Cold hard facts of Drowning

DRYA 2021 Captain Chris Stevens 9CR ASC

What's The Plan Tonight

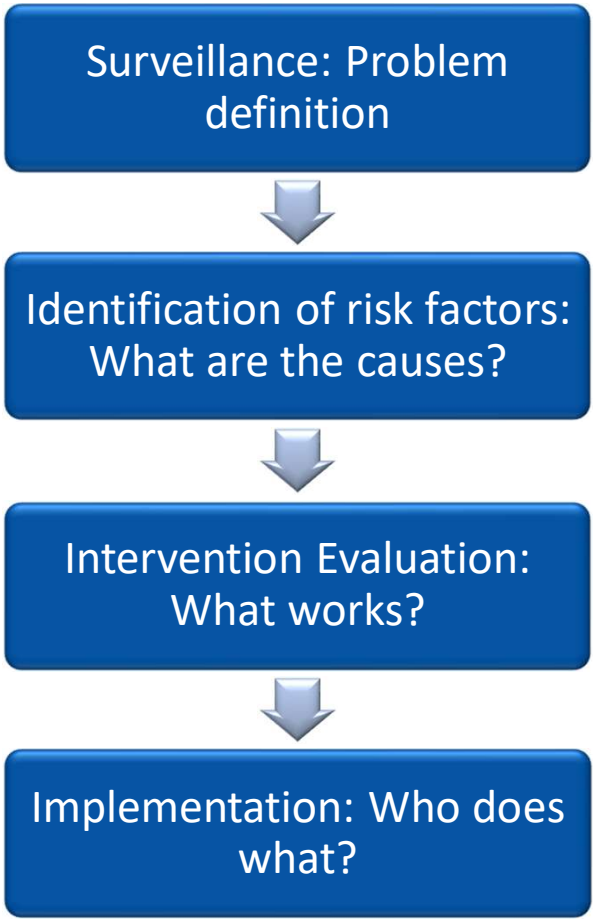
- Background to the Strategic Plan and relevant statistics
- "Take home" messages
- Life jackets
- Boating under the influence
- Search Patterns used by the USCG

The Recreational Boater Safety Strategic Plan

- The 2017-2021 plan has been written and approved
- It is a “high level” plan, details (to be included in operational annex [OA]) now under development
- Three teams working on Operational annex
  - Education, training, and outreach
  - Policies, regulations, and standards
  - Data

