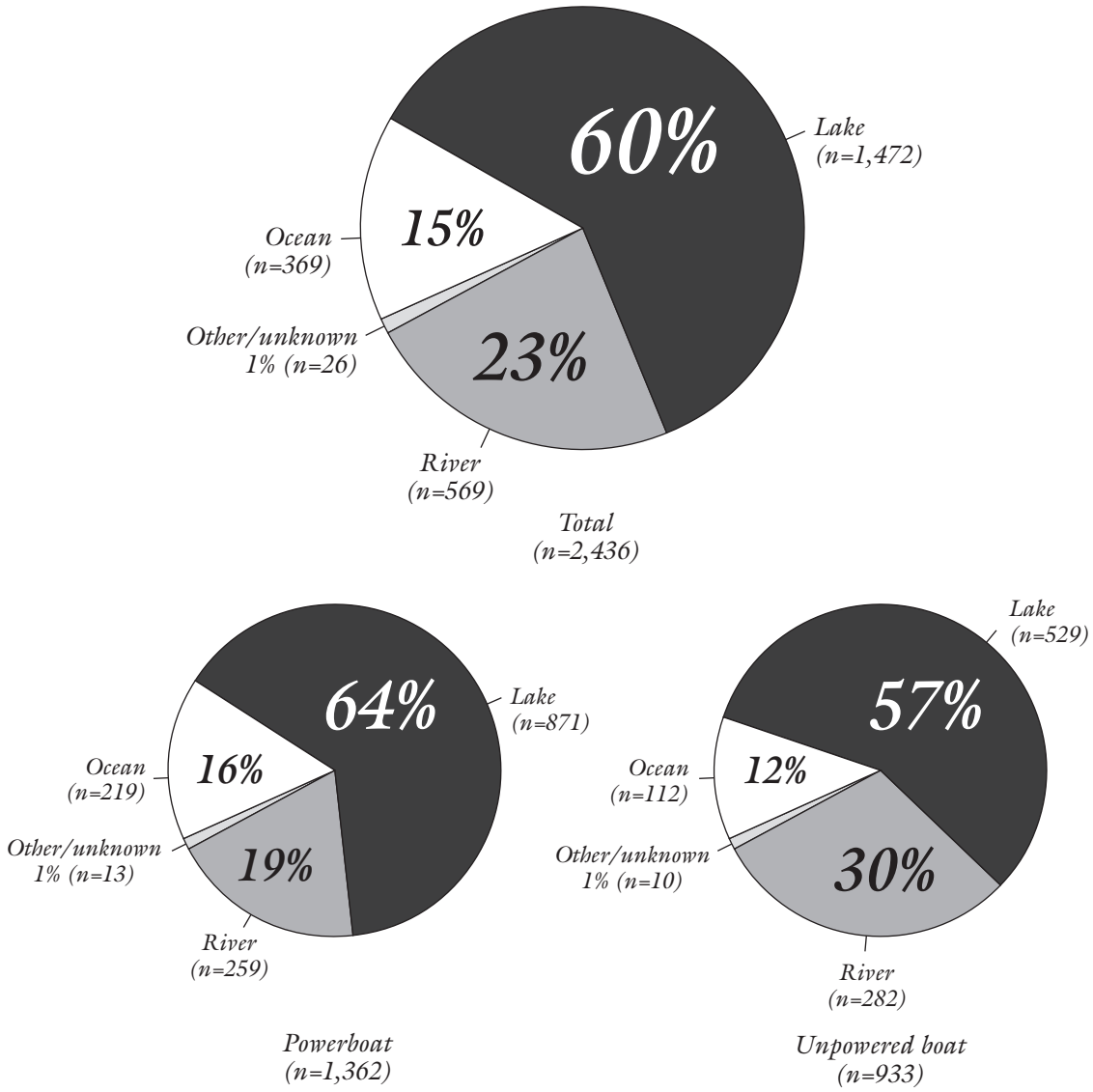
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

ENVIRONMENTAL FACTORS

BODY OF WATER Overall, lakes (including ponds and reservoirs) were most frequently involved in boating immersion deaths, followed by rivers and oceans (Figure 14, Table 11a). The proportion of deaths on rivers was significantly greater for unpowered boats.

CURRENT The power of moving water such as strong current, rapids or whitewater, hydraulic current, dam spillways, waterfalls, tide, and undertow, was associated with at least 24% of immersion deaths, possibly more since current was unknown in 43% of cases. Moving water was present in at least 20% of powerboat deaths, 30% of unpowered boat deaths, and 60% of deaths in rivers (Table 11a).

Figure 14 **RECREATIONAL BOATING* IMMERSION DEATHS† BY BODY OF WATER‡ AND BY TYPE OF BOAT, CANADA 1991-2008 (n=2,436)**



** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ "Lake" includes pond & reservoir

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

WIND AND WAVES Wind conditions were unknown for 62% of immersion deaths. For the remainder, wind was described as strong for 58%, breezy/windy for 23%, and calm for 19%. Wave conditions were unknown or irrelevant for 53% of victims. For the remainder, it was stormy for 7%, rough for 47%, choppy for 20%, and calm for 26% (Table 11a).

LIGHT CONDITIONS Light conditions were unknown for 21% of deaths. For the remainder, 33% occurred during reduced visibility (21% in the dark, 12% in twilight) and 67% during daylight (Table 11b).

WATER TEMPERATURE Water temperature was unknown for 59% of deaths. For the remainder, it was reported to be extremely cold (<10°C) for 52%, cold or cool (10-20°C) for 44%, and warm or hot (>20°C) for 4% (Table 11b).

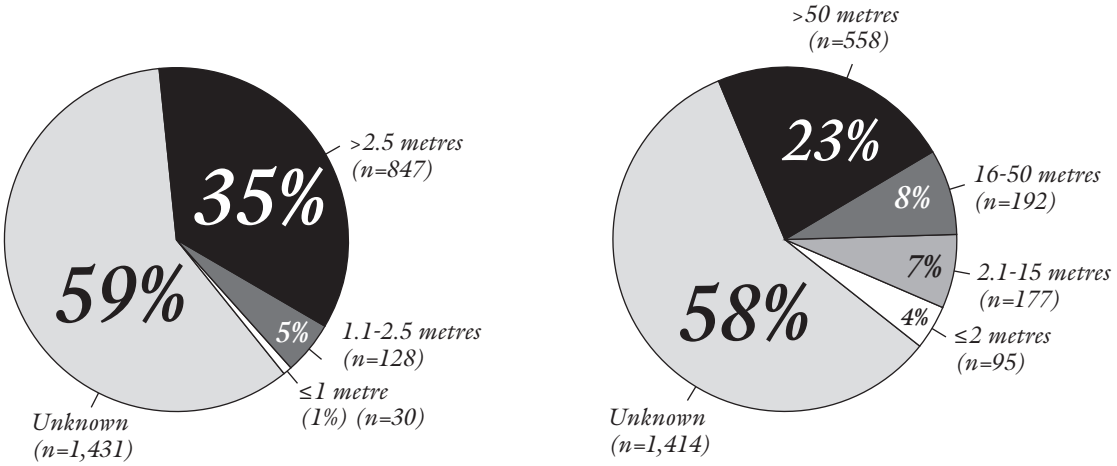
AIR TEMPERATURE Air temperature was unknown for 80% of deaths. For the remainder, it was ≤15°C for 63%, and >15°C for 37% (Table 11b).

ICE AND COLD WATER Based on the criteria used in Module 2 of the Canadian Red Cross's 10-year series (*Ice & Cold Water*), it is probable that cold water played a role in at least 35% of deaths.

DEPTH OF WATER Depth was unknown for 59% of deaths. For the remainder, 16% actually occurred in water 2.5 metres or less deep (Table 11b).

DISTANCE FROM SHORE This was unknown for 58% of deaths. Of the remainder, 45% occurred within 50 metres of shore, i.e., two lengths of a swimming pool, including 9% at 2 metres or less, 17% at 2.1-15m, and 19% at 16-50 metres (Figure 15, Table 11b).

Figure 15 **RECREATIONAL BOATING* IMMERSION DEATHS† BY DEPTH OF WATER AND DISTANCE FROM SHORE, CANADA 1991-2008 (n=2,436)**



** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*

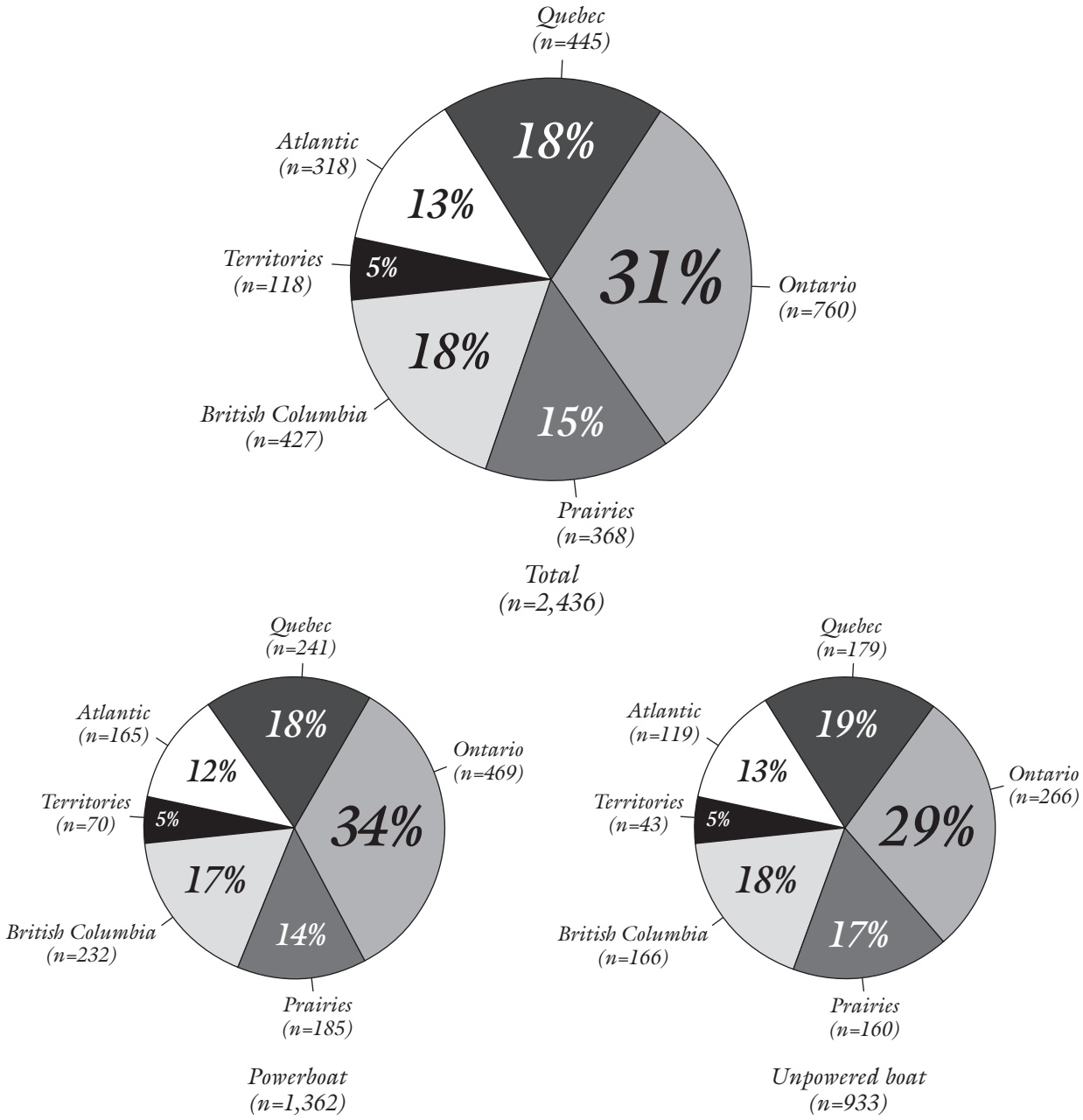
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

DAY OF THE WEEK 45% of deaths took place on Saturday and Sunday (Table 11c).

MONTH AND TYPE OF BOAT 87% of deaths occurred between May and October. 9% of unpowered deaths occurred during the spring months of March and April, compared with 5% of powered (Table 11c).

REGION The highest proportions of immersion deaths were seen in the provinces with the largest populations, Ontario, Quebec, and British Columbia (Figure 16, Table 11d).

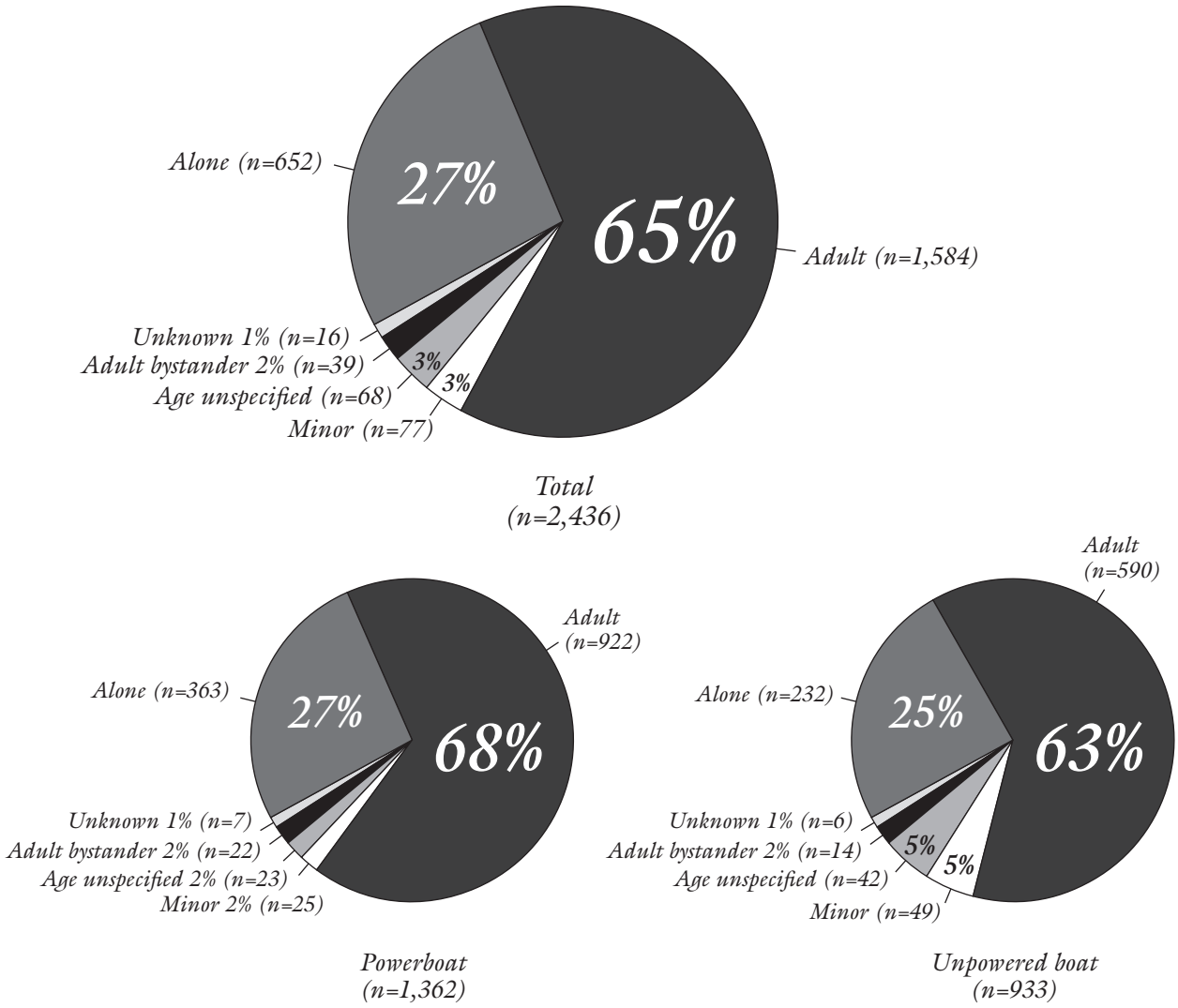
Figure 16 **RECREATIONAL BOATING* IMMERSION DEATHS† BY REGION AND BY TYPE OF BOAT, CANADA 1991-2008 (n=2,436)**



** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

ACCOMPANIMENT 27% of immersion victims were alone, while 65% were accompanied by at least one adult, 3% only by minor(s), 3% by someone of unknown age, and 2% by adult bystander(s); for 1% accompaniment was unknown (Figure 17, Table 11d).

Figure 17 **RECREATIONAL BOATING* IMMERSION DEATHS† BY ACCOMPANIMENT‡ AND BY TYPE OF BOAT, CANADA 1991-2008 (n=2,436)**



** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ "Adult" indicates that victim was accompanied by adult(s); does not exclude presence of minor(s) (<18 years); "Minor" indicates presence of minors only

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

Trauma deaths, including all injury fatalities other than immersions, accounted for 5% of boating fatalities (150/3,004) during 1991-2008 (Tables 2c, 3a).

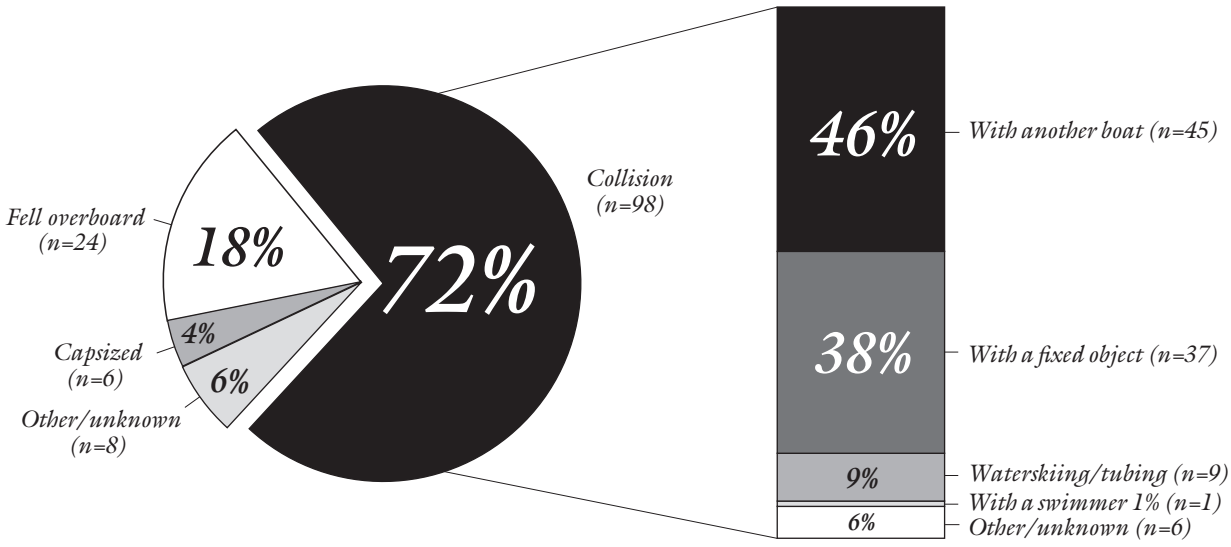
PURPOSE 136 trauma deaths (91%) were recreational, 10 (7%) were occupational, and for 4 (3%) the purpose was other/unknown (Tables 2c, 3b, c). Only recreational incidents are discussed here.

TYPE OF BOAT 90% of recreational trauma deaths involved powerboats and 9% unpowered; for the remaining 1% it was unknown whether the boat was powered or not (Table 3b).

TYPE OF INCIDENT 72% of trauma deaths resulted from various types of collisions, 18% from falling overboard, 4% from capsizing and 6% from other/unknown causes. 9% of incidents involved a person being towed, while 8% resulted in propeller injuries (Figure 18, Table 12c).

COLLISIONS Collisions were involved in 98 trauma deaths, including 46% between two boats, 38% boat with a fixed object, 9% during waterskiing/tubing, and 1% boat with a person in the water, e.g. a swimmer (Figure 18, Table 12c). Collisions accounted for 77% of powerboat and 25% of unpowered boat trauma deaths (Table 7c). (Collisions also contributed to 97 immersion deaths, including 6% of powered and 2% of unpowered; Table 7b.)

Figure 18 **RECREATIONAL BOATING* TRAUMA DEATHS† BY TYPE OF INCIDENT AND TYPE OF COLLISION, CANADA 1991-2008 (n=136)**



** Includes boating during recreation and daily life † Includes all injury fatalities other than immersion deaths*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

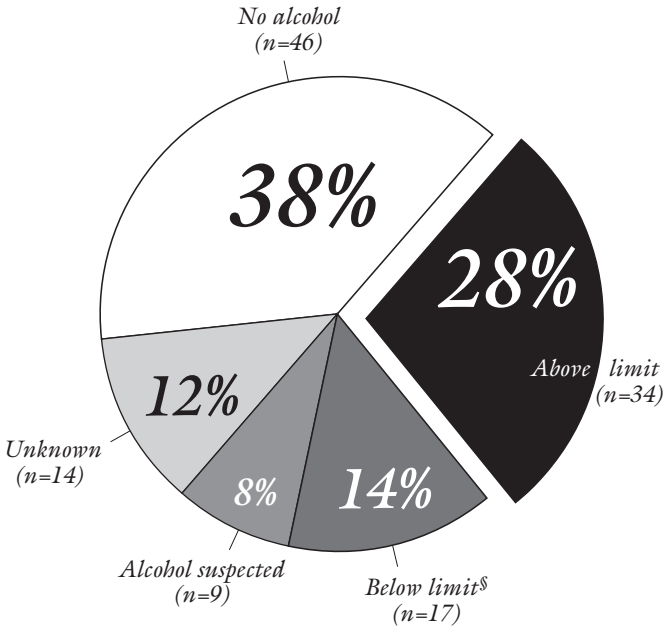
TYPE OF INJURY Traumatic incidents frequently resulted in head injury, which contributed to at least 45% of boating trauma deaths. Other injuries included spinal injury in 10%, fractures in 13%, and major lacerations in 24%. At least 4% had propeller injuries from unguarded propellers. Victims often sustained multiple injuries (Table 12d).

