

**Expanding and Refining Recreational  
Boating Safety Data in Vermont  
2019-2023 Pilot Data Report**

**September 2025**



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## Introduction

The purpose of this report is to conduct boating-related injury data analysis in Vermont through examination of multiple data sources. Examining multiple data sources more accurately captures the incidence of recreational boating accidents and injuries. Through this process, Vermont can determine characteristics of boating-related morbidity and mortality on Vermont waterways and better tailor intervention strategies to promote water safety.

Vermont is home to over 800 lakes and ponds, making it a great state for water-based recreation.<sup>1</sup> Lake Champlain is the largest lake in Vermont, and both motorized and non-motorized watercraft activities are permitted. Vermont has a relatively shorter boating season (primarily June – September) compared to other states due to its northern location. Despite the shorter season, summer is also Vermont’s busiest time of year for tourism, with over 5 million visitors traveling to enjoy the rural landscape and diverse outdoor recreation opportunities.<sup>2</sup>

Currently, there is little known about the prevalence of recreational boating-related accidents and injuries in Vermont. This report provides an initial examination of recreational boating-related incidents and injuries in Vermont over a five-year period (2019 to 2023). This report compares counts of recreational boating injuries and fatalities from emergency medical services (EMS), emergency department (ED), inpatient hospitalizations, death certificates, and data reported via the United States Coast Guard (USCG) Boating Accident Reporting Database (BARD) to identify whether there may be underreporting of boating-related incidents and injuries. While all boating-related deaths and significant injuries should be recorded in the BARD, other states have found a greater number of boating-related injuries and hospitalizations using other data sources compared to the BARD.<sup>3</sup> In this preliminary report, we examine whether there is underreporting of incidents in the BARD through an examination of additional data sources. Although we were unable to fully link data due to lack of identifying information in the BARD, this report provides the first step towards identifying and characterizing boating-related incidents in Vermont and comparing results of data systems to BARD.

This report is dedicated to the Vermonters who have died due to boating-related incidents. While the work is data-driven, each data point is far more than that. The Vermont Department of Health, along with the partner departments and people that contributed to this project, analyze these data in the context of this humanity. Although this report reflects preliminary pilot work, findings from this document can inform next steps for boating injury surveillance and programming around boating and water safety.

This project was supported in part by pilot grant funding from the Safe States Alliance. The name of this grant is “Using Data for Action-Tier 2 Leveraging Enhanced Recreational Boating data for Prevention” and the grant number is 70Z02324M00004978.

## Definitions

**Recreational Boating:** In this report, recreational boating is defined as both motorized and non-motorized vessels (e.g., kayaks, canoes and stand-up paddleboards).

**Morbidity:** Morbidity refers to a diseased state, disability, or poor health due to any cause. The term may be used to refer to the existence of any form of disease, or to the degree that the health condition or external circumstance affects the person. In this report, morbidity is measured by emergency medical services, emergency department visits, and inpatient hospitalizations for boating-related injuries.

**Mortality:** Mortality refers to death. In this report, mortality is measured by the number of people who have died due to boating-related incidents.

## Methodology, Data Sources, and Limitations

The following data sources were used to examine the prevalence of boating-related morbidity and mortality in Vermont. These data sources capture information from multiple interaction points, including Emergency Medical Services (EMS), Emergency Department (ED) visits, inpatient hospitalizations, death certificate data, and mandatory reporting of boating incidents and injuries to the U.S. Coast Guard to provide a comprehensive picture of boating-related incidents and injuries in Vermont.

The **Statewide Incident Reporting Network (SIREN)** is Vermont's EMS electronic patient care reporting system. All EMS ambulance agencies with transport capabilities are required to use SIREN to document each incident within one business day of when it occurred. This rule went into effect in January 2022. Because this report describes EMS incidents between 2019-2023, it is possible that some data related to first response or nontransporting EMS agencies are not reflected.

SIREN interaction types included in this report were defined using the record's working diagnosis codes (V91-V94) and/or information from the narrative field using keywords such as "boat," "watercraft," "water craft," "canoe," "kayak," "raft," "tube," "jetski," "waterski," "water ski," "wakeboard," and "wake board." Incidents were also manually reviewed to ensure accuracy and to remove duplications.

