

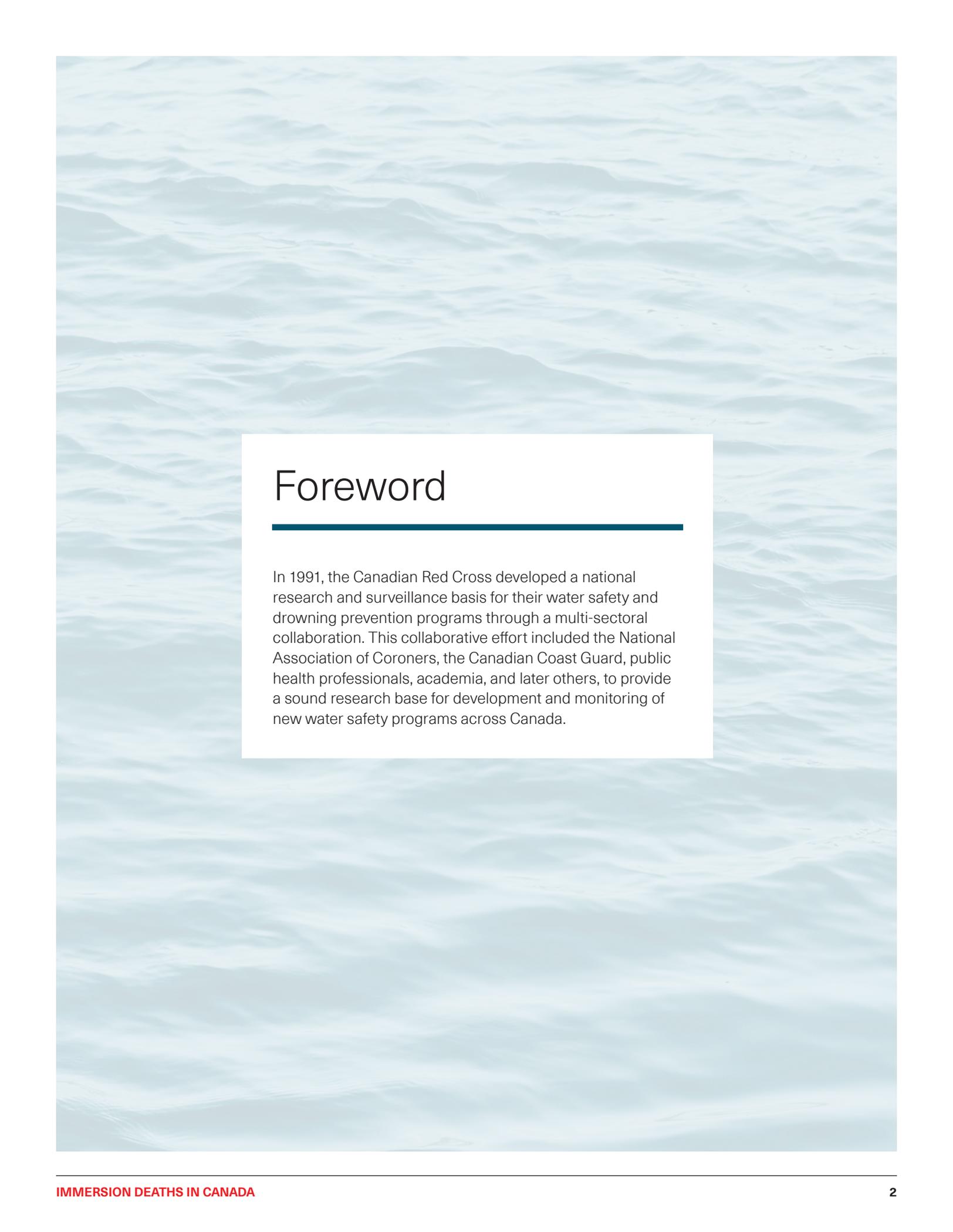


DEATHS BY IMMERSION

and other water-related injuries in Canada

2011–2015





Foreword

In 1991, the Canadian Red Cross developed a national research and surveillance basis for their water safety and drowning prevention programs through a multi-sectoral collaboration. This collaborative effort included the National Association of Coroners, the Canadian Coast Guard, public health professionals, academia, and later others, to provide a sound research base for development and monitoring of new water safety programs across Canada.

Acknowledgements



The Canadian Red Cross initiated and has supported the Canadian Surveillance System for Water-Related Fatalities since 1991.

Dr. Peter Barss of McGill University and later University of British Columbia (UBC) developed the annual reports for the Red Cross on which the earlier 2003 10-year summary and this 2020 5-year summary are based. He and **Karlyn Olsen** planned, wrote and completed the 2020 figures and analyses.

Shelley Dalke and **Meghan Mathias** of Red Cross coordinated production. Funding for this 5-year summary report is from Red Cross. Over the years, other collaborators included the National Search and Rescue Secretariat, Canadian Coast Guard, the Office of Boating Safety of Transport Canada, Montreal Public Health and the Lifesaving Society.

Red Cross gratefully acknowledges the contributions of **Kathryn Cseff** (1951– 2019), who was our primary data collector in Ontario. She worked tirelessly year after year to maintain our provincial relationships to ensure we have access to the data to support this report. She was known for her accuracy in documentation and determination to support the Red Cross in drowning prevention initiatives.

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Introduction

Statistics Canada reported drowning as the fifth leading cause of death by unintentional injury in Canada in 2016, after falls, transport deaths, poisoning and threats to breathing. This 2020 report presents risk factors and prevention from a review of 2,213 unintentional immersion deaths and other water-related injury deaths in Canada during 2011–2015, compared with 2,368 in 2006–2010.

Methods

Data were collected annually, from provincial and territorial coroners by volunteers through the Canadian Surveillance System for Water-Related Fatalities.

A detailed electronic questionnaire was used. Personal, equipment, and environmental factors of each incident were assessed for main activities and purposes. Rates were adjusted to account for age changes in the Canadian population between the two study periods. Observed differences were not tested for statistical significance. Children less than five years old were considered as non-swimmers. Analysis was completed using Stata 13.1.

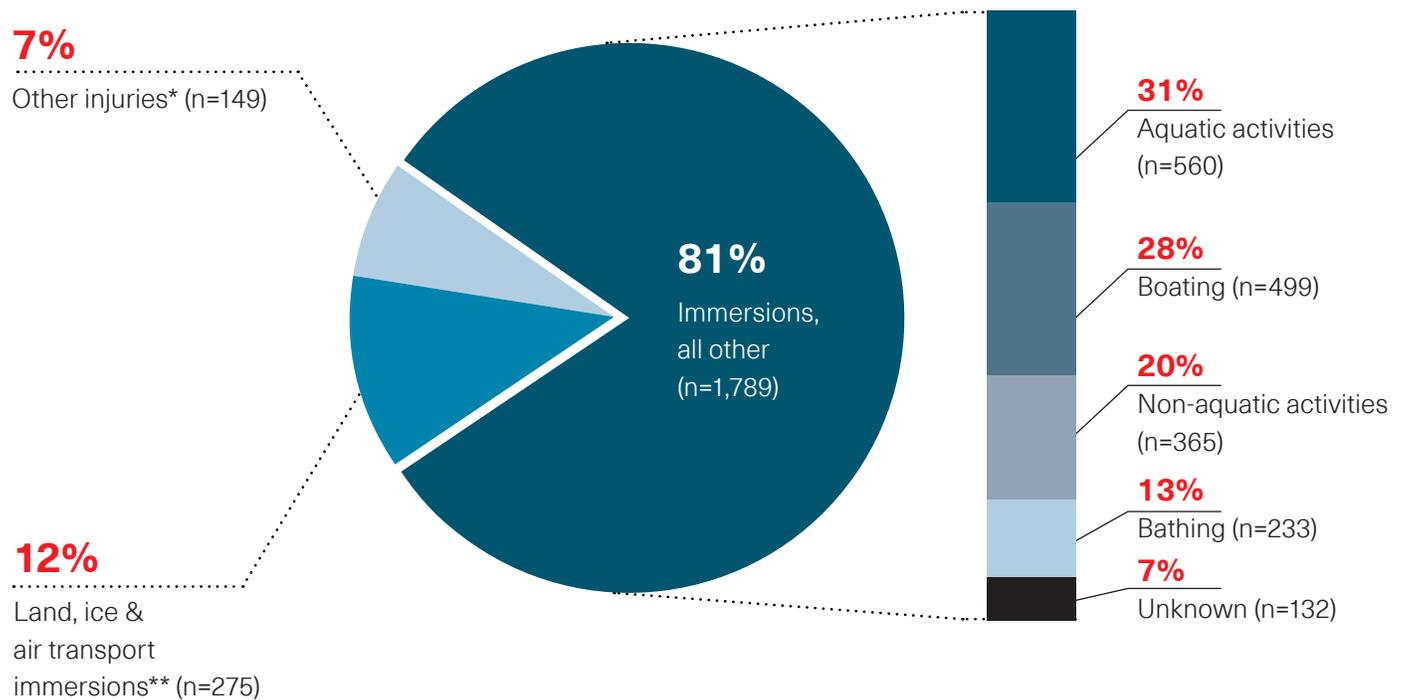
Overview of all Water-Related Injury Deaths



During 2011–2015 there were 2,231 water-related deaths in Canada, the majority of which were immersions (Figure 1). Aquatic activities, boating and playing near unprotected water were leading causes.

Swimming in areas supervised by Lifeguards provides a layer of protection to help prevent immersion deaths.

Figure 1. Water-related deaths by type of injury and type of activity
Canada 2011–2015 (n=2,231)



* Includes all water-related deaths other than immersion-related

** Includes immersions from on-road and off-road vehicles travelling on ice

Source: Canadian Red Cross, 2020

Trends in Immersion Deaths

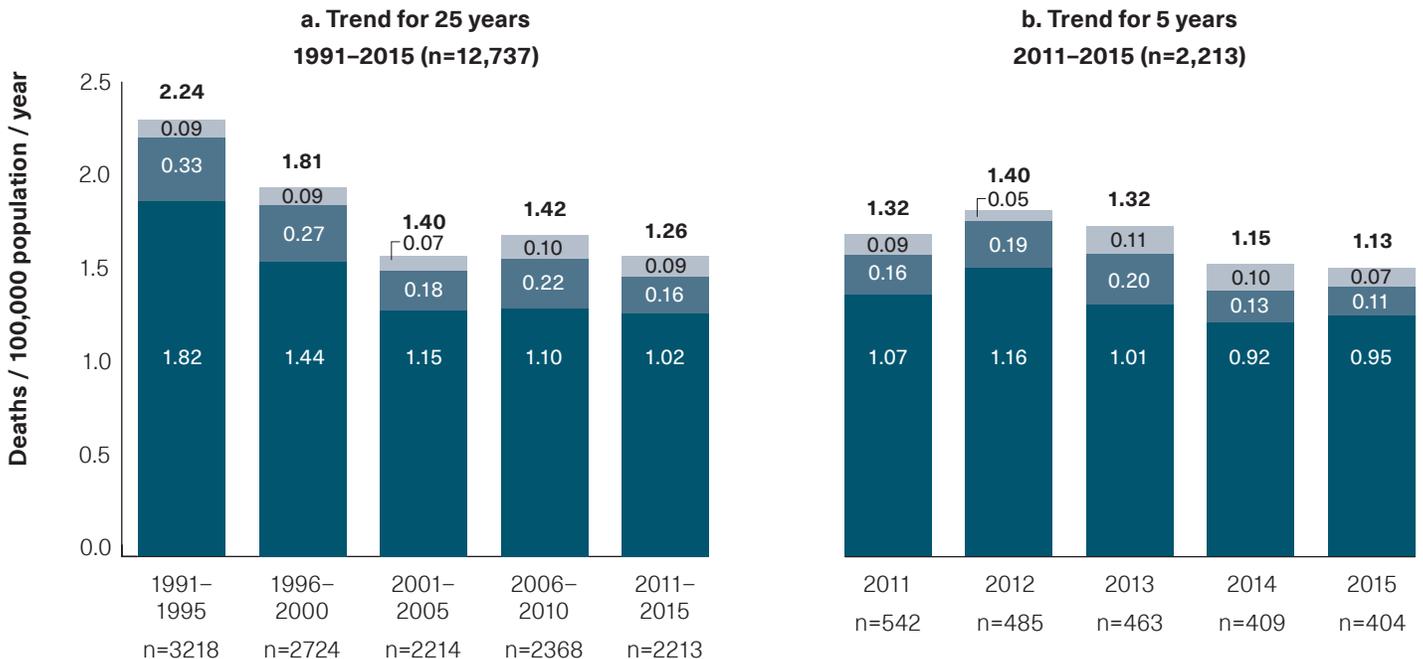


The age-adjusted rate of immersion fell by 43% between the periods 1991–1995 and 2011–2015 (Figure 2). The average decline was 13% between each of the five surveillance periods, representing a decrease of about 200 water-related deaths per 5-year period. However, the decline was much more pronounced during the first three periods than the last two.

There were no improvements for other types of water-related injuries, including trauma from boating collisions, trauma from falls into water, and air embolism from scuba diving.

Figure 2. Age-adjusted rate* and number of immersion and other water-related injury deaths
Canada 1991–2015 (n=12,737)

- Immersion deaths, excluding land, ice & air transport (n=10,224)
- Land, ice & air transport immersion deaths (n=1,811)
- Other injury deaths such as trauma** (n=702)



* Age standardized to the 2015 Canadian population

** Includes all water-related injury deaths other than immersions

Source: Canadian Red Cross, 2020

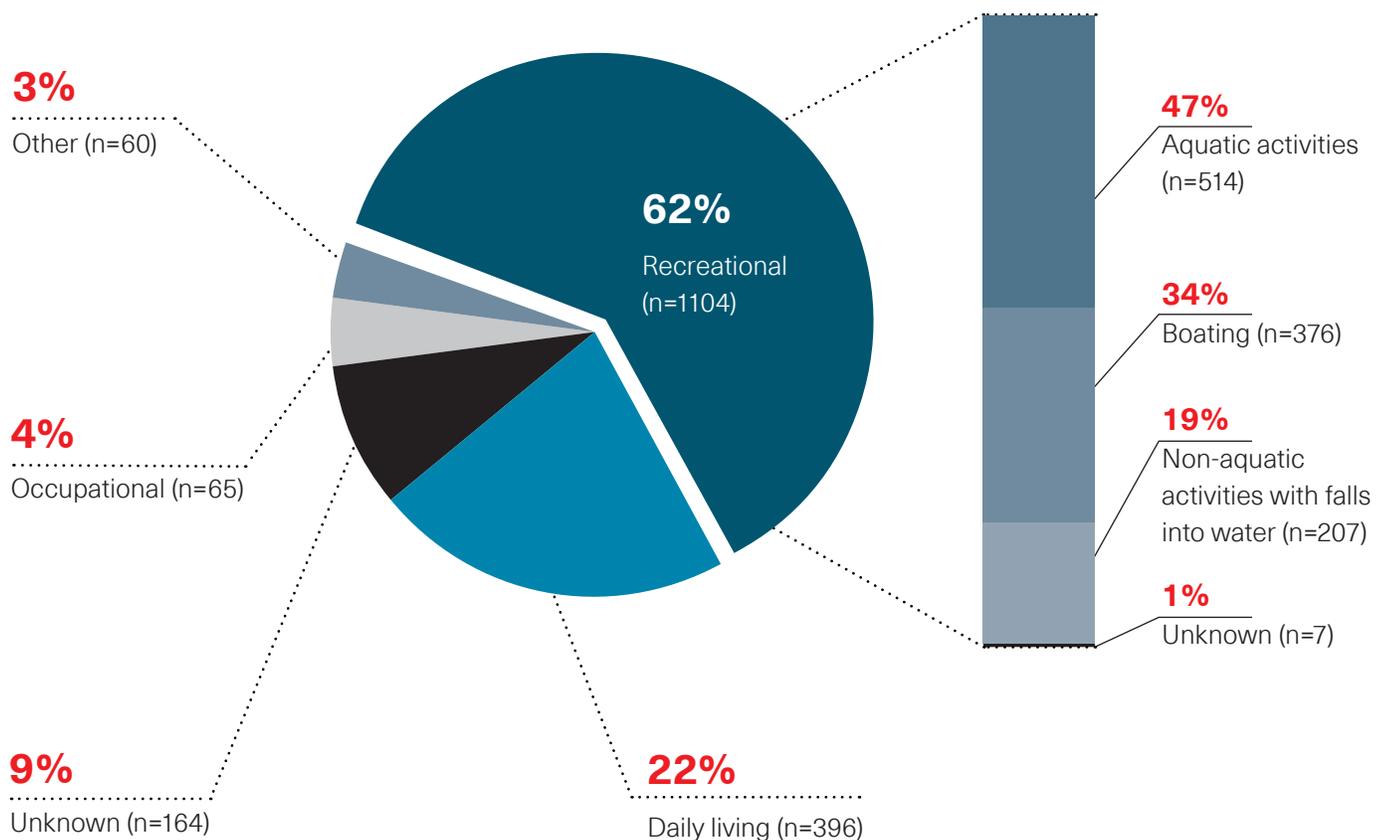
All Immersion Deaths by Activity and Purpose

For recreational deaths, aquatic activities accounted for 47%, boating 34%, and non-aquatic falls into water 19% during 2011–2015 (Figure 3). During the earlier surveillance period of 1991–2000, boating was the leading cause of immersion at 43%, aquatic 34%, and non-aquatic falls 25%.

