

THE RECREATIONAL BOAT OCCUPANT INJURY SURVEILLANCE ROUNDTABLE

Tier Two of a Three-Tiered Approach to Improve Boat Occupant Injury Surveillance Practices



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EXECUTIVE SUMMARY

Executive Summary

Recreational boating activity leads to a significant number of fatal and non-fatal injuries annually across the United States. With funding from the United States Coast Guard (USCG), Safe States and the National Association of State Boating Law Administrators (NASBLA), the Recreational Boat Occupant Injury Surveillance Project was created in 2018 to better understand the scope of non-fatal injuries that occur to all occupants of boats by bringing together public health expertise with boating safety professionals. The Project is comprised of three tiers, including 1) Conduct boat occupant injury surveillance roundtable; 2) Develop surveillance recommendations through an injury surveillance workgroup (ISW) process; and 3) Test surveillance recommendations with pilot states. This report represents the work done as part of Tier 2 and is intended to serve as a manual for state-level public health experts and boating law administrators (or their designee) to work in partnership to improve injury surveillance in their jurisdictions as part of Tier 3. Because these partnerships will be new in most areas, the analyses and recommendations in this report are meant to be introductory. It is anticipated that a more refined report will be needed based on the findings from these introductory methods.

Nine recommendations developed in Tier 1 served as guideposts for the ISW in Tier 2. They were grouped into three categories: 1) Identifying and Understanding Available Data, 2) Bringing Data Together, and 3) Collaborations. This ISW report details next steps within each of these categories to continue making progress

toward the Tier 1 recommendations.

1: Identifying and Understanding Available Data

Both public health and boating partners bring a variety of data from their respective professions. The ISW examined data sources which capture different types of data related to recreational boating and provided recommendations on which sources to move forward with in a surveillance project and high-level design of data linkage projects to examine with the pilot states in Tier 3.

A variety of terminology, inclusion and exclusion criteria and definitions for key concepts exist and differ by data category (public health vs. boating). This section of the report provides the

ISW's understanding of the landscape of the key national Boating Accident Reporting Database (BARD) as well as public health databases for surveillance experts to build upon in Tier 3.

2: Bringing Data Together

This section identifies the value of bringing boating and public health data together to more fully understand the various shared risk and protective factors that each dataset can add. Using a known injury prevention tool, The Haddon Matrix, the various datasets identified in the previous section are brought together to demonstrate how each contributes to a more complete picture of recreational boating data before, during and after a boating accident.

The section closes with seven planned analyses for Tier 3 that require use of both boating and public health datasets.

3: Collaborations

Bringing data together involves a high degree of relationship building and collaboration. Often public health experts do not know boating safety professionals in their jurisdictions and vice versa. The ISW outlined several recommendations to foster and nurture collaborations at local, state, and national levels. The most immediate partnership necessary is that between state boating law administrators and injury experts within state health departments or academic institutions at the state level.

In order to achieve progress on the overall recommendations set forth by the roundtable in Tier 1, the ISW has outlined the following action steps for states participating in Tier 3:

1. Injury epidemiologists or other experts meet with state boating law administrator (or their designee(s)).
2. Review seven analysis questions posed in this report to determine feasibility for individual states. It is anticipated that public health departments (or academic partners working on behalf of public health) would take the lead in performing the analyses listed after dialoguing with and gathering input from state boating law administrators
3. Move forward using definitions and descriptions outlined in this report.
4. Document challenges and successes for future iterations of injury surveillance recommendations for non-fatal boating incidents. States participating in Tier 3 would also be expected to participate in cohort calls routinely to pose questions and share lessons learned.

INTRODUCTION

Introduction

The Recreational Boat Occupant Injury Surveillance Project

The Recreational Boat Occupant Injury Surveillance Project is a three-tiered approach to improve non-fatal injury surveillance practices nationally (Figure 1). The project is organized and convened by the Safe States Alliance and the National Association of State Boating Law Administrators (NASBLA) to support the United States Coast Guard (USCG) in carrying out their National Recreational Boating Safety Program Strategic Plan. Descriptions for each of these lead organizations can be found in Appendix A.

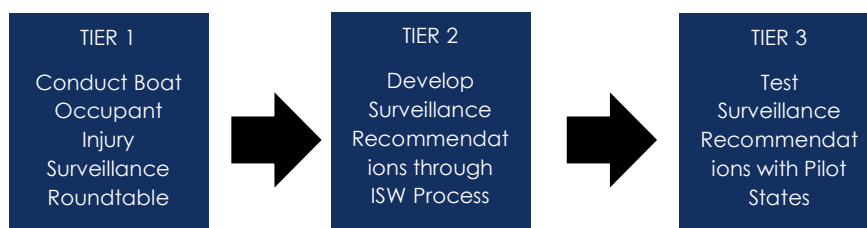


Figure 1: Three-Tier Process to Improve Boat Occupant Injury Surveillance Practices

Tier 1

Recreational boating safety and public health experts assembled to discuss current efforts to improve recreational boating-related injury data collection and analysis, examine data sources, identify key limitations, barriers, and opportunities for improvement, and

develop stronger relationships between public health and recreational boating safety professionals. The outcome of the Tier 1 process was to develop recommendations for the ISW to begin investigating in Tier 2. The nine Tier 1 recommendations for the ISW to investigate were:

1. Create, increase, and maintain multidisciplinary collaborations between public health, health care, injury prevention, and boating professionals.
2. Create consistent terms and definitions across agencies and databases.
3. Improve and expand data elements captured.
4. Improve data collection processes and strategies within BARD.
5. Improve and expand data access to all sources of boat injury surveillance data.

6. Link and integrate existing boating-related injury data sources.
7. Utilize expanded data analyses and methodologies with existing data.
8. Investigate sources of sustainable funding for recreational boating surveillance.
9. Work toward long-term social, political, and cultural change.

The full Tier 1 report can be accessed [here](#).

Tier 2

The Recreational Boat Occupant ISW is Tier 2 of a three-tiered approach to improve boat occupant injury surveillance practices nationally. The purpose of the ISW is to improve injury surveillance by examining important injury surveillance issues and challenges facing state injury prevention programs and preparing consensus-based recommendations on these issues. Participation in the ISW has been voluntary and unpaid. The COVID-19 pandemic presented challenges to actively engaging and recruiting both boating and public health professionals due to its impact on the work of both sectors. A list of people who contributed to the ISW at any time period is included in Appendix B.

The remainder of this report summarizes the work done by the ISW and lists next steps towards achieving the Tier 1 Recommendations in the future Tier 3. Improvements to injury surveillance for boating incidents will require the continued partnership of boating professionals and public health experts.

Tier 3

The future Tier 3 will work to pilot the recommendations and surveillance activities outlined in this report.

Current State of Boating Injury Surveillance

Recreational boating activity leads to a significant number of fatal and non-fatal injuries annually.

The USCG compiles an annual statistics report based on accident reports filed at the state level and submitted to the national Boating Accident Reporting Database (BARD). A full description of BARD is included in the [Tier 1 report](#) and is reprinted in Appendix C. The latest annual statistics publication of 2021 data stated that 4,439 boating accidents were reported to the USCG through BARD, involving 658 deaths and 2,641 injuries¹. Where cause of death was known, the majority (81%) of fatal boating accident victims drowned. Compared to 2020 when there was a substantial uptick in boating activity, deaths and injuries, the number of boating accidents in 2021 as reported in BARD decreased by 15.7% and there was also a

¹ United States Coast Guard. Recreational Boating Statistics 2021. Available at: https://uscgboating.org/statistics/accident_statistics.php.

15.4% decrease in the fatality rate¹. It is likely that the 2020 and 2021 report data reflect the impacts of the COVID-19 pandemic, but supplemental data would enhance understanding of these results.

BARD data have served as the data source for several analyses of boating injuries². However, the burden of *non-fatal* recreational boating injury using BARD alone is difficult to ascertain due to the various data discrepancies outlined in the Tier 1 report and noted in the USCG's recreational boating statistics report. While boating injury data is collected in several places, the inclusion and exclusion criteria of these databases, as well as the method of collection, impacts what can be known about non-fatal injury and boating. As reported in the [Tier 1 report](#), previous work by Industrial Economics, Incorporated (IEC), commissioned by the USCG, called for enhanced approaches to estimate non-fatal injuries due to a large discrepancy between injuries reported to the USCG and boating related injuries found in public health databases (injury hospitalization and emergency department visits). At the time of this report, IEC was in the process of updating these analyses. Moreover, several workgroups within NASBLA have been working on updating data elements, reporting processes and strategies for national collection simultaneously. In short, it is a known issue that state reporting to BARD varies which contributes to gaps in data within the system. Knowing more about the data gaps and injuries related to boating could help refine reporting and ultimately improve the prevention strategies and efforts in which USCG and NASBLA are involved.

Databases used by public health experts, including injury and violence epidemiologists, could provide supplemental data to improve non-fatal injury surveillance specific to recreational boating. Public health expertise in surveillance, development and implementation of prevention programs, and evaluation could be useful to boating safety professionals working to prevent injuries and implement prevention programs (e.g., life jacket distribution and boating under the influence awareness programs). Information learned from including public health databases could yield improvements to the data variables captured by USCG in BARD and other databases. Additionally, there may be opportunities to improve boating law administrator or data collection training materials with this information.

The focus of the ISW was related to public health and boating data partnerships to improve *non-fatal* injury surveillance. ***This report is intended to serve as a manual for state-level public health experts and boating law administrators to partner for the purpose of expanding the surveillance of non-fatal injuries related to recreational boating.***

² Forrester, MB. Publicly Available Database: United States Coast Guard Recreational Boating Accidents. 2022. Texas Public Health Journal 74(3):5-6

IDENTIFYING AND UNDERSTANDING AVAILABLE DATA

Identifying and Understanding Available Data

Understanding definitions, inclusion and exclusion criteria and sources are foundational elements in surveillance. This is especially critical when working across disciplines as these types of information and their use can vary widely. This is the case with boating and public health. The terms, definitions, inclusion, and exclusion criteria used by the boating safety community and public health vary. Additionally, the approach each takes to defining boating incidents varies. It is critical to have a common understanding of these approaches.

Of note, the term “accident” is no longer advocated for use in public health injury prevention discourse. However, within boating, the term is still in use, though several actions have been taken to work towards adoption of the term “occurrence” in place of accident. Adoption (and subsequent use) of the terms “occurrence” or “incident” has not yet been formalized through USCG procedures. Therefore, this report uses the term “accident” in several places in order to maintain consistency with existing USCG products and data terminology to avoid confusion. The ISW members agree that the term “incident” or “occurrence” is preferred.

Boating

Boating accident reports are collected by each state through various methodologies and data storage systems. Each state then submits incidents into the USCG Boat Accident Reporting Database (BARD). While there are many required variables for this federal database, states can add variables above and beyond the federal standard to their state report forms and databases. A copy of USCG Form CG-3865 is included in Appendix D. This form reflects the federal data variables. State boating accident report forms typically can be found on the boating agency's website or by contacting the state boating law administrator to determine what additional variables are collected at the state level, and through what process. An updated list of state boating law administrators and other boating contacts can be found at [NASBLA's website](#).

Definition of a Reportable Event (Inclusion Criteria)

Current Federal regulations (33 Code of Federal Regulations [CFR] 173.55) require the operator of any recreational vessel to file a Boating Accident Report (BAR) with the state reporting authority when, as a result of an occurrence that involves the vessel or its equipment:

1. A person dies; or
2. A person is injured and requires medical treatment beyond first aid; or
3. Damage to vessels and other property totals \$2,000 or more or there is complete loss of the vessel; or
4. A person disappears from the vessel under circumstances that indicate death or injury.
5. There is a complete loss of any vessel

Examples of “**reportable**” boating accidents are listed in the front of the annual USCG Recreational Boating Statistics and reprinted here for ease of access:

- Grounding, capsizing, sinking, or flooding/swamping
- Falls in or overboard a vessel
- Persons ejected from a vessel
- Fire or explosions that occur while underway and while anchored, moored, or docked if the fire resulted from the vessel or vessel equipment
- Water-skiing or other mishap involving a towable device
- Collision with another vessel or object
- Striking a submerged object
- A person struck by a vessel, propeller, propulsion unit, or steering machinery.
- Carbon monoxide exposure.
- Electrocution due to stray current related to a vessel.
- Casualties while swimming from a vessel that is not anchored, moored, or docked
- Casualties where natural causes served as a contributing factor in the death of an individual but the determined cause of death was drowning.

- Casualties from natural phenomena such as interaction with marine life (e.g., carp causes casualty to person) and interaction with nature (e.g., mountain side falls onto vessel causing casualties).
- Casualties where a person falls off an anchored vessel
- Casualties that result when a person departs an anchored, disabled vessel to make repairs, such as unfouling an anchor or cleaning out the intake of a jet-propelled vessel.