The **Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE)** is a syndromic surveillance system that tracks real-time healthcare visit data. ESSENCE captures every ED visit from all medical hospitals in Vermont but does not include psychiatric hospitals, the Veteran Affairs hospital, or hospitals outside of Vermont, even if they are part of the UVM Health Network. This analysis uses electronic medical records (EMR), specifically a patient's chief complaint and discharge diagnosis fields. These fields are not always accurate and are sometimes missing.

Boating-related ED visits are identified using the official syndrome definition [Recreational Boating Incidents V1](#) as defined by the Council for State and Territorial Epidemiologists (CSTE) based on the chief complaint and discharge diagnosis of the ED visit.

The **Vermont Uniform Hospital Discharge Data Set (VUHDDS)** is owned by Green Mountain Care Board (GMCB). Discharge data are collected from in-state hospitals. A primary diagnosis of a condition refers to when that condition is listed as the first diagnosis code. Any mention of the condition refers to when the condition in question is listed as any of the twenty available diagnosis codes. Boating-related analyses for VUHDDS in this document are restricted to Vermont hospitals and utilizes any mention of the condition in the twenty available diagnosis codes using the following ICD-10-CM codes: V90-V94, W16.7, Y92.814, Y93.16, Y93.17.

*All analyses, conclusions, and recommendations related to VUHDDS data in this report are solely those of the Department of Health and not necessarily those of the GMCB.*

**Vermont Vital Statistics** collects death certificate information from people who died in Vermont. Boating-related deaths are determined using the ICD-10 code for the underlying cause of death (V90-V94, W16.7, Y92.814, Y93.16, Y93.17). This analysis uses any mention of any of the relevant codes in the twenty available causes of death fields. All boating-related deaths were classified as accidental (unintentional).

**The Boating Accident Report Database (BARD)** serves as a central, national database of recreational boating accidents and is maintained by the USCG. The BARD contains accident report data, which is filed by boat operators using form CG-3865 within 48 hours for deaths, injuries, and disappearances and within 10 days for property damage only. Federal law requires that a boating report is filed under one or more of the following circumstances:

- 1) a person dies,
- 2) a person is injured and requires medical treatment beyond first aid,
- 3) a person disappears from the vessel under circumstances that indicate death or injury,
- 4) damage to vessels and other property totals \$2,000 or more (lower amounts in some states and territories), or
- 5) the boat is destroyed.

If an accident report is not filed, it is not captured in BARD. In other words, the BARD may not be representative of all boating incidents, and some fields contain missing values.

All statistical analyses were done in R Studio 4.3.2.

## Summary of Recreational Boating-related incidents

Between 2019-2023, the number of boating-related incidents/injuries varied across the data sources analyzed. Importantly, a person may appear in multiple data sources (e.g., ED visit and subsequent inpatient hospitalization), thus categories are not mutually exclusive.

**Table 1. Boating Incidents/Injuries varied across Vermont Data Sources**

Year	USCG - Accidents	USCG - Injured	EMS interactions	ED Visits- ESSENCE	Inpatient Hospitalizations- VUHDDS	USCG - Fatalities	Death Certificate - Fatalities
2019	4	2	9	41	8	4	4
2020	6	2	10	53	9	4	0
2021	8	0	~	43	~	7	5
2022	4	0	8	50	~	2	2
2023	5	2	~	45	*	1	1
<b>Total</b>	<b>27</b>	<b>6</b>	<b>38</b>	<b>232</b>	<b>25</b>	<b>18</b>	<b>12</b>
<i>Average</i>	<i>5.4</i>	<i>1.2</i>	<i>7.6</i>	<i>46.4</i>	<i>6.3</i>	<i>3.6</i>	<i>2.4</i>

~ Data suppressed due to counts less than 6, or secondary suppression of cells with any count (including those equal to 0 or equal to 6 or higher).

\*Data year 2023 not available. The analysis period for inpatient hospitalizations is 2019-2022.

Sources: 2019-2023 BARD, SIREN, ESSENCE, Vital Records. 2019-2022 VUHDDS.

### Incidents reported to the USGC

From 2019 to 2023, there were a total of 27 responses to recreational boating-related incidents with an average of 5.4 incidents per year as recorded in the BARD. Vermont responses include state, county, and local law enforcement agencies in addition to occasional responses directly by the USCG. During this analysis period, a total of 18 deaths and 6 injuries were reported to the USCG.