Just over 60% of fatal immersions occurred during recreational activities. The most frequent were aquatic, followed by boating and non-aquatic falls into water. Activities of daily life, including bathing/washing and travel on foot/walking, made up 22%. Occupational immersions comprised 4% of deaths, with fishing being the main activity (55%).

Figure 3. Immersion deaths* by activity and purpose

Canada 2011–2015 (n=1,789)



* Includes recreational, occupational and daily living immersions; excludes land, ice and air transport immersions.

Source: Canadian Red Cross, 2020

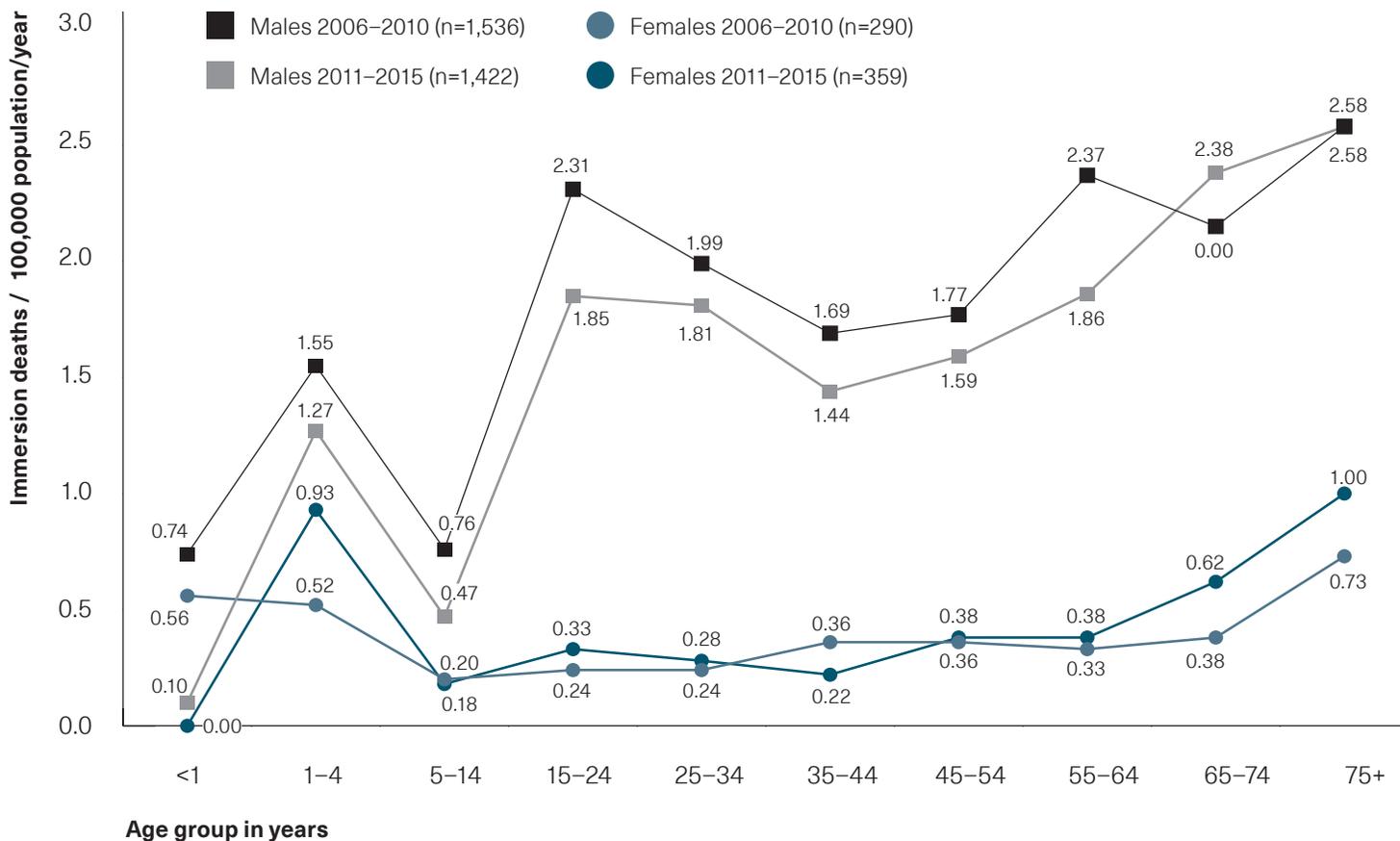
Personal Risk Factors

Age and Sex

Among females, there was an overall increase in immersion death rates, while among males there was a decrease. There was an increase among 1–4-year-old female toddlers between 2006–2010 and 2011–2015, and a slight decrease for male infants (Figure 4). There was a slight decrease for males 5–64 years old.

Figure 4. Immersion death rates* / 100,000 / year by age† and sex

Canada 2006–2010 (n=1,830), 2011–2015 (n=1,789)



Number of immersion deaths by age group

| | <1 | 1–4 | 5–14 | 15–24 | 25–34 | 35–44 | 45–54 | 55–64 | 65–74 | 75+ |
|-----------------------------|----|-----|------|-------|-------|-------|-------|-------|-------|-----|
| Males 2006–2010 | 7 | 57 | 75 | 267 | 224 | 207 | 233 | 233 | 124 | 109 |
| Males 2011–2015 | 1 | 50 | 46 | 217 | 218 | 168 | 213 | 213 | 171 | 125 |
| Females 2006–2010 | 5 | 18 | 19 | 26 | 27 | 44 | 47 | 33 | 24 | 47 |
| Females 2011–2015 | 0 | 35 | 17 | 36 | 33 | 26 | 50 | 44 | 48 | 70 |

* Includes recreational, occupational and daily living immersions; excludes land, ice and air transport immersions

† For 12 deaths, age of victim was unknown

Source: Canadian Red Cross, 2020

Older Adults

There was an increase in the rates of immersion deaths among 65–74-year-olds between 2006–2010 and 2011–2015 for both males and females. A decrease was observed for 55–64-year-old males. Cardiovascular disease including chronic conditions as well as sudden acute cardiac events was reported as an associated contributing factor for 55% of victims 65 years and older during 2011–2015.

Ethnicity–Indigenous Peoples

Among 1789 immersion deaths during 2011–2015, 9% of victims were Indigenous and 2% probable Indigenous. These proportions were unchanged from 2006–2010. Indigenous peoples made up 5% and 4% of the Canadian population in 2016 and 2011, respectively.

Medical Conditions–Loss of Consciousness Including Epilepsy and Other Seizures

During 2011–2015, 178 immersions involved epilepsy, other seizures, or other causes of loss of consciousness. For 64 victims, epilepsy was reported, while other causes of seizures were reported for 40 victims. Loss of consciousness due to seizure was known for 39 victims, and 68 victims lost consciousness due to heart conditions, diabetes or fainting. Of the 178 immersion victims involving epilepsy, other seizures or other loss of consciousness, 53 had positive samples for epilepsy medication. Deaths associated with seizure averaged 33 and 36 per year during 2006–2010 and 2011–2015, respectively.

Environment Risk Factors

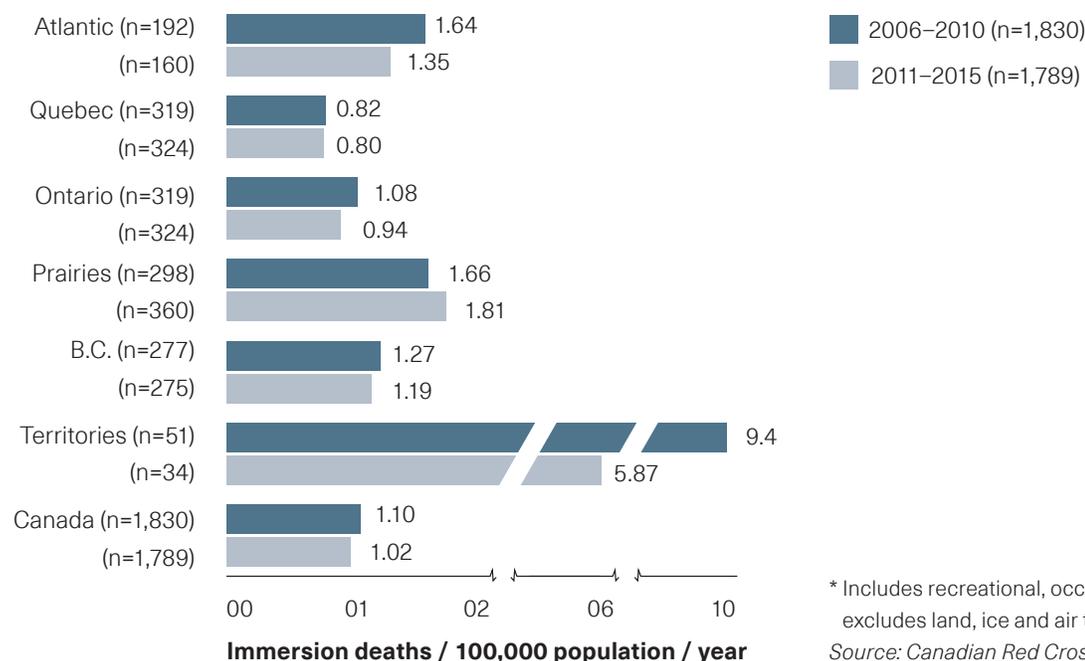
Immersion Deaths by Region of Canada

Overall, there was a 7% decrease in immersion death rates for Canada between 2006–2010 and 2011–2015 (Figure 5). The highest rates during 2011–2015 were in the territories, followed by the Prairie provinces. The greatest improvement was seen for the territories, 38%, and Atlantic provinces, 18%. A 9% increase in immersion death rates was observed for the Prairies. This was due to a 73% rise in the number of toddler immersions between the two 5-year periods, a 15% increase for 45–54-year-olds, 26% for 55–64-year-olds, 225% for 65–74-year-olds, and 180% increase for 75+-year-olds.

Figure 5. Rate and number of immersion deaths* by region

Canada 2006–2010 (n=1,830), 2011–2015 (n=1,789)

Region



* Includes recreational, occupational and daily living immersions; excludes land, ice and air transport immersions.

Source: Canadian Red Cross, 2020

Body of Water

Open bodies of water including lakes, rivers and oceans accounted for 70% of immersion deaths, compared with 25% in **built environments** such as bathtubs, swimming pools and hot tubs (Figure 6).

Rivers, Oceans, and Current

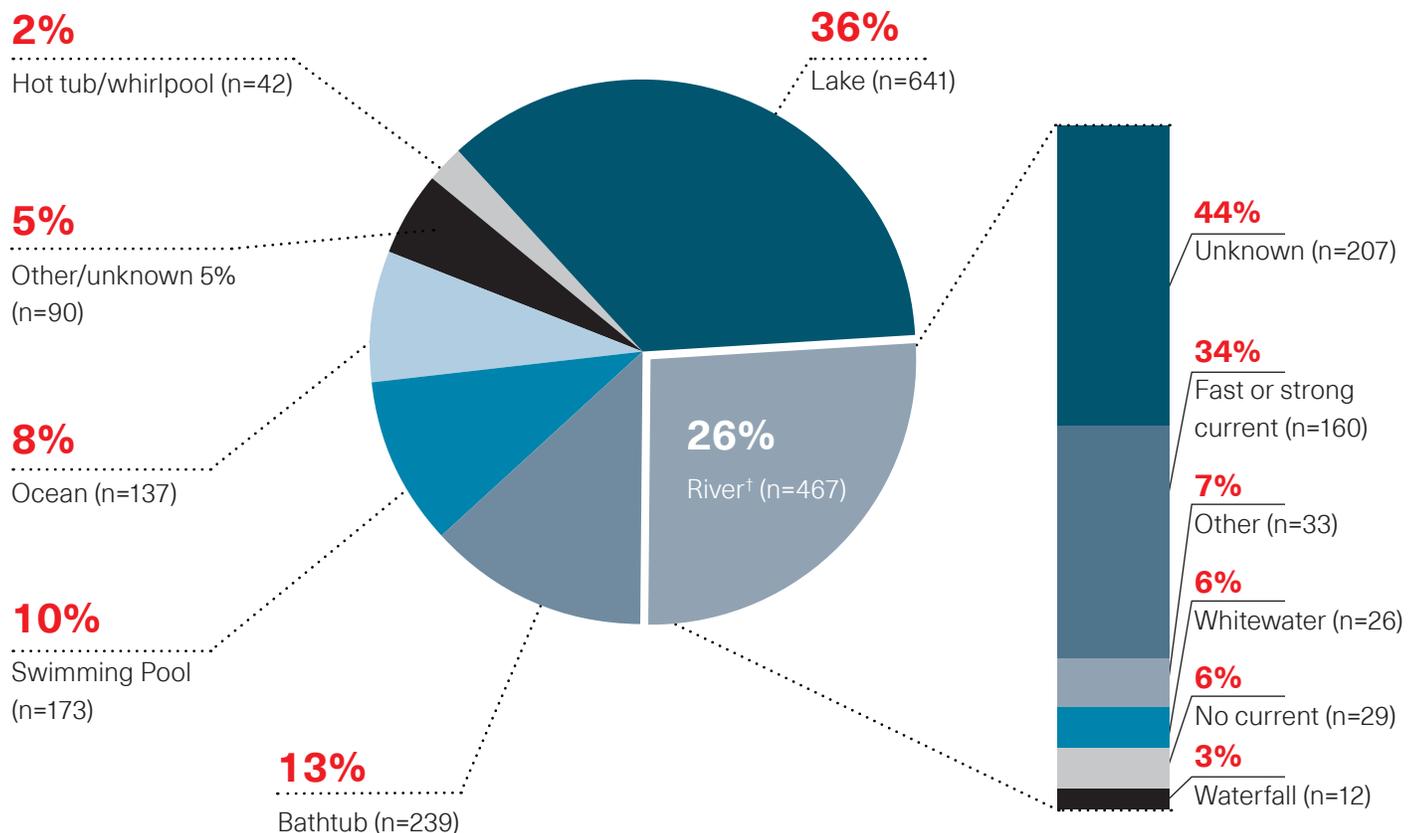
Of 1,789 immersion deaths during 2011–2015, 467 involved rivers. Aquatic activities accounted for 30% of immersions in rivers, boating 27%, non-aquatic 27%, and unknown 16%. Males accounted for 86% of river immersions; a main risk group was 15–64-year-olds. Current was reported for 231 fatal immersions in rivers. Among river boating victims 28% were properly wearing flotation in current. Among aquatic victims, 25% of those five years of age and older were reported as weak or non-swimmers.