Exclusion Criteria

Examples of “**non-reportable**” boating accidents are also listed in the front of the annual USCG Recreational Boating Statistics and are reprinted here for ease of access:

- A person dies, is injured, or is missing as a result of self-inflicted wounds, alcohol poisoning, gunshot wounds, or the ingestion of drugs, controlled substances or poison.
- A person dies, is injured, or is missing as a result of assault by another person or persons while aboard a vessel.
- A person dies or is injured from natural causes while aboard a vessel where the vessel did not contribute to the casualty.
- A person dies, is injured or is missing as a result of jumping, diving, or swimming for pleasure from an anchored, moored, or docked vessel.
- A person dies, is injured or is missing as a result of swimming to retrieve an object or a vessel that is adrift from its mooring or dock, having departed from a place of inherent safety, such as the shore or pier.
- Property damage occurs or a person dies, is injured or is missing while preparing a vessel for launching or retrieving and the vessel is not on the water and capable/ready for its intended use.
- Property damage occurs to a docked or moored vessel or a person dies, is injured, or is missing from such a vessel as a result of storms, or unusual tidal or sea conditions; or when a vessel gets underway in those conditions in an attempt to rescue persons or vessels.
- Property damage occurs to a docked or moored vessel due to lack of maintenance on the vessel or the structure to which it was moored.
- Property damage occurs to a docked or moored vessel due to theft or vandalism
- Property damage occurs to, a person dies or is injured on, or a person is missing from a non-propelled residential platform or other watercraft used primarily as a residence that is not underway.
- Casualties that result from falls from or on docked vessels or vessels that are moored to a permanent structure.
- Casualties that result from a person climbing aboard an anchored vessel from the water or swimming near an anchored vessel (unless the casualty was related to carbon monoxide exposure or stray electric current).
- Fire or explosions on anchored, docked, or moored boats where the cause of the fire was *not* attributed to the vessel or vessel equipment.
- Casualty or damage that results when the vehicle used for trailering the vessel fails.
- Casualties or damage that occur during accidents that only involve watercraft that have not been deemed a vessel.

- Casualties or damage that occur when the only vessel(s) involved are being used solely for governmental, commercial, or criminal activity.
- Casualties or damage that occur when the only vessel(s) involved are not required to be numbered and are being used exclusively for racing (exclusion in 33 CFR 173.13(a)).
- Casualties or damage that occur when the only vessel(s) involved are foreign vessels and thus not subject to U.S. Federal reporting requirements.

The aforementioned "reportable" and "non-reportable" criteria are for the *federal* BARD system and inclusion in or exclusion from the USCG's statistics report. States may have additional inclusion criteria that are beyond the federal data mandates. It is best to review state-level additions to the above with state boating law administrators. Denominator information used to calculate the fatality rates that appear in the USCG Annual Statistics report is based on 100K registered vessels (normalized for comparisons across time and states), informed by recreational vessel registration information submitted by the states using Coast Guard form CGHQ-3923.

The USCG abides by federal law which dictates several items pertaining to inclusion and exclusion criteria for the BARD system. Definitions are outlined in **Table 1**.

Table 1: Select Boating Terms and Definitions, United States Coast Guard Sources

Term	Definition for Term from Source	Source
Vessel	<p>The Coast Guard's first step is to determine whether the particular device in question is a "vessel". The process begins with the definition of the word vessel found in 1 USC 3, which is: "The word "vessel" includes every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water."</p> <p>The following have been determined to be vessels by the Coast Guard: Airboat, auxiliary sailboat, cabin motorboat, canoe, houseboat, inflatable boat, kayak, open motorboat, personal watercraft, pontoon, raft, rowboat, sailboat, stand-up paddleboard, gold dredges, argo-amphibious ATV, kiteboard, float tubes, efoils, jetboards.</p>	1 USC 3
Boating incident	A boating incident occurs when a recreational vessel that involved at least one of the following: death/disappearance, injury that required medical treatment beyond first aid, damages that equaled or exceeded \$2,000, or a total loss of vessel.	33 CFR 173.55

Public Health

Injury surveillance in public health typically begins with injury information and uses the International Classification of Disease (ICD) coding system to attribute location or detailed information about the type of incident. ICD was developed by the World Health Organization, and it is used in the clinical setting for insurance billing, and for research. Hospitals are required to use the codes, and the coding is done by medical coders. The coding is done initially in the system as the physician enters notes. The coding department will verify codes before billing is done. Depending upon the size of the hospitals, it may all be the same department that performs billing and coding. Public health databases containing information related to boating incidents can be found in Appendix E. The databases all use the ICD coding, however, inclusion and exclusion criteria differ.

The codes in **Table 2** are those which can be used to examine injuries related to boating, as included in the code definition.

Table 2: ICD Codes Related to Boating Incidents and Corresponding Definitions

ICD Code	Definition
V90.0	Drowning and submersion due to watercraft overturning
V90.1	Drowning and submersion due to watercraft sinking
V90.2	Drowning and submersion due to falling or jumping from burning watercraft
V90.3	Drowning and submersion due to falling or jumping from crushed watercraft
V90.8	Drowning and submersion due to other accident to watercraft
V91.0	Burn due to watercraft on fire
V91.1	Crushed between watercraft and other watercraft or other object due to collision
V91.2	Fall due to collision between watercraft and other watercraft or object
V91.3	Hit or struck by falling object due to accident to watercraft
V91.8	Other injury due to other accident to watercraft
V92.0	Drowning and submersion due to fall off watercraft
V92.1	Drowning and submersion due to being thrown overboard by motion or watercraft
V92.2	Drowning and submersion due to being washed overboard from watercraft

V93.0	Burn due to localized fire on board watercraft
V93.1	Other burn on board watercraft
V93.2	Heat exposure on board watercraft
V93.3	Fall on board watercraft
V93.4	Struck by falling object on board watercraft
V93.5	Explosion on board watercraft
V93.6	Machinery accident on board watercraft
V93.8	Other injury due to other accident on board watercraft
V94.0	Hitting object or bottom on body of water due to fall from watercraft
V94.1	Bather struck by watercraft
V94.2	Rider of nonpowered watercraft struck by other watercraft
V94.3	Injury to ride of (inflatable) watercraft being pulled behind other watercraft
V94.4	Injury to barefoot water-skier
V94.8	Other water transport accident
V94.9	Unspecified water transport accident
W16.7	Jumping or diving from boat striking water surface causing drowning and submersion
Y92.814	Boat as the place of occurrence of the external cause

Within each major ICD10 code V90-V94, “watercraft” can be further specified by codes to “merchant ship”, “passenger ship”, “fishing boat”, “other powered watercraft”, “sailboat”, “canoe or kayak”, “nonpowered inflatable craft”, “water-skis”, “other unpowered watercraft”, “unspecified watercraft”. In the W and Y codes, “boat” is used in place of “watercraft”.

ICD codes are not without limitations. Completeness of coding varies by state, region, and hospital and the use of external cause of injury codes (e-codes) also varies by state, hospital, and individual. Coding is dependent on who is coding, the level of training they may have, and the purpose, which is often for insurance purposes. ICD coding is also often used to

identify the actual injury and not necessarily the mechanism. For example, if there is an incident that causes a leg injury, the person coding is more likely to capture the type of injury as opposed to the fact that it happened while on a boat. Nevertheless, the data sources are an important aspect of injury surveillance. The Council for State and Territorial Epidemiologists released the [Injury Surveillance Methods Toolkit](#), an important resource in using ICD coding for injury surveillance.

Dataset Identification

A variety of datasets were identified and reviewed throughout the lifespan of the project (Appendix E). The lessons learned of this process include:

- Non-fatal injury data sources are collected at a local level and brought together at state and national levels, much like BARD.
- At this time, non-fatal injury data sources would best be used at the state level to understand surveillance gaps in injury reporting present in state boating accident reports and improve national- and state-level prevention activities.
- Federal partnerships may ease state level access to data sources.
- Opportunities at state/local levels for syndromic surveillance partnerships with state boating programs and public health may develop.

Data sets were reviewed for their utility (High, Medium, Low) in ascertaining the burden of non-fatal boating injuries at the time of this report.

Low Utility

Data sets in this category include

- Total Aquatic Data
- American Whitewater
- National Electronic Injury Surveillance System (NEISS)

Total Aquatic Data and American Whitewater contain primarily fatality data and thus have low utility in non-fatal injury surveillance. It is worth noting that Total Aquatic Data does capture “boat” variables for drowning data and has been useful at a state level as another data source on drownings. American Whitewater does capture “near death” events, however, these are specific to one type of boating (whitewater rafting) and one type of open water environment (United States rivers).

The National Electronic Injury Surveillance System, maintained by the Consumer Product Safety Commission, aims to provide timely data on unintentional consumer product-related injuries and deaths occurring in the U.S. Boats are not included as a consumer product, therefore, a

comprehensive capture of all boating injuries are not included in this system. The system does capture and report out on waterskiing, tubing and surfing injuries.³

Medium Utility

Data sets in this category include

- Healthcare Cost and Utilization Project (HCUPnet)
- National Trauma Data Bank Research Data Set

The HCUP data can be used to ascertain high-level information on a national level and were used as an important data source to demonstrate the disparity between cases captured in BARD and cases captured in hospital and ED visit discharge data. HCUP has utility at a national level and has been used in previous analyses to develop a multiplier for quantifying the degree of underreporting of non-fatal injury in BARD (IEC, 20, IEC under USCG review). However, there is greater utility in using state-level hospitalization and ED visit data to examine discrepancies at a state level in more detail.

Similarly, the National Trauma Data may be useful at a state level for information on more severe injuries (i.e., those transported to a trauma center). Currently, a national level NTDB research data set is not available.

High Utility

Data in this category are recommended for use in further analyses in Tier 3 of the project. As such, a more detailed description of these data is given.

Datasets in this category include:

- National Emergency Medical Services Information System (NEMSIS)
- National Syndromic Surveillance Program (NSSP)
- State-level hospitalization and emergency department visit data

National Emergency Medical Services Information System (NEMSIS)

One key inclusion criterion of the BARD case definition is “treatment beyond first aid”. Given this, NEMSIS, a national database documenting standardized emergency medical services transport, may be helpful to understand the burden of boating incidents on EMS systems. However, data use agreements prohibit linking NEMSIS data to other databases at this time. Additional information about NEMSIS can be found on [their website](https://www.nemsis.org/).

³ <https://www.cpsc.gov/cgibin/NEISSQuery/Data/Highlights/2021/2021%20NEISS%20Data%20Highlights.pdf>

National Syndromic Surveillance Program (NSSP)

Syndromic surveillance of electronic healthcare data from emergency department (ED) visits was originally developed to track early infectious disease outbreaks and bioterrorism attacks. Now, it is also used to monitor a wide variety of health conditions, including infectious diseases, chronic diseases, environmental health, natural disasters, mass gatherings, and injuries, including firearms, overdose, non-fatal occupational injuries, and motor vehicle crashes.⁴

The [National Syndromic Surveillance Program \(NSSP\)](https://www.cdc.gov/nssp/participation-coverage-map.html) is a collaboration between local and state health departments, health care facilities, private sector partners, and the Centers for Disease Control and Prevention. Electronic patient encounter data from emergency departments, ambulatory health care centers, inpatient health care settings, laboratories, and urgent care centers are transmitted to the BioSense platform for public health agencies to analyze. Data are available as early as 24 hours after a patient's visit. The coverage map and metrics related to NSSP participation are available at <https://www.cdc.gov/nssp/participation-coverage-map.html> (CDC, 2022).

To make use of the data within the NSSP, a community of data users known as the NSSP Community of Practice (CoP) create visits definitions. The CoP includes public health jurisdictions that contribute data to the BioSense platform as well as practitioners who use local syndromic surveillance, CDC programs, academic institutions, and other partners. Visit information within the NSSP includes free-text chief complaint, discharge diagnoses codes (ICD), and patient demographic information. This information is used to create a draft visit definition that is then validated by volunteer CoP members. Visit definitions are useful in determining what “counts” as a case and what does not when performing syndromic surveillance. More information can be found in the [NSSP Knowledge Repository](#).

The ISW determined NSSP emergency department visits to be a useful data source to use in boating injury surveillance due to its near real-time availability, the ability to determine a visit definition through a rigorous process led by NSSP, and the potential of syndromic surveillance to provide surveillance beyond the initial injury period.⁵ The ISW collaborated with Amanda Morse, formerly at the Washington State Department of Health, to develop a draft visit definition for boating incidents using NSSP. This visit definition was further refined by a committee of individuals from NSSP, Safe States, USCG, NASBLA, and the ISW. Generally, the case definition follows the following criteria:

- Visits are included if the discharge diagnosis field includes a water transport accident ICD code (V90-V94) or other related watercraft accidents (W16.7), even if the chief complaint is not specific to a recreational boating accident.