PERSONAL FACTORS

AGE AND SEX Children less than 15 years old were disproportionally involved in trauma as compared with immersions, accounting for 12% of trauma deaths, compared with 3% of immersion deaths. The same applied to females, who represented 24% of trauma deaths compared with only 7% of immersion deaths. Children and females were also overrepresented among personal watercraft (PWC) trauma deaths (Tables 13b, c).

ALCOHOL Trauma-related fatalities during boating were often associated with alcohol. Alcohol was present or suspected for 50% of victims, as compared with 46% for immersion deaths (Figures 19, 8, 9, Tables 13b, c, 9b).

Figure 19 **BLOOD ALCOHOL LEVELS* FOR TRAUMA DEATHS† DURING RECREATIONAL BOATING,‡ CANADA 1991-2008 (VICTIMS ≥15 YEARS OF AGE; n=120)**



** "Limit" refers to federal legal limit of 80 mg%; some provinces have lower limits*
† Includes all injury fatalities other than immersion deaths ‡ Includes boating during recreation and daily life
§ 12 at 1-49 mg %, 4 at 50-80 mg %, 1 unspecified

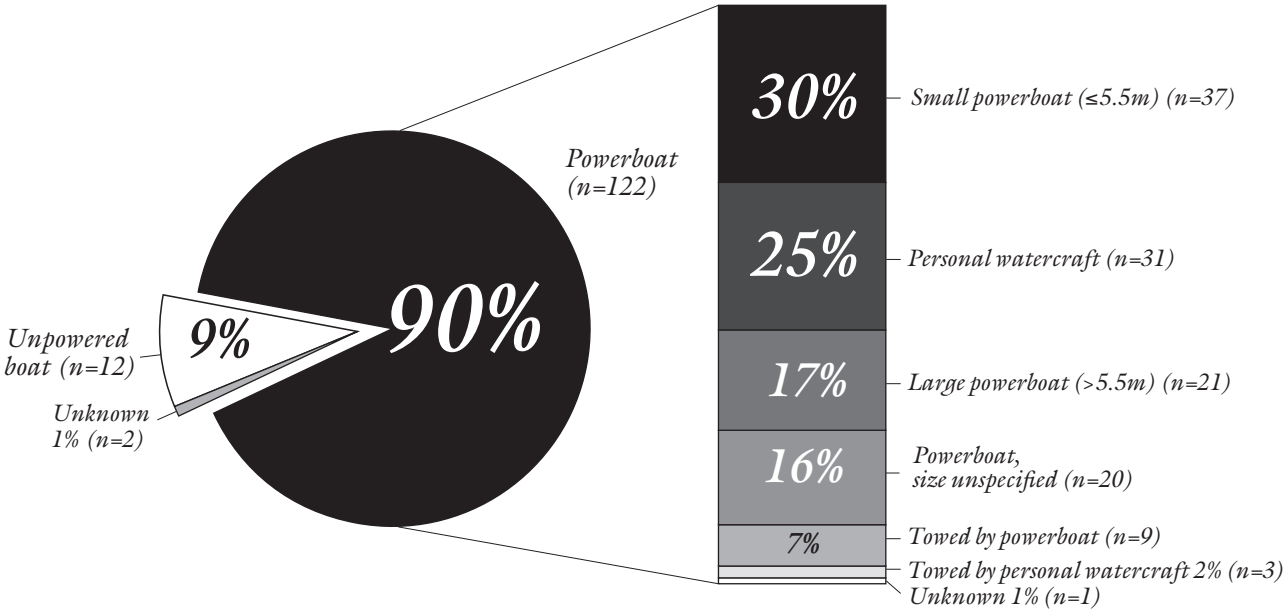
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

BOATING EXPERIENCE This was unknown for 71%; 62% of the remainder were reported as experienced boaters and 38% as occasional or inexperienced boaters (Table 13c).

EQUIPMENT FACTORS

TYPE OF BOAT AND EXTERNAL CAUSE OF INJURY 77% of powerboat trauma deaths resulted from collisions and most of the remainder from falling overboard or being ejected in fast turns. For unpowered boats, only 25% resulted from collisions, with most of the remainder from capsizing or falling overboard (Table 7c).

Figure 20 **RECREATIONAL BOATING* TRAUMA DEATHS† BY TYPE OF BOAT, CANADA 1991-2008 (n=136)**



** Includes boating during recreation and daily life † Includes all injury fatalities other than immersion deaths*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

POWERBOATS 90% of victims were boating in or being towed by a powerboat. PWCs and large powerboats were disproportionately associated with death by trauma as compared with death by immersion (Figure 20, Table 3b). Small open powerboats and size unknown powerboats, probably mainly small, were frequently involved in both trauma and immersions deaths.

PERSONAL WATERCRAFT While PWCs accounted for only 2% of powerboat immersion deaths, they were involved in 28% of powerboat trauma fatalities, including the 2% of cases where the person was being towed by a PWC (Figure 20, Table 3b). Furthermore, PWCs contributed to some of the unpowered trauma deaths: in one case, a canoeist was fatally injured after being struck by a PWC.

POWERBOAT TRAUMA & SWIMMERS Powerboats including PWCs also pose a risk of blunt trauma or massive propeller chop lacerations to people already in the water, such as swimmers, boaters who have fallen in, and others involved in aquatic activities such as diving and wading.

FLOTATION 25% of trauma victims were properly wearing a flotation device, compared with 12% of immersion victims (Tables 14b, c).

SAFETY HELMET While safety helmets are used by many river kayakers, they are rarely seen on powerboaters, even in high speed jetboats and PWCs. Data are not available on whether any of the PWC or other high speed powerboat victims were wearing a safety helmet. However, at least half — and probably most — were not, since 32% of PWC victims and 50% of other powerboat victims who died in traumatic incidents had sustained head injuries (Table 12d).

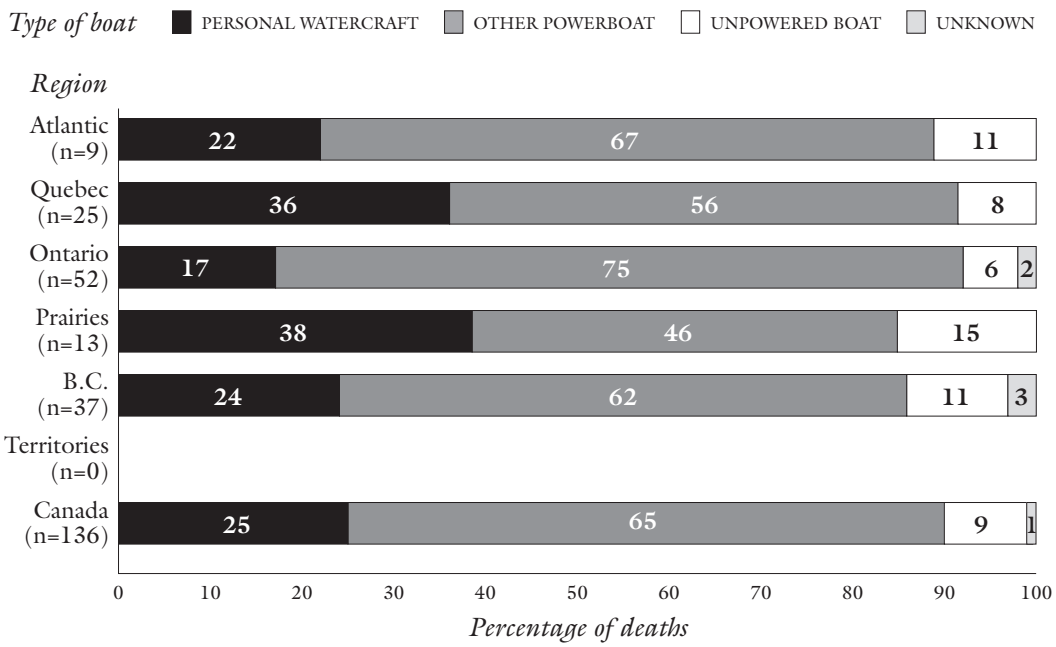
OTHER EQUIPMENT FACTORS Absent or inappropriate lighting is another risk factor for collisions. A number of collisions did involve boats travelling without lights; however, coroner and police data are incomplete for this variable so it cannot be quantified. Another issue is the lack of steerability and control of a PWC when the throttle and power jet are cut without any rudder to steer the vessel; the frequency of this factor in fatal collisions is unknown. Finally, few high speed powerboats have safety restraints, air bags, dash padding, or collapsible bows to absorb kinetic energy and prevent death in the event of a high-speed crash.

ENVIRONMENTAL FACTORS

LIGHT CONDITIONS The main pertinent environmental factor for trauma incidents is probably poor light conditions. Overall, 38% of trauma deaths occurred during darkness or twilight. This factor varied by type of boat, with only 17% of PWC incidents taking place in low light conditions compared with 49% for other types of powerboat (Table 15c).

REGION The proportion of trauma deaths by type of boat varied somewhat by region, with PWCs representing a higher percentage of deaths in the Prairies, Quebec and B.C. and other powerboats representing a higher percentage in Ontario (Figure 21, Table 15c).

Figure 21 **RECREATIONAL BOATING* TRAUMA DEATHS† BY TYPE OF BOAT AND REGION, CANADA 1991-2008 (n=136)**



** Includes boating during recreation and daily life † Includes all injury fatalities other than immersion deaths*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

There were 68 fatalities involving personal watercraft (PWC) during 1991-2008, including 33 immersions and 35 trauma deaths (Tables 3a). Traumatic incidents frequently resulted in head injury, which contributed to at least 32% of PWC trauma deaths. Other injuries included spinal injury in 18%, fractures in 12%, and major lacerations in 26%. Victims often sustained multiple injuries (Table 12d).

Overall, 19% (13/68) had head injuries, 10% (7/68) spinal injuries, and 16% (11/68) major lacerations. This compares with 4% (67/1,788) head injuries for other powerboats and 2% (17/979) for unpowered boats; 1% (11/1,788) spinal injuries for other powerboats and 0% for unpowered boats; and 2% (28/1,788) major lacerations for other powerboats and 1% (5/979) for unpowered boats.

PURPOSE 96% of PWC victims died during recreational activities, 1% during occupational activities and 3% during other/unknown activities (Tables 3b, c). Only recreational fatalities will be discussed here.

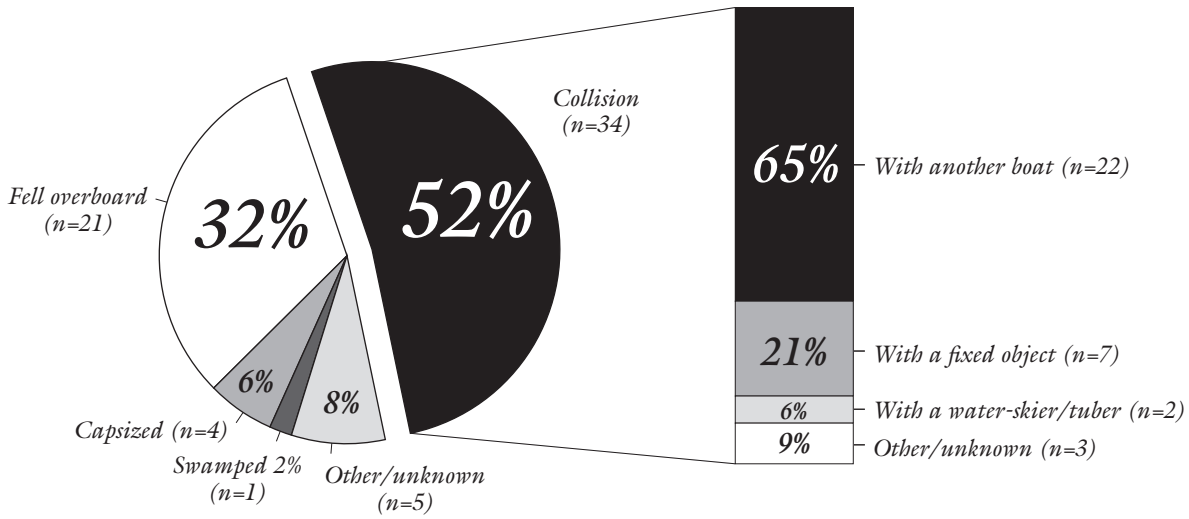
RECREATIONAL FATALITIES

There were 65 recreational fatalities involving PWC, including 31 immersion deaths and 34 trauma deaths (including 3 cases where the person was being towed by a PWC). PWCs accounted for 1% of all immersion deaths, 2% of powerboat immersion deaths, 25% of all trauma deaths and 28% of powerboat trauma deaths (Tables 3b, 12a, b, c).

Given the small number of immersion fatalities and the large proportion of trauma victims, this section will combine discussion of immersion and trauma deaths.

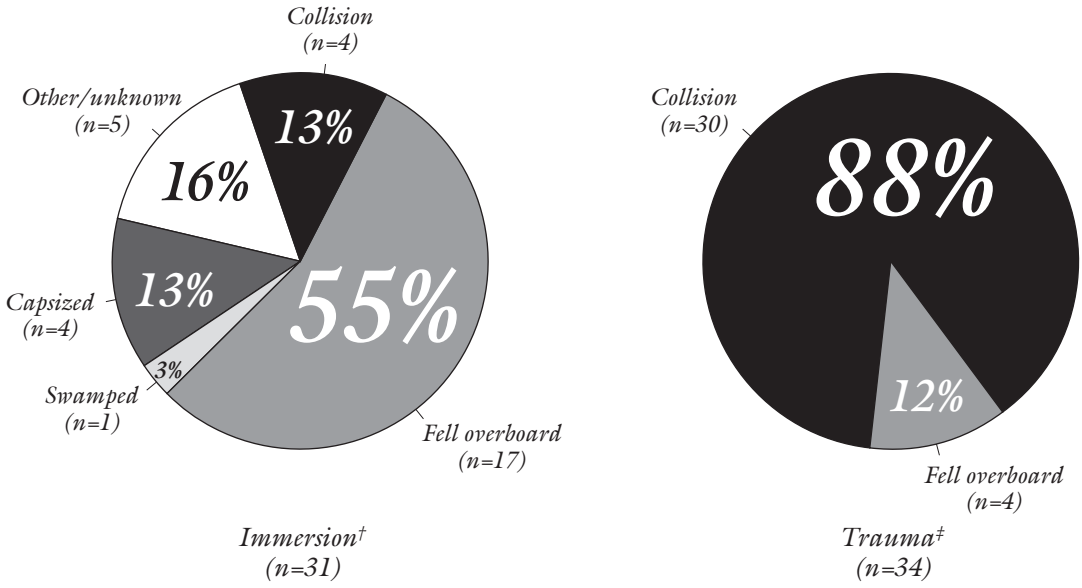
TYPE OF INCIDENT Overall, 34 victims died following a collision (52%), 21 fell overboard (32%), 4 capsized (6%), 1 was swamped (2%), 1 had other causes (2%); circumstances were unknown for the remaining 4 victims (6%). Immersion deaths most often resulted from falling overboard, while nearly all trauma deaths resulted from collision. 65% of PWC collisions involved another boat, whereas for other powerboats, only 29% of collisions involved another boat ($p<0.005$, chi square) (Figures 22, 23, Tables 12a, b, c).

Figure 22 **RECREATIONAL* PERSONAL WATERCRAFT FATALITIES† BY TYPE OF INCIDENT AND TYPE OF COLLISION, CANADA 1991-2008 (n=65)**



** Includes boating during recreation and daily life † Includes death by immersion and by trauma*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

Figure 23 **RECREATIONAL* PERSONAL WATERCRAFT FATALITIES BY NATURE OF INJURY AND TYPE OF INCIDENT, CANADA 1991-2008 (n=65)**



** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths ‡ Includes all other injury fatalities*
Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

PERSONAL FACTORS

AGE & SEX Males accounted for 85% of PWC fatalities during 1991-2008, with those 15 to 24 years at highest risk for both immersion and trauma. Females and children were overrepresented in PWC trauma deaths. While females accounted for only 3% of PWC immersion deaths, they represented 26% of trauma deaths; similarly, children under 15 accounted for only 6% of immersion deaths but for 18% of trauma deaths (Tables 13a, b, c).

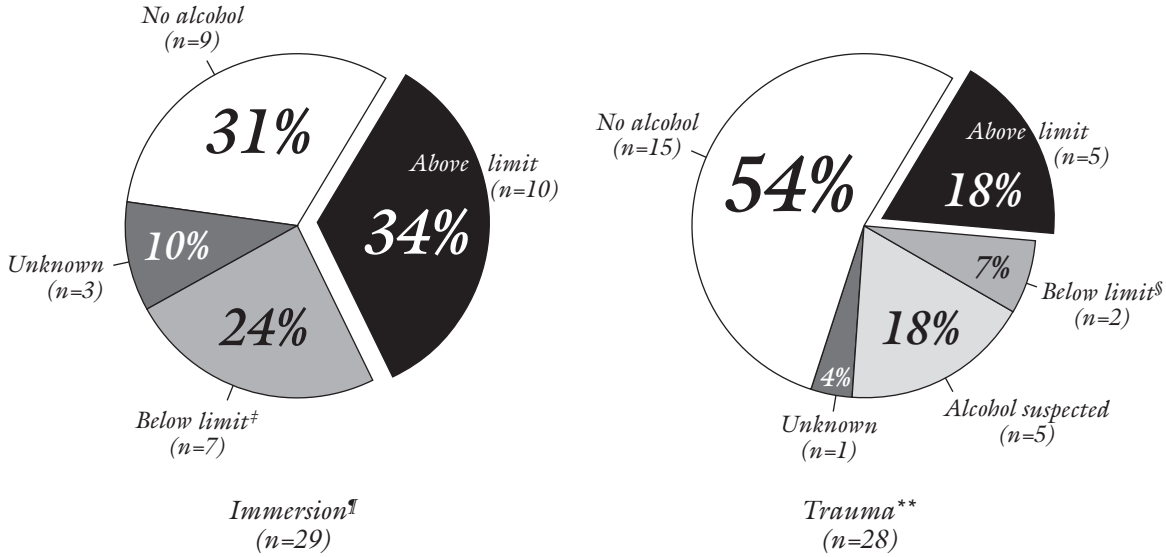
ALCOHOL Alcohol was present or suspected for 51% of PWC victims 15 years of age and older, possibly more since alcohol was unknown in 7% of cases. Alcohol was present or suspected in a higher proportion of immersion deaths than of trauma deaths (Figure 24, Tables 13a, b, c).

SWIMMING ABILITY Swimming ability was unknown for 74% of PWC victims. For the remainder, 35% were weak or non swimmers, 29% were average or strong swimmers and 35% were swimmers of unspecified ability (Table 13a).

BOATING EXPERIENCE Boating experience was unknown for 60% of PWC victims. For the remainder, 38% were experienced boaters, 58% inexperienced and 4% occasional boaters. In comparison, only 7% of powerboat victims for whom boating experience was known were inexperienced boaters (Table 13a).

ETHNICITY Although aboriginal peoples were over-represented in most categories of water-related fatality, they accounted for only 3% of PWC fatalities, roughly equivalent to the proportion they represent of the Canadian population (Table 13a).