### Emergency Medical Services (EMS) Interactions

From 2019 to 2023, there were a total of 38 EMS interactions for recreational boating-related incidents with an average of 7.6 incidents per year in Vermont. Females and people in the 25-44 age category were more likely to be involved in EMS interactions for boating-related incidents. Please note that statistical comparisons were not run on these data as numbers are too small to do these calculations. Race was not reported due to small numbers.

### Emergency Department (ED) Visits

From 2019 to 2023, there were a total of 232 ED visit interactions for recreational boating-related incidents for an average of 46.4 incidents per year in Vermont. Males and people in the 25-44 age category were more likely to visit the ED for boating-related incidents. A majority (90%) of people who visited the ED for boating-related incidents identified as white, Non-Hispanic. People who identified as Black, Indigenous, and People of Color (BIPOC) accounted for 6% of ED visits for recreational boating, and the remaining cases were unknown or missing.

### **Inpatient Hospitalizations**

From 2019 to 2022, there were a total of 25 inpatient hospitalizations for recreational boating-related incidents with an average of 6.5 incidents per year in Vermont. Males and people in the 45-64 age category were more likely to be hospitalized for boating-related incidents. Race/ethnicity data are not reported due to suppression of low numbers. Please note that statistical comparisons were not made on these data as the numbers are too small. Data for the 2023 data year is not reported as it is not yet available for analysis.

### **Fatalities (Death Certificate Data)**

From 2019 to 2023, there were a total of 12 deaths for recreational boating-related incidents with an average of 2.4 incidents per year in Vermont from death certificate data. Males and people in the 65+ age category were more likely to die from a boating-related incident. All people who died were white, Non-Hispanic. All boating-related fatalities involved drowning (n=9) or cold-water immersion/drowning (n=3) as the primary cause. Seventy-five percent of death cases mentioned no Personal Flotation Device (PFD or lifejacket) in the injury description. Please note that statistical comparisons were not run on these data as numbers are too small.

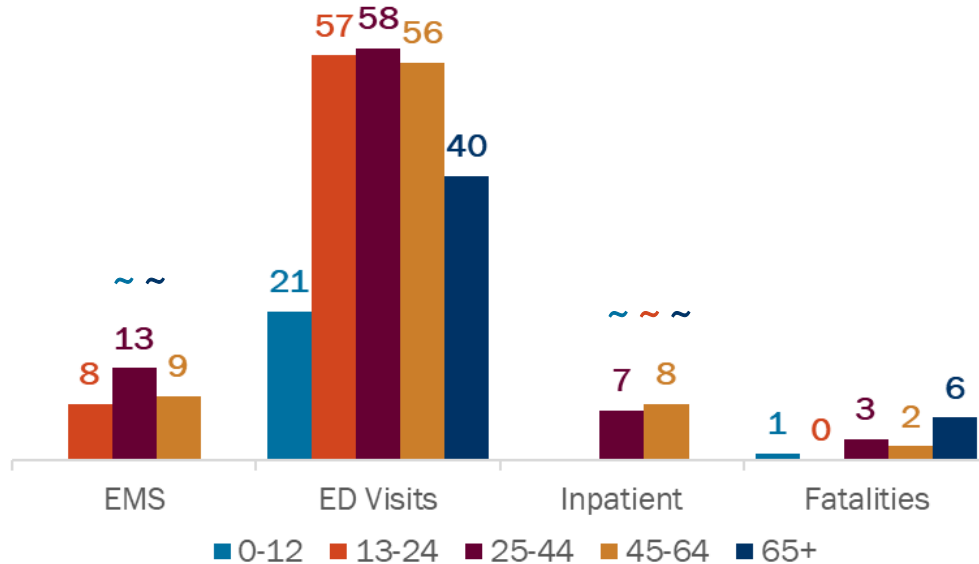
### **Comparisons of boating incidents/injuries across data sources:**

While there were responses to 27 recreational boating incidents logged in the USCG between 2019 and 2023, the number of EMS visits boating-related injuries was 1.4x higher (n=38) and ED Visits was 8.6x higher (232) as shown in Table 1. This may suggest that people who get injured may be more likely to go directly to the ED rather than calling EMS.

- While the total number of inpatient hospitalizations was lower than the total number of USCG incidents, this data is missing the 2023 data year, as it is not yet available for this data source.
- Finally, the number of fatalities from death certificate data (Vital Records) is lower than the number of fatalities reported in the BARD. Ten out of the twelve fatalities from Vital Records appear in the BARD, but there are an additional eight deaths that are reported in the BARD (n = 18).