⁴ Seil K, Marcum J, Lall R, Stayton C. Utility of a near real-time emergency department syndromic surveillance system to track injuries in New York City. *Injury Epidemiology*, 2015, 2:11

⁵ Lauper U, Chen J-H, Lin S. Window of Opportunity for New Disease Surveillance: Developing Keyword Lists for Monitoring Mental Health and Injury Through Syndromic Surveillance. *Disaster Med Public Health Preparedness*. 2017;11:173-178.

- Visits with any mention of boat, jet ski, or watercraft with a reference to an injury discharge diagnosis code or mention of an injury or accident in the chief complaint are included. Visits related to discharge diagnoses of recreational boating activities with any reference to an injury discharge diagnosis code or mention of an injury or accident in the chief complaint are also included.
- Negated visits include those where the chief complaint text indicated that the visit was in reference to a subsequent (i.e., W19XXD) or sequela (i.e., W228XXS) injury code and if the chief complaint indicated that the accident occurred while transporting the boat or on a commercial boat. Fishing boats are included; however, injuries with any mention of fish hook were negated.
- **In summary**, recreational boating accidents include accidents, injuries, or incidents that occurred on a boat but not in transporting the boat or on a commercial boat (i.e., ferry boat or cruise ship). Recreational watercraft activities that involve being towed by boats included wakeboarding, waterskiing, and tubing. Personal watercraft are included (i.e., jet skis, including brand names like Seadoo™ and Waverunner,™ as are kayaks, canoes, and rafts). Any subsequent encounters or sequelae of injury are negated in this query. This means that visits to EDs that were not the first visit for this injury were not included (e.g., a person goes to the ED on the day of the incident and returns the following day for the same issue).

At time of report publication, the visit definition was undergoing validation by several states through the CoP.

Hospitalization and ED Visit Data

State level hospitalization and emergency department visit data are a long-standing staple in injury surveillance as they offer final diagnoses. External cause of injury coding varies by state, but it is widely used across the country due partially to a Centers for Medicare and Medicaid Services rule tying participation to payment. Hospitalization and ED visit data are primarily administrative as their intent is for use in billing. The agency in charge of housing these data varies by state, but often is within the state's department of health services. Injury and violence prevention professionals in states are good sources to connect to these data.

Although hospitalization and ED discharge data are considered a "gold standard" data source in injury prevention, timeliness is a primary concern in their utility as there can often be a year or more lag between data collection and data availability. While these data are typically allowed for use in public health surveillance, access can be challenging due to patient protection laws such as HIPAA. That said, they remain an important source of data to validate visit counts.

Table 3 below summarizes the key differences between Hospital/ED Discharge and Syndromic Surveillance data. Both are useful for different purposes and warrant further examination for recreational boating injuries.

Several peer reviewed analyses comparing the utility of both NSSP and ED/Hospitalization for surveillance efforts have been done and have demonstrated NSSP as an effective public health surveillance system for other areas of injury prevention, noting that sources typically align and the addition of NSSP data expands on the information and context known about the issue^{6 7}. For this reason, the ISW felt that similar comparisons should be done as part of the Tier 3 to understand if the same can be said of boating-related injury surveillance and to document the differences in information gleaned from each system.

Table 3: Comparison of Hospital/ED Discharge and Syndromic Surveillance Data on Several Factors

Category	Hospital / ED Discharge	Syndromic Surveillance
TIMELINESS	1+ Year Lag	Real-time (24 hour)
CASE DEFINITION	Final diagnoses offered via ICD-10 codes, which are standardized ("gold standard")	Driven by creation of case definitions by experts based upon a combination of ICD codes, and free-text fields such as the chief complaint, which is not standardized
HISTORY OF USE IN THE FIELD OF INJURY PREVENTION	Traditional data source	Emerging data source
STATE-LEVEL PARTICIPATION	E-coding varies by state, but widely used across the country, enabled by Centers for Medicare/Medicaid Services rule	Participation varies by state, gaining in popularity, largely driven by increases in federal funding
TYPE OF DATA	Visit based	Visit based, although allows for ongoing monitoring (implications for economics) Not recommended for case counts Serves as EARLY WARNING system
DATA SOURCES	Hospital discharge data include hospital admissions/discharges	Varies by state but NSSP can include hospital, ED, urgent care, primary care, specialty

⁶ Rock PJ, Quesinberry D, Singleton MD, Slavova S. Emergency Medical Services and Syndromic Surveillance: A Comparison with Traditional Surveillance and Effects on Timeliness. Public Health Reports, 2021, 136(S1):72S-79S.

⁷ Vivolo-Kantor AM, Smith H, Scholl L. Differences and similarities between emergency department syndromic surveillance and hospital discharge data for nonfatal drug overdose. Ann Epidemiol. 2021, 62:43-50.

	ED data include discharge from ED	
LEVEL OF DATA	Opportunity for local, state and national level data	Opportunity for local, state and national level data



BRINGING DATA TOGETHER

Bringing Data Together

Public health experts typically have a broader perspective when considering “boating incidents” that is based on the Haddon Matrix (Figure 2, reprinted from Tier 1 Report) and might include several of the types of incidents that are listed as non-reportable events for BARD. Despite the differences in terms and approach, both boating safety and public health professionals have common goals and values around prevention of injury and death. The Haddon Matrix is a useful tool to ascertain what aspects of surveillance are important to the research questions at hand.

FACTORS				
PHASES	Host / Occupant	Vector / Vessel	Environment – Physical	Environment – Social
Pre-Event (Before the incident occurs)	<i>All Occupants:</i> <ul style="list-style-type: none"> Alcohol / drug use Life jacket use Restraint use Lookout / awareness of surroundings <i>Operator:</i> <ul style="list-style-type: none"> Vision Experience /ability Knowledge <i>Occupant:</i> <ul style="list-style-type: none"> Seating or Standing position 	<ul style="list-style-type: none"> Maintenance of boat and propulsion units Storage of onboard gear and safety equipment Speed of travel Load characteristics Loaded per capacity plate Hull type Vessel type 	<ul style="list-style-type: none"> Adequate waterway markings Weather and water conditions Time of day Depth of water Temperature of water Time of year 	<ul style="list-style-type: none"> Public/community attitudes of boating under influence of alcohol/drugs BUI laws Mandatory life jacket wear Boater education Enforcement and adjudication of boating laws Social life jacket safety norms Public attitudes on boating and boating education Economics
Event (During the incident)	<ul style="list-style-type: none"> Spread out energy in time and space with lookout persons Take action to dock properly or clear vessel Proper safety procedures Swimmer competence and water confidence Age and gender of victim 	<ul style="list-style-type: none"> Vessel size hull type gear loaded and balanced Engine cut-off switch used Closed cell foam compartments Access to safety equipment 	<ul style="list-style-type: none"> Gunwales and railings Presence of fixed objects such as submerged objects Nature of ejection, collision, vessel turn 	<ul style="list-style-type: none"> Adequate life jacket laws Other safety requirements Social norms of wearing a life jacket
Post-Event (After the incident)	<ul style="list-style-type: none"> Victim's overall health 	<ul style="list-style-type: none"> Gas tanks designed to minimize fires Items secured on deck Emergency communication and distress signal devices 	<ul style="list-style-type: none"> SAR response Good Samaritan response Distance to quality health care Situational assessments 	<ul style="list-style-type: none"> SAR availability Policies and funding supporting emergency and medical response systems Public outreach

Figure 2: Haddon Matrix of Boating Incidents

No one data source includes all categories of information outlined in the Haddon matrix (Host, Vector/Vessel, Physical Environment, Social Environment) for all time periods (pre-event, event, post-event). Table 4 shows the types of information that can be found in boating and/or public health data. In order to get a complete picture of a boating incident, at this time, data from multiple sources must be used.

Table 4: Haddon Matrix by Data Type (Boating, Public Health)

Haddon Matrix Component	Time Period	Boating Data	Public Health Data
HOST	Pre-Event	x	
	Event	x	x
	Post-Event		x
VECTOR/VESSEL	Pre-Event	x	
	Event	x	x
	Post-Event	x	
PHYSICAL ENVIRONMENT	Pre-Event	x	
	Event	x	x
	Post-Event	x	
SOCIAL ENVIRONMENT	Pre-Event	x	
	Event	x	x
	Post-Event	x	

Furthermore, a variety of specific risk and protective factor information within these Haddon Matrix categories can be found in a variety of boating and/or public health databases as mapped in Table 5, further illustrating the value of bringing public health and boating data together.

Information pertaining to the social environment is of interest to the ISW. For that reason, a number of policy-based [dashboards housed by NASBLA](#) are linked in the social environment section of Table 5. Of note, a consistent theme about boating that has been discussed throughout Tiers 1 and 2 is that of the culture of alcohol and drug use while boating. Future research is needed to understand people's attitudes and behaviors around this issue.

Table 5: Haddon Matrix Component, Risk/Protective Factor, Boating Data, Public Health, and Other Relevant Data Sources

Haddon Matrix Component	Risk/Protective Factor	Boating Data Source	Other Data Sources (Public Health)	Notes
Pre-Event Host	Alcohol / Drug use	BARD	Emergency Room Visits (varies by jurisdiction) NEMSIS	Capture of alcohol or drugs (as "opinion of person making the report") as a causal or contributing factor is data element required in BARD under 33 C.F.R. 173.57. On current Coast Guard Boating Accident Report form for entry into BARD and national statistics, then, Alcohol Use and Drug Use are available to select as contributing factors to the incident. Operator's use of Alcohol or Drugs on board or prior to incident can be captured as yes/no. Operator arrest for BUI also captured as yes/no. Passenger alcohol or drug use is not currently mandated for capture; however, alcohol use and drug use (yes/no) are listed as contributing factors to the incident. Additional information varies by state. Emergency department data may also capture if injured party was under the influence of a substance if there was reason to test for it upon presentation/examination.
	Lookout/awareness of surroundings	BARD	None	Improper lookout and operator inattention are both available selections under the "Cause" of incident in BARD.
	Life jacket use	BARD	None	"Availability and use of personal flotation devices" is a report data element required in 33 C.F.R. 173.57. The Coast Guard BAR form, then, collects number of life jackets on board, number of people (on board and towed) wearing jackets, whether operator was wearing jacket (yes/no), and whether persons who were injured or died were wearing jackets.

Haddon Matrix Component	Risk/Protective Factor	Boating Data Source	Other Data Sources (Public Health)	Notes
	Operator experience / ability	BARD	None	The current 33 C.F.R. 173.57 requires the vessel operating experience of the operator (making the report) and the Coast Guard BAR form, then, requests selection of a range of hours the operator has spent operating the type of vessel involved in the incident.
	Operator knowledge	BARD State level boater education records	None	Boating safety training of the operator is a report element required in 33 C.F.R. 173.57. The current CG BAR form, then, asks for the type of boating safety instruction completed (none, state course, USCG-AUX course, USPS course, internet, and any other forms.)
Event - Host	Victim Age	BARD	Emergency Department Visits NEMSIS NSSP	Mandatory collection: Capture of the age or DOB for the vessel operator and DOB for each person injured or killed in the incident are report elements currently required in 33 CFR 173.57. The current CG BAR form, then, has fields for age and DOB for the operator and the victim(s) who died, disappeared, or were injured.
	Victim Gender		Emergency Department Visits NEMSIS NSSP	Many states may submit sex in BARD. It is not required or validated.
	Activities at time of accident	BARD		Operator / passenger activities captured include: <ul style="list-style-type: none"> • Fishing • Hunting

Haddon Matrix Component	Risk/Protective Factor	Boating Data Source	Other Data Sources (Public Health)	Notes
Post Event Host				<ul style="list-style-type: none"> • White water activity (e.g., rafting) • Tubing • Water Skiing • Relaxing • Starting engine • Making repairs • Other
	Speeding	BARD		Excessive speed is an available selection under the "Cause" of incident field in BARD
	Mechanism of Injury	BARD*	Emergency Department Visits NEMSIS NSSP	Emergency Department Visit, NSSP, NEMSIS all use ICD coding. *This may be captured in the narrative of state boating reports, though it is not captured in a standardized format in BARD.
	Nature of Injury	BARD	Emergency Department Visits NEMSIS NSSP	BARD collects nature of most serious injury as "yes/no" variables for: <ul style="list-style-type: none"> • Scrape/bruise • Cut • Sprain/strain • Concussion / brain injury • Spinal cord injury • Broken/fractured bone • Dislocation • Internal organ injury • Amputation • Burn • Other