Figure 24 **BLOOD ALCOHOL LEVELS* FOR PERSONAL WATERCRAFT FATALITIES DURING RECREATIONAL BOATING† BY NATURE OF INJURY, CANADA 1991-2008 (VICTIMS ≥15 YEARS OF AGE; n=57)**



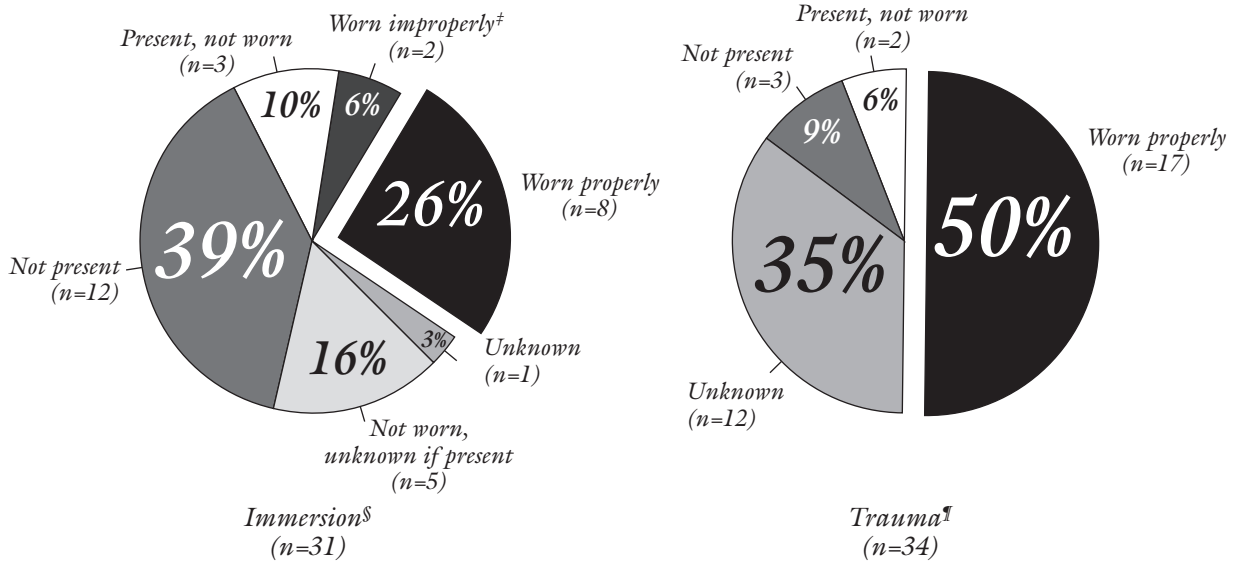
** "Limit" refers to federal legal limit of 80 mg%; some provinces have lower limits*
† Includes boating during recreation and daily life ‡ 3 at 1-49 mg %, 2 at 50-80 mg %, 2 unspecified § 1 at 1-49 mg %, 1 unspecified
*¶ Includes drownings and immersion hypothermia deaths ** Includes all other injury fatalities*

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

EQUIPMENT FACTORS

FLOTATION 26% of immersion victims were properly wearing a flotation device (Figure 25, Tables 14b, c), while 50% of trauma victims were doing so.

Figure 25 **RECREATIONAL* PERSONAL WATERCRAFT FATALITIES BY NATURE OF INJURY AND USE OF A FLOTATION DEVICE,† CANADA 1991-2008 (n=65)**



** Includes boating during recreation and daily life † Personal flotation device (PFD) or lifejacket ‡ Not fastened or inappropriate size*
§ Includes drownings and immersion hypothermia deaths ¶ Includes all other injury fatalities

Source: The Canadian Red Cross Society & the Canadian Surveillance System for Water-Related Fatalities, 2011

ENVIRONMENTAL FACTORS

BODY OF WATER 68% of fatalities occurred in lakes, 20% in rivers, 9% in the ocean, 2% in other locations, and 2% in an unknown location (Table 15a).

WIND AND WAVES Wind conditions were unknown for 80% of fatalities. For the remainder, wind was described as strong for 8%, breezy for 54% and calm for 38%. Wave conditions were unknown or other for 71% of victims. For the remainder, it was rough for 16%, choppy for 37%, calm for 42% and other for 5%; no stormy weather was reported (Table 15a).

LIGHT CONDITIONS 8% of PWC fatalities occurred in darkness, 12% in twilight, and 72% in daylight. Light conditions were unknown for 8% of deaths. (Table 15a).

MONTH AND DAY All fatalities occurred between April and October, 97% between May and September. July and August accounted for 65% of deaths, compared with 33% for other powerboats and 30% for unpowered boats. 71% of deaths took place between Friday and Sunday (Table 15a).

REGION The highest proportion of PWC fatalities were seen in Quebec and Ontario, followed by the Prairie provinces and British Columbia. There were no PWC deaths identified in the northern territories during 1991-2008, but there were 6 immersion deaths in NWT where the type of boat was unknown (Tables 15a, 5).

ACCOMPANIMENT 14% of PWC victims were alone, while 60% were accompanied by at least one adult, 9% only by minor(s) and 11% by someone of unknown age; an adult bystander was present in 6% of cases (Table 15a).

TEMPERATURE*

WATER TEMPERATURE Water temperature was unknown for 71% of PWC immersion fatalities. For the remainder, it was reported to be extremely cold (<10°C) for 44%, cold or cool (10-20°C) for 33%, and warm or hot (>20°C) for 22% (Table 15b).

AIR TEMPERATURE Air temperature was unknown for 77% of PWC immersion deaths. For the remainder, it was ≤15°C for 29%, and >15°C for 71% (Table 15b).

ICE AND COLD WATER Based on the criteria used in Module 2 of the 1991-2000 series (*Ice & Cold Water*), it is probable that cold water was a factor in 16% of PWC immersion deaths.

** Only immersion fatalities are discussed here, as temperature was not a significant contributing factor for traumatic injury.*

Table 1 **Estimated trends in total boating deaths by years, Canada 1991-2008**				
	1991-1995	**1996-2000**	**2001-2005**	**2006-2008**
Number of deaths in Red Cross database	1,099	888	672	345
Estimated % missing deaths	8*	2†	18‡	17§
Estimated number missing deaths	84	21	120	60
Estimated total deaths	1,183	909	792	405
Estimated deaths per year	237	182	158	135
Census population¶	27,296,855	28,846,760	30,007,095	31,612,895
Death rate/100,000 pop/year	0.87	0.63	0.53	0.43

** Based on data provided by Quebec: 15% missing (30/201), Alberta: 4% missing (2/45) and British Columbia: 2% missing (4/224)*

† Based on data provided by Quebec: 4% missing (6/163), Alberta: 2% missing (1/42), and British Columbia: 1% missing (2/170)

‡ Based on data provided by Quebec 18% missing (26/142), Alberta: 3% missing (1/35), British Columbia: 24% missing (34/140), Yukon: 0% missing, PEI: 20% missing (1/5), and New Brunswick: 13% missing (5/39)

§ Based on data provided by Quebec: 14% missing (8/57), Alberta: 13% missing (3/24), British Columbia: 23% missing (15/64), Yukon: 33% missing (1/3,) PEI: 50% missing (3/6), New Brunswick: 0% missing, Newfoundland: 0% missing for 2007 and 2008 (unknown for 2006), and Nova Scotia: 18% missing (4/22) for 2007 and 2008 (unknown for 2006)

¶ Source: Statistics Canada – 2006 Census. Catalogue Number 97-551-XCB2006005

Table 2a **Boating deaths* by purpose, activity, years, and power type, Canada 1991-2008 (n=3,004)†**														
	1991-1995 (n=1,099)		**1996-2000 (n=888)**		**2001-2005 (n=672)**		**2006-2008 (n=345)**		**1991-2008 (n=3,004)**		**Powered boating (n=1,856)**		**Unpowered boating (n=979)**	
Activity by purpose	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Recreational‡	**916**	**83**	**763**	**86**	**582**	**87**	**311**	**90**	**2,572**	**86**	**1,484**	**80**	**945**	**97**
Fishing	333	30	254	29	203	30	117	34	907	30	579	31	241	25
Powerboating	230	21	198	22	116	17	70	20	614	20	614	33	0	0
Canoeing	115	10	90	10	89	13	40	12	334	11	0	0	334	34
Boat travel	94	9	31	3	28	4	10	3	163	6	125	7	21	2
Hunting	44	4	66	7	38	6	14	4	162	5	102	6	52	5
Sailing	20	2	30	3	20	3	7	2	77	3	0	0	77	8
Kayaking	19	2	20	2	30	4	16	5	85	3	0	0	85	9
Other activity	22	2	20	2	11	2	12	3	65	2	33	2	13	1
Other, unpowered	11	1	12	1	12	2	9	2	44	1	0	0	43	4
White water rafting	7	1	8	1	7	1	5	1	27	1	0	0	26	3
Towed by boat§	8	1	5	1	4	1	2	1	19	1	19	1	0	0
Rowing	2	<1	12	1	5	1	1	<1	20	1	0	0	20	2
Other rafting	3	<1	8	1	3	<1	3	1	17	1	0	0	17	2
Pedal boating	1	<1	2	<1	8	1	3	1	14	<1	0	0	14	2
Embarking/ disembarking	2	<1	4	1	3	1	0	0	9	<1	4	<1	1	<1
Swimming	2	<1	1	<1	2	<1	1	<1	6	<1	4	<1	0	0
Partying	0	0	1	<1	2	<1	0	0	3	<1	2	<1	1	<1
Unknown	3	<1	1	<1	1	<1	1	<1	6	<1	2	<1	0	0
Occupational	**153**	**14**	**101**	**11**	**69**	**10**	**27**	**8**	**350**	**12**	**330**	**18**	**12**	**1**
Commercial fishing	84	8	64	7	42	6	21	6	211	7	204	11	6	1
Marine shipping	40	4	10	1	3	1	2	1	55	2	55	3	0	0
Fishing guiding or charter	3	<1	4	1	3	1	0	0	10	<1	7	<1	2	<1
Aquaculture	3	<1	3	<1	1	<1	0	0	7	<1	6	<1	0	0
Other	22	2	19	2	20	3	4	1	65	2	56	3	4	<1
Unknown	1	<1	1	<1	0	0	0	0	2	<1	2	<1	0	0
Rescue	**13**	**1**	**14**	**2**	**10**	**1**	**2**	**1**	**39**	**1**	**19**	**1**	**16**	**2**
Other	**0**	**0**	**4**	**1**	**2**	**<1**	**3**	**1**	**9**	**<1**	**6**	**<1**	**1**	**<1**
Unknown	**17**	**2**	**6**	**1**	**9**	**1**	**2**	**1**	**34**	**1**	**17**	**1**	**5**	**1**

** Includes death from all causes: drowning, immersion hypothermia, and trauma*

† In 169 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns

‡ Includes boating during recreation and daily life § Included waterskiing 5, riding on tube or other device 14

Table 2b **Boating immersion deaths* by purpose, activity, years, and power Canada 1991-2008 (n=2,854)†**

	1991-1995 (n=1,054)		1996-2000 (n=838)		2001-2005 (n=641)		2006-2008 (n=321)		1991-2008 (n=2,854)		Powered boating (n=1,720)		Unpowered boating (n=967)	
Activity by purpose	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Recreational‡	**874**	**83**	**718**	**86**	**555**	**87**	**289**	**90**	**2,436**	**85**	**1,362**	**79**	**933**	**96**
Fishing	332	32	252	30	198	31	115	36	897	31	572	33	240	25
Powerboating	202	19	164	20	102	16	54	17	522	18	522	30	0	0
Canoeing	114	11	90	11	89	14	40	12	333	12	0	0	333	35
Boat travel	90	9	29	4	28	5	9	3	156	5	118	7	21	2
Hunting	44	4	65	8	38	6	14	4	161	6	101	6	52	5
Sailing	20	2	29	4	18	3	7	2	74	3	0	0	74	8
Kayaking	19	2	20	2	29	5	16	5	84	3	0	0	84	9
Other unpowered boating	11	1	12	1	12	2	9	3	44	2	0	0	43	4
White water rafting	5	<1	7	1	6	1	5	2	23	1	1	<1	22	2
Other rafting	3	<1	8	1	3	<1	3	1	17	1	0	0	17	2
Towed by boat§	3	<1	2	<1	2	<1	0	0	7	<1	7	<1	0	0
Rowing	2	<1	12	2	4	1	0	0	18	1	0	0	18	2
Pedal boating	1	<1	2	<1	8	1	3	1	14	<1	0	0	14	1
Boarding or leaving boat	2	<1	4	<1	3	<1	0	0	9	<1	4	<1	1	<1
Swimming	2	<1	1	<1	1	<1	1	<1	5	<1	3	<1	0	0
Partying	0	0	1	<1	2	<1	0	0	3	<1	2	<1	1	<1
Other activity	21	2	19	2	11	2	12	4	63	2	31	2	13	1
Unknown	3	<1	1	<1	1	<1	1	<1	6	<1	1	<1	0	0
Occupational	**150**	**14**	**96**	**11**	**67**	**10**	**27**	**8**	**340**	**12**	**320**	**19**	**12**	**1**
Commercial fishing	82	8	63	8	42	7	21	7	208	7	201	12	6	1
Marine shipping	40	4	8	1	2	<1	2	1	52	2	52	3	0	0
Fishing guiding or charter	3	<1	4	<1	3	<1	0	0	10	<1	7	<1	2	<1
Aquaculture	3	<1	3	<1	1	<1	0	0	7	<1	6	<1	0	0
Other activity	21	2	17	2	19	3	4	1	61	2	52	3	4	<1
Unknown	1	<1	1	<1	**0**	**0**	0	0	2	<1	2	<1	0	0
Rescue	**13**	**1**	**14**	**2**	**10**	**2**	**2**	**1**	**39**	**1**	**19**	**1**	**16**	**2**
Other	**0**	**0**	**4**	**<1**	**1**	**<1**	**1**	**<1**	**6**	**<1**	**3**	**<1**	**1**	**<1**
Unknown	**17**	**2**	**6**	**1**	**8**	**1**	**2**	**1**	**33**	**1**	**16**	**1**	**5**	**1**

** Includes drownings and immersion hypothermia deaths † In 167 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns ‡ Includes boating during recreation and daily life § Included water skiing 2, pulled on tube or other device 5*

Table 2c **Boating trauma death* by purpose, activity, and years, Canada 1991-2008 (n=150)†**

	1991-1995 (n=45)		1996-2000 (n=50)		2001-2005 (n=31)		2006-2008 (n=24)		1991-2008 (n=150)		Powered boating (n=136)		Unpowered boating (n=12)	
Activity by purpose	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Recreational‡	**42**	**93**	**45**	**90**	**27**	**87**	**22**	**92**	**136**	**91**	**122**	**90**	**12**	**100**
Fishing	1	2	2	4	5	16	2	8	10	7	7	5	1	8
Powerboating	28	62	34	68	14	45	16	68	92	61	92	68	0	0
Canoeing	1	2	0	0	0	0	0	0	1	1	0	0	1	8
Boat travel	4	9	2	4	0	0	1	4	7	5	7	5	1	8
Hunting	0	0	1	2	0	0	0	0	1	1	1	1	0	0
Sailing	0	0	1	2	2	7	0	0	3	2	0	0	3	25
Kayaking	0	0	0	0	1	3	0	0	1	1	0	0	0	0
White water rafting	2	5	1	2	1	3	0	0	4	2	0	0	4	33
Towed by boat§	5	11	3	0	2	7	2	8	12	8	12	9	0	0
Rowing	0	0	0	6	1	3	1	4	2	1	0	0	2	17
Other activity	1	2	1	2	0	0	0	0	2	1	2	1	0	0
Swimming	0	0	0	0	1	3	0	0	1	1	1	1	0	0
Occupational	**3**	**7**	**5**	**10**	**2**	**7**	**0**	**0**	**10**	**7**	**10**	**7**	**0**	**0**
Commercial fishing	2	5	1	2	0	0	0	0	3	2	3	2	0	0
Marine shipping	0	0	2	4	1	3	0	0	3	2	3	2	0	0
Other activity	1	2	2	4	1	3	0	0	4	2	4	3	0	0
Other	**0**	**0**	**0**	**0**	**1**	**3**	**2**	**8**	**3**	**2**	**3**	**2**	**0**	**0**
Unknown	**0**	**0**	**0**	**0**	**1**	**3**	**0**	**0**	**1**	**<1**	**1**	**1**	**0**	**0**

** Includes all injury fatalities other than immersion deaths*
† In 2 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns
‡ Includes boating during recreation and daily life § Included waterskiing 3, riding on tube or other device 9

Table 3 **Boating deaths by cause of death, purpose, and type of boat, Canada, 1991-2008 (n=3,004)**

Type of boat	Immersions*								Trauma†	
	Total immersions (n=2,854)		Drowning without hypothermia (n=2,292)		Drowning and hypothermia (n=498)		Hypothermia without drowning (n=64)		(n=150)	
3a **All purposes (n=3,004)‡**										
	n	%	n	%	n	%	n	%	n	%
Powerboat	**1,720**	**60**	**1,376**	**60**	**301**	**60**	**43**	**67**	**136**	**91**
Small outboard (≤5.5 m)	791	28	625	27	141	28	25	39	28	19
Other small open (e.g. inflatable)	143	5	114	5	22	4	7	11	10	7
Size unknown	306	11	269	12	37	7	0	0	20	13
Large (>5.5 m)	409	14	307	13	92	18	10	16	33	22
Personal watercraft (PWC)	33	1	29	1	4	1	0	0	32	21
Towed by PWC	0	0	0	0	0	0	0	0	3	2
Towed by powerboat	7	<1	7	1	0	0	0	0	9	6
Other powerboat	1	<1	1	<1	0	0	0	0	0	0
Unknown powerboat	30	1	24	1	5	1	1	1	1	1
Unpowered boat	**967**	**34**	**769**	**33**	**179**	**36**	**19**	**30**	**12**	**8**
Canoe	579	20	464	20	103	21	12	19	1	1
Rowboat	96	3	72	3	24	5	0	0	2	1
Sailboat or sailboard	87	3	72	3	14	3	1	1	4	2
Kayak	93	3	60	3	28	6	5	8	1	1
Inflatable	68	2	59	3	8	1	1	1	4	2
Other unpowered boat	35	1	34	1	1	<1	0	0	0	0
Unknown unpowered boat	9	1	8	<1	1	<1	0	0	0	0
Unknown if powered	**167**	**6**	**147**	**6**	**18**	**4**	**2**	**3**	**2**	**1**
3b **Recreational boating§ (n=2,572)**										
	n=2,436	%	n=1,971	%	n=415	%	n=50	%	n=136	%
Powerboat	**1,362**	**56**	**1,106**	**56**	**225**	**54**	**31**	**62**	**122**	**90**
Small outboard (≤5.5 m)	724	30	577	29	127	31	20	40	27	20
Other small open (e.g. inflatable)	128	5	104	5	18	4	6	12	10	7
Size unknown	269	11	238	12	31	7	0	0	20	15
Large (>5.5 m)	179	7	133	7	42	10	4	8	21	15
Personal watercraft	31	1	27	1	4	1	0	0	31	23
Towed by PWC	0	0	0	0	0	0	0	0	3	2
Towed by powerboat	7	<1	7	<1	0	0	0	0	9	7
Other powerboat	1	<1	1	<1	0	0	0	0	0	0
Unknown powerboat	23	1	19	1	3	1	1	2	1	1
Unpowered boat	**933**	**38**	**743**	**38**	**173**	**42**	**17**	**34**	**12**	**9**
Canoe	565	23	455	23	99	24	11	22	1	1
Rowboat	89	4	65	3	24	6	0	0	2	1
Sailboat or sailboard	84	3	70	4	14	3	0	0	4	3
Kayak	90	4	59	3	26	6	5	10	1	1
Inflatable	67	3	58	3	8	2	1	2	4	3
Other unpowered boat	29	1	28	1	1	<1	0	0	0	0
Unknown unpowered boat	9	<1	8	<1	1	<1	0	0	0	0
Unknown if powered	**141**	**6**	**122**	**6**	**17**	**415**	**2**	**4**	**2**	**1**

** Includes drownings and immersion hypothermia deaths † Includes all other injury fatalities ‡ Included 78 immersion fatalities for which the purpose of the activity was rescue 39, other 6, and unknown 33, and 4 trauma fatalities for which the purpose of the activity was other 3, and unknown 1*

§ Includes boating during recreation and daily life

Table 3 **Boating deaths by cause of death, purpose, and type of boat, Canada, 1991-2008 (n=3,004)** (continued)

Type of boat	Immersions* Total immersions (n=2,854)		Drowning without hypothermia (n=2,292)		Drowning and hypothermia (n=498)		Hypothermia without drowning (n=64)		Trauma† (n=150)	
3c **Occupational boating (n=350)**										
	n=340	**%**	**n=259**	**%**	**n=71**	**%**	**n=10**	**%**	**n=10**	**%**
Powerboat	**320**	**94**	**241**	**93**	**70**	**99**	**9**	**90**	**10**	**100**
Small outboard (≤5.5 m)	52	15	38	15	11	15	3	30	1	10
Other small open (e.g. inflatable)	11	3	6	2	4	6	1	10	0	0
Size unknown	26	8	23	9	3	4	0	0	0	0
Large (>5.5 m)	223	66	168	65	50	70	5	50	9	90
Personal watercraft	1	<1	1	<1	0	0	0	0	0	0
Unknown powerboat	7	2	5	2	2	3	0	0	0	0
Unpowered boat	**12**	**4**	**11**	**4**	**0**	**0**	**1**	**10**	**0**	**0**
Canoe	6	2	5	2	0	0	1	10	0	0
Rowboat	5	2	5	2	0	0	0	0	0	0
Other unpowered boat	1	<1	1	<1	0	0	0	0	0	0
Unknown if powered	**8**	**2**	**7**	**3**	**1**	**1**	**0**	**0**	**0**	**0**

** Includes drownings and immersion hypothermia deaths † Includes all other injury fatalities*

Table 4a **Boating deaths* by type of boat and years, Canada 1991-2008 (n=3,004)**