Among 137 ocean deaths, 69% involved tide, 4% strong current, 1% ocean undertow, 1% other moving water situation, 24% unknown.

Home and Cottage Immersions

Homes were the site for 27% of immersion fatalities in Canada during 2011–2015, cottages/cabins 5%. For the period 2006–2010, homes and cottages were 24% and 5%, respectively.

Figure 6. Immersion deaths* by type of body of water and current
Canada 2011–2015 (n=1,789)



* Includes recreational, occupational and daily living immersions; excludes land, ice and air transport immersions

† Includes river, creek, stream, waterfall

Source: Canadian Red Cross, 2020

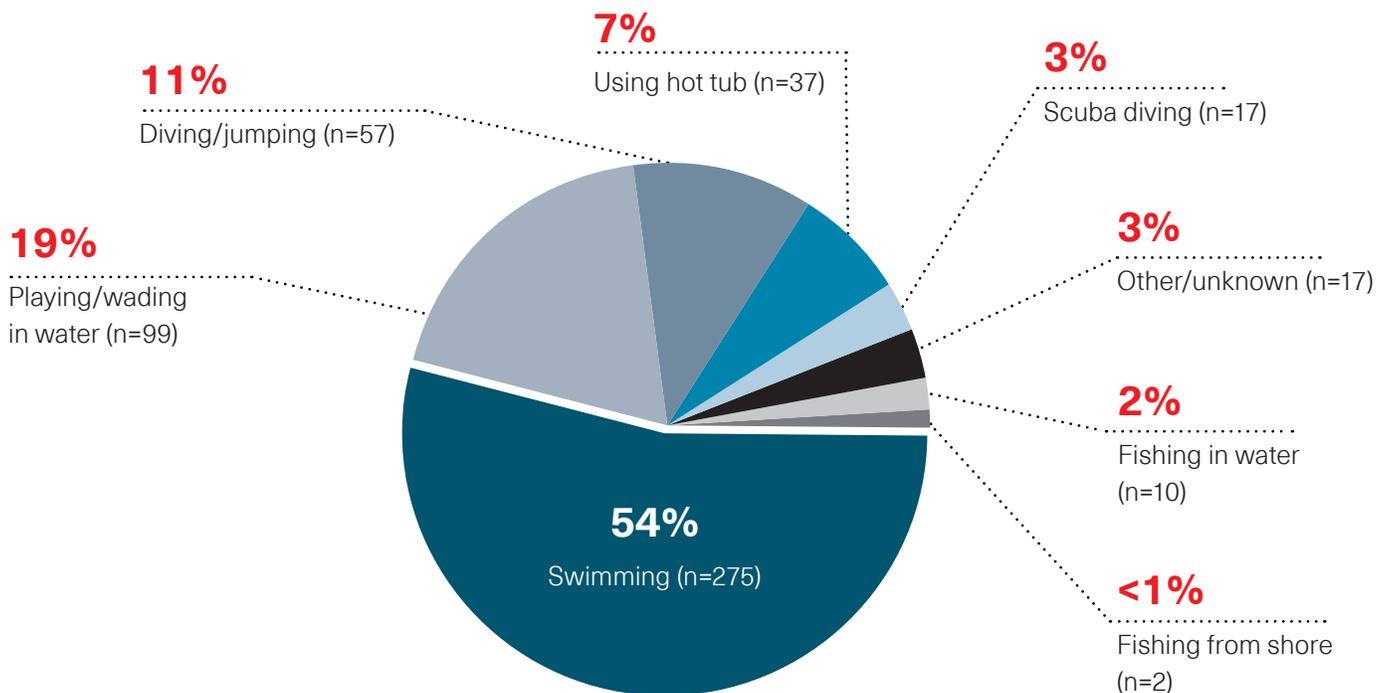


Activity

Swimming accounted for 54% of recreational aquatic deaths among victims over four years of age (Figure 7).

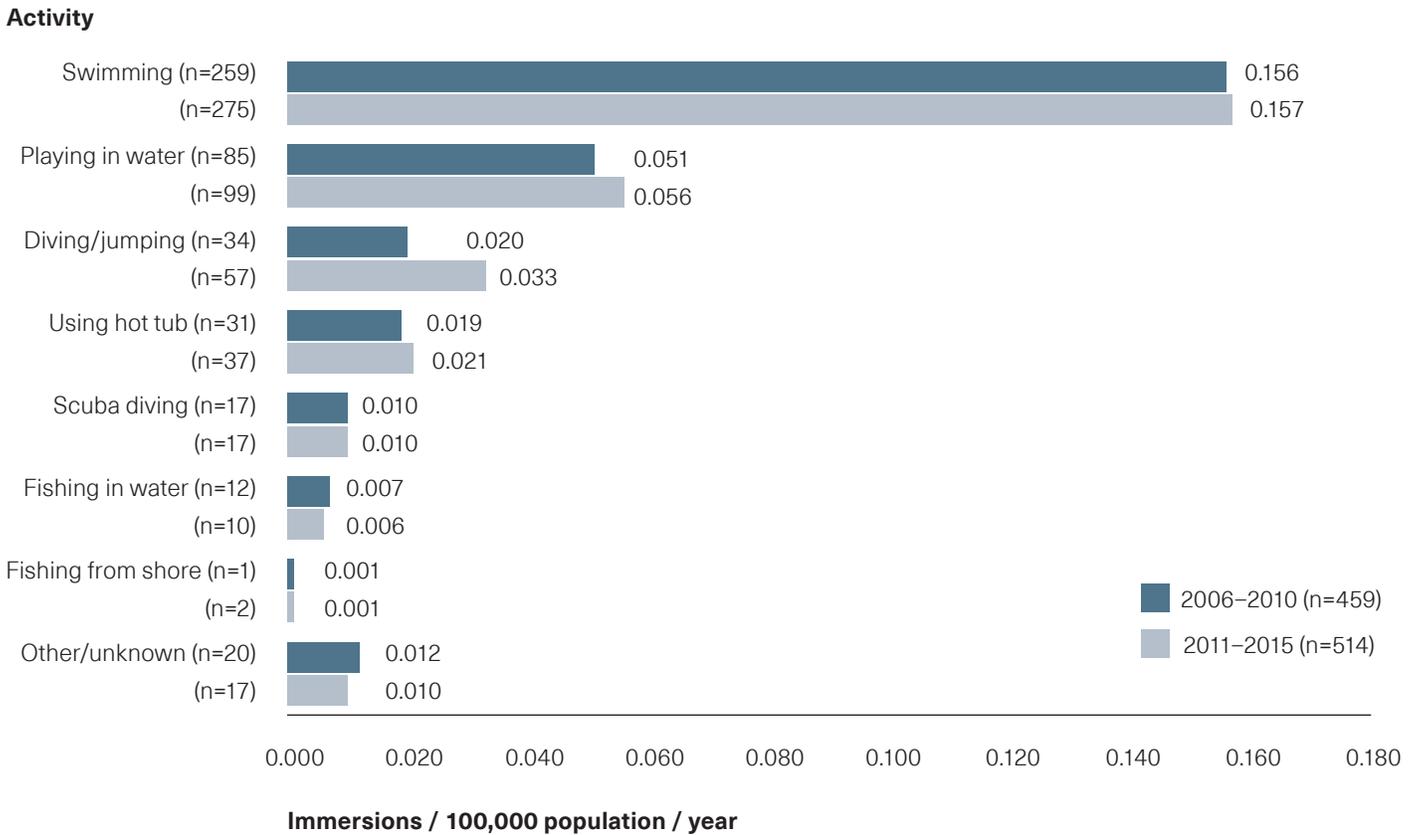
Playing in water/wading was the second most frequent activity for recreational aquatic deaths. The most significant change in trends by activity was a 68% increase in deaths from diving/jumping into water between 2006–2010 and 2011–2015 (Figure 8).

Figure 7. Recreational aquatic immersion deaths by activity
Canada 2011–2015 (n=514)



Source: Canadian Red Cross, 2020

Figure 8. Trends in recreational aquatic immersion deaths by activity
 Canada 2006–2010 (n=459), 2011–2015 (n=514)



Source: Canadian Red Cross, 2020

Personal Risk Factors

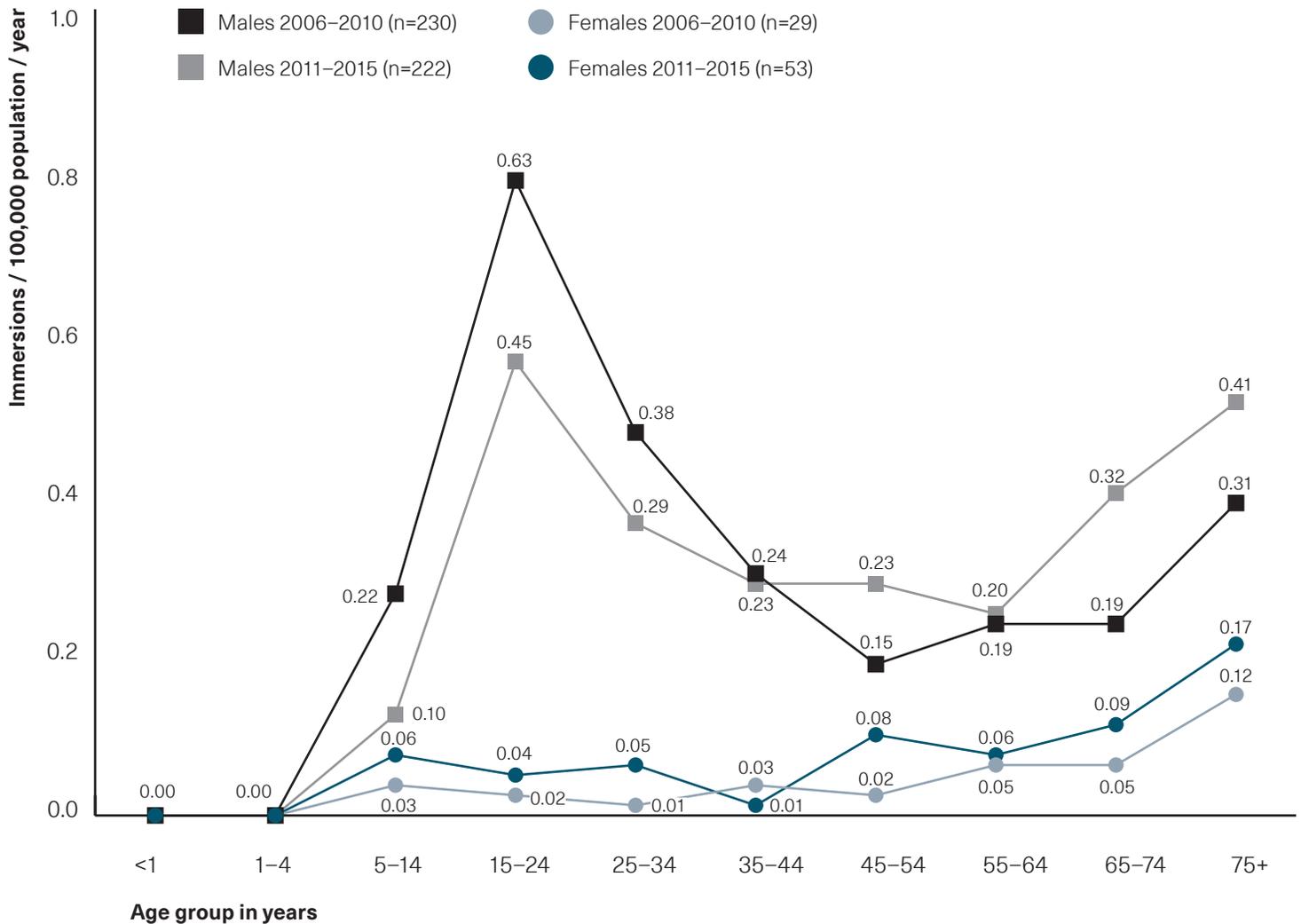
Age and Sex

The highest risk age group for swimming was 15–24-year-old males (Figure 9). The rate of death fell by 27% for this age group between 2006–2010 and 2011–2015.

Swimming Ability

At least 17% of swimming victims 5 years of age and older were weak swimmers during 2011–2015. For 12%, swimming ability was reported as strong, 14% reported as average/intermediate. Swimming ability was not specified for another 43%, and unknown for 14%.

Figure 9. Rate and number of swimming immersion deaths by age and sex
 Canada 2006–2010 (n=259), 2011–2015 (n=275)



Number of immersion deaths in age group

| | <1 | 1–4 | 5–14 | 15–24 | 25–34 | 35–44 | 45–54 | 55–64 | 65–74 | 75+ |
|-----------------------------|----|-----|------|-------|-------|-------|-------|-------|-------|-----|
| Males 2006–2010 | 0 | 0 | 22 | 73 | 43 | 29 | 20 | 19 | 11 | 13 |
| Males 2011–2015 | 0 | 0 | 10 | 53 | 35 | 27 | 31 | 23 | 23 | 20 |
| Females 2006–2010 | 0 | 0 | 3 | 2 | 1 | 4 | 3 | 5 | 3 | 8 |
| Females 2011–2015 | 0 | 0 | 6 | 4 | 6 | 1 | 10 | 7 | 7 | 12 |

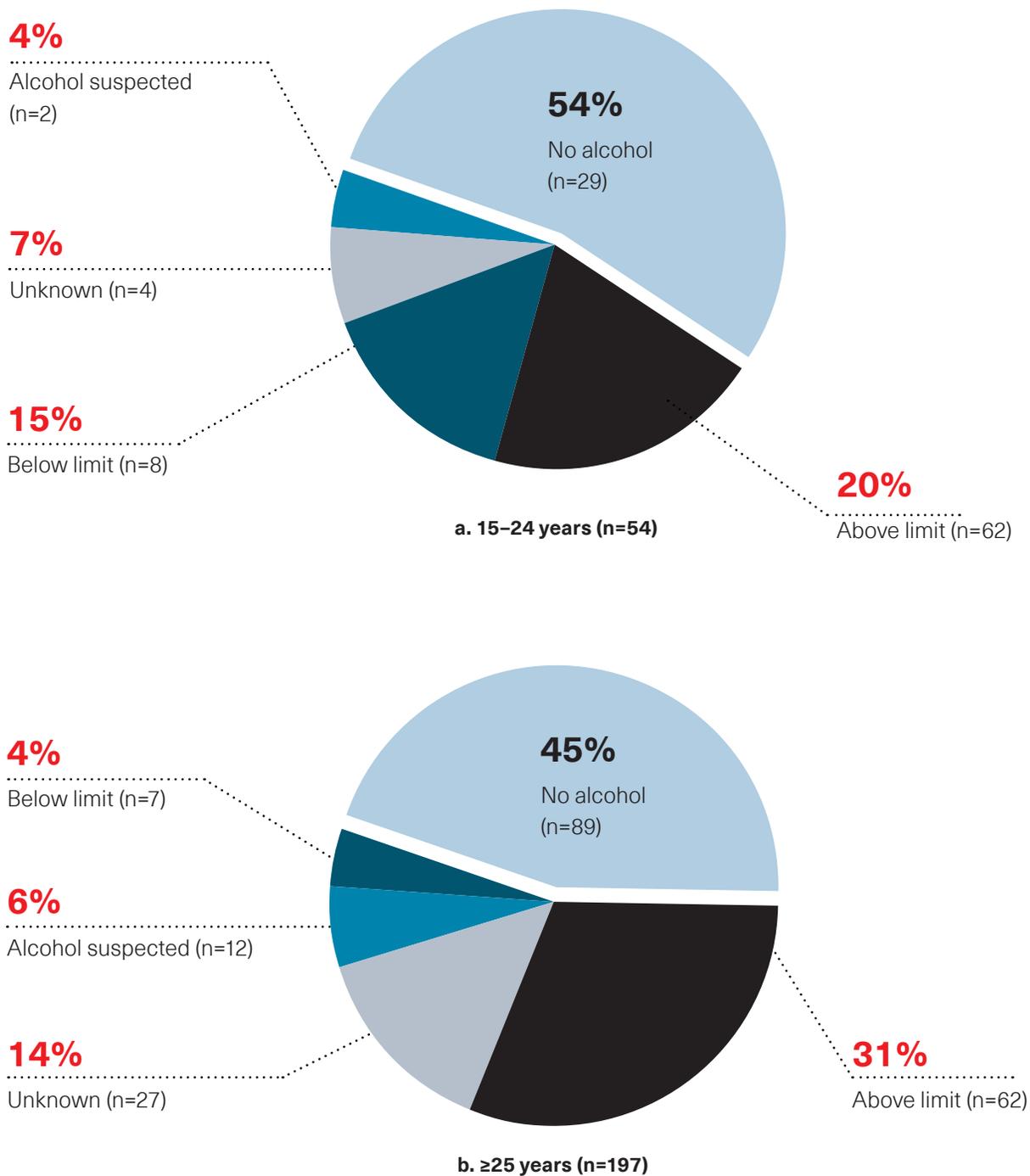
Source: Canadian Red Cross, 2020

Alcohol by Age

Alcohol was involved or suspected in 39% of swimming immersion deaths of 15–24-year-olds and 41% of victims 25 and older (Figure 10).