Haddon Matrix Component	Risk/Protective Factor	Boating Data Source	Other Data Sources (Public Health)	Notes
				Emergency Department Visit, NSSP, NEMSIS all use ICD coding.
	Injury severity	BARD	Emergency Department Visits NEMSIS NSSP	BARD collects a yes/no for "person received treatment beyond first aid" and "person was admitted to a hospital". Emergency Department Visit, NSSP, NEMSIS would have more detailed coding per ICD.
	Cause of Injury	BARD	Emergency Department Visits NEMSIS NSSP	BARD collects cause of injury data as free-text entry for the following: <ul style="list-style-type: none"> • Struck the boat/water • Was struck by • Was exposed to carbon monoxide poisoning • Received an electric shock Emergency Department Visit, NSSP, NEMSIS all use ICD coding.
PRE-EVENT - VECTOR/VESSEL	Storage of Onboard Gear and Safety Equipment	BARD		Number of life jackets on board Number of fire extinguishers on board Number of fire extinguishers used
	Hull type	BARD		Hull material type is collected.
	Vessel type	BARD		Types of boat collected: <ul style="list-style-type: none"> • Cabin motorboat • Open motorboat • Auxiliary sail • Pontoon boat • Inflatable boat • Houseboat • Sail (only) • Rowboat • Personal watercraft (e.g., Jet Ski™) • Air boat

Haddon Matrix Component	Risk/Protective Factor	Boating Data Source	Other Data Sources (Public Health)	Notes
EVENT VECTOR				<ul style="list-style-type: none"> • Canoe • Kayak • Standup paddleboard • Other
	Engine type	BARD		Types of engines and horsepower collected: <ul style="list-style-type: none"> • Outboard • Sterndrive • Inboard • Pod Drive
	Available propulsion	BARD		Types of available propulsion collected: <ul style="list-style-type: none"> • Propeller • Sail • Manual • Water Jet • Air Thrust • Other
	Number of engines	BARD		
	Fuel type	BARD		Types of fuel collected are: <ul style="list-style-type: none"> • Gas • Electric • Diesel • Other
	Safety Checks	BARD		Yes/no variables for the source of the vessel safety check (US Coast Guard Auxiliary, US Power Squadrons, Federal, State, Other)
	Loading	BARD		Improper loading and Overloading are selections available for "Cause" of incident field collected in BARD
	Vessel size	BARD		Vessel size variables include: <ul style="list-style-type: none"> • Length

Haddon Matrix Component	Risk/Protective Factor	Boating Data Source	Other Data Sources (Public Health)	Notes
				<ul style="list-style-type: none"> Depth from transom to keel Beam width at widest point
	Boat Operations at time of incident	BARD		Boat Operations yes/no collected: <ul style="list-style-type: none"> Cruising (underway under power) Changing direction Changing speed Sailing Drifting At anchor Being towed Rowing/paddling Docking / undocking Towing another vessel Launching Tied to dock/mooring Other
	Engine cut-off switch used	BARD		Operator wearing an engine cut-off switch is captured as a yes/no variable.
	Machinery / Equipment failure	BARD		Failure of following contributed to accident (yes/no): <ul style="list-style-type: none"> Engine Electrical system Fuel system Sail/mast Onboard navigation aids Onboard lights Seats Steering Throttle Shift Radio

Haddon Matrix Component	Risk/Protective Factor	Boating Data Source	Other Data Sources (Public Health)	Notes
				<ul style="list-style-type: none"> • Fire extinguisher • Ventilation • Sound equipment (e.g., horn, whistle) • Auxiliary equipment • Other
POST EVENT - VECTOR/VESSEL	Damage to boat	BARD	Insurance Data	BARD has text field for description of damage to boat
PRE-EVENT: PHYSICAL ENVIRONMENT	Adequate waterway markings	BARD		BARD has a "Cause" of incident field "Missing or inadequate navigation aids"
	Weather conditions/visibility	BARD	Weather data	<p>BARD collects overall weather conditions (yes/no):</p> <ul style="list-style-type: none"> • Clear • Cloudy • Foggy • Raining • Snowing • Hazy • Other <p>BARD also collects wind conditions:</p> <ul style="list-style-type: none"> • 0 mph • >0-12mph • >12-25mph • >25-55mph • >55mph <p>BARD documents visibility as:</p>

Haddon Matrix Component	Risk/Protective Factor	Boating Data Source	Other Data Sources (Public Health)	Notes
				<ul style="list-style-type: none"> • Good • Fair • Poor • Unknown
	Water conditions	BARD		BARD collects water conditions: <ul style="list-style-type: none"> • ≤6 in. waves • >6 – 2 ft waves • >2ft – 6 ft waves • >6 ft waves The following a yes/no selection: <ul style="list-style-type: none"> • Strong current • Hazardous waters • Congested waters
	Time of day	BARD	Emergency Department Visits NEMSIS NSSP	Bard collects Day/Night (yes/no) as well as actual time
	Temperature of Water	BARD		BARD collects approximate water temperature (°F)
	Time of year	BARD	Emergency Department Visits NEMSIS NSSP	
	Body of water name	BARD		
	Nearest City or Town to water	BARD		

Haddon Matrix Component	Risk/Protective Factor	Boating Data Source	Other Data Sources (Public Health)	Notes
EVENT - PHYSICAL ENVIRONMENT	Air temperature	BARD	Weather	BARD collects approximate air temperature (°F)
	Occupant placement	BARD		BARD has a "Cause" of incident selection "people on gunwale, bow or transom".
	Presence of fixed objects such as submerged objects	BARD		BARD has selections for the following to describe the type of accident: Collision with submerged object Collision with floating object Collision with fixed object
	Restricted vision (e.g., fog)	BARD		BARD has a "Cause" of incident selection called "restricted vision"
	Location	BARD		Location of accident is collected in BARD
POST EVENT - PHYSICAL ENVIRONMENT	Search and Rescue (SAR) Response	NASBLA State Law Dashboards	NEMSIS	
	Carbon Monoxide exposure	BARD	Emergency Department Data (see note)	BARD has an "Accident type" selection called "Carbon monoxide exposure" and captures carbon monoxide as a type of injury and cause of death. Emergency department data may capture this as well if exposure was expected and it were tested (in time/appropriately) CO metabolic half-life is about 4 hours and it must be tested with an arterial blood draw.
PRE-EVENT - SOCIAL ENVIRONMENT	Public attitudes of boating under the influence (BUI) of alcohol/drugs			
	BUI Laws	NASBLA State Law Dashboards		

Haddon Matrix Component	Risk/Protective Factor	Boating Data Source	Other Data Sources (Public Health)	Notes
		Operation Dry Water Laws by State		
	Mandatory wear/education	NASBLA State Law Dashboards		
	Enforcement and adjudication of boating laws	NASBLA State Law Dashboards		
	Social life jacket safety norms			
	Public attitudes on boating and boating education			
EVENT - SOCIAL ENVIRONMENT	Adequate life jacket laws			
	Other safety requirements	NASBLA State Law Dashboards		
	Social norms of wearing a life jacket			
POST EVENT - SOCIAL ENVIRONMENT	SAR availability	NASBLA State Law Dashboards		
	Policies and funding supporting emergency and medical response systems			

One way to frame surveillance which is inclusive of both boating requirements and public health approaches outlined in the Haddon Matrix is to categorize incidents into the following framework (Figure 3):

- **Boating Incident:** Those incidents which maintain the USCG definition for inclusion in BARD and the annual statistics
- **Boating Adjacent:** Includes those incidents that meet the USCG definition as well as some non-reportable events where by the boat/vessel is involved, but not responsible
- **No Boating Involvement:** Other water-related injuries in open water environments in which a boat was not involved

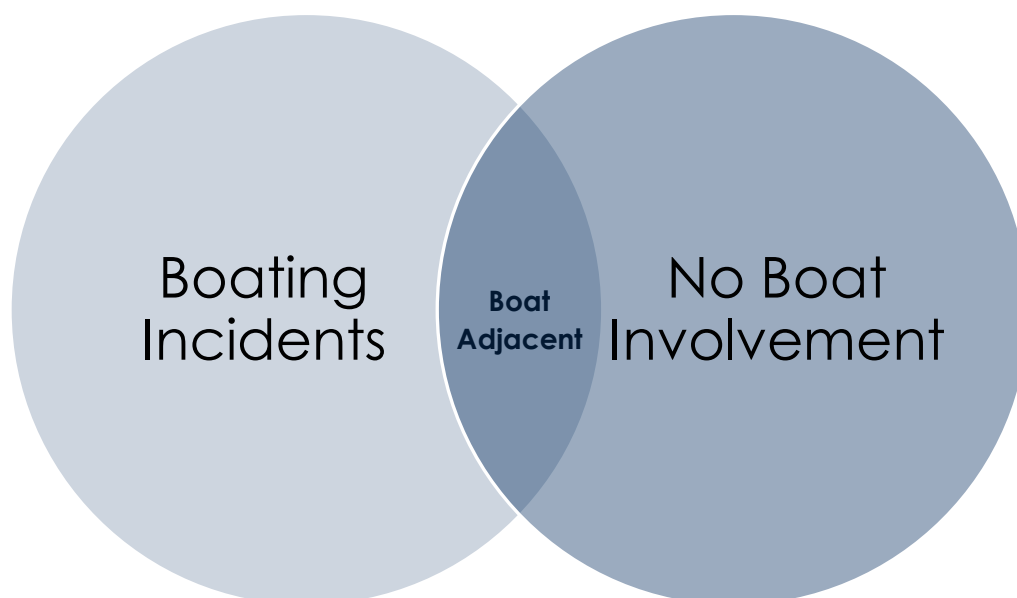


Figure 3: Framework for Injuries Occurring in Open Water Environments

A public health approach to boating incidents would include the incidents as defined for inclusion in BARD and the USCG's annual statistics, as well as be inclusive of "boating adjacent" incidents that may not meet the criteria for entry into BARD but would help in discussing prevention issues with multidisciplinary groups. At present, there is not a single-collection point for analyzing events that are deemed non-reportable for BARD. Further discussions with drowning prevention and other stakeholders may be helpful. The feasibility of using this framework will be discussed in Tier 3, in conjunction with analyses of datasets outlined in this report.

Working with Data

Seven planned analyses have been developed for use with states participating in Tier 3 of this project. The analyses are described below and summarized in Table 6. States participating in Tier 3 would need public health experts (e.g., injury epidemiologists) to complete the analyses with support and data from state boating law administrators or their designees. It is recommended that the calendar year 2021 be examined to ensure complete recording from any data source involved. It is anticipated that this guide be updated with the results from these analyses to offer more widespread guidance to all states wanting to examine recreational boating data.

It is recommended that states use both NSSP and ED data to determine if the linkages are comparable in their utility. While NSSP data are timelier, there are states that are not yet fully reporting to NSSP and it would be helpful to know what information can be gleaned from ED linkages.



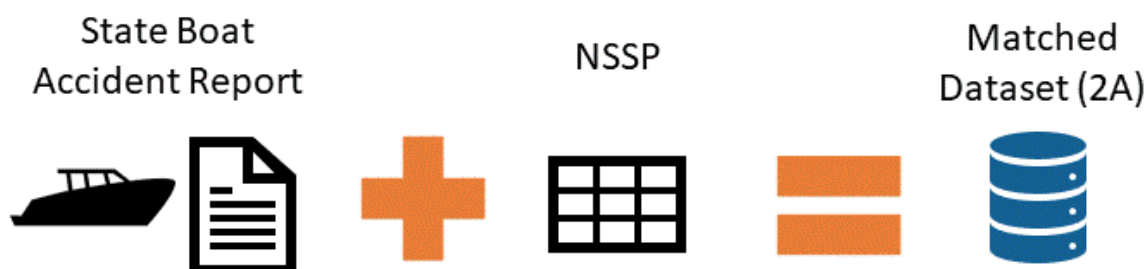
1. *How many visits meet the case definition for calendar year 2021?*

The case definition for ED and hospitalization datasets would be the list of ICD-10 codes in Table 2. This list of ICD-10 codes is also included within the NSSP case definition described earlier and currently being validated by the NSSP program.

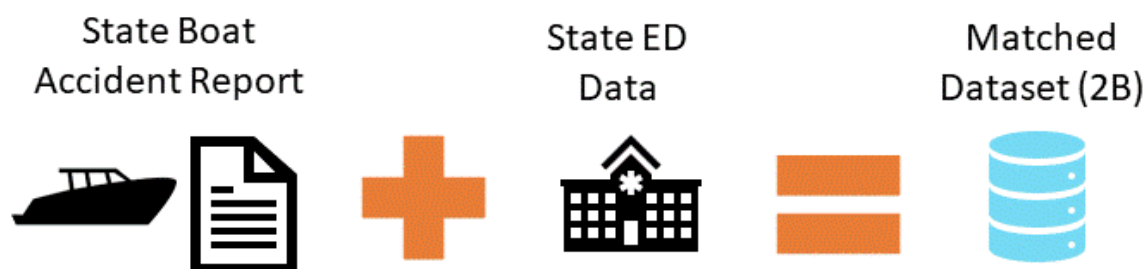


2. *What additional information could we learn about non-fatal injury incidents that are not identified in state boating accident reports?*

- A. Using the BARD case definition, state boating incident reports would be matched to NSSP based on identifying variables if present or using probabilistic matching methodologies if identifying variables (name, date of birth) are not present. The presence of these identifying variables may vary by state and data use agreement stipulations.