Some core concepts

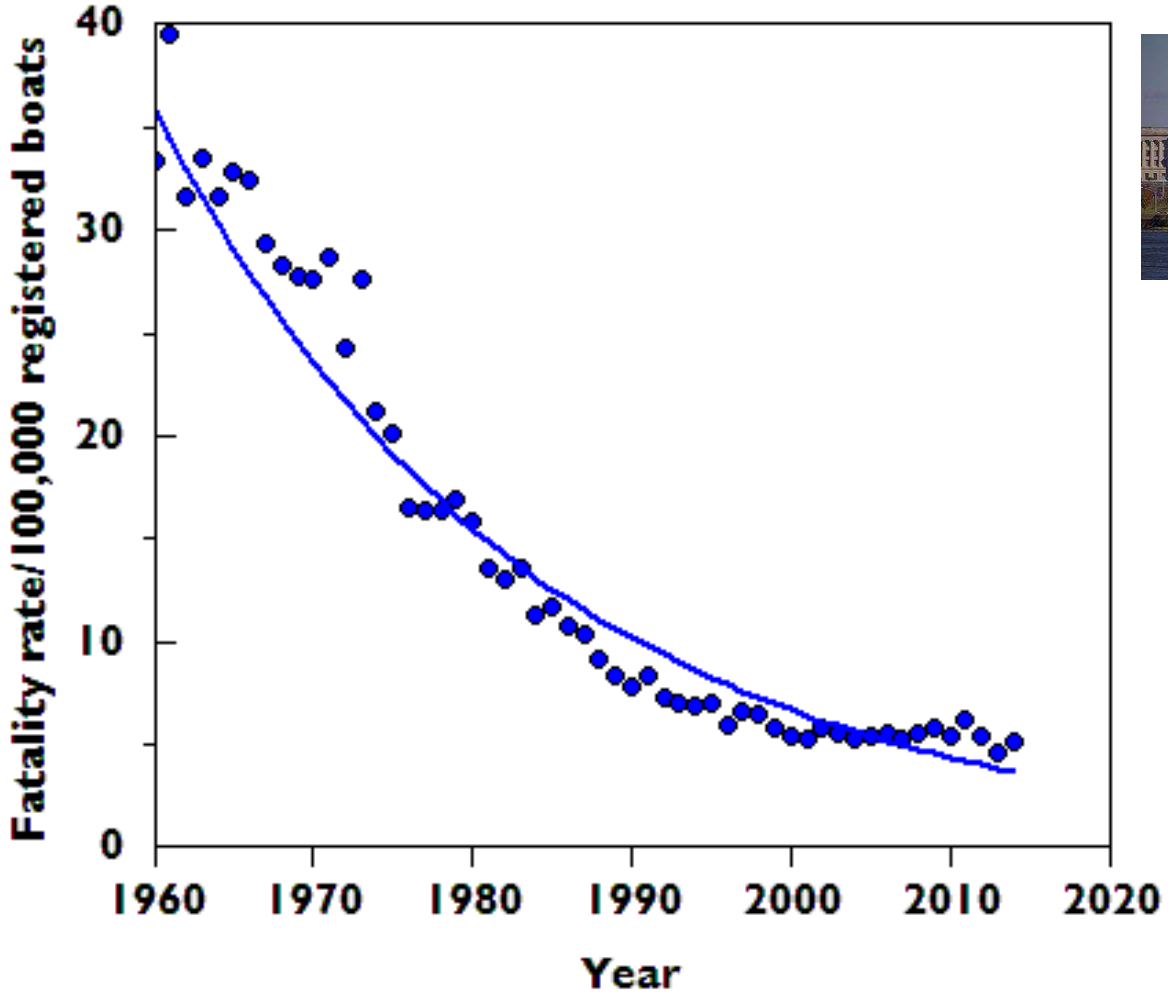
- Stress on evidence-based decision making (PHA)
  - More and better data
  - New analyses and data displays
- Knowns, known-unknowns, and un-known unknowns



Data in this presentation focused on fatalities

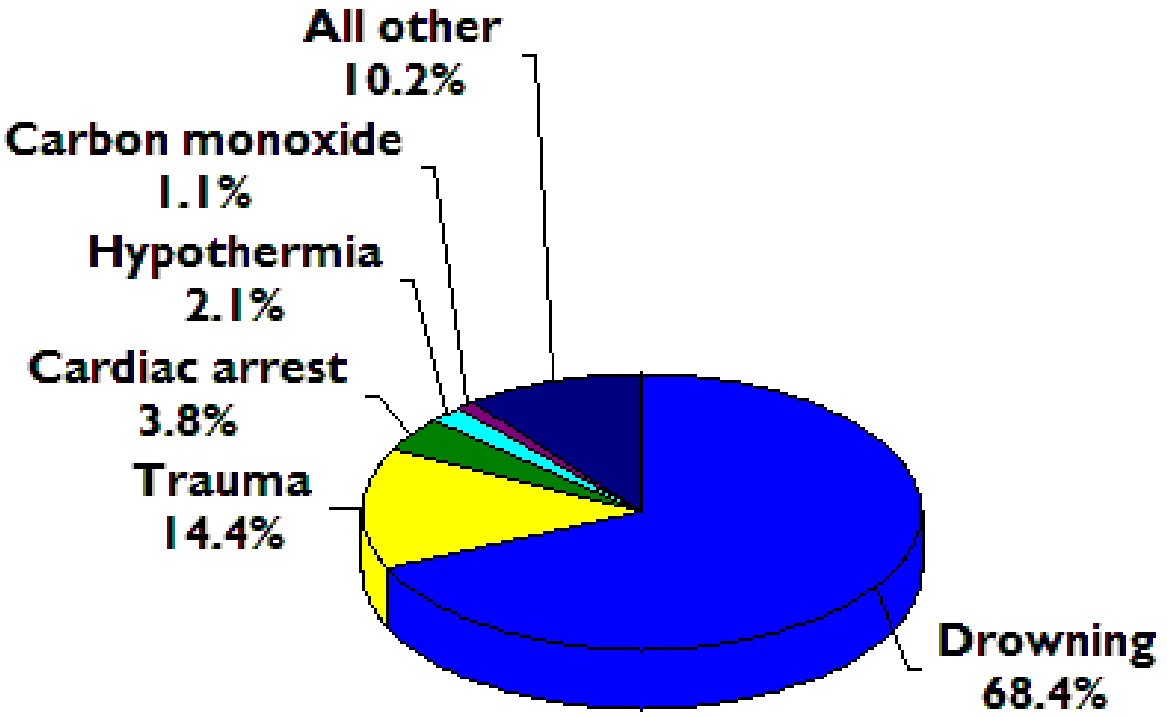
- In principle, the social costs of recreational boating accidents includes those related to fatalities, non-fatal injuries, and property damage
- We focus on fatalities because these are known with the greatest accuracy
- In the longer term it is desirable to develop better data on injuries and property damage—this is not easy