Type of boat	1991-1995 (n=1,099)		1996-2000 (n=888)		2001-2005 (n=672)		2006-2008 (n=345)		1991-2008 (n=3,004)	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Powerboat†	**732**	**67**	**563**	**63**	**379**	**56**	**182**	**53**	**1,856**	**62**
Small outboard (≤5.5 m)	366	33	238	27	137	20	78	23	819	27
Other small open (e.g. inflatable)	42	4	44	5	49	7	19	5	154	5
Size unknown	105	10	114	12	87	13	34	10	340	12
Large (>5.5 m)	181	16	130	15	89	13	43	12	443	15
Personal watercraft	20	2	30	3	11	2	7	2	68	2
Other powerboat	0	0	1	<1	0	0	0	0	1	<1
Unknown powerboat	18	2	6	1	6	1	1	1	31	1
Unpowered boat	**307**	**28**	**282**	**32**	**255**	**38**	**135**	**38**	**979**	**33**
Canoe	199	18	156	18	151	22	74	21	580	20
Rowboat	32	3	38	4	13	2	15	4	98	3
Sailboat or sailboard	25	2	35	4	22	3	9	3	91	3
Kayak	23	2	20	2	33	5	18	5	94	3
Inflatable	17	2	22	3	18	3	15	4	72	2
Other unpowered boat	9	1	9	1	13	2	4	1	35	1
Unknown unpowered boat	2	<1	2	<1	5	1	0	0	9	<1
Unknown if powered	**60**	**5**	**43**	**5**	**38**	**6**	**28**	**8**	**169**	**6**

** Includes death from all causes: drowning, immersion hypothermia, and trauma*

† Includes cases where the victim was being pulled by a powerboat (included waterskiing 5, riding on a tube or other device 14)

Table 4b **Boating immersion deaths* by type of boat and years, Canada 1991-2008 (n=2,854)**										
	1991-1995 (n=1,054)		**1996-2000 (n=838)**		**2001-2005 (n=641)**		**2006-2008 (n=321)**		**1991-2008 (n=2,854)**	
Type of boat	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Powerboat†	**690**	**65**	**516**	**62**	**354**	**55**	**160**	**50**	**1,720**	**60**
Small outboard (≤5.5 m)	356	34	233	28	130	20	72	22	791	28
Other small open (e.g. inflatable)	39	4	38	4	49	8	18	6	144	5
Size unknown	96	9	107	13	79	12	30	9	312	11
Large (>5.5 m)	169	16	118	14	85	13	37	12	409	14
Personal watercraft	12	1	13	2	6	1	2	1	33	1
Other powerboat	0	0	1	<1	0	0	0	0	1	<1
Unknown powerboat	18	1	6	1	5	1	1	<1	30	1
Unpowered boat	**304**	**29**	**279**	**33**	**250**	**39**	**134**	**41**	**967**	**34**
Canoe	198	19	156	19	151	23	74	23	579	20
Rowboat	32	3	38	4	12	2	14	4	96	3
Sailboat or sailboard	25	2	33	4	20	3	9	3	87	3
Kayak	23	2	20	2	32	5	18	6	93	3
Inflatable	15	1	21	3	17	3	15	5	68	2
Other unpowered boat	9	1	9	1	13	2	4	<1	35	1
Unknown unpowered boat	2	<1	2	<1	5	1	0	0	9	1
Unknown if powered	**60**	**6**	**43**	**5**	**37**	**6**	**27**	**8**	**167**	**6**

** Includes drownings and immersion hypothermia deaths*

† Includes cases where the victim was being pulled by a powerboat (included waterskiing 2, riding on tube or other device 5)

Table 4c **Boating trauma deaths* by type of boat and years, Canada 1991-2008 (n=150)**										
	1991-1995 (n=45)		**1996-2000 (n=50)**		**2001-2005 (n=31)**		**2006-2008 (n=24)**		**1991-2008 (n=150)**	
Type of boat	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Powerboat	**42**	**93**	**47**	**94**	**25**	**81**	**22**	**92**	**136**	**91**
Small outboard (≤5.5 m)	10	22	5	10	7	23	6	25	28	19
Other small open (e.g. inflatable)	3	7	6	12	0	0	1	4	10	7
Size unknown	6	13	5	10	7	23	2	8	20	13
Large (>5.5 m)	11	24	12	24	4	13	6	25	33	22
Personal watercraft (PWC)	7	16	16	32	4	13	5	21	32	21
Towed by PWC†	1	2	1	2	1	3	0	0	3	2
Towed by powerboat†	4	9	2	4	1	3	2	8	9	6
Unknown powerboat	0	0	0	0	1	3	0	0	1	1
Unpowered boat	**3**	**7**	**3**	**6**	**5**	**16**	**1**	**4**	**12**	**8**
Canoe	1	2	0	0	0	0	0	0	1	1
Rowboat	0	0	0	0	1	3	1	4	2	1
Sailboat or sailboard	0	0	2	4	2	7	0	0	4	2
Kayak	0	0	0	0	1	3	0	0	1	1
Inflatable	2	5	1	2	1	3	0	0	4	2
Unknown if powered	**0**	**0**	**0**	**0**	**1**	**3**	**1**	**4**	**2**	**1**

** Includes all injury fatalities other than immersion deaths † Included waterskiing 3, riding on tube or other device 9*

Table 5 **Boating deaths* by region, years, and power type, Canada 1991-2008 (n=3,004)†**														
	1991-1995 (n=1,099)		1996-2000 (n=888)		2001-2005 (n=672)		2006-2008 (n=345)		1991-2008 (n=3,004)		Powered boating (n=1,856)		Unpowered boating (n=979)	
Province/territory	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
NFLD & Labrador	69	6	53	6	51	8	24	7	197	6	130	7	55	6
Nova Scotia	81	7	69	8	30	4	23	7	203	7	148	8	35	4
Prince Edward Island	11	1	9	1	3	1	3	1	26	1	15	1	7	1
New Brunswick	42	4	20	2	36	5	11	3	109	4	73	4	30	3
Quebec	177	16	158	18	116	17	53	15	504	17	288	15	186	19
Ontario	294	27	249	28	202	30	112	32	857	28	552	30	276	28
Manitoba	53	5	39	4	38	6	15	4	145	5	87	5	54	6
Saskatchewan	46	4	37	4	22	3	17	5	122	4	58	3	53	5
Alberta	45	4	42	5	36	5	21	6	144	5	70	4	63	6
British Columbia	224	21	184	21	106	16	49	14	563	19	354	19	173	17
Nunavut‡	0	0	4	<1	4	1	1	1	9	<1	8	<1	1	<1
Northwest Territories‡	47	4	14	2	15	2	13	4	89	3	63	3	20	2
Yukon Territory	10	1	10	1	13	2	3	1	36	1	10	1	26	3

** Includes death from all causes: drowning, immersion hypothermia, and trauma*

† In 169 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns

‡ *Nunavut was part of Northwest Territories until 1998*

Table 6 **Recreational boating* deaths† by purpose and year, Canada 1991-2008 (n=2,572)**						
	Recreation‡ (n=2,298)		Daily Life (n=274)		Total deaths§ (n=2,572)	
Year	**n**	**%**	**n**	**%**	**n**	**%**
1991	175	8	18	7	193	8
1992	155	7	47	17	202	8
1993	157	7	19	7	176	7
1994	131	6	35	13	166	6
1995	167	7	12	4	179	7
1996	171	7	12	4	183	7
1997	150	7	12	4	162	6
1998	132	6	22	8	154	6
1999	133	6	11	4	144	6
2000	111	5	9	3	120	5
2001	107	5	9	3	116	5
2002	117	5	11	4	128	5
2003	112	5	9	3	121	5
2004	100	4	20	7	120	5
2005	93	4	4	1	97	4
2006	87	4	8	3	95	4
2007	83	4	8	3	91	4
2008	117	5	8	3	125	5

** Includes boating during recreation and daily life † Includes death from all causes: drowning, immersion hypothermia, and trauma*

‡ Included 5 recreational boaters who died while attempting rescue

§ Some deaths are missing from the database, particularly during 2002-2007. See Table 1

Table 7a **Recreational boating* deaths† by incident, years and source of power, Canada 1991-2008 (n=2,572)‡**

	1991-1995 (n=916)		1996-2000 (n=763)		2001-2005 (n=582)		2006-2008 (n=311)		1991-2008 (n=2,572)		Powered boating (n=1,484)		Unpowered boating (n=945)	
Incident	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Capsized	332	36	294	39	248	43	128	41	1,002	39	421	28	538	57
Fell overboard	245	27	190	25	137	24	79	25	651	25	457	31	142	15
Swamped	110	12	95	12	67	12	33	11	305	12	211	14	85	9
Collision	80	9	67	9	31	5	17	5	195	8	174	12	20	2
Jumped overboard§	2	<1	6	1	6	1	11	4	25	1	15	1	8	1
Other	32	3	33	4	26	4	14	5	105	4	68	5	24	3
Unknown	115	13	78	10	67	12	29	9	289	11	138	9	128	13

** Includes boating during recreation and daily life † Includes death from all causes: drowning, immersion hypothermia, and trauma*
‡ In 143 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns
§ Jumped in to retrieve person or object

Table 7b **Recreational boating* immersion deaths† by incident, years and source of power, Canada 1991-2008 (n=2,436)‡**

	1991-1995 (n=874)		1996-2000 (n=718)		2001-2005 (n=555)		2006-2008 (n=289)		1991-2008 (n=2,436)		Powered boating (n=1,362)		Unpowered boating (n=933)	
Incident	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Capsized	331	38	291	41	247	45	127	44	996	41	419	31	534	57
Fell overboard	240	27	184	26	127	23	76	26	627	26	436	32	139	15
Swamped	110	13	95	13	67	12	33	11	305	12	211	15	85	9
Collision	46	5	32	4	16	3	3	1	97	4	80	6	17	2
Jumped overboard§	2	0	6	1	6	1	11	4	25	1	15	1	8	1
Other	30	3	32	4	25	5	10	4	97	4	63	5	22	2
Unknown	115	13	78	11	67	12	29	10	289	12	138	10	128	14

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ In 141 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns § Jumped in to retrieve person or object

Table 7c **Recreational boating* trauma deaths† by incident, years and source of power, Canada 1991-2008 (n=136)‡**

	1991-1995 (n=42)		1996-2000 (n=45)		2001-2005 (n=27)		2006-2008 (n=22)		1991-2008 (n=136)		Powered boating (n=122)		Unpowered boating (n=12)	
Incident	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Capsized	1	2	3	7	1	4	1	4	6	4	2	2	4	33
Fell overboard	5	12	6	13	10	37	3	14	24	18	21	17	3	25
Collision	34	81	35	78	15	56	14	64	98	72	94	77	3	25
Other	2	5	1	2	1	4	4	18	8	6	5	4	2	17

** Includes boating during recreation and daily life † Includes all injury fatalities other than immersion deaths*
‡ In 2 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns

Table 8 **Recreational boating* immersion deaths† by contributing risk factors,‡ Canada 1991-2008 (n=2,436)§**

	1991-1995 (n=874)		1996-2000 (n=718)		2001-2005 (n=555)		2006-2008 (n=289)		1991-2008 (n=2,436)		Powered boating (n=1,362)		Unpowered boating (n=933)	
Risk factor	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Rough water/ large waves	180	21	188	26	134	24	56	19	558	23	331	24	213	23
Strong winds	132	15	160	22	122	22	58	20	472	19	283	21	178	19
Standing up in craft (other than to urinate)	64	7	80	11	46	8	26	9	216	9	139	10	71	8
Overloaded boat	61	7	70	10	51	9	25	9	207	8	139	10	65	7
Collisions	**43**	**5**	**42**	**6**	**26**	**5**	**12**	**4**	**123**	**5**	**90**	**7**	**33**	**4**
Boat with fixed object	26	3	33	5	24	4	11	4	94	4	67	5	28	3
Boat with another boat	15	2	9	1	2	<1	1	<1	27	1	22	2	5	1
Boat with person (e.g. swimmer)	2	<1	0	0	0	0	0	0	2	<1	1	<1	1	<1
Abrupt turn or other dangerous maneuver	13	1	40	6	43	8	11	4	107	4	75	6	30	3
Victim fell off boat and boat kept going	0	0	19	3	27	5	20	7	66	3	65	5	1**	<1
Urinating (lost balance, etc.)	25	3	18	3	13	2	6	2	62	3	37	3	20	2
Boarding or leaving moored boat	15	2	14	2	16	3	8	3	53	2	24	2	12	1
Engine failure¶	0	0	27	4	18	3	7	2	52	2	46	3	6	1
Starting motor (eg. manual pull cord)	9	1	10	1	4	1	2	1	25	1	22	2	3	<1
Swimming to recover drifted boat	3	<1	7	1	13	2	2	1	25	1	13	1	7	1
Speeding	0	0	7	1	7	1	5	2	19	1	19	1	0	0
Wake of power boat	7	1	2	<1	2	<1	4	1	15	1	12	1	3	<1
Other	232	26	271	38	260	47	228	79	991	41	560	41	386	41
Unknown	347	40	157	22	118	21	28	10	650	27	315	23	279	30

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths ‡ There may have been more than one contributing risk factor per incident § In 141 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns*

*¶ Included 6 boats classified as unpowered: canoe 3, sailboat 3 ** Boat was a sailboat that continued under sail or was using a motor*

Table 9a **Recreational boating* immersion deaths† by personal factors: sex, age, ethnicity, swimming ability, and boating experience, Canada 1991-2008 (n=2,436)‡**

	1991-1995 (n=874)		1996-2000 (n=718)		2001-2005 (n=555)		2006-2008 (n=289)		1991-2008 (n=2,436)		Powered boating (n=1,362)		Unpowered boating (n=933)	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Sex														
Males	814	93	652	91	520	94	269	93	2,255	93	1,253	92	866	93
Females	60	7	64	9	35	6	19	7	178	7	107	8	66	7
Unknown	0	0	2	0	0	0	1	<1	3	<1	2	<1	1	<1
Age group in years														
<1	3	<1	0	0	1	0	0	0	4	<1	3	<1	1	<1
1 to 4	9	1	7	1	1	0	0	0	17	1	14	1	2	<1
5 to 14	18	2	17	2	9	2	8	3	52	2	30	2	21	2
15 to 24	165	19	125	17	97	17	41	14	428	18	171	13	244	26
25 to 34	205	23	141	20	75	14	46	16	467	19	240	18	204	22
35 to 44	185	21	144	20	111	20	43	15	483	20	286	21	171	18
45 to 54	126	14	116	16	115	21	45	16	402	16	245	18	127	14
55 to 64	78	9	89	12	77	14	63	22	307	13	193	14	88	10
65 to 74	61	7	57	8	50	9	27	9	195	8	128	9	54	6
75 +	21	2	18	3	18	3	16	6	73	3	48	4	18	2
Unknown	3	<1	4	1	1	0	0	0	8	<1	4	<1	3	<1
Ethnicity														
Aboriginal, definite	170	19	76	11	67	12	32	11	345	14	207	15	113	12
Aboriginal, probable	0	0	16	2	7	1	5	2	28	1	20	1	7	1
All other	332	38	473	66	378	68	235	81	1,418	58	743	55	591	63
Unknown	372	43	153	21	103	19	17	6	645	27	392	29	222	24
Swimming ability														
Non-swimmer	116	13	79	11	55	10	32	11	282	11	170	12	104	11
Weak swimmer	38	4	51	7	35	6	30	10	154	6	76	6	74	8
Average swimmer	23	3	27	4	22	4	22	8	94	4	50	4	43	5
Strong swimmer	44	5	25	3	14	3	11	4	94	4	39	3	55	6
Swimmer, level unknown	81	9	58	8	49	9	22	8	210	9	105	8	87	9
Unknown	572	65	478	67	380	68	172	59	1,602	66	922	68	570	61
Boating experience														
Experienced boater	181	21	141	20	134	24	69	24	525	22	316	23	179	19
Occasional boater	44	5	49	7	22	4	37	13	152	6	72	5	77	8
Inexperienced boater	30	3	42	6	27	5	23	8	122	5	35	3	87	10
Unknown	619	71	486	68	372	67	160	55	1,637	67	939	69	590	63

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ In 141 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns

Table 9b **Recreational boating* immersion deaths† by personal factors: alcohol and other drugs for victims 15 years and older, Canada 1991-2008 (n=2,363)‡§**

	1991-1995 (n=839)		1996-2000 (n=676)		2001-2005 (n=532)		2006-2008 (n=271)		1991-2008 (n=2,318)		Powered boating (n=1,295)		Unpowered boating (n=889)	
Blood alcohol level¶	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
No alcohol	249	30	280	41	205	39	111	**41**	845	36	448	35	366	41
Below limit	**121**	**14**	**81**	**12**	**71**	**13**	**37**	**14**	**310**	**13**	**178**	14	**115**	13
1-49 mg%	50	6	34	5	18	3	15	**6**	117	5	73	6	39	4
50-80 mg%	34	4	27	4	14	3	8	**3**	83	4	44	3	35	4
Unspecified	37	4	20	3	39	7	14	**5**	110	5	61	5	41	5
Above limit	**226**	**27**	**167**	**25**	**132**	**25**	**74**	**27**	**599**	**26**	**348**	27	**198**	22
81-99 mg %	5	1	13	2	8	2	2	**1**	28	1	14	1	13	1
100-150 mg%	47	6	52	8	27	5	17	**6**	143	6	75	6	60	7
151-200 mg%	64	8	37	5	27	5	20	**7**	148	6	89	7	47	5
201-250 mg%	42	5	32	5	34	6	16	**6**	124	5	70	5	39	4
251-299 mg%	34	4	18	3	17	3	8	**3**	77	3	49	4	21	2
>300 mg%	30	4	15	2	19	4	9	**3**	73	3	46	4	17	2
Unspecified	4	<1	0	0	0	0	2	**1**	6	0	5	0	1	0
Alcohol suspected	**53**	**6**	**44**	**7**	**41**	**8**	**31**	**11**	**169**	**7**	**96**	7	**61**	7
Unknown	190	23	104	15	83	16	18	**7**	395	17	225	17	149	17

	1991-1995 (n= 842)		1996-2000 (n=671)		2001-2005 (n=527)		2006-2008 (n=275)		1991-2008 (n=2,315)		Powered boating (n=1,287)		Unpowered boating (n=893)	
Other drugs	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
No drugs	273	32	229	34	186	35	118	43	806	35	422	33	339	40
Illegal drugs	**39**	**5**	**48**	**7**	**49**	**9**	**29**	**11**	**165**	**7**	**61**	**5**	**94**	**11**
Consumed	23	3	41	6	37	7	25	9	126	5	48	4	71	8
Cannabis/ marijuana	0	0	30	4	26	5	16	6	72	3	23	2	47	5
Cocaine	0	0	9	1	10	2	1	<1	20	1	8	1	10	1
Other (PCP/opiates)	0	0	1	<1	1	<1	3	1	5	<1	2	<1	2	<1
Unknown	23	3	1	<1	0	<1	5	2	29	1	15	1	12	1
Suspected	16	2	7	1	12	2	4	1	39	2	13	1	23	3
Legal drugs	**14**	**2**	**26**	**4**	**16**	**3**	**18**	**7**	**74**	**3**	**38**	**3**	**25**	**3**
Consumed	12	1	21	3	14	3	14	5	61	3	30	2	20	2
Suspected	2	<1	5	1	2	<1	4	1	13	1	8	1	5	1
No suspected drugs	30	4	67	10	28	5	24	9	149	6	91	7	47	5
Unknown	486	58	301	45	248	47	86	31	1,121	48	675	52	388	43

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*

‡ This table excludes victims for whom decomposition rendered blood alcohol unreliable (alcohol 45, drugs 48); 95 victims included in this table had an alcohol reading not clearly attributable to beverage alcohol

§ In 134 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns

¶ "Limit" refers to federal legal limit of 80 mg%; some provinces have lower limits

Table 10a **Recreational boating* immersion deaths† by equipment factors: type of boat and flotation device, Canada 1991-2008 (n=2,436)‡**

	1991-1995 (n=874)		1996-2000 (n=718)		2001-2005 (n=555)		2006-2008 (n=289)		1991-2008 (n=2,436)		Powered boating (n=1,362)		Unpowered boating (n=933)	
Type of boat	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Powerboat	**539**	**62**	**412**	**57**	**279**	**50**	**132**	**46**	**1,362**	**56**	**1,362**	**100**	**0**	**0**
Small outboard (≤5.5 m)	322	37	210	29	122	22	70	24	724	30	724	53	0	0
Other small open (eg. inflatable)	37	4	35	5	39	7	17	6	128	5	128	9	0	0
Size unknown	87	10	92	13	64	12	26	9	269	11	269	20	0	0
Large (>5.5 m)	68	8	53	7	42	8	16	6	179	7	179	13	0	0
Personal watercraft Towed by PWC	11	1	13	2	5	1	2	1	31	1	31	2	0	0
Towed by powerboat	3	<1	2	<1	2	<1	0	0	7	<1	7	1	0	0
Other powerboat	0	0	1	<1	0	0	0	0	1	<1	1	<1	0	0
Unknown powerboat	11	1	6	1	5	1	1	<1	23	1	23	2	0	0
Unpowered boat	**288**	**33**	**269**	**37**	**243**	**44**	**133**	**46**	**933**	**38**	**0**	**0**	**933**	**100**
Canoe	193	22	151	21	148	27	73	25	565	23	0	0	565	61
Rowboat	27	3	37	5	11	2	14	5	89	4	0	0	89	10
Sailboat or sailboard	24	3	31	4	20	4	9	3	84	3	0	0	84	9
Kayak	21	2	20	3	31	6	18	6	90	4	0	0	90	10
Inflatable	15	2	21	3	16	3	15	5	67	3	0	0	67	7
Other unpowered boat	6	1	7	1	12	2	4	1	29	1	0	0	29	3
Unknown unpowered boat	2	0	2	<1	5	1	0	0	9	<1	0	0	9	1
Unknown if powered	**47**	**5**	**37**	**5**	**33**	**6**	**24**	**8**	**141**	**6**	**0**	**0**	**0**	**0**
Lifejacket/PFD														
Not present	243	28	209	29	124	22	82	28	658	27	314	23	323	35
Present, not worn	165	19	161	22	128	23	74	26	528	22	386	28	126	14
Not worn, uncertain if present	131	15	157	22	136	25	48	17	472	19	244	18	185	20
Present, worn properly	102	12	79	11	75	14	40	14	296	12	142	10	147	16
Present, worn improperly	31	4	19	3	18	3	18	6	86	4	46	3	36	4
Unknown	202	23	93	13	74	13	27	9	396	16	230	17	116	12
Other equipment factors														
Victim fully clothed	0	0	351	49	308	55	4	1	663	27	379	28	242	26
Wearing hip waders	3	<1	11	2	4	1	0	0	18	1	11	1	7	1
Engine failure	0	0	4	1	0	0	0	0	4	0	4	0	0	0
Other equipment	101	12	71	10	52	9	96	33	320	13	188	14	123	13
None	467	53	261	36	142	26	2	1	872	36	497	36	332	36
Unknown	303	35	44	6	68	12	189	65	604	25	314	23	242	26