- B. Using the BARD case definition, state boating accident reports would be matched to ED visits on several identifying variables if present or using probabilistic matching methodologies if identifying variables (name, date of birth) are not present. The presence of these identifying variables may vary by state and data use agreement stipulations.

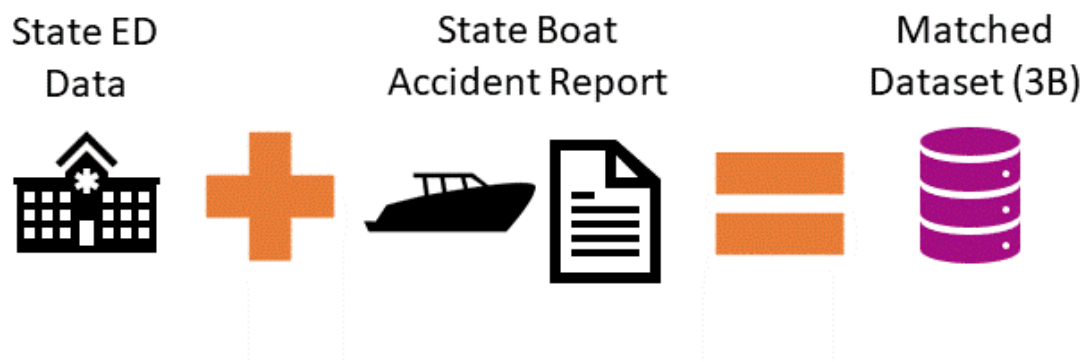


3. How many and what type of non-fatal incidents are identified in NSSP (Analysis 3A) and/or ED data (Analysis 3B) that do not have a corresponding state boating accident report that both meet and do not meet the BARD case definition?

- A. Using the boating incident case definition developed with the NSSP program, boating incidents would be pulled from NSSP data and matched to state boat accident reports on several identifying variables if present or using probabilistic matching methodologies if identifying variables are not present. The presence of these identifying variables may vary by state and data use agreement stipulations.



- B. Using the boating incident case definition developed with the NSSP program, boating incidents would be pulled from state ED visit data and matched to state boat accident reports on several identifying variables if present or using probabilistic matching methodologies if identifying variables are not present. The presence of these identifying variables may vary by state and data use agreement stipulations.



4. What recommendations could be disseminated to boating safety and public health professionals to improve state boating accident reports?

Researchers found hospitalization PLUS syndromic surveillance data may enhance classification and capture of injuries with possible improved efforts at prevention⁸. The matched data sets produced through the above linkages should be discussed considering what additional classification changes and recommendations could be disseminated to boating safety and public health professionals to improve existing data.

⁸ Borjan M & Lumia M. Evaluation of a state based syndromic surveillance system for the classification and capture of non-fatal occupational injuries and illnesses in New Jersey. *Am J Ind Med.* 2017; 60:621-626.



5. *How many EMS visits are categorized as “water transport accident” (Code 9650)?*



6. *How does this number compare to the state boating accident report data for this state?*

It is unknown to what degree NEMSIS data could be used to add further detail about non-fatal boating injuries, though EMS data paired with syndromic surveillance data has been demonstrated to be helpful in identifying overdose cases in a timely fashion⁶. States may want to examine NEMSIS data for their state using the NEMSIS code 9650 for “water transport accident” to determine what the value add of this information is for surveillance uses and to see how it compares to information captured in state boating accident reports. NEMSIS data are not able to be linked to other data sources so this analysis may be limited in its utility.



7. *What is the utility in using the Boating Incident Framework (Figure 3) in local jurisdictions as an approach to injury surveillance in water environments?*

The question posed by this analysis is looking for state-level feedback on how to potentially frame injury prevention in open water environments as one that is inclusive of boating and non-boating activity given the shared risk and protective factors that may exist and the shared prevention activities.

Table 6: Analysis Questions to Guide Tier 3

Question No.	Analysis Question	Analysis Type	Methodological Notes	Data Set(s) Needed	Report Output
1	<i>How many visits meet the case definition for calendar year 2021?</i>	Quantitative	Case definitions vary by data set: <ul style="list-style-type: none"> NSSP should use the approved CoP data definition. Hospitalizations and ED Visits use the list of ICD codes in this report. Document the inclusion/exclusion criteria that the state boating law administrator uses for state accident reports. 	NSSP ED Visits Hospitalizations State Boating Accident Reports	For each data set, report the number of visits that meet the case definition.
2	<i>What additional information could we learn about non-fatal injury incidents that are not identified in state boating accident reports?</i>	Descriptive	Data linkages <ul style="list-style-type: none"> Matching on identifiers if possible. Probabilistic matching may be necessary 	<div>A. State boating accident reports + NSSP</div> <div>B. State boating accident reports + ED</div>	For each linkage performed: Document the linkage methodology used. How many cases matched? How many cases did not match? What is different about the cases that did not match (qualitative)?

3	<i>How many and what type of non-fatal incidents are identified in NSSP that do not have a corresponding state boating accident report that both meet and do not meet the BARD case definition?</i>	Descriptive	Data Linkages <ul style="list-style-type: none"> Matching on identifiers if possible. Probabilistic matching may be necessary	A. NSSP + State boating accident reports	For each linkage performed: Document the linkage methodology used. How many cases matched? How many cases did not match? What is different about the cases that did not match (qualitative)?
				B. ED + State boating accident reports	
4	<i>What recommendations could be disseminated to boating safety and public health professionals to improve state boating accident reports?</i>	Comparison of above analyses	Each state participating in Tier 3 will develop recommendations, and the group of states will discuss this throughout the project.	Output of Questions 1-3	What recommendations, if any, do you have based on the outcome of the above analyses? What additional questions do you have?
5	<i>How many EMS visits are categorized as "water transport accident" (Code 9650)?</i>	Descriptive		NEMESIS	Report the number of cases in the state for 2021 that are coded 9650.
6	<i>How does this number from Analysis 5 compare to the state boating accident report</i>	Comparison		State boating accident reports NEMESIS	Report the number of state boating accident reports where EMS transport was used. What factors may attribute to mismatch of outputs from analyses 5 and 6?

	<i>data for this state?</i>				
7	<i>What is the utility in using the Boating Incident Framework in local jurisdictions as an approach to injury surveillance in water environments?</i>	Descriptive		All	Given your experiences conducting the analyses outlined, what recommendations do you have for using the databases for continued surveillance?

Reporting Requirements

States participating in Tier 3 of the project will co-develop final output metrics to ensure consistency and standardization in reporting based on the sample report outputs documented in Table 6.

Additionally, process information will also be of interest to help USCG, NASBLA and partners determine the utility of the analytic approaches outlined here. Process outputs of interest include:

- How many hours were attributed to each analysis
- How many people were involved
- Details about how data was accessed, stored, linked, and analyzed
- Barriers to the project
- Any caveats to your analysis
- How findings might be used within the states

This information would be used to update this manual and potentially create supporting standardized procedural materials for states to use.

Data Access

Both boating and public health data have differing levels of access as outlined in Table 7. Injury and violence prevention experts (e.g., epidemiologists) within each state likely will have contacts and procedures to access NSSP, ED, and hospitalization data. Additional data use agreements may be needed for the above analyses. Typically, a request for state boating data to the state boating law administrator will be the necessary first step in acquiring the boating accident reporting data for the above linkages. Any data access issues will need to be negotiated at the state level. Collaborations between both disciplines can enable access in many areas.

Table 7: Access Notes for High Impact Datasets

Data Source	Level	Access Notes	Reporting
Boat Accident Reporting Database (BARD)	Federal	Access to the national dataset would require approval and clearance from all participating states.	Recreational Boating Statistics Reports are publicly available here .
Boat Accident Reports	State	Each state maintains its own boating accident reporting, typically submitted directly into BARD though some have their own system, either in-house or via a third-party vendor, that auto-inputs	A listing of state boating law administrators and other boating contacts is available on the NASBLA website .

		into BARD. State-level data can be accessed through the state boating law administrators.	
National Syndromic Surveillance Program (NSSP)	State	Access to NSSP system is limited within states.	State level contacts can be made by emailing CDC NSSP office nssp@cdc.gov or by working with state level epidemiologists within your state's department of health.
Emergency Department and Hospitalization Data	State	Access to ED visit and hospitalization data vary by state. Outreach to injury and violence prevention professionals in your state as a starting place.	Safe States Alliance can connect people to state IVP professionals. Email info@safestates.org
National Emergency Medical Services Information System (NEMSIS)	Federal State	A variety of publicly available data is available on the NEMSIS website	Research databases can be applied for.

Collaborations

Collaboration between boating safety professionals and public health professionals will advance the lessons learned and the ability to conduct analyses in Tier 3 and beyond. Additional collaborations would be fruitful to advance different areas of boating injury surveillance outside the scope of Tier 3. The ISW developed this comprehensive list to guide federal and state level professionals who are interested in further developing collaborations around recreational boating data surveillance and prevention program development and evaluation as well as funders who are looking to push the field forward.

The following categories are used in Table 8 below:

1. **Expertise:** This refers to a collaboration where the benefit would be related to building relationships to gain expertise in each area. This category is further subdivided into Public Health, Transportation, or Advocacy. Public health is further subdivided into epidemiology, injury, drowning.
2. **Data Process/Methods:** This refers to a collaboration where the main benefit would be related to building relationships to gain knowledge around data processes or methods used by other groups to collect data.
3. **Data:** This refers to a collaboration where the main benefit would be related to building

relationships to gain data access in each area and/or to improve data collection systems and processes. This category is further subdivided into Boating and Public Health. Public Health is further subdivided into injury, drowning.

4. **Shared Risk and Protective Factors:** This refers to a collaboration where the main benefit would be to build relationships based on the alignment of shared risk and protective factors.

Table 8: Categories of Potential Collaborations to Advance Recreational Boating Injury Surveillance and Prevention

Category	Definition	Sub-categories	Example Organizations With Whom To Partner
Expertise	This refers to a collaboration where the benefit would be related to building relationships to gain expertise in a given area . This category is further subdivided into Public Health, Transportation, or Advocacy. Public health is further subdivided into epidemiology, injury, drowning.	Public Health Epidemiology Injury Drowning	American Public Health Association Council of State and Territorial Epidemiologists Centers for Disease Control National Center for Injury Prevention & Control Great Lakes Water Safety Consortium National Drowning Prevention Alliance Water Safety USA Safe States Alliance Washington State Drowning Prevention Network Safe Kids Worldwide
		Transportation	Federal Aviation Administration National Highway Traffic Safety Administration Federal Railroad Administration USCG National Transportation Safety Board
		Advocacy / Policy Public Policy Organizational Policy	Mothers Against Drunk Driving Safe States Alliance US National Water Safety Action Plan Families United to Prevent Drowning
		Boating	USCG NASBLA National Boating Safety Advisory Committee National Water Safety Congress National Safe Boating Council American Canoe Club

Category	Definition	Sub-categories	Example Organizations With Whom To Partner
Data Process / Methods	This refers to a collaboration where the main benefit would be related to building relationships to gain knowledge around data processes or methods used by other groups to collect data.	Incident Investigation Processes	National Highway Traffic Safety Administration Federal Railroad Administration NASBLA Standard on Investigative Training for Boating Incidents National Center for Child Fatality Review USCG
Data	This refers to a collaboration where the main benefit would be related to building relationships to gain data access in each area. This category is further subdivided into Boating and Public Health. Public Health is further subdivided into injury, drowning.	Boating	USCG NASBLA Great Lakes Water Association Departments of Natural Resources State Game and Fish Departments
		Public Health Injury Drowning	National Center for Health Statistics Hospital Associations State-level Injury and Violence Prevention professionals (Safe States Alliance)
		Economic (e.g., Years per Life Lost / Quality Adjusted Life Years)	Sales tax data / Purchase data State offices for Licensing & Registration Fees Insurance Companies
		Weather	National Oceanic and Atmospheric Administration
		Industry	Vessel manufacturers Life Jacket Association Marine Trade Associations National Marine Manufacturer's Association
		Mechanism of Injury	NASBLA Paddle Sports Committee National Safe Boating Week - National Safe Boating Council National Trauma Centers
Shared Risk and	This refers to a collaboration where the main benefit would	Circumstances of Injury	Child Death Review teams
		Education Boating	NASBLA National Boating Education Standards

Category	Definition	Sub-categories	Example Organizations With Whom To Partner
Protective Factors (SRPF)	be related to building relationships to capitalize on SRPF.	education Policies Swimming Lessons	Panel USCG Auxiliary American Boating Club / United States Power Squadron USCG - Compliance with Manufacturing Regulations Boat US Foundation Marine Trade Association - National and State National Marine Manufacturers Association Marine Retailers Association of the Americas (dealers) American Red Cross YMCA Boy Scouts/Girl Scouts Water Safety/Boating Safety National Drowning Prevention Alliance Water Safety USA Commercial providers of education State Boating Office (Varies by State: Fish & Wildlife, Department of Natural Resources) US Sailing Foundation American Canoe Association National Center for Child Fatality Review
		Alcohol Use	Mothers Against Drunk Driving NASBLA State Health Departments Department of Transportation Office of Drug and Alcohol Policy NHTSA International Association of Chiefs of Police National Governor's Highway Safety Associations National Sheriff's Association Marine Patrol State Parks and Rec Association of Marine Industries National Marine Manufacturers Association American Boat and Yacht Council Local marine trade associations - designated skipper programs National District Attorneys National Safety Council SAMHSA (Substance Abuse and Mental

Category	Definition	Sub-categories	Example Organizations With Whom To Partner
			Health Services Administration) National Institute Alcohol Addiction
		Substance Use	CDC National Center for Injury Prevention and Control OD2A Program SAMHSA (Substance Abuse and Mental Health Services Administration) Washington Marijuana Growers Association
		Recreational Groups	American Canoe Club Outdoor Industry Association

Specialized Groups

While fatalities are outside the scope of the ISW, the intersection with boating and drowning cannot be ignored. The ISW has highlighted several special interest groups that would be helpful to have boating professionals aware of and participate in at a local level.