Figure 10. Swimming immersion deaths by alcohol involvement* & age group

Canada 2011–2015 (n=259)†



* Legal limit is 80mg% in all provinces except Ontario and British Columbia, where it is 50mg%

† This figure excludes 3 victims 15–24 years old and 5 victims ≥25 years old; decomposition rendered blood alcohol unreliable.

Source: Canadian Red Cross, 2020

Environment Risk Factors

Body of Water

Lakes followed by rivers were the most frequent body of water for swimming deaths (Figure 11 and Figure 12). Built environments including private home pools and other pools such as condo and hotel pools each represented 13% of deaths.

Figure 11. Swimming immersion deaths by type of body of water
Canada, 2011–2015 (n=275)

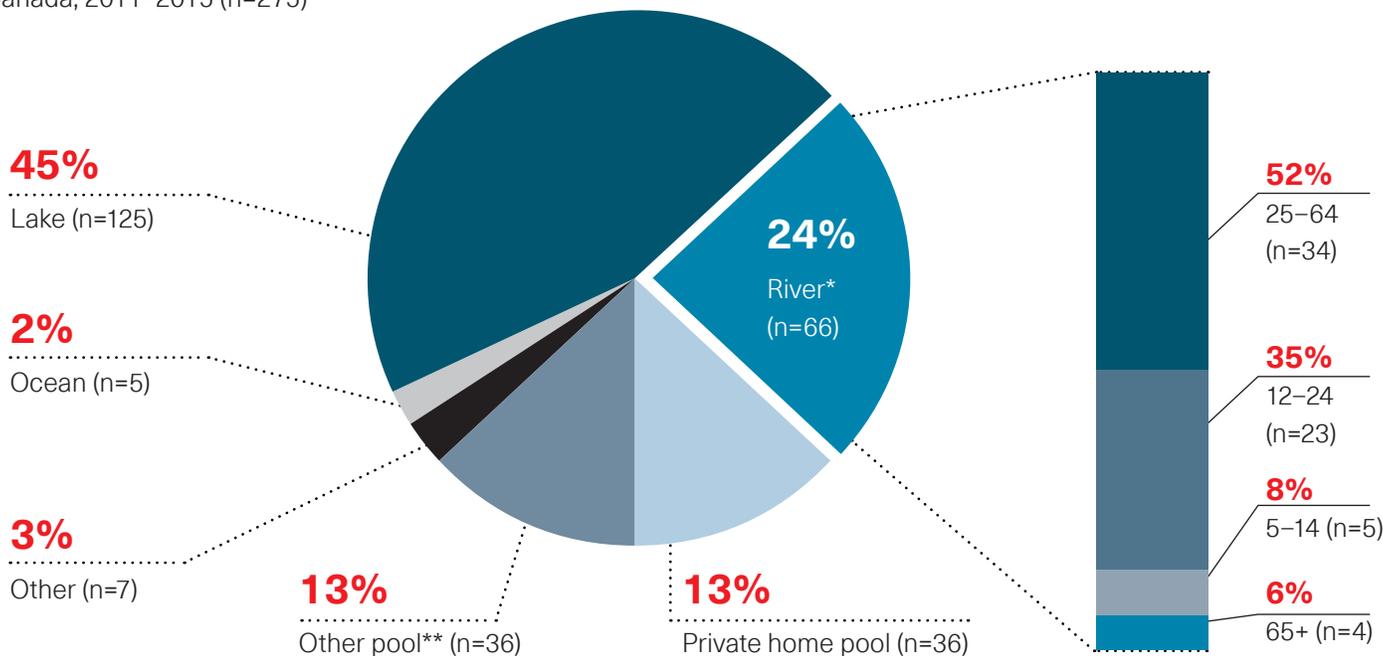
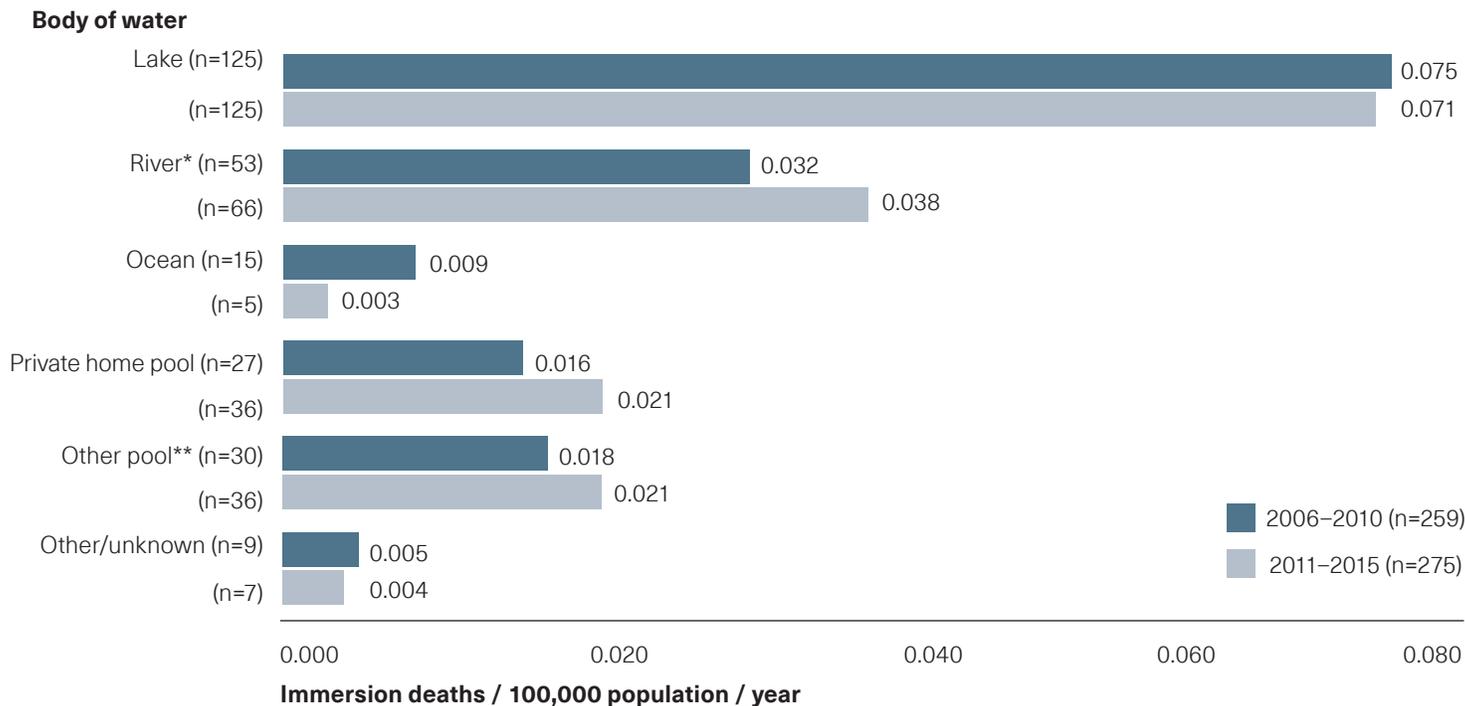


Figure 12. Trends in swimming immersion deaths by body of water
Canada 2006–2010 (n=259), 2011–2015 (n=275)



* Includes river, creek, stream, waterfall

** Includes public pools, hotel/motel pools, private club, and apartment/condo pools.

Source: Canadian Red Cross, 2020

Swimming Pools

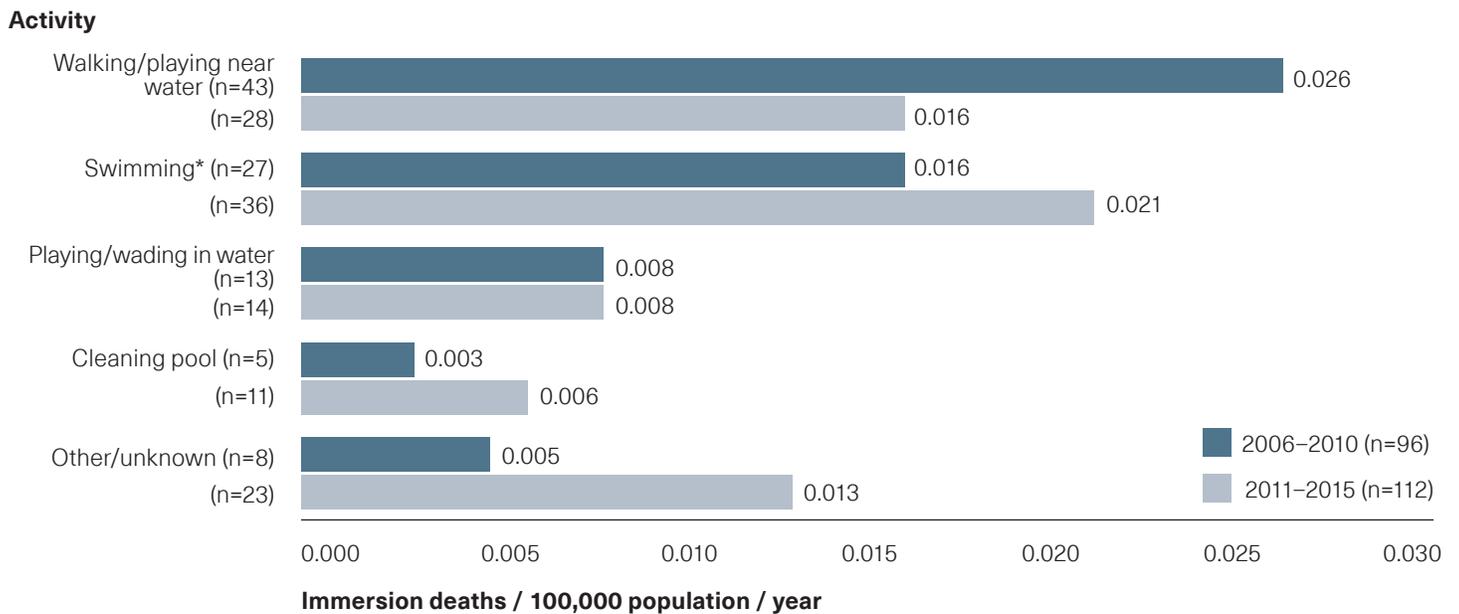
Deaths in swimming pools involve both aquatic and non-aquatic activities.

Activity

Swimming was the most frequent activity associated with deaths in private home swimming pools during 2011–2015 (Figure 13). About 30% (n=11) of swimming pool incidents involved victims 75+ years. Non-aquatic activities such as walking and playing near a pool were the next most frequent.

Figure 13. Trends in single-family home swimming pool immersion deaths by activity

Canada 2006–2010 (n=96), 2011–2015 (n=112)



* Swimming excludes all victims <5 years old who are considered non-swimmers

Source: Canadian Red Cross, 2020

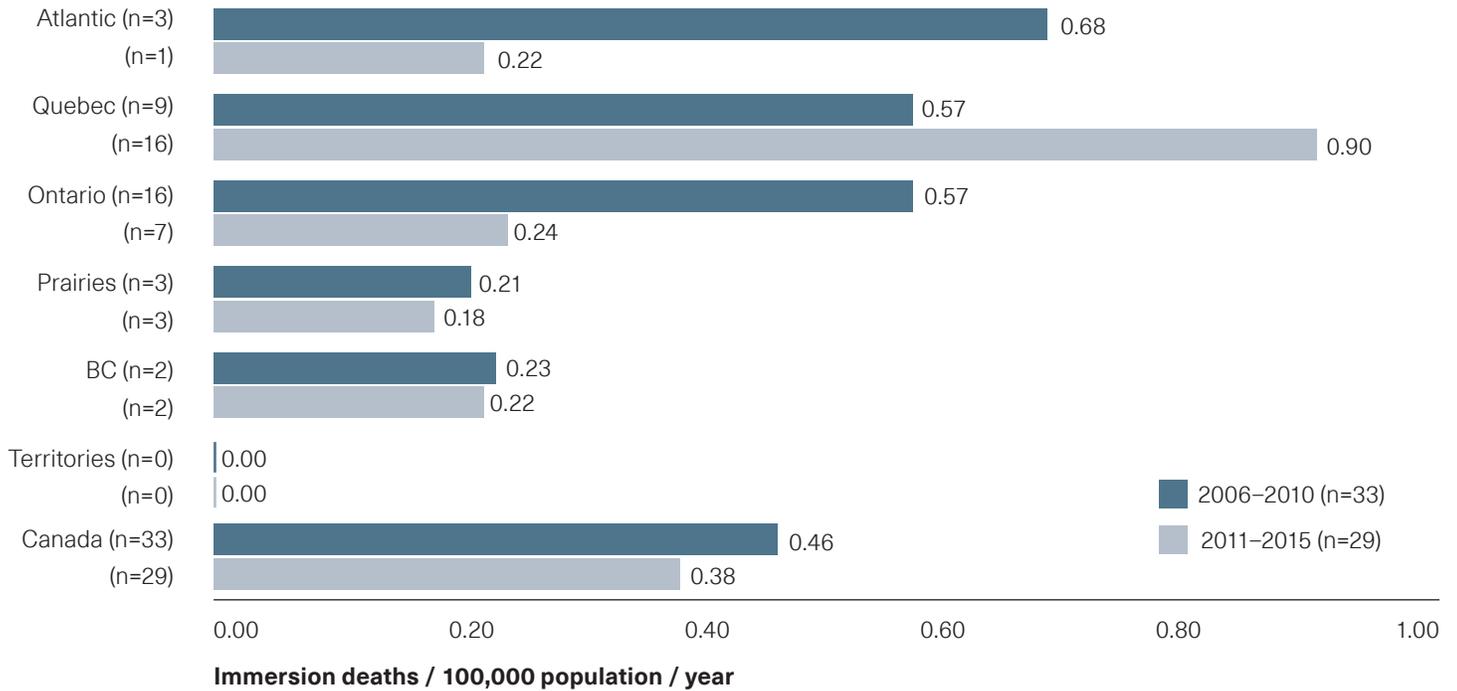
Region

About half of immersions in private home pools involving toddlers 1–4 years of age during 2011–2015 were in Quebec (Figure 14). An increase in the number of immersion deaths was observed for Quebec between 2006–2010 and 2011–2015, while Ontario saw a decrease.