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ In 141 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns

Table 10b **Recreational boating* immersion deaths† by flotation device and region, Canada 1991-2008 (n=2,436)**

Personal flotation device	Not present (n=658)		Present, not worn (n=528)		Not worn, uncertain if present (n=472)		Present, worn properly (n=296)		Present, worn improperly (n=86)		Unknown (n=396)		Total (2,436)
Region	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**
Canada	**658**	**27**	**528**	**22**	**472**	**19**	**296**	**12**	**86**	**4**	**396**	**16**	**2,436**
Atlantic	**70**	**22**	**55**	**17**	**90**	**28**	**37**	**12**	**16**	**5**	**50**	**16**	**318**
NFLD & Labrador	29	25	14	12	33	28	16	14	9	8	16	14	117
Nova Scotia	20	18	16	15	40	36	10	9	2	2	22	20	110
Prince Edward Island	5	33	4	27	1	7	0	0	0	0	5	33	15
New Brunswick	16	21	21	28	16	21	11	14	5	7	7	9	76
Quebec	**173**	**39**	**91**	**20**	**45**	**10**	**62**	**14**	**21**	**5**	**53**	**12**	**445**
Ontario	**185**	**24**	**226**	**30**	**127**	**17**	**63**	**8**	**18**	**2**	**141**	**19**	**760**
Prairies	**114**	**31**	**65**	**18**	**90**	**24**	**36**	**10**	**14**	**4**	**49**	**13**	**368**
Manitoba	51	40	25	19	15	12	10	8	6	5	22	17	129
Saskatchewan	33	31	13	12	37	35	5	5	3	3	16	15	107
Alberta	30	23	27	20	38	29	21	16	5	4	11	8	132
British Columbia	**72**	**17**	**73**	**17**	**108**	**25**	**73**	**17**	**14**	**3**	**87**	**20**	**427**
Territories	**44**	**37**	**18**	**15**	**12**	**10**	**25**	**21**	**3**	**3**	**16**	**14**	**118**
Nunavut‡	0	0	1	33	1	33	1	33	0	0	0	0	3
Northwest Territories‡	36	45	10	13	5	6	12	15	3	4	14	18	80
Yukon Territory	8	23	7	20	6	17	12	34	0	0	2	6	35

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*

‡ Nunavut was part of Northwest Territories until 1998

Table 11a **Recreational boating* immersion deaths† by environmental factors, Canada 1991-2008 (n=2,436)‡**

	1991-1995 (n=874)		1996-2000 (n=718)		2001-2005 (n=555)		2006-2008 (n=289)		1991-2008 (n=2,436)		Powered boating (n=1,362)		Unpowered boating (n=933)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Body of water														
Lake or pond	518	59	424	59	322	58	181	63	1,445	59	855	63	518	56
River, stream, creek, waterfall	182	21	179	25	137	25	71	25	569	23	259	19	282	30
Ocean	155	18	104	14	84	15	26	9	369	15	219	16	112	12
Reservoir, dugout, retention pond	12	1	5	1	5	1	5	2	27	1	16	1	11	1
Canal	2	<1	2	<1	3	1	1	0	8	<1	4	<1	2	<1
Dam, inlet, spillway	2	<1	1	<1	3	1	4	1	10	1	6	<1	4	<1
Other	1	<1	0	0	1	<1	1	0	3	<1	1	<1	2	<1
Unknown	2	<1	3	<1	0	0	0	0	5	<1	2	<1	2	<1
Current for all bodies of water														
Fast/strong current	85	10	107	15	45	8	21	7	258	11	136	10	109	12
Rapids, white water	49	6	35	5	35	6	18	6	137	6	41	1	94	10
Hydraulic current	0	0	1	<1	6	1	4	1	11	<1	0	0	11	1
Waterfall	2	<1	1	<1	5	1	0	0	8	<1	4	<1	4	<1
Dam spillway	1	<1	5	1	3	1	1	<1	10	<1	5	<1	4	<1
Undertow	7	1	7	1	3	1	0	0	17	1	14	1	1	<1
Tide	28	3	54	8	32	6	12	4	126	5	65	5	47	5
Other moving water	4	<1	5	1	10	2	4	1	23	1	14	1	9	1
Not moving water	185	21	266	37	191	34	148	51	790	32	446	33	308	33
Unknown	513	59	237	33	225	41	81	28	1,056	43	637	47	346	37
Current for rivers (n=569)														
	n=182	%	n=179	%	n=137	%	n=71	%	n=569	%	n=259	%	n=282	%
Fast/strong current	45	25	83	46	37	27	20	28	185	33	89	34	86	31
Rapids, white water	45	25	34	19	32	23	18	25	129	23	33	13	94	33
Hydraulic current	0	0	1	1	6	4	3	4	10	2	0	0	10	4
Waterfall	2	1	1	1	5	4	0	0	8	1	4	2	4	1
Dam spillway	0	0	4	2	1	1	0	0	5	1	2	1	2	1
Undertow	2	1	0	0	0	0	0	0	2	<1	2	1	0	0
Tide	0	0	0	0	0	0	3	4	3	1	1	<1	1	<1
Other moving water	2	1	3	2	0	0	3	4	8	1	4	2	4	1
No moving water	3	2	3	2	1	1	4	6	11	2	6	2	3	1
Unknown	83	46	50	28	55	40	20	28	208	37	118	46	78	28
Wind														
Strong winds	193	22	165	23	128	23	55	19	541	22	331	24	194	21
Breeze	99	11	57	8	43	8	12	4	211	9	140	10	64	7
Calm	75	9	55	8	41	7	4	1	175	7	103	8	65	7
Unknown	507	58	441	61	343	62	218	75	1,509	62	788	58	610	65
Waves														
Storm	17	2	38	5	20	4	5	2	80	3	50	4	27	3
Rough	224	26	156	22	107	19	48	17	535	22	324	24	195	21
Choppy	93	11	51	7	50	9	33	11	227	9	134	10	88	9
Calm	83	10	77	11	66	12	64	22	290	12	168	12	111	12
Other	0	0	8	1	1	0	4	1	13	1	10	1	3	<1
Unknown	457	52	388	53	311	54	135	47	1,291	53	676	50	509	55

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*

‡ In 141 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns

Table 11b **Recreational boating* immersion deaths† by environmental factors, Canada 1991-2008 (n=2,436)‡**

	1991-1995 (n=874)		1996-2000 (n=718)		2001-2005 (n=555)		2006-2008 (n=289)		1991-2008 (n=2,436)		Powered boating (n=1,362)		Unpowered boating (n=933)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Water Temperature														
Extremely cold (<10C)	158	18	205	29	103	19	59	20	525	22	282	21	215	23
Cold or cool (10 to 20C)	139	16	106	15	110	20	85	29	440	18	245	18	170	18
Warm/Hot (≥21C)	10	1	4	1	12	2	12	4	38	2	17	1	21	2
Unknown	567	65	403	56	330	59	133	46	1,433	59	818	60	527	56
Air Temperature§														
Extremely Cold (≤-6°C)	15	2	6	1	6	1	0	0	27	1	18	1	9	1
Very cold (-5 – +5°C)	17	2	32	4	15	3	2	1	66	3	38	3	27	3
Cool/Cold (-5 – +14°C)	44	5	0	0	0	0	0	0	44	2	23	2	20	2
Cold (6 – 15°C)	59	7	58	8	47	8	1	<1	165	7	99	7	55	6
Moderate/Warm (15 – 32°C)	30	3	0	0	0	0	0	0	30	1	24	2	5	1
Moderate (16 – 27°C)	43	5	53	7	35	6	4	1	135	6	62	5	62	7
Hot (≥28°C)	5	1	6	1	4	1	1	<1	16	1	6	0	9	1
Unknown	661	76	563	78	448	81	281	97	1,953	80	1,092	80	746	80
Weather														
Snowing	2	<1	4	1	1	<1	1	<1	8	<1	7	1	1	<1
Foggy	14	2	10	1	8	1	0	0	32	1	19	1	13	1
Raining	49	6	32	4	19	3	10	3	110	5	70	5	34	4
Cloudy	62	7	44	6	19	3	3	1	128	5	74	5	51	5
Clear	102	12	87	12	75	14	3	1	267	11	152	11	106	11
Other	20	2	11	2	10	2	2	1	43	2	29	2	12	1
Unknown	625	71	530	74	423	76	270	93	1,848	76	1,011	74	716	77
Light Conditions														
Dark	174	20	111	15	83	15	37	13	405	17	224	16	147	16
Twilight	81	9	79	11	49	9	25	9	234	10	141	10	86	9
Light	385	44	406	57	317	57	176	61	1,284	53	721	53	508	54
Unknown	234	27	122	17	106	19	51	18	513	21	276	20	192	21
Time of Incident														
Reported/known	197	23	215	30	166	30	82	28	660	27	382	28	255	27
Estimated	396	45	269	37	170	31	106	37	941	39	511	38	372	40
Unknown	281	32	234	33	219	39	101	35	835	34	469	34	306	33
Place Occurred														
Rural	673	77	535	75	419	75	203	70	1,830	75	1,060	78	675	72
Urban	188	22	158	22	133	24	85	29	564	23	284	21	238	26
Unknown	13	1	25	3	3	1	1	<1	42	2	18	1	20	2
Water depth														
0-1 meter (0-3.2ft)	8	1	6	1	11	2	5	2	30	1	15	1	13	1
1.1-2.5 m (3.3-8.1ft)	54	6	30	4	25	5	19	7	128	5	66	5	56	6
>2.5 m (8.1 ft)	288	33	256	36	186	34	117	40	847	35	520	38	284	30
Unknown	524	60	426	59	333	60	148	51	1,431	59	761	56	580	62
Distance to shore														
0-2 metres (0-6ft)	36	4	23	3	22	4	14	5	95	4	55	4	21	2
2.1-15 m (7-49ft)	71	8	50	7	41	7	15	5	177	7	87	6	82	9
16-50 m (50-162ft)	78	9	51	7	37	7	26	9	192	8	95	7	90	10
>50 m (162ft)	214	25	175	24	94	17	75	26	558	23	342	25	200	21
Unknown	475	54	419	58	361	65	159	55	1,414	58	783	57	540	58

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ In 141 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns
§ The overlap of temperatures in this table is due to the fact that classification categories were revised in 1993

Table 11c **Recreational boating* immersion deaths† by environmental factors, Canada, 1991-2008 (n=2,436)‡**														
	1991-1995 (n=874)		**1996-2000 (n=718)**		**2001-2005 (n=555)**		**2006-2008 (n=289)**		**1991-2008 (n=2,436)**		**Power boating (n=1,362)**		**Unpowered boating (n=933)**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Day of week														
Monday	96	11	69	10	53	10	38	13	256	11	151	11	87	9
Tuesday	96	11	61	8	57	10	33	11	247	10	137	10	94	10
Wednesday	103	12	61	8	51	9	27	9	242	10	139	10	90	10
Thursday	95	11	81	11	55	10	43	15	274	11	160	12	97	10
Friday	109	12	82	11	79	14	25	9	295	12	166	12	116	12
Saturday	206	23	176	25	144	26	70	24	596	24	333	24	228	24
Sunday	162	18	165	23	112	20	53	18	492	20	258	19	206	22
Unknown	7	2	23	3	4	1	0	0	34	1	18	1	15	2
Month														
January	7	1	8	1	8	1	3	1	26	1	17	1	6	1
February	7	1	3	<1	7	1	2	1	19	1	10	1	8	1
March	18	2	16	2	11	2	2	1	47	2	18	1	26	3
April	38	4	34	5	21	4	18	6	111	5	46	3	58	6
May	114	13	129	18	82	15	49	17	374	15	190	14	160	17
June	155	18	123	16	107	19	57	20	442	18	257	19	160	17
July	160	18	109	15	117	21	49	17	435	18	232	17	179	19
August	136	15	91	13	81	15	36	12	344	14	209	15	113	12
September	100	11	96	13	59	11	40	14	295	12	183	13	92	10
October	99	11	67	9	44	8	26	9	236	10	142	10	86	9
November	29	3	29	3	14	3	5	2	77	3	45	3	28	3
December	8	1	9	1	4	1	2	1	23	1	12	1	11	1
Unknown	3	1	4	3	0	0	0	0	7	0	1	0	6	1
Date of pronounced death														
Date of incident	465	53	367	51	280	50	102	35	1,214	50	656	48	480	51
Different date	356	41	325	45	256	46	170	59	1,107	45	625	46	423	45
Presumed dead§	26	3	26	4	19	3	4	1	75	3	55	4	19	2
Unknown	27	3	0	0	0	0	13	5	40	2	26	2	11	1

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ In 141 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns § Body never recovered

Table 11d **Recreational boating* immersion deaths† by environmental factors, Canada, 1991-2008 (n=2,436)‡**

	1991-1995 (n=874)		1996-2000 (n=718)		2001-2005 (n=555)		2006-2008 (n=289)		1991-2008 (n=2,436)		Power boating (n=1,362)		Unpowered boating (n=933)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Region														
Atlantic	110	12	89	12	81	15	38	13	318	13	165	12	119	13
Quebec	154	18	140	19	102	18	49	17	445	18	241	18	179	19
Ontario	266	30	221	31	176	32	97	34	760	31	469	34	266	29
Prairies	120	14	108	15	90	16	50	17	368	15	185	14	160	17
British Columbia	172	20	137	19	79	14	39	13	427	18	232	17	166	18
Territories	52	6	23	3	27	5	16	6	118	5	70	5	43	5
Location														
Open water	222	25	0	0	0	0	0	0	222	9	153	11	65	7
Cottage/cabin	54	6	46	6	31	6	19	7	150	6	75	6	73	8
Provincial park	54	6	33	5	28	5	23	8	138	6	51	4	81	9
Aboriginal reserve	30	3	46	6	27	5	14	5	117	5	67	5	42	5
Marina	17	2	26	4	17	3	9	3	69	3	40	3	18	2
Municipal park	26	3	10	1	12	2	4	1	52	2	18	1	31	3
Conservation area	20	2	8	1	17	3	12	4	57	2	37	3	20	2
Private campground	10	1	11	2	10	2	5	2	36	1	17	1	16	2
Private residence	8	1	10	1	7	1	11	4	36	1	6	0	24	3
National park	6	1	4	1	7	1	5	2	22	1	7	1	15	2
All other locations	298	34	452	63	340	61	164	57	1,254	51	726	53	455	49
Unknown	129	15	72	10	59	11	23	8	283	12	165	12	93	10
Accompaniment														
Alone	218	25	186	26	157	28	91	31	652	27	363	27	232	25
≥1 adult companions	510	58	437	61	326	59	170	59	1,443	59	814	60	557	60
≥1 adults and minors	52	6	52	7	24	4	13	4	141	6	108	8	33	4
≥1 minors	38	4	15	2	18	3	6	2	77	3	25	2	49	5
≥1 adult bystanders	19	2	12	2	4	1	4	1	39	2	22	2	14	2
Others-age unknown	26	3	15	2	24	4	3	1	68	3	23	2	42	5
Unknown	11	1	1	<1	2	<1	2	1	16	1	7	1	6	1

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ In 141 cases it was unknown if the boat was powered or unpowered; they were excluded from the two right columns

Table 12a **Recreational boating* deaths†: type of incident for personal watercraft compared with other boats, Canada, 1991-2008 (n=2,572)‡§**

	All boats (n=2,572)		Personal watercraft (n=65)		Other powerboats (n=1,419)		Unpowered boats (n=945)	
	n	%	n	%	n	%	n	%
Type of incident								
Capsized	**1,002**	**39**	**4**	**6**	**417**	**29**	**538**	**57**
Boat with fixed object	23	1	0	0	12	1	11	1
Fell overboard	**651**	**25**	**21**	**32**	**436**	**31**	**142**	**15**
Boat with fixed object	7	<1	0	0	3	<1	4	<1
Boat with person	5	<1	0	0	5	<1	0	0
Waterskiiing/tubing¶	3	<1	1	2	2	<1	0	0
Swamped	**305**	**12**	**1**	**2**	**210**	**15**	**85**	**9**
Boat with another boat	1	<1	0	0	1	<1	0	0
Boat with fixed object	6	<1	0	0	3	<1	3	<1
Collision	**195**	**8**	**34**	**52**	**140**	**10**	**20**	**2**
Boat with another boat	71	3	22	34	40	3	8	1
Boat with fixed object	91	4	7	11	77	5	7	1
Boat with person	2	<1	0	0	1	<1	1	<1
Waterskiing/tubing¶	10	<1	2	3	8	1	0	0
Other	21	1	3	5	14	1	4	<1
Jumped overboard**	**25**	**1**	**0**	**0**	**15**	**1**	**8**	**1**
Waterskiing/tubing¶	1	0	0	0	1	<1	0	0
Other	**105**	**4**	**1**	**2**	**67**	**5**	**24**	**3**
Boat with fixed object	3	<1	0	0	0	0	3	<1
Boat with person	1	<1	0	0	1	<1	0	0
Waterskiing/tubing¶	4	<1	0	0	4	<1	0	0
Unknown	**289**	**11**	**4**	**6**	**134**	**9**	**128**	**13**
Boat with fixed object	1	<1	0	0	1	<1	0	0
Waterskiing/tubing¶	1	<1	0	0	1	<1	0	0

** Includes boating during recreation and daily life † Includes death from all causes: drowning, immersion hypothermia, and trauma*
‡ In 143 cases it was unknown if the boat involved was a personal watercraft, another powerboat, or an unpowered boat
§ There were 11 propeller injuries identified: 8 fell overboard, 1 capsized, 1 collision, and 1 swamped
*¶ Included waterskiing 5, riding on tube or other device 14 **Jumped in to retrieve person or object*

Table 12b **Recreational boating* immersion deaths†: type of incident for personal watercraft compared with other boats, Canada, 1991-2008 (n=2,436)‡ §**

	All boats (n=2,436)		Personal watercraft (n=31)		Other powerboats (n=1,331)		Unpowered boats (n=933)	
	n	%	n	%	n	%	n	%
Type of incident								
Capsized	**996**	**41**	**4**	**13**	**415**	**31**	**534**	**57**
Boat with fixed object	23	1	0	0	12	1	11	1
Fell overboard	**627**	**26**	**17**	**55**	**419**	**31**	**139**	**15**
Boat with fixed object	7	<1	0	0	3	<1	4	<1
Boat with person	1	<1	0	0	1	<1	0	0
Waterskiing/tubing¶	2	<1	0	0	2	<1	0	0
Swamped	**305**	**12**	**1**	**3**	**210**	**16**	**85**	**9**
Boat with another boat	1	<1	0	0	1	<1	0	0
Boat with fixed object	6	<1	0	0	3	<1	3	<1
Collision	**97**	**4**	**4**	**13**	**76**	**6**	**17**	**2**
Boat with another boat	26	1	2	6	19	1	5	1
Boat with fixed object	54	2	1	3	46	3	7	1
Boat with person	1	<1	0	0	0	0	1	<1
Waterskiing/tubing¶	1	<1	0	0	1	<1	0	0
Other	15	1	1	3	10	1	4	<1
Jumped overboard**	**25**	**1**	**0**	**0**	**15**	**1**	**8**	**1**
Waterskiing/tubing¶	1	<1	0	0	1	<1	0	0
Other	**97**	**4**	**1**	**3**	**62**	**5**	**22**	**2**
Boat with fixed object	2	<1	0	0	0	0	2	<1
Waterskiing/tubing¶	2	<1	0	0	2	0	0	0
Unknown	**289**	**12**	**4**	**13**	**134**	**10**	**128**	**14**
Boat with fixed object	1	<1	0	0	1	<1	0	0
Waterskiing/tubing¶	1	<1	0	0	1	<1	0	0

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*

‡ In 141 cases it was unknown if the boat involved was a personal watercraft, another powerboat, or an unpowered boat

§ There were 5 propeller injuries identified: 3 fell overboard, 1 capsized and 1 swamped

*¶ Included waterskiing 2, riding on tube or other device 5 ** Jumped in to retrieve person or object*