Child Death Review Teams: Every state has child death review teams, multidisciplinary groups that review to go over the circumstances of a child fatality in order to frame prevention recommendations. Boating professionals are an important group to tap into when a boating-related death occurs.

Drowning Coalitions/Workgroups: Several drowning related coalitions and workgroups exist and the expertise that a state boating law administrator or other boating safety professional brings is not found elsewhere. The following is a list of national-level initiatives:

[The United States National Water Safety Action Plan](#)

[National Center for Fatality Review Drowning Pilot Project](#)

[National Drowning Prevention Alliance](#)

[Safe Kids Worldwide](#)

Additionally, many states have local coalitions dedicated to drowning prevention.

SUMMARY RECOMMENDATIONS FOR ACTION

Recommendations

This report has outlined the following recommendations for action for federal, state and local partners. These are summarized below.

Federal Partners, Including Funders

- Continue developing cross-organization relationships between public health and boating to allow for continued data sharing, data use and development and evaluation of prevention policies and programs.
- Promote funding of cross-organization relationship building, data sharing, and data projects to make use of and advance the recommendations outlined in this report.
- Incorporate learnings from projects into strategic plans and training materials

State Boating Law Administrators

- Connect with public health-oriented partners in your communities including injury and violence prevention professionals, child death review teams, and drowning prevention coalitions.
- Strategize collectively in how to enhance boating safety efforts
- Work to share data with partners to enhance surveillance efforts
- Help boating professionals understand the connection to public health efforts to improve boating safety.

Injury and Violence Prevention Professionals / Public Health

- Connect with state boating law administrators in your state to share learnings from this report and public health efforts connected to boating and water environments
- Strategize collectively in how to enhance boating safety efforts
- Work to share data with partners to enhance surveillance efforts
- Help integrate boating professionals into public health efforts

States Participating in Tier 3

- In addition to those recommendations for action listed under state boating law administrators and injury and violence prevention professionals, states participating in Tier 3 will need to have participation from BOTH state boating law administrators or their designees and public health experts.
- It is anticipated that public health departments (or academic partners working on behalf of public health) would take the lead in performing the analyses listed with input and dialogue with state boating law administrators
- States participating in Tier 3 would also be expected to participate in cohort calls routinely to share lessons learned and questions.

CONCLUSION

Conclusion

Partnerships between the boating and public health communities maximize the expertise that both groups bring to the table. One critical way to improve non-fatal injury surveillance of boating incidents is for partnerships at the state level to share data and begin to analyze data from multiple sources, link data and collaborate on designing, implementing, and evaluating prevention policies and programs.

Appendix A: Sponsors Information

The **National Association of State Boating Law Administrators (NASBLA)** is a national nonprofit, 501(c)3 organization that works to develop public policy for recreational boating safety. NASBLA represents the recreational boating authorities of all 50 states and the U.S. territories. NASBLA is a professional community leading recreational boating safety through innovation and collaboration for excellence in policy development, national standards, and best practices.

The goals of NASBLA are:

- **Diversified Funding:** Create a diversified funding portfolio to ensure the association's sustainability and broaden revenue streams for future initiatives.
- **Eliminate Barriers for Boaters:** Reduce barriers to safe and enjoyable boating to increase public participation.
- **Expanded Training:** Expand training and professional development opportunities to better serve a diversity of needs.
- **Proactive Legislative Program:** Advocate and build support for state and national policy positions to advance innovative solutions for safety and security challenges.
- **State Program Performance and Efficiency:** Promote excellence in state boating program administration to increase efficiency and effectiveness.



For more information about NASBLA, visit their [website](#).

The **Safe States Alliance** is a national non-profit organization and professional association whose mission is to strengthen the practice of injury and violence prevention. To advance this mission, Safe States Alliance engages in activities that include:

- Increasing awareness of injury and violence throughout the lifespan as a public health problem;
- Enhancing the capacity of public health agencies and their partners to ensure effective injury and violence prevention programs by disseminating best practices, setting standards for surveillance, conducting program assessments, and facilitating peer-to-peer technical assistance;
- Providing educational opportunities, training, and professional development for those within the injury and violence prevention field;
- Collaborating with national organizations and federal agencies to achieve shared goals;
- Advocating for public health policies to advance injury and violence prevention;
- Convening leaders and serving as the voice of injury and violence prevention programs within state health departments; and



- Representing the diverse professionals within the injury and violence prevention field.

For more information about the Safe States Alliance, visit their [website](#).

The United States Coast Guard (USCG) Boating Safety Division is dedicated to reducing loss of life, injuries, and property damage that occur on United States waterways by improving the knowledge, skills, and abilities of recreational boaters.



Produced under a grant from the Sport Fish Restoration and Boating Trust Fund, administered by the U.S. Coast Guard.

For more information about USCG Boating Safety Division, visit their [website](#).

Appendix B: List of Individuals Involved

ISW Members

Boating Safety

Joe Campbell, TN	Emily King, OH	Derek VanDyke, WA
Mark Chanski, CT	Brian Moore, USCG	Seth Wagner, FL
Deborah Gona, KY	Alex Otte, KY	Susan Weber, USCG
Jonathan Hsieh, USCG	Ron Sarver, NASBLA	
Cody Jones, TX	Susan Stocker, IA	

Public Health

Amy Bailey, TX	Carly Roberts, MD	Sarah Stempski, WA
Tessa Clemens, GA	Laura Rowen, MI	Kelli Toth, AK
Sharon Gilmartin, NC	Kristen Sanderson, LA	

Consultations

Holly Hedegaard, National Center for Health Statistics, Injury Epidemiologist
Mia Israel, Council for State and Territorial Epidemiologists
Alan Mai, Florida State Department of Health, Senior Epidemiologist
Katie McDaniel, Florida State Department of Health, Section Administrator
Amanda Morse, (formerly) Washington State Department of Health, Syndromic Surveillance
Linda Quan, Pediatrician, Drowning Expert
Lakshmi Radhakrishnan, Centers for Disease Control, National Syndromic Surveillance Program
William Ramos, University of Indiana, Drowning Expert
Andzelika Rzucidlo, Centers for Disease Control, National Syndromic Surveillance Program
Zachary Stein, Centers for Disease Control, National Syndromic Surveillance Program
David Zane, Injury Epidemiologist (Ret.), Member of the Central Texas Drowning Prevention Action Team and International Drowning Researchers Alliance, TX

Appendix C: Overview of BARD Reprinted from Tier 1 Report

Chapter 46 of the United States Code, Section 6102 mandates the creation of federal regulations for collection, analysis and publications of data reports. This code also allows statistics to be released if permissible by the state that submitted the data.

The Code of Federal Regulations 33 CFR 173 outlines the criteria for the public responsibility to report an accident to the state, as outlined on pages 7-8 of this report. Additionally, the contents of a report are outlined, including overview information, vessel information, and people information. It was noted that although the CFR describes data elements that are required to be collected, it does not always specify fields.

The Coast Guard Recreational Boating Accident Report Form (CG-3865) (Appendix D) contains and details elements that are outlined in the Code of Federal Regulations. It specifies eleven fields to describe the nature of the injury (scrape/bruise, cut, sprain/strain, concussion/brain injury, spinal cord injury, broken/fractured bone, dislocation, internal organ injury, amputation, burn, other), as well as two fields to document the extent of the injury (treatment beyond first aid, admitted to a hospital). This form must be approved every three years; as such, this approval process provides an opportunity for changes to be made. This discussion brought up important points that were documented in the roundtable recommendations:

- Most states use their own boating accident report form, which *may or may not contain the same information as that of the USCG*.
- The CFR-required elements may have different fields. The example provided was that the CFR requires the element "operator experience" but does not specify the ranges.
- On that note, ranges that are used to complete fields vary across each state's boating accident report form. For example, USCG uses "over 500 hours" as the highest range, whereas some states may use "over 100 hours".
- Persons who fill out the boating accident report forms vary from owners/operators of vessels to law enforcement investigators; owner/operator forms can introduce bias to the data collection.

BARD is an electronic reporting system states can use to submit recreational boating accident reports to USCG, either by manual data entry or electronic transfer from a State's own system. BARD is only accessible by authorized state and USCG personnel. In addition to data entry, authorized personnel can query records, track incidents reported in media, map incidents, and produce comprehensive statistical reports.

Data from BARD have public-facing uses, as well as internal utility. The USCG standardizes data from BARD to create an annual statistics publication for the public that provides a national perspective on causes and types of accidents, operator and victim information, and registration data. Data are also uploaded to a public-interfacing website that allows the user to create specific tables or charts.⁹ Finally, the USCG releases a public version of the database upon request. This public database does not contain personally-identifiable information or

⁹ Available at: <https://bard.knightpoint.systems/PublicInterface/Report1.aspx>

records from states that do not give permission for their data to be included. Internally, data from BARD are used in USCG performance reports to the U.S. Department of Homeland Security, to guide the development of the National Recreational Boating Safety Strategic Plan, measure program compliance with regulations, and advance regulatory efforts.

Strengths and challenges of BARD were outlined in this presentation. BARD is considered a good source of information for fatal incidents and a good source of information for validated fields such as incident causes and events, injury type and body location, cause of death, life jacket use for fatal victims, and vessel types. Challenges of BARD that were outlined include:

- Lack of knowledge of reporting requirements, which results in severe underreporting for injury-only and damage-only incidents.
- Lack of uniformity in data fields and definitions, which poses challenges to standardization.
- Lack of detail in some reports, which poses challenges to analysis.
- Fields that are not required in CFR are not collected uniformly across states, and as a result, have limited utility for comparison on a national scale.
- Data are not fully validated.
- BARD contains limited demographic information.

Potential upcoming changes to BARD were also discussed. These might include changes to:

- Thresholds for injury and damages reporting.
- Types of incidents that need to be reported.
- Types of vessels that are applicable to reporting.
- Data collection processes.
- Data system updates.
- Shifting responsibility of reporting from the public to states.
- Timelines for reporting.