Figure 14. Trends in toddler immersion deaths in private home pools by region

Canada 2006–2010 (n=33), 2011–2015 (n=29)

Region



Source: Canadian Red Cross, 2020

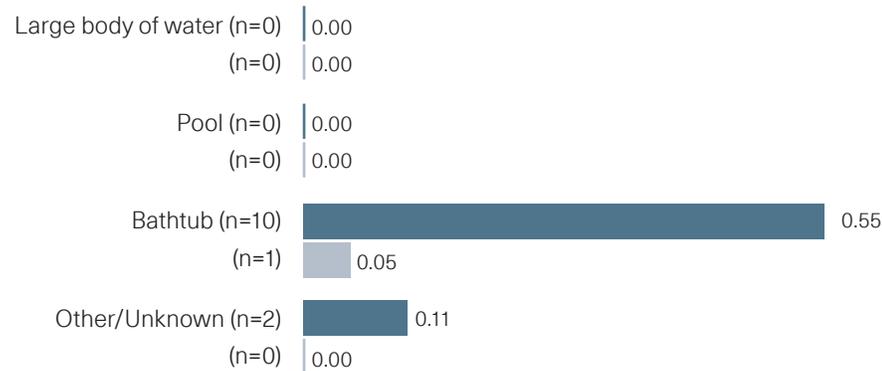
Age and Body of Water

Infants mainly died in bathtubs during 2006–2010, while there was only one infant death in bathtubs during 2011–2015 (Figure 15). Toddlers mainly died in pools and large open bodies of water during both surveillance periods. Older children and youth mainly died in large bodies of water such as lakes and rivers.

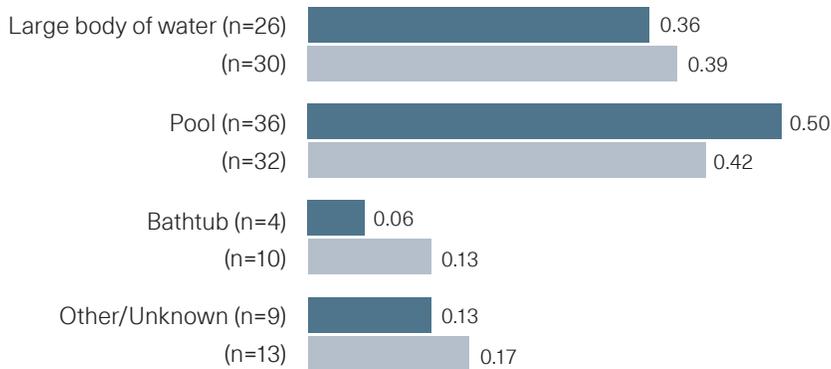
Figure 15. Child and youth immersion deaths* by age and type of body of water†

Canada 2006–2010 (n=313), 2011–2015 (n=247)

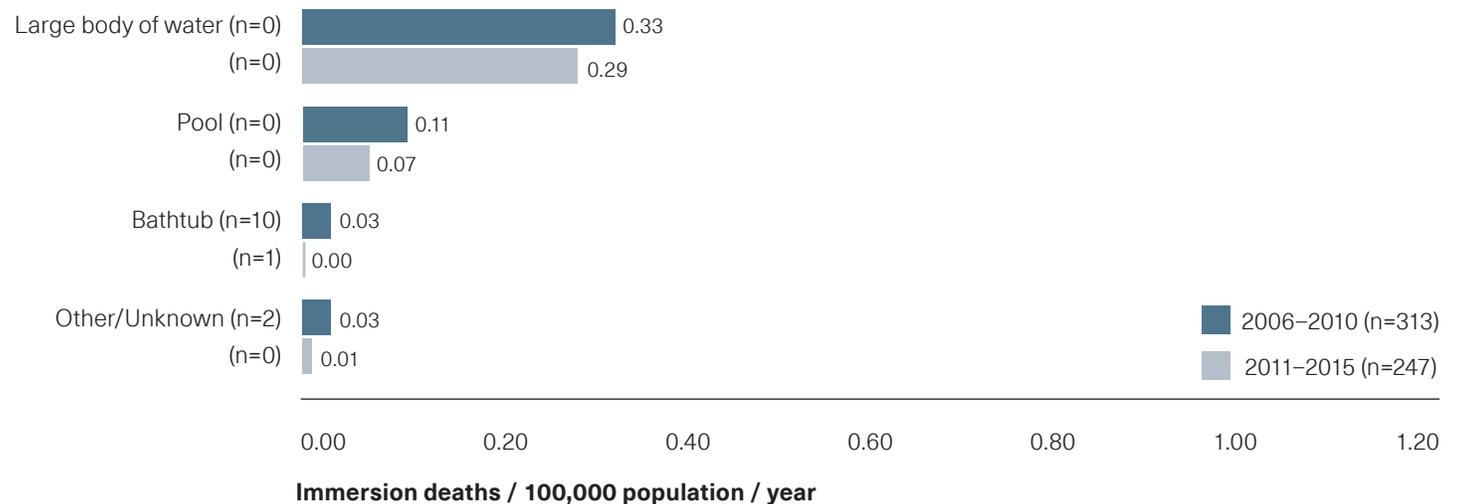
<1 year



1–4 years



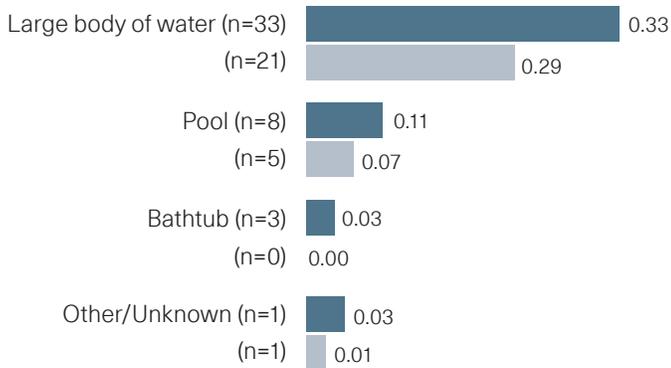
5–9 years



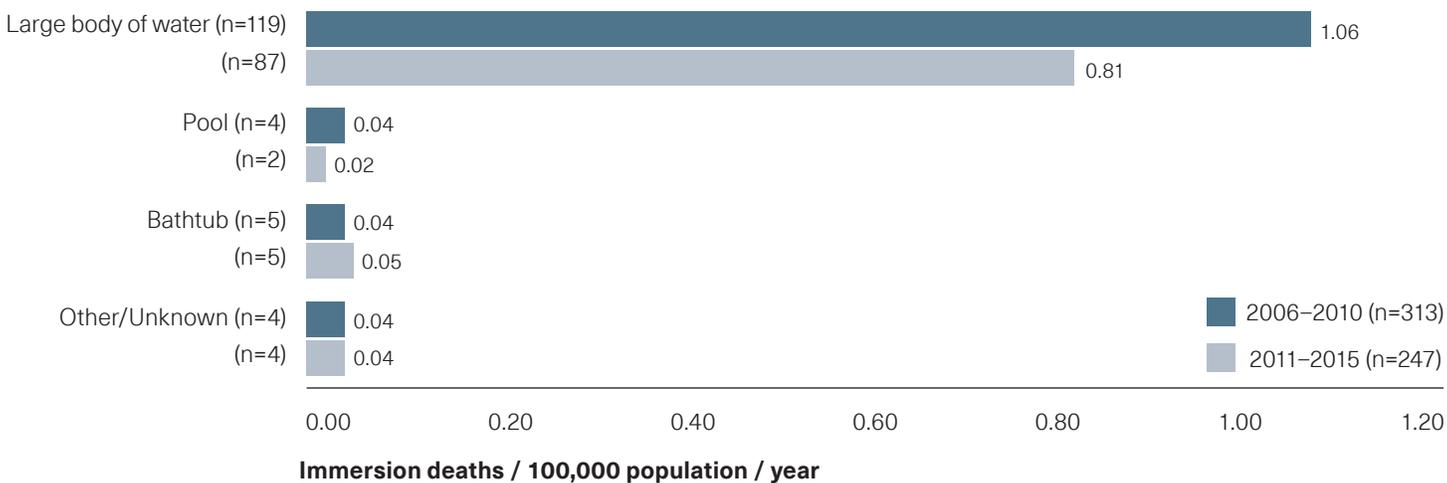
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Figure 15. Continuation

10–14 years



15–19 years



* Includes recreational, occupational & daily living immersions. There was only 1 occupational immersion, of 15–19-year-old age group, during 2006–2010 and none during 2011–2015. This figure excludes land, ice and air transport immersions.

† Large body of water includes ocean, river, lake, reservoir and pond

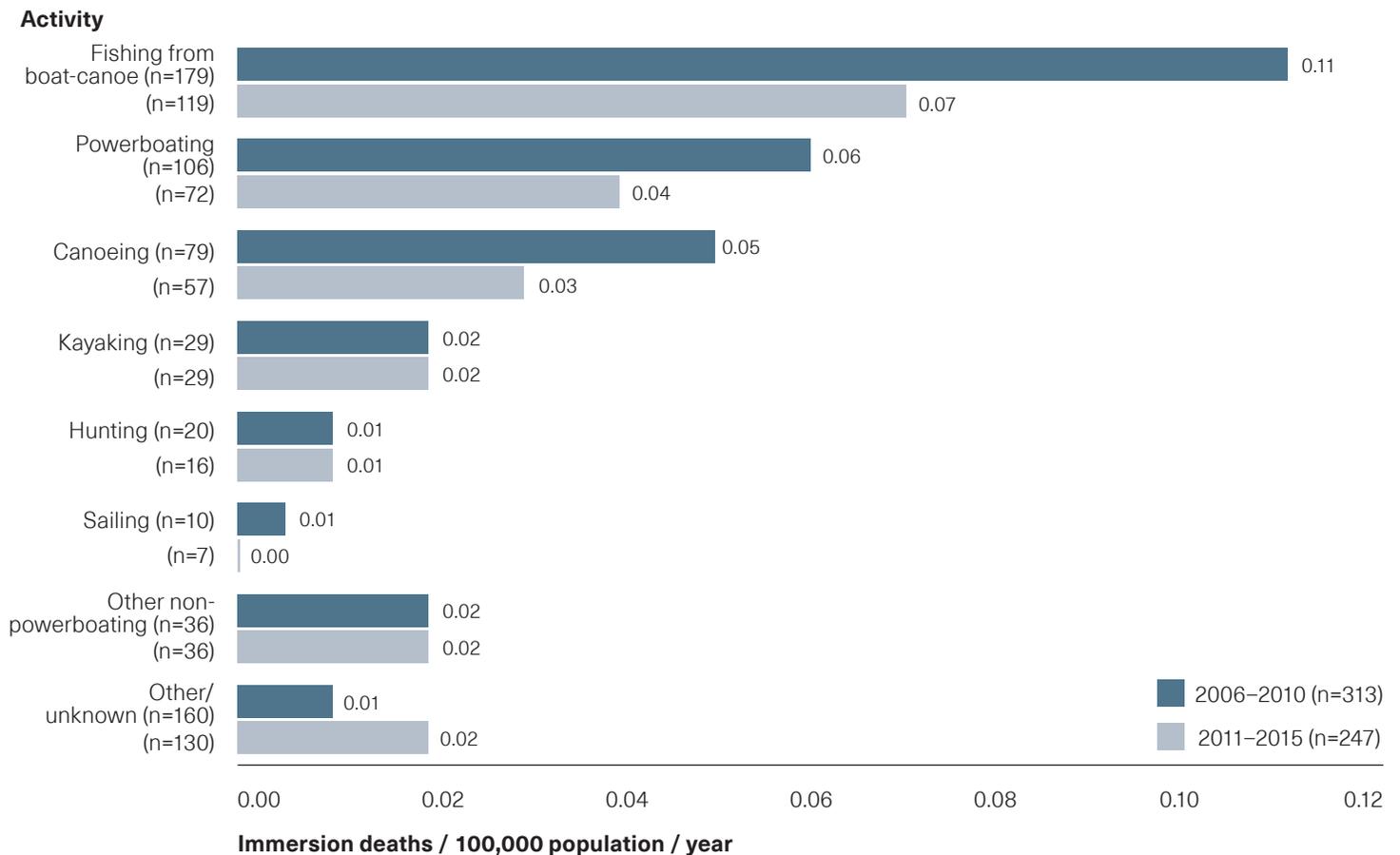
Source: Canadian Red Cross, 2020



Activity

Fishing was the most frequent activity for recreational boating fatalities during 2011–2015, followed by powerboating and canoeing (Figure 16). The overall rate of recreational boating immersion deaths fell by 26% between the two 5-year periods.

Figure 16. Trends in recreational boating immersion deaths by activity
Canada 2006–2010 (n=481), 2011–2015 (n=376)



Source: Canadian Red Cross, 2020

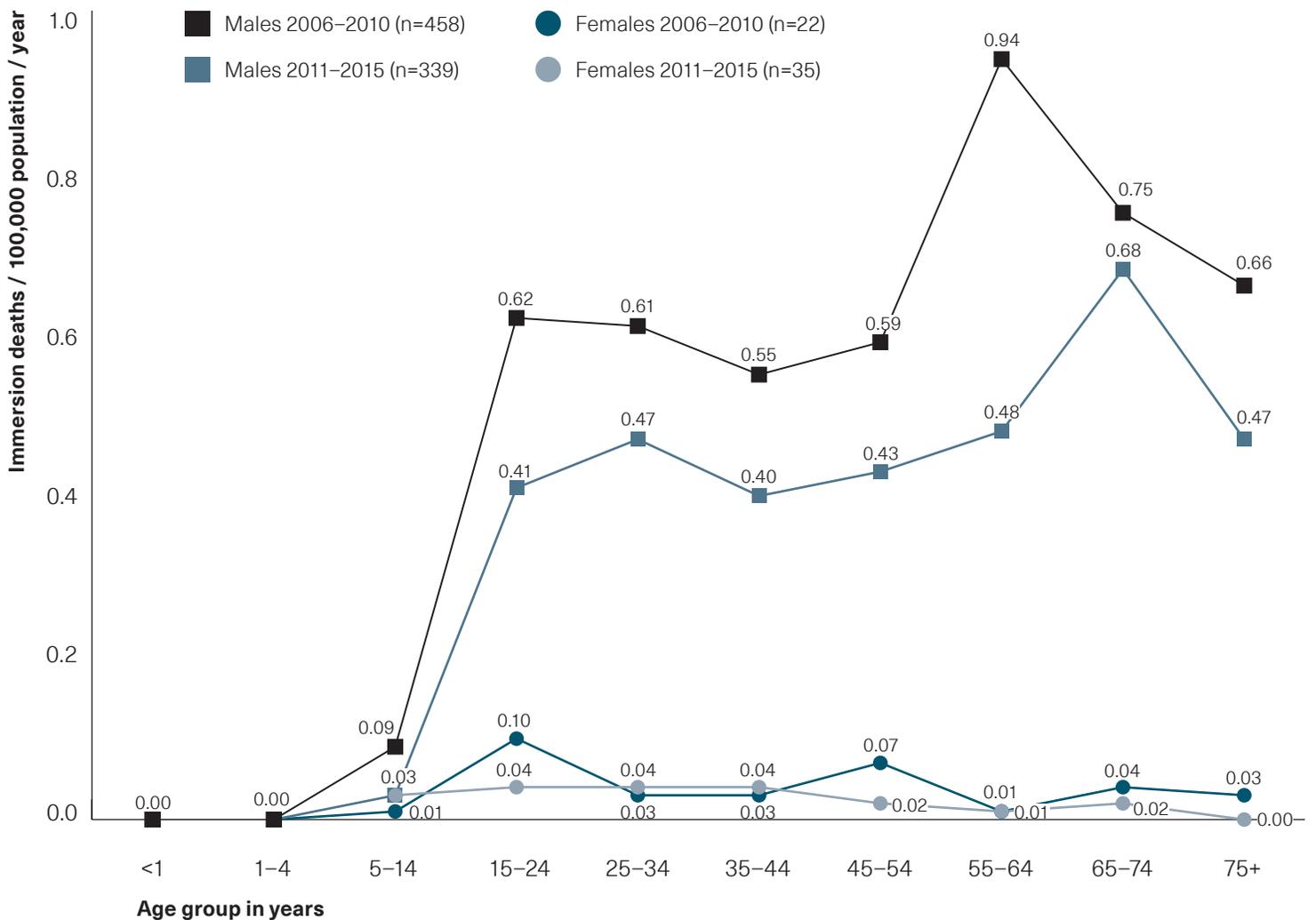
Personal Risk Factors

Age and Sex

Most boating immersion fatalities were males 15 years of age and older. There was a decline in rates between the two 5-year periods (Figure 17). There were no child victims in the 0–4 age group during either 5-year period. In the 5–14-year age group, deaths fell from 12 to 4 between 2006–2010 and 2011–2015.