Progress over the years



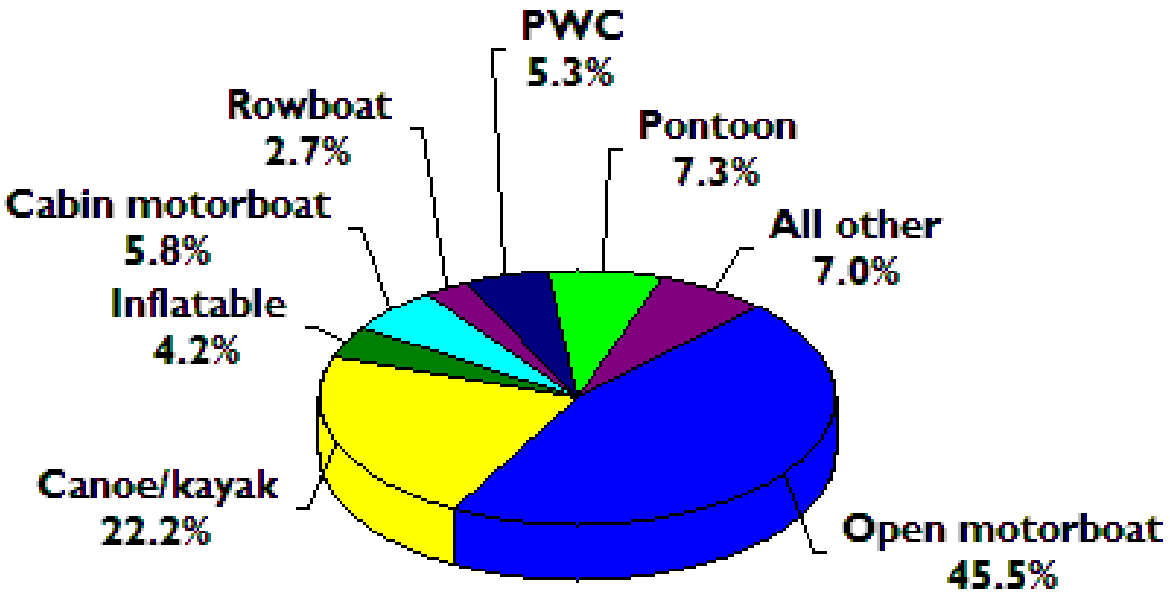
Can we sustain progress?