Appendix D: USCG Boating Accident Report Form CG-3865


DEPARTMENT OF HOMELAND SECURITY U.S. Coast Guard RECREATIONAL BOATING ACCIDENT REPORT			OMB Control Number: 1625-0003 Expires: 07/31/2022
INSTRUCTIONS: Use "Report required because" section below to determine if a report is required for your accident. If required, please have each vessel owner or operator involved in the accident submit a report to their state reporting authority. Each boat operator/owner involved in an accident should submit a separate report. For each question below, please provide answers if applicable and if known; otherwise leave blank.			
Privacy Act Notice			
Authority: 46 U.S.C. 6102 and 33 CFR 173 & 174 authorize the collection of information on boating accidents. Purpose: The Coast Guard uses this information for statistical purposes, chiefly to inform the public, to measure the Program's efforts, and to regulate issues relating to boating safety. Routine Uses: The Coast Guard shares this information within the agency, and if state and federal law permit it, to the public.			
REPORT SUBMISSION			
Report required because (select all that apply): <input type="checkbox"/> At least one person in this accident died: If so, how many? <input type="text"/> <input type="checkbox"/> At least one injured person in this accident required or was in need of treatment beyond first aid: If so, how many? <input type="text"/> <input type="checkbox"/> At least one person in this accident disappeared and has not yet been recovered: If so, how many? <input type="text"/> <input type="checkbox"/> All boat and other property damage (e.g., fishing/hunting gear) caused by this accident totaled (or likely totaled) \$2,000 or more: Approximate value of damage to your boat: \$ <input type="text"/> Approximate value of damage to your other property: \$ <input type="text"/> <input type="checkbox"/> Your or another boat in this accident was (or likely was) a total loss		To be submitted within: 48 hours (if injury, disappearance or death) 10 days (if boat/property damage only) To be submitted to: (Local State Reporting Authority) <input type="text"/> Phone: <input type="text"/> <small>You may submit any comments concerning the accuracy of the burden estimate or any suggestions for reducing the burden to: Commandant (CG-BSX-21), U.S. Coast Guard, Washington, DC 20593-0001 or Office of Management and Budget, Paperwork Reduction Project (1625-0003), Washington, DC 20503. Questions relating to the collection of this data should be sent to the Coast Guard.</small>	
Report submitted by (select all that apply): <input type="checkbox"/> Boat Operator (required if possible) <input type="checkbox"/> Boat Owner (if operator unable, or same as operator) <input type="checkbox"/> Other (describe): <input type="text"/>		For State Agency Use Only	
First Name <input type="text"/> Last Name <input type="text"/> Phone <input type="text"/>		First Name <input type="text"/> Last Name <input type="text"/> Phone: <input type="text"/> Primary Cause of Accident <input type="text"/>	
ACCIDENT SUMMARY			
WHEN Date: <input type="text"/> Time: <input type="text"/> am <input type="checkbox"/> pm <input type="checkbox"/> <small>(mm/dd/yyyy) (select one)</small>		ACCIDENT DESCRIPTION: Briefly describe this accident (attach extra pages if necessary) <input type="text"/>	
WHERE Body of Water Name <input type="text"/>			
Location (on water) description <input type="text"/> Nearest city/town <input type="text"/> County: <input type="text"/> State: <input type="text"/>			
YOUR BOAT – PEOPLE # people on board (including operator): <input type="text"/> # people being towed (e.g., on tubes, skis): <input type="text"/> # people wearing lifejackets (on board or towed): <input type="text"/>		DAMAGE TO YOUR BOAT: Briefly summarize any damage to your boat <input type="text"/>	
OTHER BOATS INVOLVED IN ACCIDENT # of other boats involved: <input type="text"/>			
		DAMAGE TO YOUR OTHER PROPERTY: (NOT BOAT) Briefly summarize any damage to your other property (not boat) <input type="text"/>	

For each question below, please provide answers IF APPLICABLE AND IF KNOWN, otherwise leave blank.											
YOUR BOAT											
BOAT IDENTIFICATION											
Your Boat Name: _____						Manufacturer: _____					
Model Name: _____						Model Year: _____					
Registration #: _____						Documentation #: _____					
Hull Identification # (HIN): _____						Rented: <input type="checkbox"/> Yes <input type="checkbox"/> No					
SIZE ESTIMATES											
Length: _____ ft.		Depth from transom (stern) to keel (bottommost point): _____ ft. _____ in.				Beam width at widest point: _____ ft.					
HULL MATERIAL											
Type of Hull Material (select one)											
<input type="checkbox"/> Fiberglass		<input type="checkbox"/> Wood		<input type="checkbox"/> Rubber/vinyl/canvas		<input type="checkbox"/> Other (describe): _____					
<input type="checkbox"/> Aluminum		<input type="checkbox"/> Steel		<input type="checkbox"/> Plastic							
BOAT TYPE											
Boat Type (select one)						Available Propulsion (select all that apply)					
<input type="checkbox"/> Cabin motorboat	<input type="checkbox"/> Inflatable boat	<input type="checkbox"/> Personal watercraft (PWC) (e.g., Wave Runner™, Jet Ski™, Sea-Doo™)		<input type="checkbox"/> Paddlecraft:		<input type="checkbox"/> Propeller		<input type="checkbox"/> Air thrust			
<input type="checkbox"/> Open motorboat	<input type="checkbox"/> Houseboat			<input type="checkbox"/> Canoe		<input type="checkbox"/> Sail		<input type="checkbox"/> Other (describe): _____			
<input type="checkbox"/> Auxiliary sail	<input type="checkbox"/> Sail (only)	<input type="checkbox"/> Air boat		<input type="checkbox"/> Kayak		<input type="checkbox"/> Standup Paddleboard		<input type="checkbox"/> Manual			
<input type="checkbox"/> Pontoon boat	<input type="checkbox"/> Rowboat	<input type="checkbox"/> Other (describe): _____				<input type="checkbox"/> Water jet					
ENGINE											
# Engines: _____		Engine type and horsepower (select one)				Fuel type (select all that apply)					
Manufacturer: _____		<input type="checkbox"/> Outboard		<input type="checkbox"/> Sterndrive		<input type="checkbox"/> Inboard		<input type="checkbox"/> Pod drive		<input type="checkbox"/> Gas <input type="checkbox"/> Electric	
Total horsepower: _____ hp		<input type="checkbox"/> No engine		<input type="checkbox"/> Other: _____		<input type="checkbox"/> Diesel		<input type="checkbox"/> Other: _____			
SAFETY MEASURES											
Organizations that have conducted a vessel safety check (VSC) on board your boat within the past year (including carriage of safety equipment, e.g., lifejackets, anchor and line, fire extinguishers):											
US Coast Guard Auxiliary: VSC Decal? <input type="checkbox"/> Yes <input type="checkbox"/> No		US Power Squadrons: VSC Decal? <input type="checkbox"/> Yes <input type="checkbox"/> No		Federal Agency (Name): _____		State Agency (Name): _____					
				Other Agency (Name): _____							
# Life jackets on board: _____		# Fire extinguishers on board: _____		Type of fire extinguishers (e.g., ABC): _____							
		# Fire extinguishers used: _____									
ACCIDENT DETAILS – EXTERNAL CONDITIONS											
WEATHER											
Overall weather was (select one)				It was (select one)		Visibility was (select one)		Wind was (select one)			
<input type="checkbox"/> Clear		<input type="checkbox"/> Raining		<input type="checkbox"/> Day		<input type="checkbox"/> Good		<input type="checkbox"/> 0 mph (none)			
<input type="checkbox"/> Cloudy		<input type="checkbox"/> Snowing		<input type="checkbox"/> Night		<input type="checkbox"/> Fair		<input type="checkbox"/> Over 0, up to 12 mph (light)			
<input type="checkbox"/> Foggy		<input type="checkbox"/> Hazy				<input type="checkbox"/> Poor		<input type="checkbox"/> Over 12, up to 25 mph (moderate)			
<input type="checkbox"/> Other (describe): _____				Approximate air temperature: _____ °F				<input type="checkbox"/> Over 25, up to 55 mph (strong)			
								<input type="checkbox"/> Over 55 mph (stormy)			
WATER											
Overall water conditions (select one):						Other water conditions:					
<input type="checkbox"/> Up to 6 in. waves (calm)						Approximate water temperature: _____ °F					
<input type="checkbox"/> Over 6 in., up to 2 ft. waves (choppy)						Strong current? <input type="checkbox"/> Yes <input type="checkbox"/> No					
<input type="checkbox"/> Over 2 ft., up to 6 ft. waves (rough)						Hazardous waters? (e.g., rapid tidal flow, currents) <input type="checkbox"/> Yes <input type="checkbox"/> No					
<input type="checkbox"/> Over 6 ft. waves (very rough)						Congested waters? <input type="checkbox"/> Yes <input type="checkbox"/> No					

For each question below, please provide answers IF APPLICABLE AND IF KNOWN, otherwise leave blank.			
ACCIDENT DETAILS – ACTIVITIES AND OPERATIONS ON YOUR BOAT			
OPERATOR/PASSENGER ACTIVITIES			
Operator/passenger activities on your boat at time of accident:			
Activities were (select one)		Operator/Passenger activities (select all that apply)	
<input type="checkbox"/> Recreational	<input type="checkbox"/> Fishing	<input type="checkbox"/> Tubing	<input type="checkbox"/> Starting engine
<input type="checkbox"/> Commercial	<input type="checkbox"/> Hunting	<input type="checkbox"/> Water Skiing	<input type="checkbox"/> Making repairs
	<input type="checkbox"/> White water activity (e.g., rafting)	<input type="checkbox"/> Relaxing	<input type="checkbox"/> Other (list):
BOAT OPERATIONS			
Your boat operations at time of accident (select all that apply)			
<input type="checkbox"/> Cruising (underway under power)	<input type="checkbox"/> Drifting	<input type="checkbox"/> Racing	<input type="checkbox"/> Towing another vessel
<input type="checkbox"/> Changing direction	<input type="checkbox"/> At anchor	<input type="checkbox"/> Rowing/paddling	<input type="checkbox"/> Launching
<input type="checkbox"/> Changing speed	<input type="checkbox"/> Being towed	<input type="checkbox"/> Docking/undocking	<input type="checkbox"/> Tied to dock/mooring
<input type="checkbox"/> Sailing	<input type="checkbox"/> Other (list):		
ACCIDENT DETAILS – CONTRIBUTING FACTORS ON YOUR BOAT			
CONTRIBUTING FACTORS			
Indicate factors on your boat which may have contributed to this accident (select all that apply)			
<input type="checkbox"/> Alcohol use	<input type="checkbox"/> Improper lookout	<input type="checkbox"/> Dam/lock	<input type="checkbox"/> Starting in gear
<input type="checkbox"/> Drug use	<input type="checkbox"/> Operator inattention	<input type="checkbox"/> Force of wake/wave	<input type="checkbox"/> Sharp turn
<input type="checkbox"/> Excessive speed	<input type="checkbox"/> Operator inexperience	<input type="checkbox"/> Hazardous waters	<input type="checkbox"/> Restricted vision (e.g., fog)
<input type="checkbox"/> Improper anchoring	<input type="checkbox"/> Language barrier	<input type="checkbox"/> Heavy weather	<input type="checkbox"/> Mission/inadequate aids to navigation (e.g., buoy, daymarker)
<input type="checkbox"/> Improper loading	<input type="checkbox"/> Navigation rules violation	<input type="checkbox"/> Ignition of fuel or vapor	<input type="checkbox"/> Inadequate on-board navigation lights
<input type="checkbox"/> Overloading	<input type="checkbox"/> Failure to vent	<input type="checkbox"/> Hull failure	<input type="checkbox"/> People on gunwale, bow or transom
<input type="checkbox"/> Other (describe):			
ACCIDENT DETAILS – YOUR BOAT			
MACHINERY/EQUIPMENT FAILURE			
Failure of the following machinery/equipment on your boat contributed to this accident (select all that apply)			
<input type="checkbox"/> Engine	<input type="checkbox"/> Onboard lights	<input type="checkbox"/> Shift	<input type="checkbox"/> Sound equipment (e.g., horn, whistle)
<input type="checkbox"/> Electrical system	<input type="checkbox"/> Seats	<input type="checkbox"/> Radio	<input type="checkbox"/> Auxiliary equipment
<input type="checkbox"/> Fuel system	<input type="checkbox"/> Steering	<input type="checkbox"/> Fire extinguisher	<input type="checkbox"/> Other (list):
<input type="checkbox"/> Sail/mast	<input type="checkbox"/> Throttle	<input type="checkbox"/> Ventilation	
<input type="checkbox"/> Onboard navigation aids (e.g., GPS)			
ACCIDENT DETAILS – EVENTS ON YOUR BOAT			
ACCIDENT EVENTS			
Types of events occurring to/on your boat during accident (select all that apply)			
<input type="checkbox"/> Collision with recreational boat	<input type="checkbox"/> Flooding/swamping	<input type="checkbox"/> Person fell overboard	
<input type="checkbox"/> Collision with commercial boat (e.g., tug, barge)	<input type="checkbox"/> Fire/explosion – fuel	<input type="checkbox"/> Person fell on/within boat	
<input type="checkbox"/> Collision with fixed object (e.g., dock, bridge)	<input type="checkbox"/> Fire/explosion – non-fuel	<input type="checkbox"/> Sudden medical condition	
<input type="checkbox"/> Collision with submerged object (e.g., stump, cable)	<input type="checkbox"/> Carbon monoxide exposure	<input type="checkbox"/> Person struck by boat	
<input type="checkbox"/> Collision with floating object (e.g., log, buoy)	<input type="checkbox"/> Mishap of skier, tuber, wake boarder, etc.	<input type="checkbox"/> Person struck by propeller or propulsion unit	
<input type="checkbox"/> Capsizing	<input type="checkbox"/> Person left boat voluntarily	<input type="checkbox"/> Person electrocuted	
<input type="checkbox"/> Grounding	<input type="checkbox"/> Person ejected from boat (caused by collision or maneuver)		
<input type="checkbox"/> Sinking	<input type="checkbox"/> Other (describe):		