Figure 17. Recreational boating immersion deaths by age and sex†

Canada 2006–2010 (n=481), 2011–2015 (n=376)



Number of immersion deaths in age group

| | <1 | 1–4 | 5–14 | 15–24 | 25–34 | 35–44 | 45–54 | 55–64 | 65–74 | 75+ |
|-----------------------------|----|-----|------|-------|-------|-------|-------|-------|-------|-----|
| Males 2006–2010 | 0 | 0 | 9 | 72 | 69 | 67 | 78 | 92 | 43 | 28 |
| Males 2011–2015 | 0 | 0 | 3 | 48 | 57 | 47 | 57 | 55 | 49 | 23 |
| Females 2006–2010 | 0 | 0 | 3 | 4 | 5 | 5 | 3 | 1 | 1 | 0 |
| Females 2011–2015 | 0 | 0 | 1 | 11 | 4 | 4 | 9 | 1 | 3 | 2 |

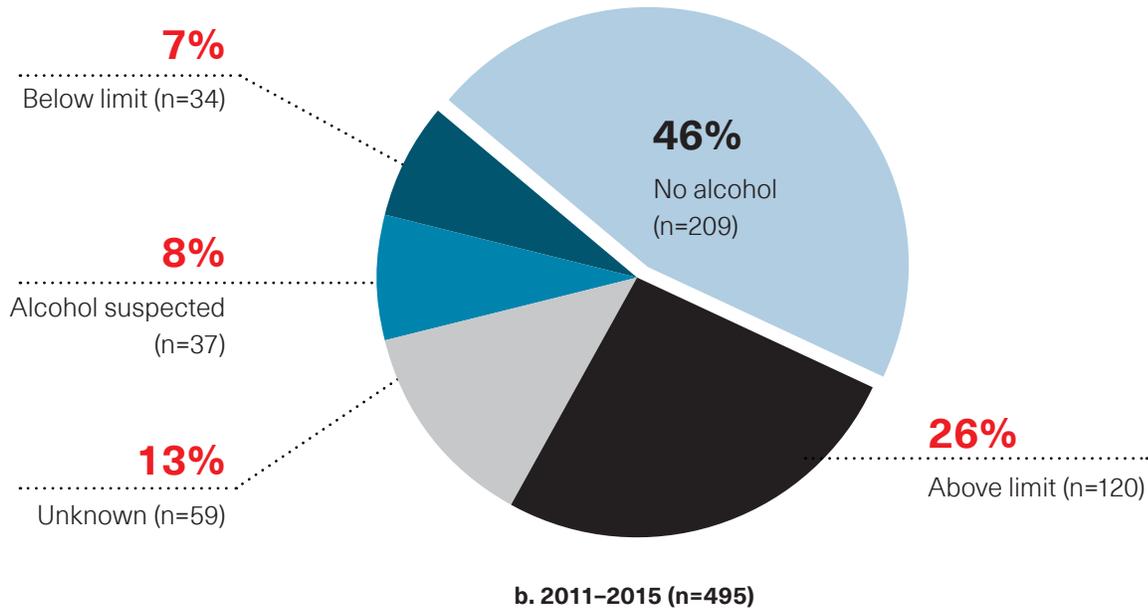
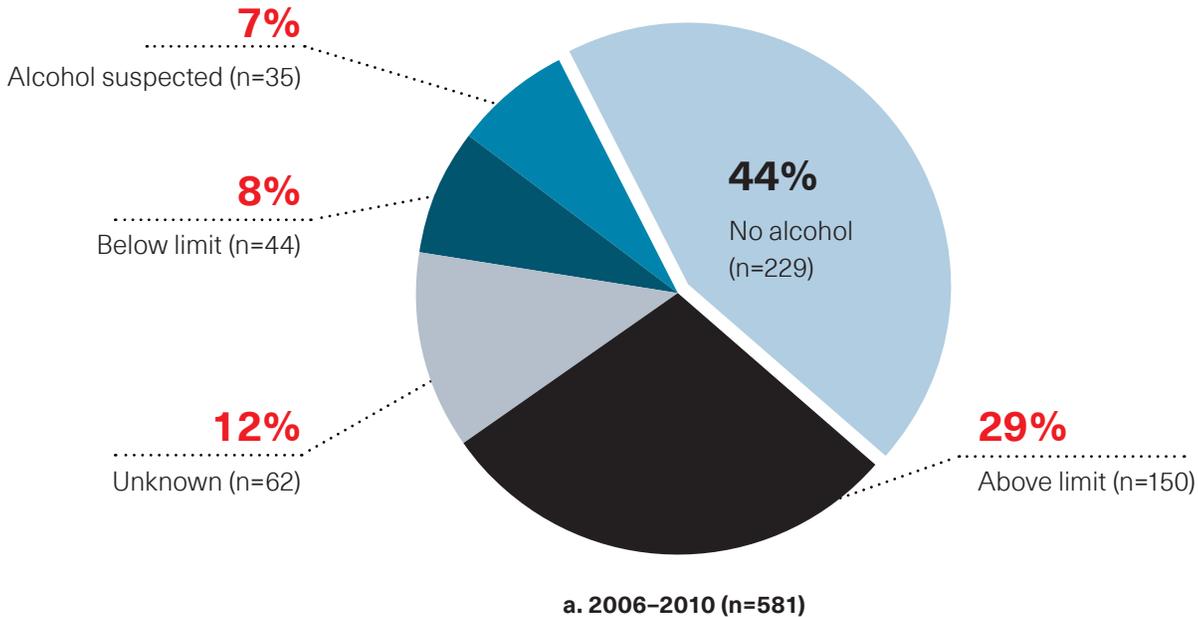
† For 2 deaths, age of victim was unknown

Source: Canadian Red Cross, 2020

Alcohol

Among boating victims during 2011–2015, 26% had an alcohol level over the legal limit for operating a motor vehicle, 7% below the limit, and another 8% had suspected alcohol involvement (Figure 18). Alcohol involvement is likely underestimated, since another 13% had unreported alcohol involvement. There was little improvement in the proportion of boating immersions involving alcohol between 2006–2010 and 2011–2015.

Figure 18. Boating immersion deaths* by alcohol involvement among victims ≥15 years of age†**
Canada 2006–2010 (n=581), 2011–2015 (n=495)



* Includes recreational, daily living and occupational boating immersions

** Legal limit is 80mg% in all provinces except Ontario and British Columbia where legal limit is 50mg%

† This figure excludes 61 victims during 2006–2010 and 36 victims during 2011–2015; decomposition rendered blood alcohol unreliable.

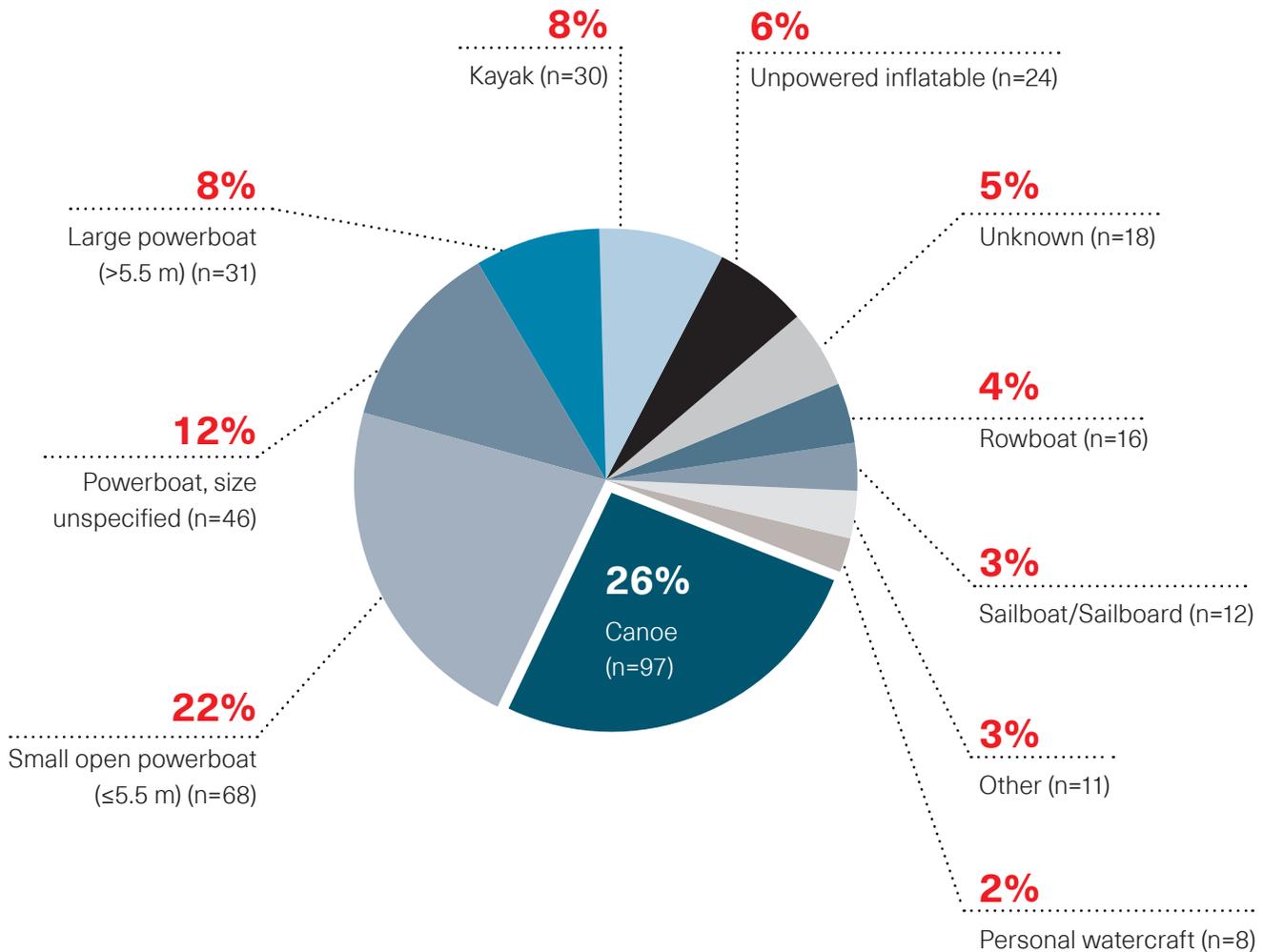
Source: Canadian Red Cross, 2020

Equipment Risk Factors

Type of Boat

Canoes followed up by small open powerboats were the most frequent type of boat involved in boating immersions (Figure 19). The rate of deaths fell by 25% and 43% for canoes and small open powerboats between 2006–2010 and 2011–2015, respectively (Figure 20).

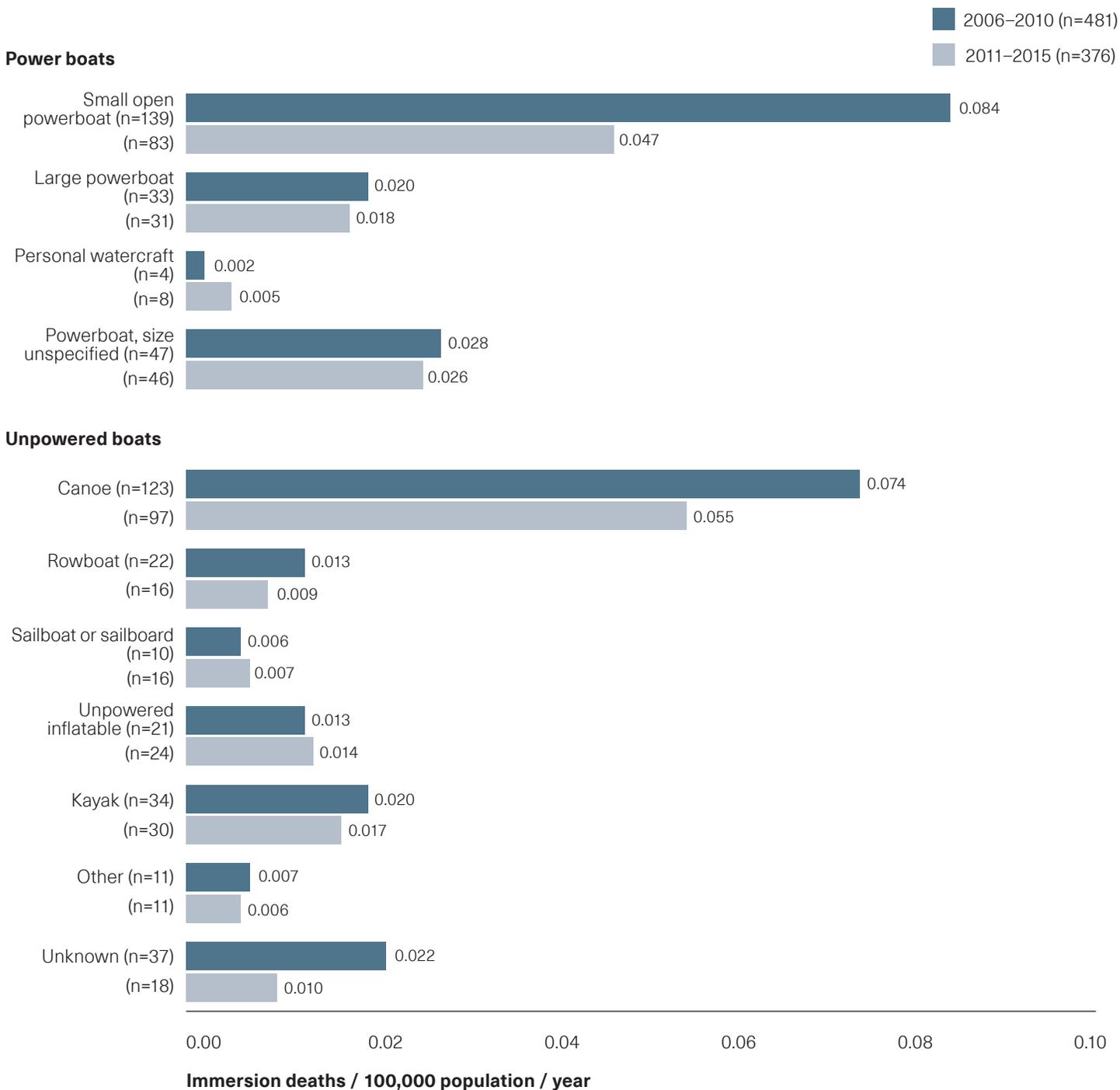
Figure 19. Recreational boating immersion deaths by type of boat
Canada 2011–2015 (n=376)