Table 12c **Recreational boating* trauma deaths†: type of incident for personal watercraft compared with other boats, Canada, 1991-2008 (n=136)‡§**

	All boats (n=136)		Personal watercraft (n=34)		Other powerboats (n=88)		Unpowered boats (n=12)	
	n	%	n	%	n	%	n	%
Type of incident								
Capsized	**6**	**4**	**0**	**0**	**2**	**2**	**4**	**33**
Fell overboard	**24**	**18**	**4**	**12**	**17**	**19**	**3**	**25**
Boat with person	4	1	0	0	4	2	0	0
Waterskiing/tubing¶	1	1	1	3	0	0	0	0
Collision	**98**	**72**	**30**	**88**	**64**	**73**	**3**	**25**
Boat with another boat	45	33	20	59	21	24	3	25
Boat with fixed object	37	27	6	18	31	35	0	0
Boat with person (eg. swimmer)	1	1	0	0	1	6	0	0
Waterskiing/tubing¶	9	7	2	6	7	8	0	0
Other	6	6	2	6	4	5	0	0
Other	**8**	**6**	**0**	**0**	**5**	**6**	**2**	**17**
Boat with fixed object	1	1	0	0	0	0	1	8
Waterskiing/tubing¶	2	1	0	0	2	2	0	0

** Includes boating during recreation and daily life † Includes all injury fatalities other than immersion deaths*
‡ In 2 cases it was unknown if the boat involved was a personal watercraft, another powered boat, or an unpowered boat
§ There were 6 propeller injuries identified: 5 fell overboard, 1 collision
¶ Included waterskiing 9, riding on tube or other device 3

Table 12d **Recreational boating* trauma deaths†: autopsy and coroner findings for nature of injury for personal watercraft compared with other boats, Canada, 1991-2008 (n=136)‡§**

	All boats (n=136)		Personal watercraft (n=34)		Other powerboats (n=88)		Unpowered boats (n=12)	
	n	%	n	%	n	%	n	%
Nature of Injury¶								
Head injuries	61	45	11	32	44	50	6	50
Spinal Injuries	13	10	6	18	7	8	0	0
Fractures/dislocation	18	13	4	12	13	15	1	8
Major lacerations	32	24	9	26	20	23	3	25
Other injuries	36	26	9	26	25	28	2	17
No injuries	2	1	0	0	2	2	0	0
Drowning/hypothermia**	33	24	2	6	27	31	4	33
Unknown	29	21	12	35	15	17	2	17

** Includes boating during recreation and daily life † Includes all injury fatalities other than immersion deaths*
‡ In 2 cases it was unknown if the boat involved was a personal watercraft, another powered boat, or an unpowered boat
§ There were 6 propeller injuries identified: 5 fell overboard, 1 collision
*¶ There may have been more than one injury per victim ** Drowning/hypothermia was secondary to traumatic injury*

Table 13a **Recreational boating* deaths†: personal factors for personal watercraft compared with other boats, Canada, 1991-2008 (n=2,572)‡**

	All boats (n=2,572)		Personal watercraft (n=65)		Other powerboats (n=1,419)		Unpowered boats (n=945)	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Age								
<1	5	0	0	0	4	0	1	0
1 to 4	21	1	1	2	17	1	2	0
5 to14	63	2	7	11	34	2	21	2
15 to 24	461	18	20	31	179	13	249	26
25 to 34	491	19	14	22	247	17	207	22
35 to 44	510	20	13	20	299	21	172	18
45 to 54	422	16	6	9	256	18	129	14
55 to 64	315	12	3	5	197	14	89	9
65 to 74	199	8	1	2	130	9	54	6
75 +	77	3	0	0	52	4	18	2
Unknown	8	0	0	0	4	0	3	0
Sex								
Male	2,358	92	55	85	1,291	91	875	93
Female	211	8	10	15	126	9	69	7
Unknown	3	0	0	0	2	0	1	0
Blood alcohol level§ for victims 15 years and older (n=2,438)¶								
	n=2,438		n=57		n=1,344		n=901	
No alcohol	891	37	24	42	460	34	376	42
Below limit	**327**	13	**9**	16	**185**	14	**116**	13
1-49 mg%	129	5	4	7	81	6	39	4
50-80 mg%	87	3	2	4	45	3	36	4
Unspecified	111	5	3	5	59	4	41	5
Above limit	**633**	26	**15**	26	**367**	27	**198**	22
Alcohol suspected	**178**	7	**5**	9	**99**	7	**61**	7
Unknown	409	17	4	7	233	17	150	17
Swimming ability								
Non-swimmer	286	11	3	5	171	12	104	11
Weak swimmer	154	6	3	5	73	5	74	8
Average swimmer	96	4	4	6	48	3	43	5
Strong swimmer	96	4	1	2	39	3	56	6
Swimmer, level unknown	217	8	6	9	105	7	88	9
Unknown	1,723	67	48	74	983	69	580	61
Boating experience								
Experienced boater	550	21	10	15	326	23	184	19
Occasional boater	155	6	1	2	73	5	78	8
Inexperienced boater	134	5	15	23	32	2	87	9
Unknown	1,733	67	39	60	988	70	596	63
Ethnicity								
Aboriginal, definite	348	14	2	3	208	15	113	12
Aboriginal, probable	28	1	0	0	20	1	7	1
All other	1,506	59	45	69	775	55	601	64
Unknown	690	27	18	28	416	29	224	24

** Includes boating during recreation and daily life † Includes death from all causes: drowning, immersion hypothermia, and trauma*
‡ In 143 cases it was unknown if the boat was a personal watercraft, another powerboat, or an unpowered boat
§ "Limit" refers to federal legal limit of 80 mg%; some provinces have lower limits
¶ This table excludes 47 victims for whom decomposition rendered blood alcohol unreliable;
96 victims included in this table had an alcohol reading not clearly attributable to beverage alcohol

Table 13b **Recreational boating* immersion deaths†: personal factors for personal watercraft compared with other boats, Canada, 1991-2008 (n=2,436)‡**

	All boats (n=2,436)		Personal watercraft (n=31)		Other powerboats (n=1,331)		Unpowered boats (n=933)	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Age								
<1	4	0	0	0	3	0	1	0
1 to 4	17	1	1	3	13	1	2	0
5 to 14	52	2	1	3	29	2	21	2
15 to 24	428	18	9	29	162	12	244	26
25 to 34	467	19	8	26	232	17	204	22
35 to 44	483	20	7	23	279	21	171	18
45 to 54	402	17	3	10	242	18	127	14
55 to 64	307	13	2	6	191	14	88	9
65 to 74	195	8	0	0	128	10	54	6
75 +	73	3	0	0	48	4	18	2
Unknown	8	0	0	0	4	0	3	0
Sex								
Male	2,255	93	30	97	1,223	92	866	93
Female	178	7	1	3	106	8	66	7
Unknown	3	0	0	0	2	0	1	0
Blood alcohol level§ for victims 15 years and older (n=2,363)¶								
	n=2,318		n=29		n=1,266		n=889	
No alcohol	845	36	9	31	439	35	366	41
Below limit	**310**	13	7	24	**171**	14	**115**	13
1-49 mg%	117	5	3	10	70	6	39	4
50-80 mg%	83	4	2	7	42	3	35	4
Below limit, unsp.	110	5	2	7	59	5	41	5
Above limit	**599**	26	**10**	34	**347**	27	**206**	23
Alcohol suspected	**169**	7	**0**	0	**96**	8	**61**	7
Unknown	395	17	3	10	222	18	149	17

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ In 141 cases it was unknown if the boat was a personal watercraft, another powerboat, or an unpowered boat
§ "Limit" refers to federal legal limit of 80 mg%; some provinces have lower limits
¶ This table excludes 45 victims for whom decomposition rendered blood alcohol unreliable; 95 victims included in this table had an alcohol reading not clearly attributable to beverage alcohol

Table 13c **Recreational boating* trauma deaths†: personal factors for personal watercraft compared with other boats, Canada, 1991-2008 (n=136)‡**

	All boats (n=136)		Personal watercraft (n=34)		Other powerboats (n=88)		Unpowered boats (n=12)	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Age								
<1	1	1	0	0	1	1	0	0
1 to 4	4	3	0	0	4	4	0	0
5 to 14	11	8	6	18	5	6	0	0
15 to 24	33	24	11	32	17	19	5	42
25 to 34	24	18	6	18	15	17	3	25
35 to 44	27	20	6	18	20	22	1	8
45 to 54	20	15	3	9	14	16	2	17
55 to 64	8	6	1	3	6	7	1	8
65 to 74	4	3	1	3	2	3	0	0
75 +	4	3	0	0	4	4	0	0
Sex								
Male	103	76	25	74	68	78	9	75
Female	33	24	9	26	20	22	3	25
Boating experience								
Experienced boater	25	18	5	15	15	17	5	42
Occasional boater	3	2	1	3	1	1	1	8
Inexperienced boater	12	9	10	29	2	2	0	0
Unknown	96	71	18	53	70	80	6	50
Blood alcohol level§ for victims 15 years and older (n=120)¶								
	n=120		n=28		n=78		n=12	
No alcohol	46	38	15	54	21	27	10	83
Below limit	**17**	14	**2**	7	**14**	18	**1**	8
1-49 mg%	12	10	1	4	11	14	0	0
50-80 mg%	4	3	0	0	3	4	1	8
Below limit, unsp.	1	1	1	4	0	0	0	0
Above limit	**34**	28	**5**	18	**29**	37	**0**	0
Alcohol suspected	**9**	8	**5**	18	**3**	4	**0**	0
Unknown	14	12	1	4	11	14	1	8

** Includes boating during recreation and daily life † Includes all injury fatalities other than immersion deaths*

‡ In 2 cases it was unknown if the boat involved was a personal watercraft, another powerboat, or an unpowered boat

§ "Limit" refers to federal legal limit of 80 mg%; some provinces have lower limits

¶ 1 victim included in this table had an alcohol reading not clearly attributable to beverage alcohol

Table 14a **Recreational boating* deaths† by equipment factors: flotation device for personal watercraft compared with other boats, Canada 1991-2008 (n=2,572)‡**

	All boats (n=2,572)		Personal watercraft (n=65)		Other powerboats (n=1,419)		Unpowered boats (n=945)	
	n	%	n	%	n	%	n	%
Lifejacket/PFD								
Not present	663	26	15	23	304	21	323	34
Present, not worn	547	21	5	8	399	28	127	13
Not worn, uncertain if present	490	19	5	8	255	18	187	20
Worn properly	330	13	25	38	145	10	153	16
Worn improperly	88	3	2	3	45	3	37	4
Irrelevant	3	0	0	0	2	0	0	0
Unknown	451	18	13	20	269	19	118	12

** Includes boating during recreation and daily life † Includes death from all causes: drowning, immersion hypothermia, and trauma*
‡ In 143 cases it was unknown if the boat was a personal watercraft, another powerboat, or an unpowered boat

Table 14b **Recreational boating* immersion deaths† by equipment factors: flotation device for personal watercraft compared with other boats, Canada 1991-2008 (n=2,436)‡**

	All boats (n=2,436)		Personal watercraft (n=31)		Other powerboats (n=1,331)		Unpowered boats (n=933)	
	n	%	n	%	n	%	n	%
Lifejacket/PFD								
Not present	658	27	12	39	302	23	323	35
Present, not worn	528	22	3	10	383	29	126	14
Not worn, uncertain if present	472	19	5	16	239	18	185	20
Worn properly	296	12	8	26	134	10	147	16
Worn improperly	86	4	2	6	44	3	36	4
Irrelevant	3	0	0	0	2	0	0	0
Unknown	393	16	1	3	227	17	116	12

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ In 141 cases it was unknown if the boat was a personal watercraft, another powerboat, or an unpowered boat

Table 14c **Recreational boating* trauma deaths† by equipment factors: flotation device for personal watercraft compared with other boats, Canada 1991-2008 (n=136)‡**

	All boats (n=136)		Personal watercraft (n=34)		Other powerboats (n=88)		Unpowered boats (n=12)	
	n	%	n	%	n	%	n	%
Lifejacket/PFD								
Not present	5	4	3	9	2	2	0	0
Present, not worn	19	14	2	6	16	18	1	8
Not worn, uncertain if present	18	13	0	0	16	18	2	17
Worn properly	34	25	17	50	11	13	6	50
Worn improperly	2	1	0	0	1	1	1	8
Unknown	58	43	12	35	42	48	2	17

** Includes boating during recreation and daily life † Includes all injury fatalities other than immersion deaths*
‡ In 2 cases it was unknown if the boat was a personal watercraft, another powerboat, or an unpowered boat

Table 15a **Recreational boating* deaths†: environmental factors for personal watercraft compared with other boats, Canada, 1991-2008 (n=2,572)‡**

	All boats (n=2,572)		Personal watercraft (n=65)		Other powerboats (n=1,419)		Unpowered boats (n=945)	
	n	%	n	%	n	%	n	%
Body of water								
Lake	1,530	59	44	68	892	63	522	55
River	599	23	13	20	269	19	288	30
Ocean	384	15	6	9	226	16	113	12
Other	52	2	1	2	29	2	20	2
Unknown	7	0	1	2	3	0	2	0
Day of week								
Monday	269	10	6	9	155	11	90	10
Tuesday	257	10	1	2	145	10	95	10
Wednesday	251	10	5	8	140	10	93	10
Thursday	286	11	7	11	164	12	98	10
Friday	321	12	10	15	181	13	116	12
Saturday	632	25	16	25	349	25	231	24
Sunday	522	20	20	31	267	19	207	22
Unknown	34	1	0	0	18	1	15	2
Month								
January	26	1	0	0	17	1	6	1
February	19	1	0	0	10	1	8	1
March	48	2	0	0	19	1	26	3
April	113	4	1	2	47	3	58	6
May	386	15	9	14	192	14	161	17
June	463	18	6	9	271	19	161	17
July	478	19	21	32	249	18	184	19
August	382	15	21	32	224	16	114	12
September	310	12	6	9	187	13	96	10
October	238	9	1	2	143	10	86	9
November	78	3	0	0	46	3	28	3
December	24	1	0	0	13	1	11	1
Unknown	7	0	0	0	1	0	6	1
Region								
Atlantic	327	13	5	8	168	12	120	13
Quebec	470	18	17	26	247	17	181	19
Ontario	812	32	17	26	500	35	269	28
Prairies	381	15	13	20	183	13	162	17
British Columbia	464	18	13	20	251	18	170	18
Territories	118	5	0	0	70	5	43	5
Accompaniment								
Alone	679	26	9	14	378	27	235	25
≥1 adult companions	1,520	59	34	52	848	60	564	60
≥1 adults and minors	153	6	5	8	113	8	35	4
≥1 minors	82	3	6	9	24	2	49	5
≥1 adult bystanders	43	2	4	6	22	2	14	1
Others – age unknown	78	3	7	11	26	2	42	4
Unknown	17	1	0	0	8	1	6	1

** Includes boating during recreation and daily life † Includes death from all causes: drowning, immersion hypothermia, and trauma*
‡ In 143 cases it was unknown if the boat was a personal watercraft, another powerboat, or an unpowered boat

Table 15a **Recreational boating* deaths†: environmental factors for personal watercraft compared with other boats, Canada, 1991-2008 (n=2,572)‡** (continued)

	All boats (n=2,572)		Personal watercraft (n=65)		Other powerboats (n=1,419)		Unpowered boats (n=945)	
	n	%	n	%	n	%	n	%
Wind								
Strong winds	550	21	1	1	337	24	196	21
Breeze	218	8	7	11	139	10	65	7
Calm	196	8	5	8	119	8	65	7
Unknown	1,608	63	52	80	824	58	619	65
Waves								
Storm	81	3	0	0	51	4	27	3
Rough	547	21	3	5	327	23	201	21
Choppy	233	9	7	11	133	9	88	9
Calm	323	13	8	12	191	13	113	12
Other	15	1	1	1	10	1	4	<1
Unknown	1,373	53	46	71	707	50	512	54
Light Conditions								
Dark	441	17	5	8	253	18	148	16
Twilight	249	10	8	12	148	10	86	9
Light	1,355	53	47	72	734	52	518	55
Unknown	527	20	5	8	284	20	193	20

** Includes boating during recreation and daily life † Includes death from all causes: drowning, immersion hypothermia, and trauma*
‡ In 143 cases it was unknown if the boat was a personal watercraft, another powerboat, or an unpowered boat

Table 15b **Recreational boating* immersion deaths†: environmental factors for personal watercraft compared with other boats, Canada, 1991-2008 (n=2,436)‡**

	All boats (n=2,436)		Personal watercraft (n=31)		Other powerboats (n=1,331)		Unpowered boats (n=933)	
	n	%	n	%	n	%	n	%
Body of Water								
Lake	1,445	59	19	61	836	63	518	56
River	569	23	8	26	251	19	282	30
Ocean	369	15	4	13	215	16	112	12
Other	48	2	0	0	27	2	19	2
Unknown	5	0	0	0	2	0	2	0
Water Temperature								
Extremely cold (<10C)	525	21	4	13	278	21	215	23
Cold or cool (10 to 20C)	440	18	3	10	242	18	170	18
Warm/Hot (≥21C)	38	2	2	6	15	1	21	2
Unknown	1,433	59	22	71	796	60	527	57
Air Temperature§								
Extremely Cold (≤-6°C)	27	1	0	0	18	1	9	1
Very cold (-5 – +5°C)	66	3	0	0	38	3	27	3
Cool/Cold (-5 – +14°C)	44	2	0	0	23	2	20	2
Cold (6 – 15°C)	165	7	2	7	97	7	55	6
Moderate/Warm (15 – 32°C)	30	1	2	7	22	2	5	<1
Moderate (16 – 27°C)	135	5	2	7	60	5	62	7
Hot (≥28°C)	16	1	1	3	5	<1	9	1
Unknown	1,953	80	24	77	1,068	80	746	80

** Includes boating during recreation and daily life † Includes drownings and immersion hypothermia deaths*
‡ In 141 cases it was unknown if the boat was a personal watercraft, another powerboat, or an unpowered boat
§ The overlap of temperatures in this table is due to the fact that classification categories were revised in 1993

Table 15c **Recreational boating* trauma deaths†: environmental factors for personal watercraft compared with other boats, Canada, 1991-2008 (n=136)‡**

	All boats (n=136)		Personal watercraft (n=34)		Other powerboats (n=88)		Unpowered boats (n=12)	
	n	%	n	%	n	%	n	%
Body of Water								
Lake	85	62	25	74	56	63	4	33
River	30	22	5	15	18	20	6	50
Ocean	15	12	2	6	11	13	1	8
Other	4	3	1	3	2	2	1	8
Unknown	2	1	1	3	1	1	0	0
Wind								
Strong winds	9	7	0	0	7	8	2	17
Breeze	7	5	2	6	4	4	1	8
Calm	21	15	4	12	17	19	0	0
Unknown	99	73	28	82	60	69	9	75
Waves								
Storm	1	1	0	0	1	1	0	0
Rough	12	9	0	0	6	7	6	50
Choppy	6	4	2	6	4	4	0	0
Calm	33	24	5	15	26	29	2	17
Other	2	1	1	3	0	0	1	8
Unknown	82	61	26	76	51	58	3	25
Water Temperature								
Extremely cold (<10C)	10	8	0	0	7	9	2	17
Cold or cool (10 to 20C)	16	12	7	21	6	7	3	25
Warm/Hot (≥21C)	7	5	2	6	4	4	1	8
Unknown	103	75	25	74	71	80	6	50
Air Temperature§								
Extremely Cold (≤-6C)	1	1	0	0	0	0	1	8
Cold (+6 to +15C)	2	1	0	0	1	1	1	8
Moderate (16C to 27C)	23	17	5	15	17	19	1	8
Hot (≥28C)	2	1	1	3	1	1	0	0
Unknown	108	80	28	82	69	79	9	75
Light Conditions								
Dark	36	26	2	6	32	36	1	8
Twilight	15	11	4	12	11	12	0	0
Light	71	52	26	76	34	38	10	83
Unknown	14	11	2	6	11	13	1	8
Month								
March	1	1	0	0	1	1	0	0
April	2	1	1	3	1	1	0	0
May	12	9	4	12	7	8	1	8
June	21	15	4	12	16	18	1	8
July	43	31	9	26	29	33	5	42
August	38	28	14	41	22	25	1	8
September	15	11	2	6	8	9	4	33
October	2	1	0	0	2	2	0	0
November	1	1	0	0	1	1	0	0
December	1	1	0	0	1	1	0	0

** Includes boating during recreation and daily life † Includes all injury fatalities other than immersion deaths*

‡ In 2 cases it was unknown if the boat involved was a personal watercraft, another powerboat, or an unpowered boat

Table 15c **Recreational boating* trauma deaths†: environmental factors for personal watercraft compared with other boats, Canada, 1991-2008 (n=136)‡** (continued)

	All boats (n=136)		Personal watercraft (n=34)		Other powerboats (n=88)		Unpowered boats (n=12)	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Region								
Atlantic	9	7	2	6	6	7	1	8
Quebec	25	18	9	26	14	16	2	17
Ontario	52	38	9	26	39	44	3	25
Prairies	13	9	5	15	6	7	2	17
British Columbia	37	28	9	26	23	27	4	33
Accompaniment								
Alone	27	20	3	9	21	24	3	25
≥1 adult companions	77	57	20	59	48	55	7	58
≥1 adults and minors	12	9	3	9	7	8	2	17
≥1 minors	5	4	3	9	2	2	0	0
≥1 adult bystanders	4	3	1	3	3	3	0	0
Others-age unknown	10	7	4	12	6	7	0	0
Unknown	1	1	0	0	1	1	0	0

** Includes boating during recreation and daily life † Includes all injury fatalities other than immersion deaths*
‡ In 2 cases it was unknown if the boat involved was a personal watercraft, another powerboat, or an unpowered boat

OVERVIEW OF ACTIVITIES & RISK FACTORS FOR ALL BOATS

Boating is by far the most frequent type of activity leading to water-related injury fatality in Canada, accounting for more than 3,000 deaths in Canada during 1991-2008. The purpose of the boating activity was 86% recreational, including activities of daily life, 12% occupational, and the remainder other purposes such as rescue. For recreational boating, 95% of deaths resulted from immersion including drowning with or without cold exposure, and 5% from trauma such as head injury from incidents such as collisions and falls.