Therefore, there appears to be an underreporting of boating-related incidents and injuries to the USCG compared to data from other Vermont data sources.

**People aged 25-44 were more likely to be involved in boating-related incidents. Half of the boating-related fatalities occurred in people aged 65 and older.**

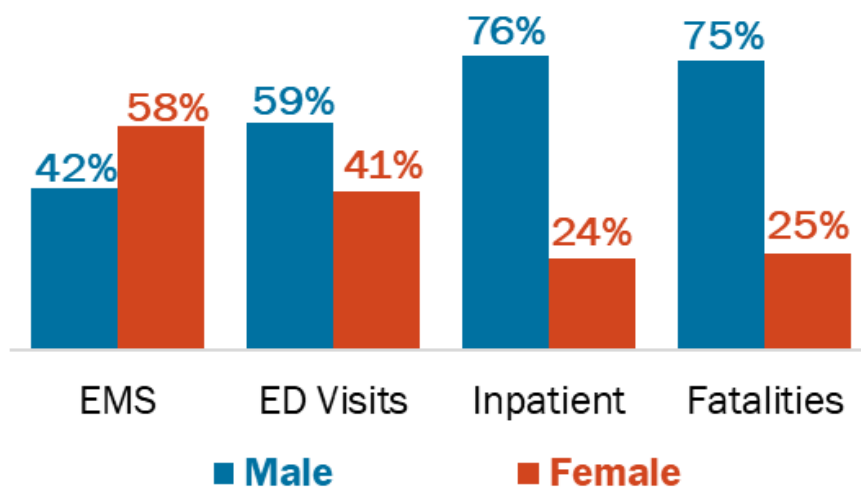


Source: SIREN, ESSENCE and Vital Records 2019-2023; VUHDDS 2019-2022

~ = data suppression for respective age groups due to counts less than 6, including secondary suppression of cells with any count (including those equal to 0 or equal to 6 or higher).

Note: 0-12 was selected to reflect mandatory life jacket use as required by law for this age group.

**Fatalities and hospital interactions for boating-related incidents are higher for males compared to females, while EMS calls are more common for females.**



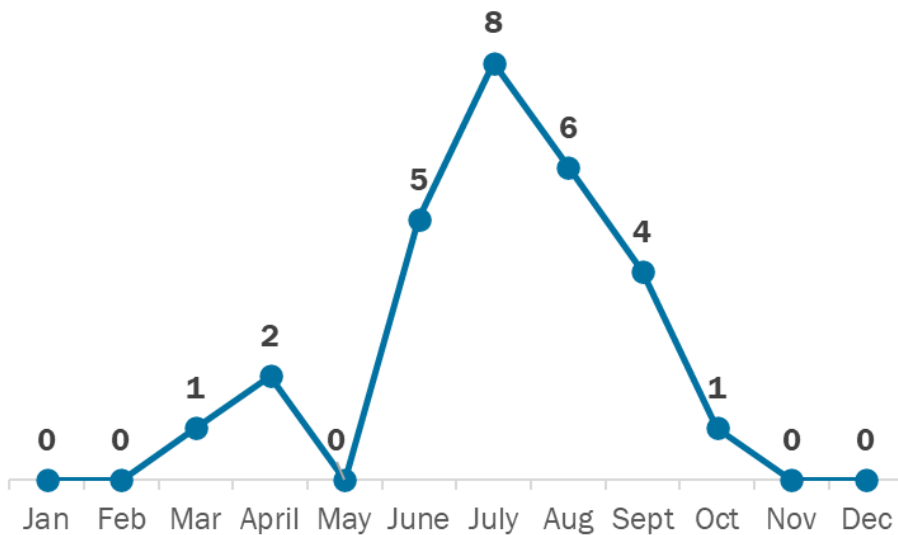
Source: SIREN, ESSENCE and Vital Records 2019-2023; VUHDDS 2019-2022