Source: Canadian Red Cross, 2020

Figure 20. Trends in recreational boating immersion deaths by type of boat

Canada 2006–2010 (n=481) 2011–2015 (n=376)



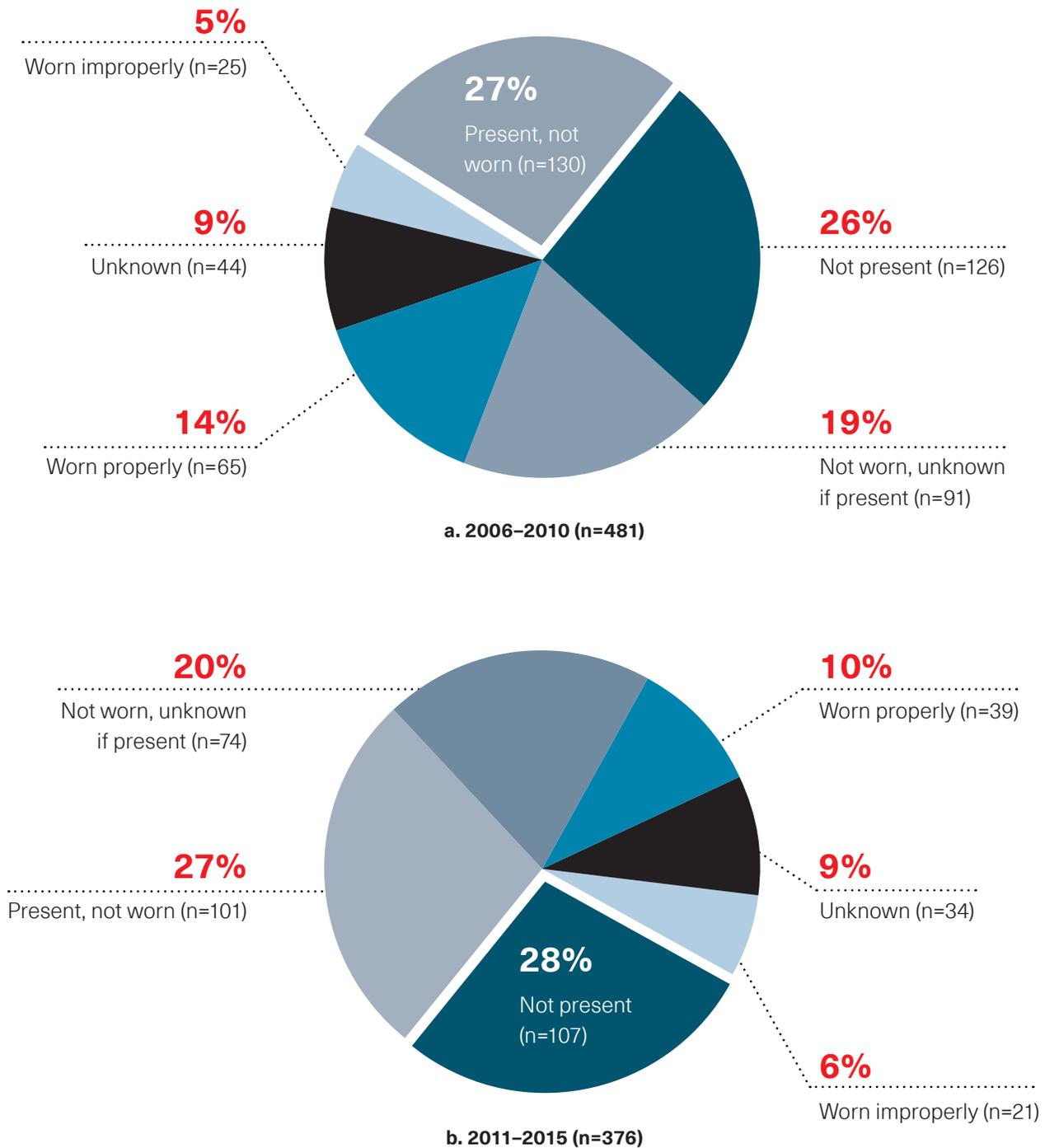
Source: Canadian Red Cross, 2020

Flotation

While the number of recreational boating victims fell by 22% between the two 5-year surveillance periods, the proportion wearing a lifejacket/personal flotation device (PFD) declined from 14% to 10% (Figure 21). Flotation was not present for 26% and 28% of victims during 2006–2010 and 2011–2015, respectively, a violation of current recreational boating regulations.

Figure 21. Trends in recreational boating immersion deaths by wearing of a lifejacket/PFD

Canada 2006–2010 (n=481), 2011–2015 (n=376)



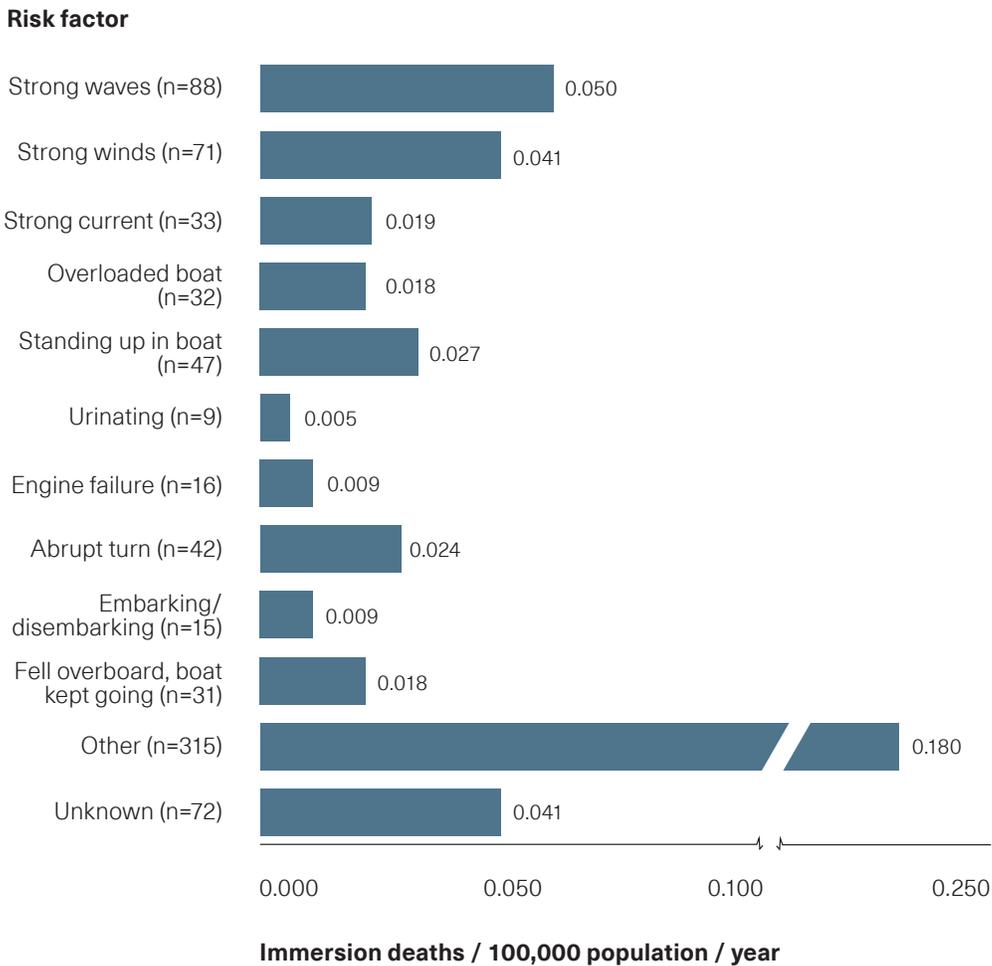
Note: Current Canadian regulations do not require wearing of a PFD, only presence on a boat
 Source: Canadian Red Cross, 2020

Environment Risk Factors

Wind, Waves and Other Risk Factors

Large waves, strong wind, current and overloading a boat can be lethal and were frequently reported as factors contributing to boating immersions (Figure 22). Risky maneuvers including standing up in a boat and abrupt turns were also frequently reported.

Figure 22. Boating immersion deaths by risk factors*
Canada 2011–2015 (n=495)



* There may be more than one risk factor per incident
Source: Canadian Red Cross, 2020

Non-Aquatic Falls Into Water



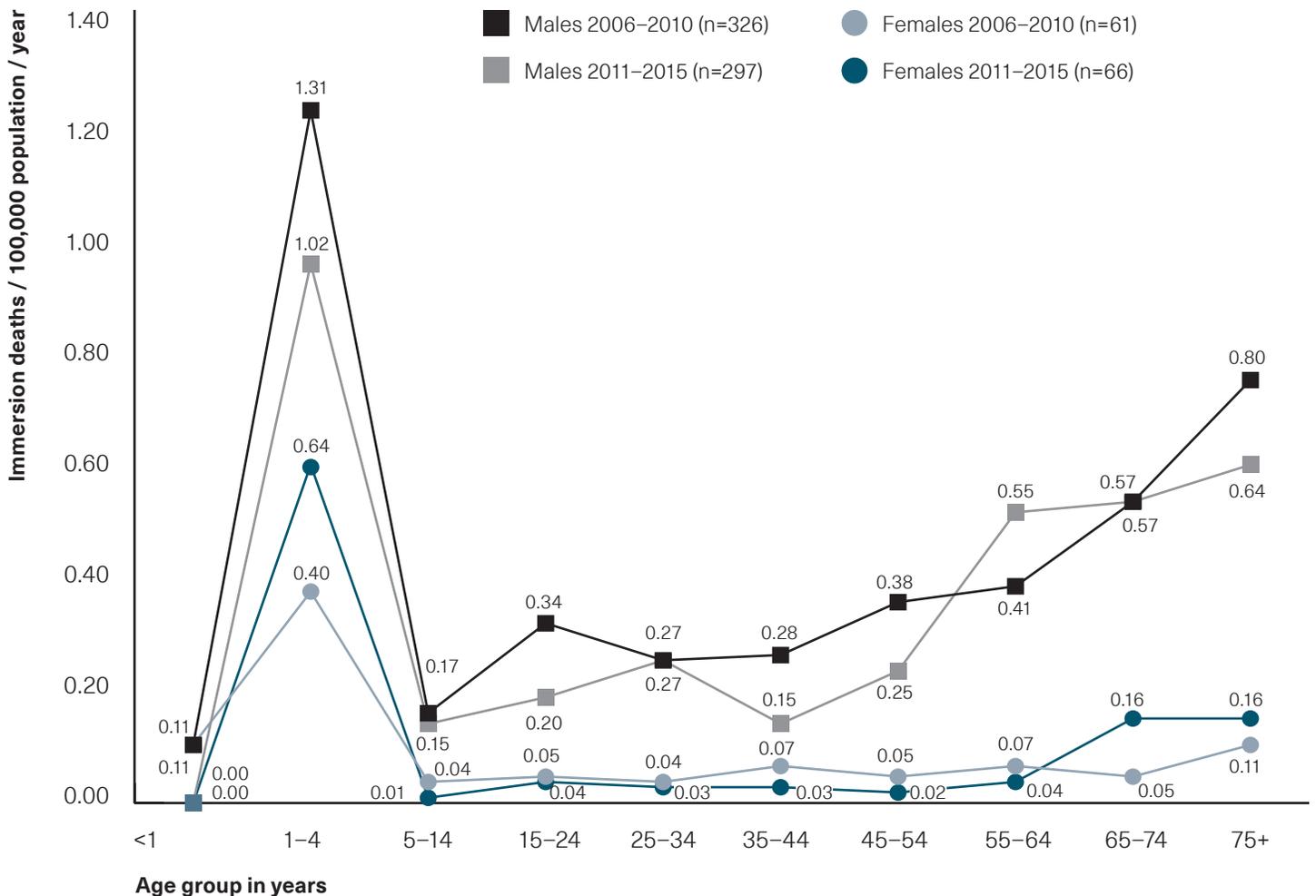
Personal Risk Factors

Age and Sex

The highest risk group for non-aquatic falls into water were male toddlers, followed by adult males 55 years and older (Figure 23).

Figure 23. Non-aquatic fall immersion deaths* by age and sex†

Canada 2006–2010 (n=388), 2011–2015 (n=365)



Number of immersion deaths in age group

| | <1 | 1–4 | 5–14 | 15–24 | 25–34 | 35–44 | 45–54 | 55–64 | 65–74 | 75+ |
|-----------------------------|----|-----|------|-------|-------|-------|-------|-------|-------|-----|
| Males 2006–2010 | 1 | 48 | 17 | 39 | 30 | 34 | 50 | 40 | 33 | 34 |
| Males 2011–2015 | 0 | 40 | 15 | 23 | 32 | 18 | 34 | 63 | 41 | 31 |
| Females 2006–2010 | 1 | 14 | 4 | 6 | 4 | 8 | 7 | 7 | 3 | 7 |
| Females 2011–2015 | 0 | 24 | 1 | 4 | 3 | 4 | 2 | 5 | 12 | 11 |