RECREATIONAL BOATING

For recreational boating, deaths associated with powerboats accounted for 58% of deaths and unpowered boats for 37%; for the remaining 6% it was unknown whether the boat was powered or unpowered. The most frequent recreational boating activity was fishing, accounting for 37% of immersion deaths. Other activities included powerboating 21%, canoeing 14%, hunting 7%, boat travel 6%, kayaking 3%, sailing 3%, rafting 2% and other/unknown 7%.

The type of incident leading to immersion death varied between categories of boating. Type of incident during powered boating included falling overboard 32%, capsizing 31%, swamping 15%, collision 6%, and other/unknown 16%, while for unpowered boating incidents included capsizing 57%, falling overboard 15%, swamping 9%, collision 2%, and other/unknown 17%. Type of incident also varied between immersion and trauma fatalities; while collisions accounted for only 4% of immersion deaths, they resulted in 72% of trauma deaths. A disproportionate number of collision deaths involved personal watercraft (PWCs).

Considering personal factors such as age, sex, and alcohol consumption, the peak of risk for powered boating immersions was a plateau for males between 25 and 74 years, contrasting with unpowered boating where there was a peak at 15-24 years with deaths tapering off somewhat for older age groups. Children under 15 years accounted for only 3% of immersion deaths, females of all ages for only 7%. Hence males 15 and older accounted for about 90% of victims, making them the key target group for prevention. On the other hand, children under 15 accounted for 12% of trauma deaths. Alcohol was associated with 46% of recreational immersion deaths — possibly more, since alcohol was unknown for 17% of victims, and was more frequently associated with powered boating than with unpowered boating.

As for equipment factors, small powerboats predominated in recreational immersion deaths, most probably accounting for about 45% considering that most unknown boats were likely mainly small ones, followed by canoes at 23%. For trauma deaths, small powerboats probably accounted for about 40%, PWCs for 25%, and large powerboats for about 15%. Trauma fatalities often involved head injury, which was reported by coroners for 32% of PWC victims and 50% of other powerboat victims. There were no reports of helmet use among victims. Many of the persons killed while being towed by a powerboat were on tubes or other devices rather than water skis. While a water skier can let go of the tow rope and has some control over their direction when danger is imminent, people being towed on other devices may have no control when approaching a fixed object and should at least be wearing helmets. Another equipment issue is the non-use or ineffectiveness of “dead-man” engine shut offs, as evidenced by the increasing proportion of powerboat victims, including 10-15% of deaths during 2006-2008, who drowned or were run over by their boat after it continued on when they fell overboard.

Clearly the most fundamental item of safety equipment for prevention of immersion deaths is a properly worn flotation device; this was borne out by the fact that only 12% of all recreational immersion victims were known to have worn one, including 10% of powered and 16% of unpowered victims, with another 4% improperly wearing one. Even fewer non-swimmers and weak swimmers were reported to have worn flotation. It is difficult to

imagine how a boater experiencing the shock of a fall overboard, capsize, or swamping, especially under the adverse wind, wave, cold water, and light conditions when such incidents frequently occur, could manage to retrieve and properly don a flotation device. Furthermore, without the initial buoyancy of worn flotation, the first moment of immersion could be fatal due to hyperventilation and inhalation of water, as discussed below in the section entitled "Understanding hazards and prevention of cold immersion". Unfortunately, there was no change in the proportion of victims wearing flotation during 1991-2008.

A key environmental factor for recreational boating immersion deaths in Canada is cold water, which has been associated with at least 35% of fatalities. Most incidents occurred on lakes, followed by rivers. For lakes and oceans, strong winds and waves are frequent environmental factors, while current was a factor for at least 60% of deaths in rivers. Wind, waves, extremely cold water, and twilight or darkness were associated with many recreational boating deaths. 87% of deaths occurred between May and October. At least 19% and possibly many more boating immersion victims died within about 50 metres from shore, and should have been able to swim to shore if wearing a flotation device.

The possibility of rescue plus resuscitation was available for only about 1 in 8 victims, emphasizing the importance of personal knowledge and preparedness for pre-event and event phases of potential injury incidents, especially avoiding boating during adverse conditions, in unsafe boats, and with lack of safety equipment such as properly worn flotation.

As for trends, there was a 27% decrease in the rate of all boating fatalities between 1991-1995 and 1996-2000. The trends during 2001-2008 are less clear due to an increased proportion of deaths missing from the surveillance database during this period, but estimates suggest at least a small decrease.

In summary, the main personal risk factors for boating deaths included ages 15 years and older, male gender, and alcohol; very few women or children were involved. Failure to wear a flotation device was an equipment factor for up to 88% of victims, and for an even higher proportion of non-swimmers and those who had consumed alcohol. Important environmental factors were extremely cold water, wind, waves, current and darkness. Fishing was the most frequent activity associated with boating immersion deaths.

ACTIVITIES & RISK FACTORS FOR PERSONAL WATERCRAFT

For all types of boat, immersion (i.e. drowning and/or hypothermia) accounted for 95% of deaths and trauma for only 5%; however, the situation was quite different for PWCs, where trauma accounted for 52% and immersion for 48%. A high proportion of immersion deaths, 55%, resulted from falling or being ejected from the PWC, whereas for trauma deaths, 88% followed a collision and 12% resulted from falling off the PWC. Nearly half of the incidents resulted from dangerous manoeuvres such as abrupt turns. Collisions accounted for 52% of all PWC deaths, suggesting that even when death was attributed to immersion, victims may have incurred inapparent injuries such as mild traumatic brain damage sufficient to cause drowning. PWC collision deaths more frequently resulted from collision with another boat, 65%, as compared with a fixed object 21%, while for other powerboats, 29% of collision deaths resulted from another boat and 56% from a fixed object. Further field investigation is needed to determine whether this high risk of collision with other boats is at least in part related to the lack of a rudder and loss of steering control of PWCs when the throttle is cut at high speeds.

Considering personal risk factors, the age profile was younger and more females were involved than for other categories of recreational boating; 12% of victims were less than 15 years old, 83% were between 5 and 44 years old, and 15% were female.

Alcohol was associated with at least 51% of PWC deaths. For PWC operators, lower levels of alcohol may be sufficient to trigger a fatal incident, suggesting a higher baseline level of risk for this type of boat.

As for equipment factors, PWCs differ from other powerboats in a number of ways. For one thing, boaters ride on rather than in the craft, making them more susceptible to falling off, and more vulnerable to injury in the event of a collision. In addition, this type of boat has no propeller or rudder. Instead, the engine drives a water jet pump which provides both power and steering. Without a rudder, the operator can only steer when the throttle is engaged. In the event of a potential collision, the intuitive tendency, particularly for an inexperienced operator, is to cut the throttle and turn away from the other boat, person, or object. But since throttle in the form of the impeller water jet is required for steering, the PWC will not turn but simply continue on its original trajectory. This lack of off-throttle steering capacity may explain why so many PWC fatalities resulted from collisions with other boats. While some PWCs reportedly do now have rudders, most would not yet be so equipped. Inability to slow or reverse the boat by reversing a jet driver impeller as opposed to a propeller may also be a factor.

PWCs have engines of up to 250 horsepower that can accelerate to 80 km per hour within 3 seconds and attain maximum speeds in excess of 100 km per hour, so clearly power and speed were probable factors in many incidents, although such details are not routinely recorded by police and coroners.

Flotation devices were worn properly by 26% of immersion victims, about double that for other boaters; however, the data are based on small numbers. Wearing of flotation was 50% among victims of trauma from collisions and falling off the PWC.

Although the type of flotation device is not specified in police and coroner reports, it is probable that most were personal flotation devices (PFDs) and not lifejackets, which are capable of supporting the victim's mouth and nose clear of the water during temporary loss of consciousness. Helmets were also not routinely mentioned in PWC death reports; however the fact that 32% of trauma victims reportedly sustained a head injury suggests that few if any wore helmets.

Environment factors such as wind, waves, cold water, current and darkness were rarely associated with deaths involving PWCs, compared with other types of boat.

HOW TO AVOID BOATING INJURIES

Eighteen years of research across Canada show that the vast majority of boaters who die — whether in powered or unpowered boats — have neglected basic principles of boating safety such as always wearing a flotation device, using protective equipment against cold immersion, and verifying weather conditions such as wind, waves, and water temperature. It is probable that most victims failed to obtain appropriate training in boating safety, and that many had inadequate swimming skills to cope with unexpected immersion.

Nonetheless, it is not appropriate to blame the victims for such deaths when decision makers have not yet implemented appropriate protection by implementing regulations to require wearing of flotation devices by all boaters, and construction standards for open boats that would facilitate survival in frequently encountered adverse conditions. In illustration, most victims died of immersion on lakes in small open powerboats and canoes. Such boats are generally not designed to a standard level of safety so as to facilitate survival in adverse wind, wave, and cold conditions. Such conditions can rapidly arise on open bodies of water such as lakes. While certain types of boating — such as running river rapids, with its associated hazards — require specialised training, skills, and equipment, most boating deaths result from neglect of basic principles with which every boater should be familiar, and from poorly designed small boats. Most deaths described in this report could have been averted if the following fundamentals had been respected:

- Immersions during boating are sudden unexpected events requiring advance preparation by proper wearing of a comfortable flotation device appropriate to the type of boating activity;

- All adverse conditions, especially water temperatures 15°C or less, necessitate wearing of supplementary hypothermia protection;
- Sudden wind, waves and cold arise frequently and are a major threat for boaters far from sheltered waters in lakes and on the ocean; therefore, advance verification of weather, including wind and wave conditions, is required, and only boats with approved designs should be used where such conditions are to be expected;
- River currents, especially when concentrated around rocks, bridge pilings, and in hydraulics at the base of dams, have enormous kinetic energy that can trap the unwary;
- Since many boating deaths occur from unexpected events such as falls into water and wind and waves, operators and passengers who have consumed even small amounts of alcohol increase their risk. Current federal BAC levels may be adequate. Probably more important is improved enforcement, especially at popular sites for high speed powerboats including PWCs, and at holiday events where many boats may congregate.

Nevertheless, it has been found that errors people make tend to be related to the type of boat they habitually use (McKnight et al., 2006), as well as to the specific hazards of different bodies of water. Therefore, general training on key safety issues needs to be followed up by specific information and practice for the boat(s) of main interest for the trainee, and knowledge about issues related to the body of water where boating will occur. In illustration, ocean boaters require navigational skills, and data on tides and currents in their region, while river boaters must be aware of hazards such as fallen log strainers, dam hydraulics, and large rocks, how to avoid them, and what to do if they cannot be avoided. Fishers and hunters are special activity groups who use boats to pursue their preferred activity; while knowledgeable about fishing or hunting they may not have sufficient training in safe boating practices. In illustration, individuals in New Zealand using a kayak for fishing who were involved in hazardous incidents tended to be less experienced as kayakers and involved in more serious problems than other kayakers (Bailey, 2010).

Effectiveness of educational interventions is not well proven for injury prevention, and they require frequent repetition, so it is not wise to rely on such measures alone. However, swimming training (Brenner et al., 2009) and research-based water safety training (Canadian Red Cross, Module 1, 2006) appear to help prevention of immersion deaths of children, and should help more adult boaters to survive. Boating and swimming instruction should include practical experience with cold and current in the requirements. Written examinations should be supplemented by research-based training on the hazards of current and of cold immersion and how to prevent problems with them, including the value of flotation devices. Piloting and evaluation of water safety training in high schools should be considered for targeting older students, including immigrants who may not have sufficient information about the hazards of cold immersion and river current, swimming training, and flotation devices. A study in Manitoba found knowledge of survival time in cold water to be considerably underestimated even among attendees of cold-stress seminars (Giesbrecht and Pretorius, 2008). This might lead to unnecessary panic rather than taking definitive action to deal with the situation. Since basic swimming ability is protective against immersion deaths (Brenner et al., 2009), pilot programmes are needed to test mandatory basic swim testing at school entry, followed by school-based training sufficient for the student to swim a pool length, so as to be able to survive a fall into water, whether from a boat that has capsized or swamped, or from shore or pool side.

Population-based survey and experimental research is also needed to assess the effect of current mandatory boating licensing and training requirements on knowledge, attitude, and practices at intervals after testing. It would be helpful if a national database of persons taking current and improved boating examinations and training could be linked with national coroner data from Statistics Canada to verify training status of deceased boaters. Improved research-based programmes with training in swimming, cold exposure, and coping with current should be piloted and evaluated. Interestingly, a survey of safety practices among boaters in Australia indicated that not being a member of a boating association and boating less often in protected waters were associated with a higher level

of boating safety behaviour (Virk and Pikora, 2011). While reasons for this are unclear, boating groups and boaters who make frequent outings should ensure that vigilance regarding safety is not affected by overconfidence and a false sense of security, and that safety knowledge, training, and equipment are regularly reviewed.

With respect to alcohol, it is known that even small amounts can affect performance. On the other hand, many boating victims have extremely high levels of alcohol. In Norway, median blood alcohol concentrations were higher among boat operators than in car drivers Khiabani et al., 2008). The Canadian data in this report show that for about 600 boaters above the limit of 80 mg%, there were another 300 below the limit. Of those above the limit, 46% were above 200 mg%, far exceeding the limit, and 12% above 300 mg%. This is alarming, since above 200 mg%, stupor, loss of understanding, and impaired sensations reportedly result in severe motor impairment, loss of consciousness, and memory blackout, while above 300 mg%, severe central nervous depression, unconsciousness and possible death are the effects. In Australia, a boating education course reportedly reduced the odds of not taking a drink while boating (Miller et al., 2008).

A factor other than alcohol and fatigue that affects cognitive performance is prolonged physical pounding and associated stress resulting from travel in small high speed boats. Suspension seats to ameliorate this effect improved cognitive performance and decreased fatigue and sleepiness (McMorris et al., 2009). Related trauma includes the so-called wave jumper's spinal fractures associated with hard landings of airborne PWCs (Carmel et al., 2004) and other fractures of the spine seen with bumpy boat rides (Chukwunyerenwa and O'Rourke, 2010).

Another design issue that kills boaters when they fall overboard and are run over by their own boat, or fall in near another boat, and non-boaters struck by boats is the lack of propeller guards on most powered boats. The nature of severe propeller chop injuries were described in an autopsy series of over 100 such deaths in a district of China during 1994-2005 (Yu et al., 2008).

A structured comprehensive approach to prevention is essential. Modern principles of injury prevention include careful assessment of personal, equipment, and environment risk factors for different time phases of potential injury incidents, including pre-event, event, and post-event phases. Pre-event phase interventions include evidence-based personal training of all boaters in open-water boating hazards and skills so that life-threatening immersions do not occur. A well designed boat can help avoid immersion, and should promote rapid reentry and survival even if immersion occurs. A flotation device is an item of safety equipment; when worn by a boater, it helps to prevent injury (drowning and/or hypothermia) during an immersion in water due to swamping or capsizing, i.e., the event phase of an incident. A properly worn and activity-appropriate flotation device is the single most valuable and essential item of safety equipment; other safety equipment includes bags with throw ropes for rescue, and cold-protective equipment such as wet and dry suits to enhance survival of cold water immersions. Post-event phase interventions include personal rescue skills for retrieving boaters safely from high seas or current, and cardiopulmonary resuscitation (CPR) for revival if needed.

Small open powerboats are the most frequent type of boat associated with recreational boating fatalities. Such boats are frequently manufactured in stackable form for easy transport and sale. As a result, many include minimal flotation insufficient to keep the boat well out of the water when swamped or overturned, especially with a heavy engine attached and possibly other heavy loads aboard. Such boats also lack design features to facilitate re-entry and emptying the vessel of water in the event of a swamping, or to get out onto an overturned vessel in order to keep the boater's body out of cold water. Since wind and waves are frequent on lakes where such boats tend to be used, strict safety requirements should be mandatory and proven by laboratory and field testing. Experimental research should be funded to test different designs of small open fishing boats for such survivability design issues. This could be done at the defense and civil environmental labs in Toronto, at other suitable laboratories elsewhere in Canada, or at

private survival research and training companies such as in Halifax. Field testing under real conditions would also be essential. Safety ratings should then be required based on a full load or preferably a slight overload including engine to simulate real-life conditions, provided to all potential purchasers, and be clearly visible to the operators in large letters.

Other experimental research could include development and evaluation of water temperature sensors as a research basis for subsequent legislation to make them mandatory on all standard powerboats, small and large, with visible warnings at 15°C (orange) for severe cold and 10°C (red) for extreme cold. This could provide a research basis for legislation. PWCs lose steering capability when power is cut. Some means of steering other than the power jet might help to avoid collisions. Research could help with this issue and provide a basis for legislation. Dead man's controls not easily disabled are needed for all powerboats. Experimental research with different designs of dead man's controls could also be complemented by field surveys to verify acceptability, functionality, and use. Population-based survey research could also assess reasons why they are not used, or are disabled by many boaters. This could provide a sound research basis for legislation and enforcement for mandatory use. Other research could focus on energy absorbing padded dashes, operator areas, possible automatic release safety belts for high speed jetboats and similar models where high energy crashes are to be expected, as well as on the safety of powerboats that have open bow areas with seating. Similar research on padding and other protective structures could be useful for PWCs.

For flotation devices, experiments with users and non-users could help to create designs that are comfortable and cool enough for different seasons and activities, and others that offer at least partial protection in the event of cold weather immersion, while retaining comfort and functionality for different activities. Field research and programmes for loaner or free or subsidised flotation devices in northern and aboriginal communities should be assessed, and continued or expanded if effective in increasing wearing. In aboriginal communities in Alaska, U.S.A., self-reported PFD wearing was reported to be about 50%, with poverty, low education, and young age risk factors for not wearing a PFD (Redwood et al., 2009); however, only 17% of non-occupational boating fatality victims were wearing a flotation device (Strayer et al., 2010). It has been difficult to conduct national epidemiologic research on risk factors and prevention of boating deaths for aboriginal populations with frequent exposure to risk of fatality during water-related activities. All provincial and territorial coroners, particularly in the largest province of Ontario, should require the collection and making available of data on aboriginal ethnicity in anonymous form for aggregate use in research and prevention of water-related injury fatalities.

For traumatic injuries, even momentary minor injury or concussion of the brain is potentially fatal on the water, so helmets and padded dashboards are needed where a blow to the head is likely, such as for travel on PWCs and other high speed boats, and in kayaks or canoes in high grade rapids. Helmets are already required by all reputable clubs and instructors for most white water kayaking, rafting and some canoeing. Fatalities involving PWCs, including immersions and trauma, mainly resulted from collisions. Most passengers on high speed boats, as on motorcycles and snowmobiles, do not wear safety restraints; therefore, helmets should be required as on other high-speed transport where passengers are unrestrained. Head injury could occur from falling off, and a brief loss of consciousness accompanied by immersion could be fatal. Therefore, as well as lifejackets, powerboaters who travel at high speed need helmets that will keep their head out of the water in the event of brain injury. Our findings confirm that head injuries are frequent among victims of boating trauma deaths. Hospital studies of trauma among PWC users in the United States found that about half of the victims sustained head injury; mandatory helmet use was recommended (Rubin et al., 2003, Jones 2000). Due to many fatal head and multiple injuries in children and adults on personal watercraft in Canada, helmets should be obligatory, and specialised flotation devices assessed for protection against chest and abdominal injuries.

PERCEPTION OF RISK

A key issue in prevention is perception of risk for different activities. Actual risk of water-related injury and death per exposure to water tends to be much higher than commonly perceived. Thus while the risk of death or severe injury from a motor vehicle crash is quite low per trip, nearly all drivers and passengers in Canada now wear a safety belt and avoid alcohol. On the other hand, people are often seen loading their boat with alcohol, and forgetting to bring or sitting on their flotation devices rather than wearing them. Strangely enough, the research has shown that non-swimmers were even less likely than other boating victims to correctly wear flotation — particularly alarming given that many unpowered boats are small and narrow, and hence relatively unstable and easily capsizable. The lesson for those who train and educate the public is that a first priority should be to discuss risk perception. Only then can misperceptions be corrected so that each individual has a realistic appreciation of the risk of injury for boating activities. At that point, the discussion can move on to risk factors for specific activities and environments, and essential training and equipment. In the end, risk of injury needs to be reduced to a sensible and reasonable level. Otherwise, boating makes no sense.