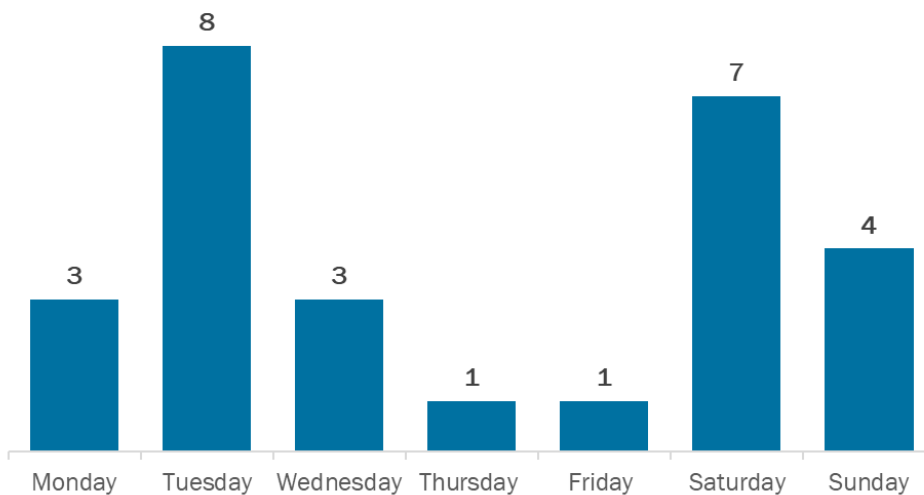
## Additional Characteristics of boating-related Incidents

From 2019 to 2023, boating-related incidents reported to the USCG resulted in an estimated total of \$114,087 in property damage with an average of \$22,847 per year. Boating incidents were most frequent during the summer months (June, July and August) and on Tuesdays and Saturdays. Boating incidents were more likely to occur during the day than at night. Boating incidents in Vermont most frequently occurred on Lake Champlain and surrounding areas (e.g., Mallett’s Bay) compared to other Vermont lakes, ponds, and streams. Please note that statistical comparisons were not run on these data as numbers are too small.

### Number of recreational boating-related incidents by month and day of the week.

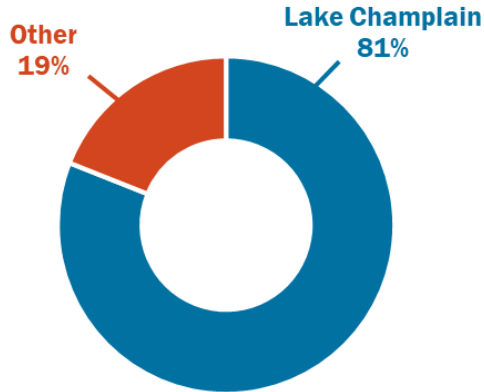


Source: BARD 2019-2023



Source: BARD 2019-2023

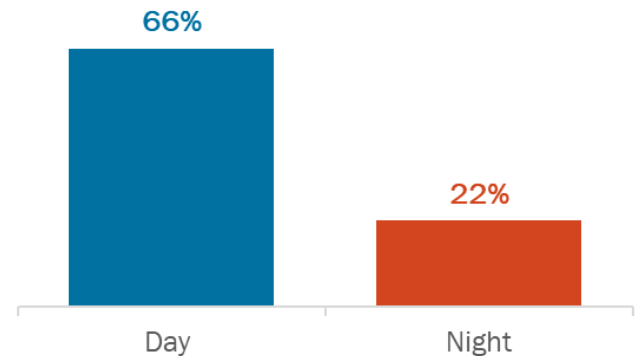
## Recreational boating-related incidents are most likely to occur on Lake Champlain.



Source: BARD 2019-2023

Note: The “Other” category includes other Vermont Lakes, ponds, and creeks.

## Two-thirds of boating-related incidents occurred during the day.



Source: BARD 2019-2023

Note: Percentages do not add up to 100% due to missing values

## Challenges and Future Directions

This report provides the first step towards identifying and characterizing boating-related incidents in Vermont through a variety of data sources. This section addresses the limitations of this report and the opportunity for future directions.

The small number of boating-related incidents in Vermont is one challenge to data analysis and reporting. Future analyses could combine more years of data to minimize the need for data suppression and conduct statistical analyses on the data. With a larger sample, rates could also be calculated to examine the rate of recreational boating-related incidents in Vermont as compared to other states or on the national level and to better capture fluctuations over time. Additionally, future analyses could also examine the differences between motorized and non-motorized boats in Vermont across the data sources as available information allows. While outside the scope and feasibility of this report, understanding any demographic differences or other factors (e.g., wearing of PFD) between motorized versus non-motorized boats could further inform water safety interventions and programmatic efforts.