* Includes recreational, occupational and daily living immersions

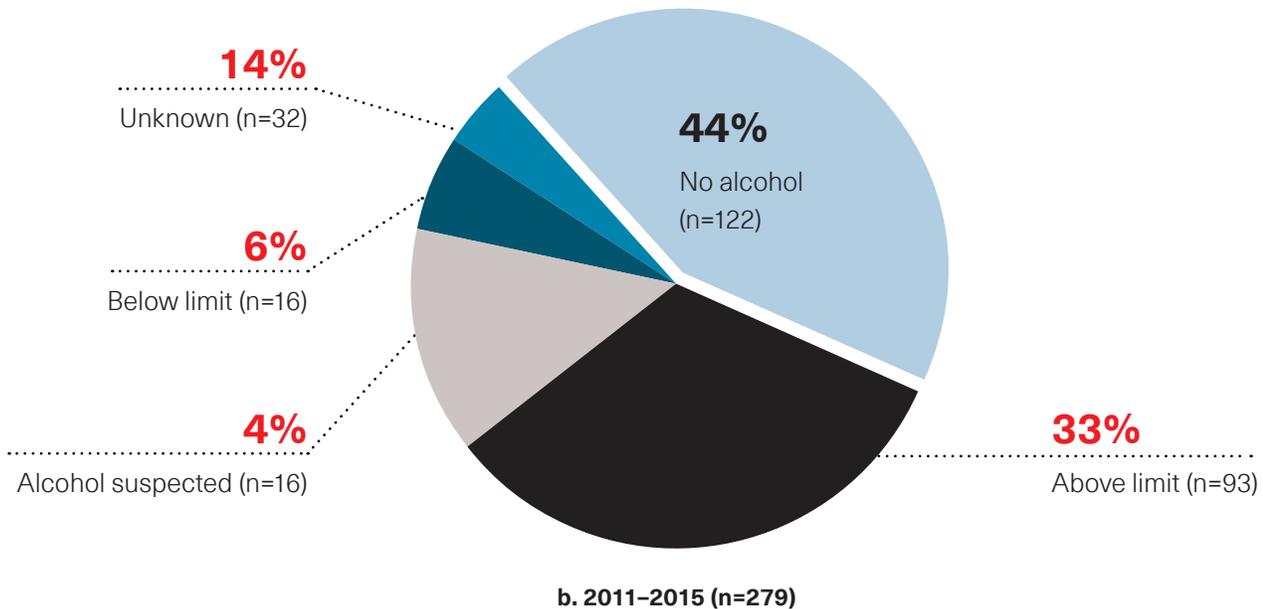
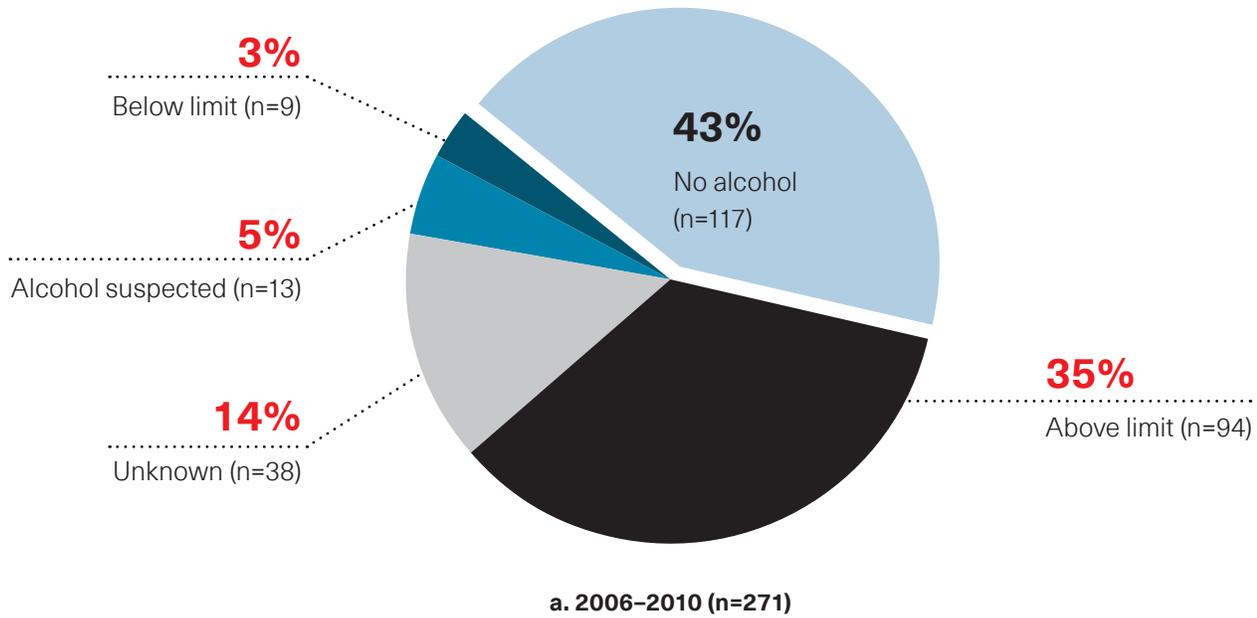
† For 2 deaths, age of victim was unknown

Source: Canadian Red Cross, 2020

Alcohol

43% of non-aquatic activity immersions of victims 15 years of age and older involved alcohol (Figure 24). There was no improvement in the proportion of non-aquatic immersions involving alcohol between 2006–2010 and 2011–2015.

Figure 24. Non-aquatic fall immersion deaths* by alcohol involvement for victims ≥ 15 years of age†**
Canada 2006–2010 (n=303), 2011–2015 (n=285)



* Includes recreational, occupational and daily living immersions

** Legal limit is 80mg% in all provinces except Ontario and British Columbia where legal limit is 50mg%

† This figure excludes 32 victims during 2006–2010 and 6 victims during 2011–2015 where decomposition rendered blood alcohol unreliable.

Source: Canadian Red Cross, 2020

Environment Risk Factors

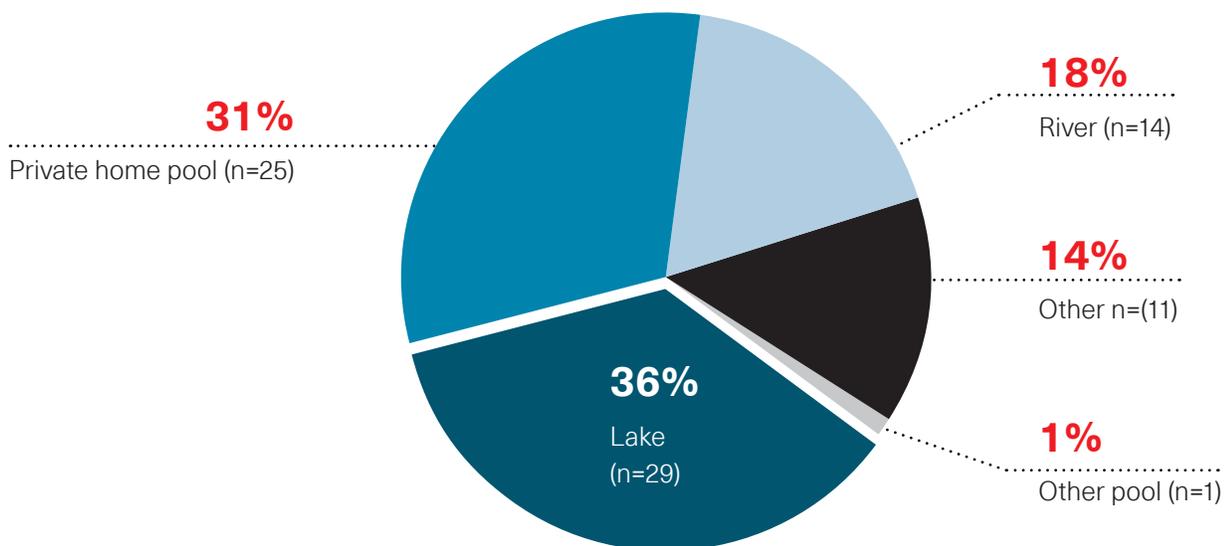
Body of Water

Non-aquatic activity immersions frequently involved lakes and private home pools for children 0–14 years of age, whereas rivers and lakes were more frequently the body of water for victims 15 years of age and older (Figure 25).

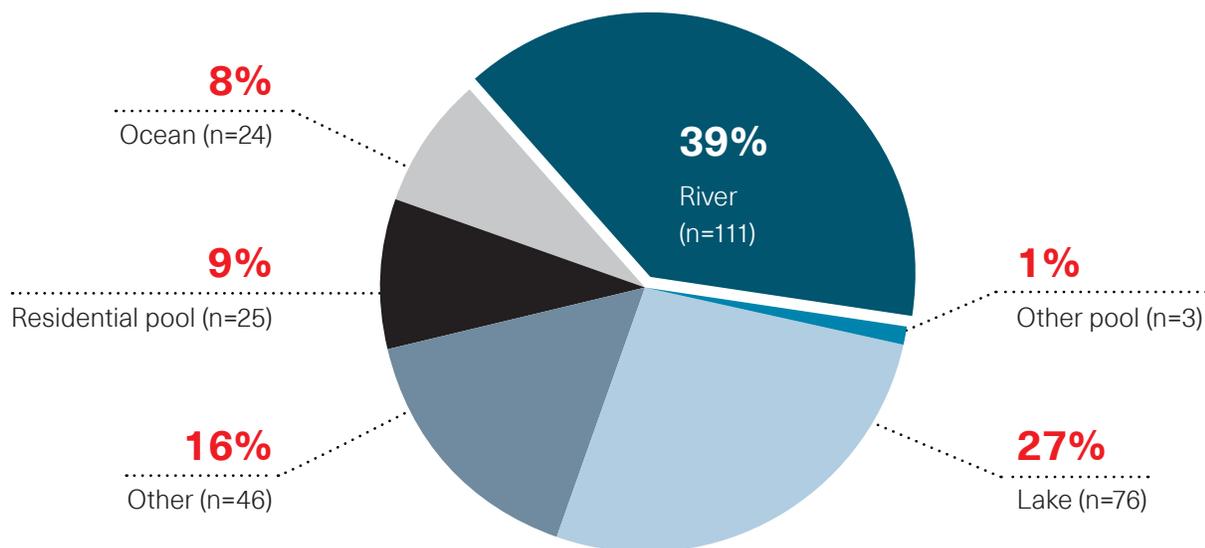
Pool Enclosures

The presence of a self-closing and self-latching gate was reported for only 10% of immersion deaths. 21% of private home pool deaths during 2011–2015 involved fencing which met bylaw standards, while in 8% a fence was present but sub-standard, in 11% a fence was present but no further information about standards was available, and for 10% there was no fence present. This is likely a conservative number since for nearly half of all deaths occurring in backyard pools, presence of a fence was not recorded.

Figure 25. Non-aquatic fall immersion deaths* by age group and body of water
Canada 2011–2015 (n=365)



a. Children 0–14 years (n=80)



b. 15 years and older (n=285)

* Includes recreational, occupational and daily living immersions

Source: Canadian Red Cross, 2020

Summary and Recommendations

Trends by Age

While immersion deaths have declined at nearly all ages, especially for children and for adult male boaters, it is essential to continue progress towards low to zero mortality, especially for non-aquatic falls into water among children. While rates among women are low, they did increase during 2011–2015. For youth and adults 15–55, a wide range of activities requires targeting. For 55–64-year-olds, rates declined 22%, yet rates for 65–74-year-olds increased 11%. These age groups may merit specific attention for their main at-risk activities.



ACTIVITIES AND RISK FACTORS FOR IMMERSION DEATHS

Personal Risk Factors

The most frequent activities for immersion deaths are now aquatic, including swimming and wading. This is followed by boating, especially fishing. Fishing, powerboating, and canoeing each fell by a third between 2006–2010 and 2010–2015. The change relates to steady improvement in prevention of boating deaths, while for aquatic and home incidents progress has been slower. Falls into water while playing near unprotected waters such as pools and river current are a cause. Loss of consciousness due to seizures/epilepsy, heart disease and diabetes have remained frequent.

Many victims are non- or weak swimmers. Alcohol was a personal risk factor for about a third of swimmers aged 15 and older. For boating deaths, wearing a flotation device remains uncommon. Among youth and adults 15–75+ years of age, males continue to be the main boating victims, while there were no child victims 0–4. For over a quarter of boating

deaths, no flotation device was present. Current regulations require one lifejacket/PFD per person. Updated regulations that mandate wearing a lifejacket/PFD when boating would have a significant impact on reduction of boating-related immersion fatalities. For 1–4-year-olds, pools were the main body of water and for infants, bathtubs. For 5–14-year-olds, large open bodies of water followed by pools were most frequent and for youth 15–19, nearly all deaths occurred in open water. To be effective, evidence-based swimming and water safety training should focus on proven **water safety competencies** for main aquatic and other activities and falls into water. **Training** should start in pools, to ensure competency for all children by school entry. Ideally, current in pools would be a safe teaching aid. Later, training for youth should progress to performance in current and other open-water conditions.

Equipment Risk Factors

For boating, wearing a comfortable **flotation device** appropriate for active and less active boating is a key element for safety. In colder conditions, flotation providing hypothermia protection is essential. Also important are evidence-based **boating competencies**. Home safety is built-environment based. Measures are needed to prevent loss of consciousness from seizures, medications, alcohol, and other drugs during bathing in baths and pools.

SPECIAL RISK GROUPS AND RISK FACTORS

Personal Risk Factors

Cardiovascular disease, including chronic conditions as well as sudden acute events, were commonly reported, especially for adults 65+ years where cardiovascular disease and sudden acute cardiac events were reported frequently. Diabetes and potential loss of consciousness near water during non-aquatic activities were reported among older victims. Chronic disease may not be causal but could be among other multifactorial contributors. Specific attention to populations 65+ years may be warranted. Water safety interventions targeting main at-risk activities are needed.

Environment Risk Factors

Current

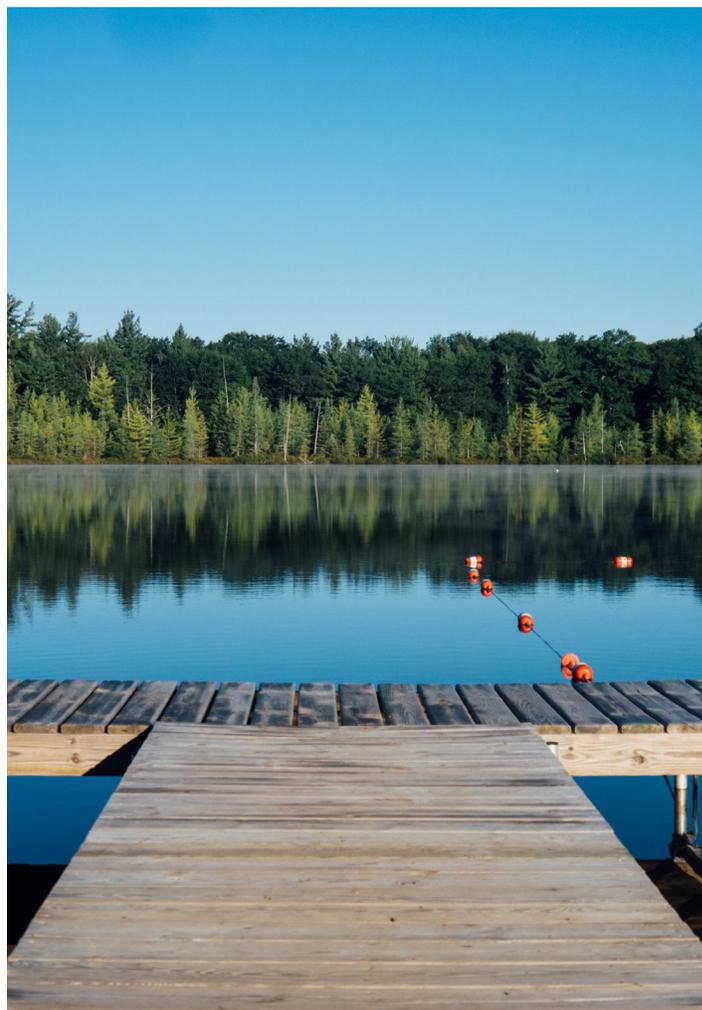
Current is an important factor in water-related deaths in Canada. Water safety theory and practice should provide surveillance and research-based water safety competencies, including pool and open water practice setting a ferry angle of the body to cross and escape from current.

For **occupational immersions**, attention is needed for coastal provinces with high numbers of deaths. Programs should focus on competency of those who work near or in water as open water swimmers, while flotation and cold protective devices should be fitted and provided.

Homes and Cottages

Nearly all **home** fatalities, including most toddler and infant deaths involved consumer products in built environments. No improvement has occurred since surveillance began. Such deaths should be avertible by design, eliminating or modifying pools and adult bathtubs, and/or automatic prevention of child access. Non-climbable fences and automatically closing and latching gates are essential for protection of small children from pools. Key fence characteristics that decrease in climbability include a smooth surface and no horizontal structure to grasp. Chain link fences and those with horizontal bars are rapidly climbable by even small children. Quebec has many of the home pools in Canada so requires special attention to regulations mandating automatic pool gates.

Alcohol and seizures were other modifiable hazards. Over half of deaths involved built-environment products and



may have been averted by safer home design. Examples of essential safe home design for persons with seizure disorders include replacing baths with showers with large drains, as well as avoiding unsupervised use of bathtubs and unsupervised recreation in and around open water. For infants, use of small infant tubs is recommended. Appropriate use of medication is also important.

Deaths in **cottage** environments are a fifth of the number in homes; however, given the relative frequency of time spent at cabins versus homes, risk is high per unit of exposure time. Excepting infants, victims included nearly all age groups of children, youth and adults. Cottage immersions occur predominantly in natural bodies of water, mainly lakes and rivers, and uncommonly in built environments. Main cottage activities were aquatic falls into water associated with activities such as playing and walking near water, as well as boating. Prevention should target barriers to prevent falls into water, safe boating and safe swimming competencies, and taking holidays away from cottages near water when children are at vulnerable ages.