Boating fatalities by cause of death 2019



Total: 626

Boating fatalities by type of boat



Total: 626


Drowning accounts for ~ 70% of boating fatalities in a typical year
~85% of victims were not wearing life jackets

2019 Stats

Table 1 - 2019 EXECUTIVE SUMMARY

TOP FIVE PRIMARY ACCIDENT TYPES

Accident Rank	Accident Type	Number of Accidents	Number of Deaths	Number of Injuries
1	Collision with recreational vessel	1071	47	650
2	Collision with fixed object	493	44	326
3	Grounding	413	16	253
4	Flooding/swamping	399	45	124
5	Falls overboard	299	189	122

VESSEL TYPES WITH THE TOP CASUALTY NUMBERS

Casualty Rank	Type of Boat	Drownings	Other Deaths	Total Deaths	Total Injuries	Total Casualties
1	Open motorboat	201	87	288	1246	1534
2	Personal watercraft	24	22	46	614	660
3	Cabin motorboat	14	20	34	248	282
4	Canoe/kayak	107	18	125	121	246
5	Pontoon	32	8	40	153	193

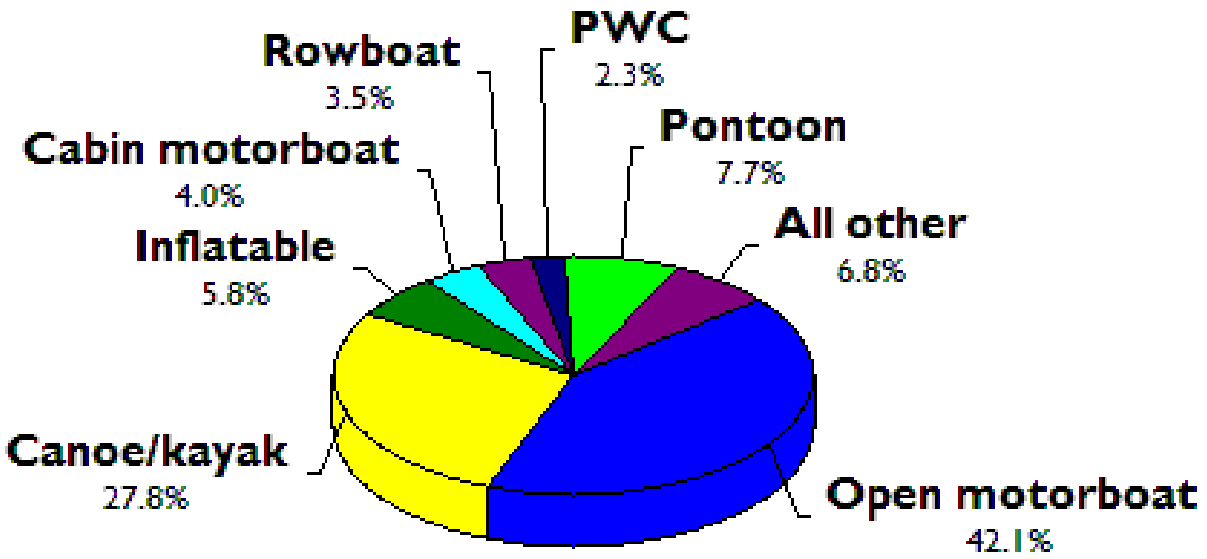
LIFE JACKET WEAR BY TOP FIVE KNOWN CAUSES OF DEATH

Known Cause of Death Rank	Cause of Death	Number of Deaths	Life Jacket		
			Worn	Not Worn	Unknown if worn
1	Drowning	439	57	362	20
2	Trauma	92	35	49	8
3	Cardiac arrest	17	5	12	0
4	Carbon monoxide poisoning	5	0	3	2
5	Hypothermia	4	2	2	0