Future analyses could examine the possibility of data linkage to further characterize the number of boating-related incidents in Vermont. While this report provided the first step towards identifying and characterizing boating-related incidents through a variety of data sources, linking the data may help to resolve discrepancies and form a more cohesive picture of boating-related incidents in Vermont.

For example, the number of fatalities over the analysis period as reported by the BARD was higher than the number of fatalities from Vermont death certificate data. Because death certificate data is publicly available, we were able to examine how many of these fatalities also appeared in the BARD. While ten out of twelve of the fatalities from Vermont Vital Records were captured in the BARD, the BARD reported an additional 8 fatalities. Although these numbers are inconsistent, it is possible that additional boating-related deaths were captured in other ICD 10 codes (e.g., natural water drowning codes such as W69). Likewise, two fatalities from Vital Records were missing from the BARD, indicating that USCG accident reports were not filed for these incidents. The ability to access demographic and identifiable variables (e.g., first and last name or social security number, date of birth, and sex) across all data sources in this report would allow for future data linkage to determine the true number of recreational boating-related incidents and injuries in Vermont.

As the highest number of fatalities occurred among the 65+ population and among males according to death certificate data, programmatic efforts to target these populations may be important. The 65+ population may especially benefit from the use of life jackets due to the potential for medical events in the water due to underlying health conditions or other factors. It is also possible that this population may be participating in recreational boating more frequently than other age groups due to more leisure time in retirement age, income, or other factors. Likewise, it is possible that males are more likely to participate in recreational boating than females. Alternatively, males may be less likely than females to wear PFDs, which could increase the likelihood of boating-related injury and death. While outside the scope of this report, future reports on this topic could further explore factors that influence boating-related morbidity and mortality.

Lastly, this report suggests that there may be underreporting of boating incidents documented in the BARD when compared to a higher number of boating-related interactions with ED and EMS data. The number of ED visits may be greater than other data sources due to concerns with having a boating-related incident reported and documented. Obtaining data from urgent care centers would further enhance comprehensive reporting of boating-related injuries.

## Conclusions

This report shows initial but important trends in the data that may be helpful to promote water safety and reduce boating-related injury and morbidity. Data from this report indicate underreporting of recreational boating-related incidents and injuries into the BARD. Our findings also suggest the importance of wearing PFDs to reduce boating-related fatalities.

People experiencing a higher prevalence of boating-related incidents and injuries in Vermont include:

- Males (ED visits and hospitalizations)
- People aged 25-44
- People identifying as white, Non-Hispanic (only available for ED visits)

People experiencing a higher prevalence of boating-related mortality in Vermont include:

- Males
- People aged 65+
- People identifying as white, Non-Hispanic
- People who do not wear a PFD

Boating-related incidents in Vermont are most likely to occur:

- On Tuesdays, followed by Saturdays
- In summer months
- During the day
- On Lake Champlain

Overall findings of the project include:

- Recreational boating-related morbidity (e.g., ED visits, EMS interactions) over the analysis period appears to be more frequent than the number of incidents and injuries reported to the USCG. This suggests that there may be underreporting of recreational boating-related incidents and injuries into the BARD.
- The highest number of boating-related fatalities occurred in the 65+ age category and among males. Of the twelve fatalities from Vermont Vital Records, 75% mentioned no PFD in the injury description.
- Boating-related incidents result in an estimated average of \$22,847 in property damage per year in Vermont.

## Resources

To learn more about water safety in Vermont:

<https://www.healthvermont.gov/emergency/injury-prevention/water-safety-vermont>

To learn more about boating safety in Vermont:

<https://www.vtfishandwildlife.com/fish/boating-in-vermont>

## References

1. [www.vermontvacation.com/things-to-do/outdoor-recreation/water-sports/](http://www.vermontvacation.com/things-to-do/outdoor-recreation/water-sports/)
2. [www.accd.vermont.gov/accd/tourism](http://www.accd.vermont.gov/accd/tourism)
3. [www.cdc.gov/nssp/php/story/washington-data-confirms-underreporting-boating-injuries.html](http://www.cdc.gov/nssp/php/story/washington-data-confirms-underreporting-boating-injuries.html)

For more information about the data contact: [AHS.VDHIInjuryData@vermont.gov](mailto:AHS.VDHIInjuryData@vermont.gov)