BOAT SMART

Wearing rates for flotation devices in boats lag far behind those for seatbelts in cars: only 12% of recreational boaters who died during 1991-2008 were wearing a flotation device. This is a major opportunity for prevention by good legislation and enforcement, and of course individual safety practices such as taking time in advance to choose and purchase an appropriate flotation device for the activity that is planned, to ensure that the device is cool and comfortable and will be worn. Nearly all victims of boating drowning are males 15 years and older, so this is the key target group for prevention. It is best to focus on youth and adult male or family wearing, rather than child wearing; in order to help and protect any children who may be present in boats, adults first need to protect themselves by wearing their own flotation. In the northwestern United States in 1995, 91% of boaters less than 5 years old were observed to be wearing a PFD, compared with only 13% of those 15 years and older (Quan et al., 1998). Based on data in the current report, nearly 90% of boating immersion deaths could potentially have been prevented by proper wearing of an appropriate flotation device; however, other factors do play a role in boating deaths, so the proportion of deaths prevented could be less. In the United States, a 2000-2006 study comparing drowning deaths of boaters wearing and not wearing a PFD estimated that wearing a flotation device could have prevented 50% of deaths (Cummings et al., 2011).

UNDERSTANDING HAZARDS AND PREVENTION OF COLD IMMERSION

The overall trend for Canada in cold-water boating immersions has been discouraging, with a rate of 0.28 deaths per 100,000 population per year in 1991-1995 and 0.26 during 1996-2000 (Canadian Red Cross, Module 2, 2006). It is probable that the only highly effective means of bringing about a major reduction in the overall cold-water boating immersion death rate is legislation and enforcement to ensure wearing of appropriate personal protective equipment. While research-based education and training are essential, on their own they have proven relatively ineffective, as for other injury prevention measures such as safety belts in cars.

Users of all boats, especially those who travel on the ocean, large lakes, and fast rivers, and during spring and fall when the hazards of cold immersion are greater, should be familiar with how to avoid cold immersion and how to respond when it occurs. It is highly recommended that all boaters review Module 2 of the Canadian Red Cross 10-year research, *Ice & Cold Water*. A brief summary of its main points is reproduced here.

The ***four stages of death*** from cold immersion (Brooks/Transport Canada, 2003; Golden & Hervey, 1984), include:

STAGE 1. Gasping and cold shock
STAGE 2. Swimming failure
STAGE 3. Hypothermia
STAGE 4. Post-rescue collapse

Most cold-water immersion deaths occur during the first two stages, rather than from generalized hypothermia. Knowledge of the effects of these stages is essential for prevention, and should be well understood by all boaters. Unexpected falls from powerboats are frequent, while unpowered boats are relatively unstable and immersion can occur at any time without warning. Because immersion in cold water at ≤15°C can kill almost immediately without the presence and proper use of flotation equipment, any immersion is potentially fatal and should be avoided if at all possible.

For larger boats, life rafts are strongly recommended to help avoid immersion (Brooks/Transport Canada 2003), but since this is impractical for many small powerboats and most unpowered boats, flotation is essential to minimize the degree of immersion as well as to prevent submersion of the airways. Prevention of hypothermia is necessary mainly where immersion is prolonged, such as during incidents far from shore on large lakes or oceans, or near dangerous rocks and cliffs in rough seas. Prevention of post-rescue collapse after prolonged immersion involves appropriate handling of a victim during and after rescue.

Since they are least understood and most important for the general public, now consider details of stages 1 and 2 of the event phase of cold immersions:

STAGE 1. GASPING/COLD SHOCK Death can occur rapidly during the first few minutes of immersion from so-called cold shock. The use of the term "shock" for this stage could be misleading, since in most types of clinical shock the blood pressure drops dangerously low, whereas in response to cold it can rise very high. It is helpful to remember that the "shock" or stress of sudden immersion in cold water leads to various responses by the body, the most serious of which is involuntary gasping respirations, which, if the airways are below the surface when this response occurs, can lead to aspiration of water resulting in drowning. A temporary decrease in or loss of consciousness due to the effects on the brain of rapid deep breathing (hyperventilation) could also be fatal in the context of immersion (Mantoni et al., 2007). Death may also occur as a result of cardiac arrhythmias. The biochemical effects of hyperventilation on muscles might also impair the ability to swim or tread water. Hyperventilation stimulated by cold-water immersion in non-habituated subjects was found to decrease brain blood flow by half, raising the risk of fainting, aspirating water, and drowning (Mantoni et al., 2008). However, after several cold immersions, subjects were able to adapt to this response. Important for education in cold water survival, even without previous cold water experience, subjects were able to adapt to ice-water immersion by voluntarily reducing their rapid breathing, which maintained blood flow to the brain.

STAGE 2. LOSS OF MANUAL PERFORMANCE Next in the time sequence is loss of strength in the limbs due to cooling of muscles and nerves. Nerves may fail to signal muscle to contract, and muscle may be unable to contract (Tipton and Golden, 2006). First to go may be the fine muscles of the hands. Ability to hang on to an overturned boat is lost, the individual is unable to perform activities such as putting on or fastening a flotation device, and, more gradually, loses the ability to swim effectively. The effects of stage two may result from both local cooling and from the shutdown of blood to the limbs in response to cold. Limb strength is necessary for a person floating in water to help keep the face turned away from wind and waves so that water is not aspirated into the lungs. If the victim is unable to keep the airways above the surface or away from waves, drowning will occur.

On a positive note, it was found in experiments in Sweden and the United Kingdom that volunteers were able to swim for at least an hour in water at 10°C, and most swam for 90 minutes (Tipton et al., 1999). Even among volunteers who swam for 90 minutes in water at 10°C, the problem leading to swim failure was not hypothermia, which by definition is generalized and affects the core of the body, but rather local muscle cooling of the limbs. Other experiments with swimmers wearing a personal flotation device (PFD) showed that

they were able to swim an average of 889 metres in water at 14°C and 650 metres at 10°C before swim failure (Wallingford et al., 2000, Kenny et al., 2000). During another study in Canada of both novice and expert swimmers, it was observed that both groups could swim for about 45 minutes in 10°C water before incapacitation. The expert swimmers could swim faster and were able to swim an average 1.4 km, compared with 820 m for the novices, with an average distance for both groups of 1.1 km (Lounsbury 2004, Lounsbury and Ducharme 2005). However, these results may not always apply to an unexpected injury incident in dark and/or stormy conditions.

Now consider some practical implications of the four stages of death from immersion. First, for people who fall into very cold water, protection of the airway from gasping associated with sudden exposure to cold is very important. Otherwise, water can be inhaled and drowning initiated rapidly. Thus from a practical perspective, this stage is a phase of gasping/acute drowning and also of sudden cardiovascular effects. For prevention of sudden drowning, use of appropriate flotation helps keep the body higher and the mouth and nose out of the water to minimize inhalation, i.e., prevents submersion of the head during this critical phase. Appropriate flotation should also help to avoid submersion of the airways if consciousness or use of muscles is temporarily impaired due to hyperventilation. Such findings provide strong support for mandatory wearing of a flotation device by boaters, since a submersed boater will be at high risk of immediate death before he has the opportunity to find and put on a flotation device, a difficult task even in warm water. Specialized flotation devices are now available to boost the body high out of the water during this stage of immersion. Other protection of airways such as splashguards has been recommended. Better yet is complete avoidance of immersion by use of a life raft.

Whatever the equipment that happens to be available, the victim of a sudden cold immersion should concentrate on protecting their airway from cold water inhalation until their breathing stabilizes and gasping stops (Ducharme, 2006). This would include avoiding swimming for a few minutes during the cold shock period, until the massive gasping, rapid breathing, high blood pressure, and rapid heart rate have a chance to subside. Only then should the individual decide on a course of action.

Practical implications of the sequence of progression and rapidity of loss of strength of hands and later limbs, known as the incapacitation phase, include the fact that hanging on to an overturned boat is a reasonable survival strategy only if rescue will be rapid. If rescue is delayed, the immersed person will lose the ability to hang on — this can occur within 10-15 minutes — or even to keep the face away from wind and waves, and will drown. Unfortunately, with both nerve conduction and muscle contraction blocked, and with no blood flowing to the limbs, mind cannot control matter.

Therefore, if one is immersed in cold water, unable to climb out of the water onto a stable object, drifting away from shore, and rapid rescue is unlikely, it may be preferable to swim to safety, especially if one is wearing a flotation device, is a good swimmer, and the distance is not too great, i.e., immediate self-rescue. Red Cross drowning data support such an approach (Sawyer and Barss, 1998). As noted above, it may be feasible to swim up to about one kilometre in cold water.

On the other hand, if the distance is great and/or rapid rescue by others is known or probable, the victim should immediately make every effort to get as much of the body as possible out of the water as quickly as possible if there is something to climb onto; although it may feel colder out of the water than in, it is always better to be out of the water (Tipton and Golden, 2006). If this cannot be achieved in the first 10 to 20 minutes or so, it may rapidly become impossible due to loss of hand and arm strength. Other options include raising the probability of detection and rescue by immediate use of flares and other measures (Ducharme, 2006). This must be done right away, as the ability to open and deploy flares is also rapidly lost in cold water. As noted by Ducharme, the goal or ultimate objective is not to preserve body heat, but to move out of the water as quickly as possible.

Furthermore, since boaters have been found dead on land after surviving an initial cold immersion, those who travel in isolated conditions should always carry a change of warm dry clothing in a waterproof float bag so that if immersion does occur, dry clothing can be donned immediately upon reaching shore.

DON'T UNDERESTIMATE CURRENT

Current was a factor in most river drownings involving unpowered boats, and was a probable factor for many powerboat drownings as well. As with many sources of powerful kinetic energy, current can be dangerous for boaters who have not dedicated sufficient time to the study of river currents, and received expert practical training in navigating with current — ferrying their boat or body by setting a proper angle against the current — and in river rescue.

A boater, swimmer or wader who underestimates the power of current can be swept away in an instant. At best one may be swept into calmer water and escape to shore, at worst be trapped underwater against an immovable object or in recirculating current. Many a river paddler who decided to shoot an innocent-looking small dam, or powerboater who got swept over a dam, has been trapped underwater by the immense power of a recirculating hydraulic, to be expected at the base of most such man-made structures. Boaters may also at times need to walk in current, so must be familiar with the hazards of foot entrapment when moving about on the rocky bottoms of fast-flowing rivers.

Rivers were the site of drowning for 23% of recreational boating immersion deaths, including 19% of deaths involving powerboats and 30% of deaths involving unpowered boats, resulting in at least 569 fatalities over 18 years, and probably more. Current is also a factor in some ocean drownings. Effective evidence-based training in how to manage the hazards of current for boating and — since boaters sometimes end up immersed in current unexpectedly — for swimming, wading, and falls into water could have helped avert about 25% of boating immersion deaths per year, saving about 600 lives.

Education and training should include the theory of current and the types of scenarios to be expected based on epidemiologic analysis of the determinants of many incidents. Training needs to include how to safely manoeuvre a boat in current, how to avoid hazards such as tree/log strainers and dam hydraulics, how to use the power of current for self-rescue, and how to rescue others. Other important issues include the selection and use of appropriate boats for river, including a smooth rounded bottom with sufficient rocker for rapid turning in current; adequate freeboard or safety skirts so the boat does not fill with water in turbulent zones; basic safety equipment such as bow and stern ropes; and, for canoes and kayaks, flotation bags to keep water out and prevent collapse and pinning. Kayakers, canoeists and rafters who run rapids at high levels of difficulty and hazard also need to protect themselves against brain injury from collision with rocks by always wearing a helmet, since even a momentary loss of consciousness can be fatal in water.

Armed with the right knowledge and training, the individual should be much better protected during all time phases of injury, including pre-event, event, and post-event. And, of course, the right attitude is essential to avoid unwise risks.

Research-based water safety instruction and swimming instruction on how to deal with current for high school students, and later reinforcement for youth and young adults, represent a grand opportunity for prevention. In our country, covered with innumerable rivers and streams, every Canadian should be able to safely manoeuvre in current when the need arises.

SPECIAL OPPORTUNITIES FOR LARGE GAINS IN PREVENTION

Boating as recreation is predicted to increase with climate change (Shaw and Loomis, 2008). There are several major opportunities for prevention of boating fatalities in Canada which could limit the suffering of affected families and reduce the enormous costs associated with these deaths. While all of the above recommendations would be beneficial

and mutually supportive in many incidents, the single most effective initiative, based on the research, would be the mandatory wearing of appropriate flotation by all recreational boaters at all times, for an annual cost savings of about $330 million. Mandatory wearing would render enforcement much simpler, since it would be apparent from a distance whether or not boaters were wearing flotation. (Enforcement of the current regulation of carrying flotation devices in the boat is difficult, since officers must stop the boat and ask to see the flotation devices. Such enforcement is intrusive, time consuming, and impractical.)

To support this intervention:

- Legislation and enforcement for wearing of a flotation device should include all boats, except perhaps when at anchor or tied up at a wharf. Legislation should include drifting boats, since persons who fall or jump into the water are often unable to regain a drifting boat;
- Operators need to be legally responsible for PFD-wearing by all occupants. For unstable small boats such as canoes and kayaks, wearing a PFD at all times is especially critical. Special emphasis and enforcement is necessary for adult males;
- Shops selling flotation devices for all boaters should be required to stock both models for inactive boating (powerboats) and active boating (at least canoeing). For PWCs, specialised models may be needed to help protect from chest and abdominal trauma in high speed crashes;
- Comfortable models suitable for hot weather, and others when water temperatures are extremely low, should be available where flotation devices are sold. Cold water models could be required early in the season when water temperatures are cold. Specific designs for kayaking and other activities such as rowing of racing shells could be sold at more specialised shops.

Other boating safety issues that remain to be addressed by legislation, regulations, and enforcement include:

- Wearing of personal protective equipment as helmets by users of small unstable boats such as PWCs and jet boats that travel at speeds sufficient to frequently cause fatal head injuries and/or loss of consciousness resulting in drowning to unrestrained occupants, in the event of collisions
- Engineering of PWCs to render rudders mandatory to allow steering when the jet impeller drive force is cut, and redesign to allow stopping and reversing the boat by engine force
- Raising standards for flotation, freeboard, and design features to cope with adverse weather conditions and facilitate reentry into small open aluminum boats
- Implementing engine wrist lanyard engine turnkeys/shut offs for outboard motors that prevent the engine being started unless the driver is connected, as for PWCs. Alternatively, develop sensing devices that cut the engine forward drive when the operator is detected as no longer in his seat.

CONCLUSION

From the above, it is clear that by an appropriate combination of preventive measures, the vast majority of boating deaths could be prevented. Since most boating victims were economically active young to middle-aged adult males, a conservative estimate of the average economic loss per victim would be about $2 million direct and indirect costs, including human capital losses of lifetime family earnings, for a total loss of about $6 billion during the period. If even a proportion of such losses were allocated by government to research-based prevention, evaluation, training, and education, and especially to legislation and enforcement of flotation-wearing, the economic return on investment would be great.

See also the 2009-2010 media monitoring summary on page 73.

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In 2009 and 2010, recreational boating-related fatalities were tracked through media reports. The term "fatalities" is used to summarize unintentional deaths that may have resulted from drowning, hypothermia due to cold water immersion, trauma and pre-existing medical conditions.

LIMITATIONS

The reported fatalities are not considered to be a complete list of all recreational boating fatalities for 2009 and 2010, as using media searches to track incidents has limitations. In 2009, only English media sources were monitored. The media searches are based upon key words that will trigger the article to be flagged. In situations where the boater is identified only as missing, the article will not be flagged. Likewise, when a body is located in the water several months after the incident occurs, the media may not follow up the story with the incident details (identifying if this was recreational boating related incident) that led to the person being found in the water. Media reports may not include information on the specifics of the incident such as if the persons involved were wearing a lifejacket or personal flotation device (PFD), the type of boat involved, etc.

The reported fatalities were tracked during the periods mentioned only; the numbers have not been updated after the reported tracking period. More accurate numbers are typically captured through the ongoing unintentional water related fatality tracking the Canadian Red Cross does with the cooperation of provincial and territorial coroner and chief medical examiner offices as well as Statistics Canada.

SOURCES

The media sources monitored and summarized in this report are the major national and provincial publications across Canada, including print and internet sites. In addition to these sources, **Transport Canada's Office of Boating Safety** (Ottawa) was able to provide access to boating fatality data captured in both the **Ontario Provincial Police** Fatal Marine Incidents Reports, and the Quebec Regional Boating Fatality Reports (prepared by the Office of Boating Safety, Quebec) based on data collected through the media and by the **Sûreté du Québec** (SQ). In many cases, these reports provided additional details on the incidents reported in the media, as well as identified a few incidents not found in the media search.

Each media report is reviewed for information on the following:

- **When:** Date of incident
- **Who:** Age and gender of deceased as well as survivors of the incident
- **Where:** Province and body of water
- **What:** Type of boating incident (capsize, collision, fell overboard etc.) as well as type of boat (length, and powered or unpowered)
- **Why:** Factors that may have contributed to the incident or fatality such as excessive speed, use of Lifejacket/PFD, environmental conditions (weather and water conditions).

RECREATIONAL BOATING FATALITIES BY MONTH AND YEAR, 2009–2010		
Month	2009†	2010
January	Not tracked	1
February	Not tracked	3
March	Not tracked	5
April	Not tracked	7
May	20	17
June	11	22
July	18	28
August	20	13*
September	7	15
October	8	8
November	4	3
December	0	0
TOTAL	88	122*

RECREATIONAL BOATING FATALITIES BY REGION AND YEAR, 2009–2010		
Province/territory	2009†	2010
Newfoundland & Labrador	6	12
Prince Edward Island	0	2
New Brunswick	0	4
Nova Scotia	1	5
Quebec	22	24
Ontario	34	33
Manitoba	2	6
Saskatchewan	1	4
Alberta	10	7
British Columbia	11	23*
Nunavut	0	1
Northwest Territories	0	1
Yukon	1	0
TOTAL	88	122*

In 2009, there were 88 fatalities that were tracked from May to December. The monthly tracking began in August, and a historical search for fatalities was conducted for May to July 2009. In 2010, tracking was completed on a monthly basis with 122* recreational boating fatalities being reported upon.

RECREATIONAL BOATING FATALITIES BY AGE AND SEX, 2009–2010				
	Male		Female	
Age range	2009†	2010	2009†	2010
0-14	0	4	0	0
15-24	17	24	0	2
25-44	24	42	0	3
45-64	31	28	1	2*
65+	12	15	1	0
Not specified	2	2	0	0
TOTAL	86	115	2	7*

In 2009, 50 fatalities occurred in lakes (57%), 24 fatalities occurred in rivers (27%), and 14 fatalities occurred in coastal waters‡ (16%). In 2010, 59* fatalities occurred in lakes (48%), 34 fatalities occurred in rivers (28%), and 29 fatalities occurred in coastal waters (24%).

** In June 2011, the RCMP announced a homicide investigation regarding the reported drowning of a female, age 50; as of the completion of this report, no charges have been laid*
† Includes fatalities reported for May to December
‡ Coastal waters for the Media Monitoring report include the St. Lawrence Seaway, the Great Lakes, and the Atlantic, Pacific and Arctic Oceans

TYPE OF BOAT

The 2009 media reports identified 46 fatalities (52%) involving powered boats. 32 of these boats were identified as under 6 metres in length, 7 boats were over 6 metres in length, and 3 were personal watercraft (PWC). The remaining boats were identified as powerboats without mention of length. Unpowered boats (canoes, kayaks, sailboats, pedal boats) were involved in 32 fatalities (36%), and the type of boat was not identified in 10 reports (11%).

The 2010 media reports identified 45* fatalities (37%) involving powerboats, with 32* of these boats identified as under 6 metres in length (including all boats described as a small boat where length was not specified), and 13 boats as over 6 metres in length. Unpowered boats were involved in 50 fatalities (41%); the most common was the canoe with 29 fatalities followed by the kayak with 13 fatalities. The type of boat was not identified in 27 reports (22%).

USE OF FLOTATION

The 2009 reports identified 61 fatalities involving boaters who had chosen not to wear a lifejacket/PFD. Only 7 fatalities (8%) occurred with the boater wearing a PFD. The remaining 20 media fatality reports (23%) did not indicate whether or not the boater was wearing a PFD at the time of the incident or when the body was recovered.

The 2010 reports identified 63* fatalities (51%) involving boaters who were not wearing a lifejacket/PFD at the time of the incident. Only 13 fatalities (11%) occurred with the boater wearing a PFD. The remaining 46 media fatality reports (38%) did not indicate whether or not the boater was wearing a PFD at the time of the incident or when the body was recovered.

TYPE OF INCIDENT

In 2009, a capsized boat was identified as the incident that resulted in 32 in-water fatalities (36%) followed by an unexpected fall overboard that resulted in 27 boater fatalities (31%); 17 reports (19%) did not identify the nature of the incident, and 12 reports were classified as other incidents (collisions, attempting rescue, etc.)

In 2010, a capsized boat was identified as the incident that resulted in 55 in-water fatalities (45%) followed by an unexpected fall overboard that resulted in 30* boater fatalities (25%); 19 reports (16%) did not identify the nature of the incident, and 18 reports were classified as other incidents (collisions, attempting rescue, etc.).

** In June 2011, the RCMP announced a homicide investigation regarding the reported drowning of a female, age 50; as of the completion of this report, no charges have been laid*