For each question below, please provide answers IF APPLICABLE AND IF KNOWN, otherwise leave blank.									
ACCIDENT DETAILS –YOUR BOAT- INJURED PEOPLE RECEIVING OR IN NEED OF TREATMENT BEYOND FIRST AID									
Report only injured people on, struck by, or being towed by your boat, receiving or in need of treatment beyond first aid. Do not report injured people on, struck by, or being towed by another boat or no boat (e.g., swimmers, people on a dock). If more than one injured person to report, attach additional copies of this page. If none, SKIP INJURED PEOPLE section.									
INJURED PERSON									
First Name			MI		Last Name				
Street									
City			State			Zip			
Phone			Date of Birth (mm/dd/yyyy)			Age			
INJURY DETAILS									
Injury caused when person (select all that apply)					Nature of most serious injury (select one)				
<input type="checkbox"/> Struck the (e.g., boat, water):					<input type="checkbox"/> Scrape/bruise				
<input type="checkbox"/> Was struck by a (e.g., boat, propeller):					<input type="checkbox"/> Cut				
<input type="checkbox"/> Was exposed to carbon monoxide poisoning					<input type="checkbox"/> Sprain/strain				
<input type="checkbox"/> Received an electric shock					<input type="checkbox"/> Concussion/brain injury				
<input type="checkbox"/> Other (describe):					<input type="checkbox"/> Spinal cord injury				
<input type="checkbox"/> Person was wearing lifejacket?					<input type="checkbox"/> Broken/fractured bone				
<input type="checkbox"/> Person received treatment beyond first aid?					<input type="checkbox"/> Body part of most serious injury (e.g., head, trunk, leg):				
<input type="checkbox"/> Person was admitted to a hospital?					<input type="checkbox"/> Other (describe):				
ACCIDENT DETAILS – YOUR BOAT – DEATHS/DISAPPEARANCES									
Only report deaths/disappearances of people on, struck by, or being towed by your boat. If more than one death/disappearance to report, attach additional copies of this page. If none, SKIP DEATHS/DISAPPEARANCES section.									
PERSON WHO DIED/DISAPPEARED									
First Name			MI		Last Name				
Street									
City			State			Zip			
Phone			Date of Birth (mm/dd/yyyy)			Age			
DETAILS OF DEATH/DISAPPEARANCE									
Injury caused when person (select all that apply)					Nature of death/disappearance (select one)				
<input type="checkbox"/> Struck the (e.g., boat, water):					<input type="checkbox"/> Death – by drowning				
<input type="checkbox"/> Was struck by a (e.g., boat, propeller):					<input type="checkbox"/> Death – other likely cause (describe)				
<input type="checkbox"/> Was exposed to carbon monoxide poisoning					<input type="checkbox"/> Disappeared and not yet recovered				
<input type="checkbox"/> Received an electric shock					<input type="checkbox"/> Person was wearing lifejacket?				
<input type="checkbox"/> Other (describe):					<input type="checkbox"/> Yes <input type="checkbox"/> No				

For each question below, please provide answers IF APPLICABLE AND IF KNOWN, otherwise leave blank.								
ACCIDENT DETAILS – YOUR BOAT OPERATOR								
OPERATOR INSTRUCTION				OPERATOR SAFETY MEASURES				
Boating safety instruction completed (select all that apply)				On board, prior to accident, was operator wearing:				
<input type="checkbox"/>	None			A lifejacket?	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
<input type="checkbox"/>	State course			An engine cut-off switch (Lanyard or wireless device) if equipped?	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
<input type="checkbox"/>	USCG Auxiliary course			On board, prior to accident, was operator using:	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
<input type="checkbox"/>	US Power Squadrons course							
<input type="checkbox"/>	Internet (name of sponsoring organization)			Alcohol?	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
<input type="checkbox"/>	Other (describe)			Drugs?	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
				Operator arrested for Boating Under the Influence?	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
				Weather reports consulted prior to accident?	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
OPERATOR EXPERIENCE								
Experience operating this type of boat (select one)								
<input type="checkbox"/>	0 to 10 hours		<input type="checkbox"/>	Over 10, up to 100 hours		<input type="checkbox"/>	Over 100, up to 500 hours	
						<input type="checkbox"/>	Over 500 hours	
ACCIDENT DETAILS – OTHER KEY PEOPLE								
Only report other key people not already documented as injured, died, disappeared or operator/owner of your boat. If more than two other key people to report, attach additional copies of this page.								
NAME/ADDRESS								
This other key person was a(n) (select all that apply)								
<input type="checkbox"/>	Other boat operator		<input type="checkbox"/>	Other boat owner		<input type="checkbox"/>	Owner of other damaged property	
<input type="checkbox"/>	Passenger on your boat		<input type="checkbox"/>	Witness				
First Name		MI		Last Name				
Street								
City		State		Zip		Phone		
Other boat name (if any)				Other boat registration # (if any)				
NAME/ADDRESS								
This other key person was a(n) (select all that apply)								
<input type="checkbox"/>	Other boat operator		<input type="checkbox"/>	Other boat owner		<input type="checkbox"/>	Owner of other damaged property	
<input type="checkbox"/>	Passenger on your boat		<input type="checkbox"/>	Witness				
First Name		MI		Last Name				
Street								
City		State		Zip		Phone		
Other boat name (if any)				Other boat registration # (if any)				

For each question below, please provide answers IF APPLICABLE AND IF KNOWN, otherwise leave blank.						
YOUR BOAT OPERATOR						
NAME/ADDRESS						
First Name		MI		Last Name		
Street						
City		State		Zip		
AGE/GENDER/PHONE						
Date of Birth (mm/dd/yyyy)		Age		Gender	<input type="checkbox"/> Male <input type="checkbox"/> Female	Phone
YOUR BOAT OWNER						
If same as <i>your boat operator</i> SKIP rest of YOUR BOAT OWNER section.						
NAME/ADDRESS/PHONE						
First Name		MI		Last Name		
Street						
City		State		Zip		Phone
PERSON SUBMITTING THIS REPORT						
If same as <i>your boat operator</i> OR <i>owner</i> , SKIP rest of PERSON SUBMITTING THIS REPORT section.						
NAME/ADDRESS/PHONE/ROLE						
First Name		MI		Last Name		
Street						
City		State		Zip		Phone
I was a(n) (select one)						
<input type="checkbox"/>	Other person on board <i>this</i> boat					
<input type="checkbox"/>	Accident witness <i>not</i> on board <i>this</i> boat					
<input type="checkbox"/>	Other (describe):					
SIGNATURE OF PERSON SUBMITTING THIS REPORT						
Your signature					Date (mm/dd/yyyy)	
<p>An Agency may not conduct or sponsor and a person is not required to respond to an information collection, unless it displays a currently valid OMB Control Number.</p> <p>The Coast Guard estimates that the average burden for this report form is 30 minutes. You may submit any comments concerning the accuracy of this burden estimate or any suggestions for reducing the burden to: Commandant (CG-BSX-21), U.S. Coast Guard, Washington, DC 20593-0001 or Office of Management and Budget, Paperwork Reduction Project (1625-0003), Washington, DC 20503.</p>						

Appendix E: Non-USCG Sources of Data to Assess Burden of Nonfatal Boating Injuries

Data Source	Description	Utility	Strengths	Limitations
National Emergency Medical Services Information System (NEMSIS)	<p>"The National Emergency Medical Services Information System (NEMSIS) is the national database that is used to store EMS data from states and territories. NEMSIS is a universal standard for how patient care information resulting from an emergency 911 call for assistance is collected."</p> <p>https://nemsis.org/</p>	High	Public data set available	Time lag of 1+ year
State-level Hospitalization and emergency department (ED) data	Hospital discharge data and emergency department visit data are traditional, gold standard sources of non-fatal injury surveillance which use standardized coding (ICD).	High	Widely used across country, enabled by Centers for Medicare / Medicaid Rule	<p>Typically, a time lag for data exists, especially at national level</p> <p>E-coding varies by state</p> <p>Economic data included</p> <p>Access to state-level data varies and protected through data use agreements</p>
National Syndromic Surveillance Program (NSSP)	<p>NSSP is an emerging data source for injury surveillance utilizing emergency department visit data.</p> <p>https://www.cdc.gov/nssp/index.html</p>	High	<p>Real-time (24 hour)</p> <p>Offers context for cases (qualitative)</p> <p>Visit based</p> <p>Create a standardized case definition that all</p>	<p>Driven by chief complaint, not standardized</p> <p>Participation varies by state (though gaining in popularity due to federal funding) – Currently 71% of nation's emergency department visits are participating.</p>

Data Source	Description	Utility	Strengths	Limitations
			states can use	
National Trauma Data Bank Research Data Set	<p>The National Trauma Data Bank is the “largest aggregation of United States trauma register data assembled. Registry data is compiled annually.” Contents represent all injuries that were taken to a trauma center. Available at:</p> <p>https://www.facs.org/quality-programs/trauma/tap/center-programs/ntdb/datasets</p>	Medium	ICD-10 coded, rich dataset includes information on injury event, diagnosis, care, outcomes, and costs of treatment of injured patients	<p>Data is often abstracted by facility program staff</p> <p>National research dataset is currently unavailable (June 2019). State level requests can be made at state health department</p>
Healthcare Cost and Utilization Project (HCUPnet)	<p>“The Healthcare Cost and Utilization Project (HCUP) datasets are collated by the Agency for Healthcare Research and Quality. HCUPnet is a free online query system based on data from the HCUP and provides health care statistics and information for hospital inpatient, emergency department, and ambulatory settings.”</p> <p>Free online query system based on data from the Healthcare Cost and Utilization Project</p> <p>Available at:</p> <p>https://hcupnet.ahrq.gov/#setup</p>	Medium	Health care statistics and information for hospital inpatient, emergency department, and ambulatory settings	<p>Basic level information provided</p> <p>Useful for national level metrics</p>
American Whitewater	The American Whitewater Accident Database catalogs over 1600 fatalities and close calls on whitewater rivers dating back to 1972.	Low	In depth information for niche topic	<p>Self-report information limited to whitewater rivers.</p> <p>American Whitewater depends on its members</p>

Data Source	Description	Utility	Strengths	Limitations
	https://www.americanwhitewater.org/content/Accident/view/			to forward the reports and information on accidents on the water. First-hand accounts are best, but information from a newspaper article or social media post often provides the initial information that ultimately leads to more in-depth review and follow up.
National Electronic Injury Surveillance System	<p>"The National Electronic Injury Surveillance System is operated by the Consumer Product Safety Commission and collects data on consumer product-related injuries occurring in the United States."</p> <p>National surveillance system of the Consumer Product Safety Commission tracking number and severity of consumer-product related injuries to persons treated in hospital emergency departments</p> <p>Available at: https://www.cpsc.gov/cgibin/NEISSQuery/ </p>	Low	National data set, injury information	Per the 2018 coding manual ¹⁰ , boating injuries are not reportable (page 13). An inquiry sent in November 2022 confirmed, "Recreational boating activities are not included in the NEISS. The product code 3298 [Boats and Boating] is only used in NEISS-All Injury Program (AIP)."
Total Aquatic Data	<p>This is an aggregate database sourced mainly from media reporting.</p> <p>https://totalaquatic.llc/drownings-1</p>	Low	<p>In depth information for drownings that are sourced</p> <p>Not limited to boating</p>	Sourced from media reports so may not be fully comprehensive

¹⁰ 2018 Coding Manual is located here:

<https://www.cpsc.gov/cgibin/NEISSQuery/Data/Info%20Docs/2018%20NEISS%20Coding%20Manual.pdf>

Appendix F: Literature Reviewed

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Appendix G: Acronyms Used

BARD: Boating Accident Report Database
BUI: Boating Under the Influence
CDC: Centers for Disease Control and Prevention
CFR: Code of Federal Regulations
CODES: Crash Outcome Data Evaluation System
CSTE: Council for State and Territorial Epidemiologists
HCUP: Healthcare Cost and Utilization Project
HHS: U.S. Department of Health and Human Services
HIPAA: Health Insurance Portability and Accountability Act
ICD: International Classification of Diseases
IEC: Industrial Economics, Incorporated
ISW: Injury Surveillance Workgroup
NASBLA: National Association of State Boating Law Administrators
NCHS: National Center for Health Statistics
NCIPC: National Center for Injury Prevention and Control
NHTSA: National Highway and Traffic Safety Administration
NVDRS: National Violent Death Reporting System
QALY: Quality Adjusted Life Years
SAR: Search and Rescue
SRPF: Shared Risk and Protective Factors
USCG: United States Coast Guard
YPLL: Years of Potential Life Lost