TOP TEN KNOWN PRIMARY CONTRIBUTING FACTORS OF ACCIDENTS

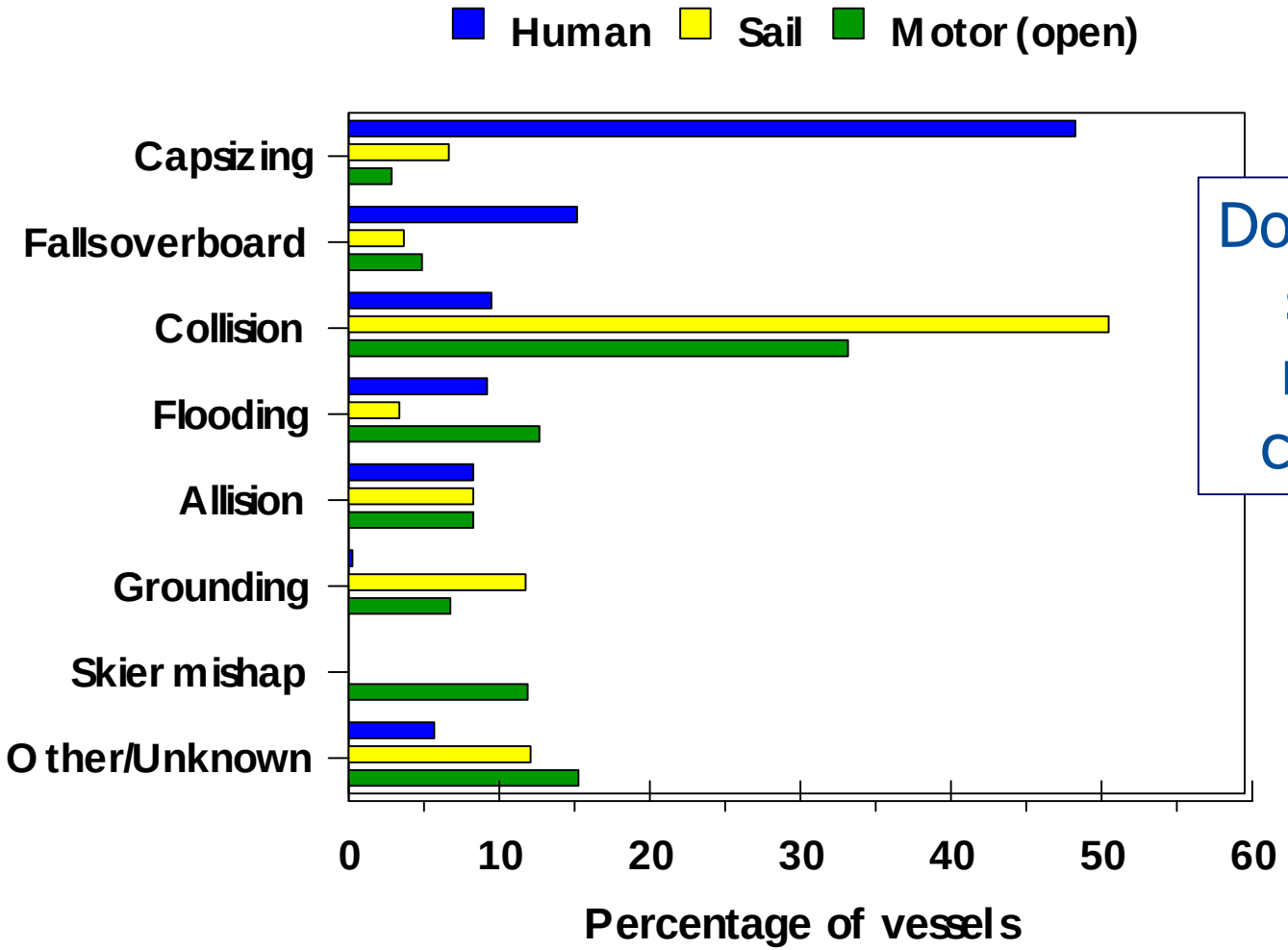
Accident Rank	Contributing Factor	Number of Accidents	Number of Deaths	Number of Injuries
1	Operator inattention	546	36	296
2	Improper lookout	506	26	425
3	Operator inexperience	458	39	273
4	Excessive speed	358	22	325
5	Alcohol use	282	113	221
6	Machinery failure	274	18	93
7	Navigation rules violation	235	21	141
8	Weather	184	31	58
9	Hazardous waters	170	48	87

Open motorboats account for majority of drownings



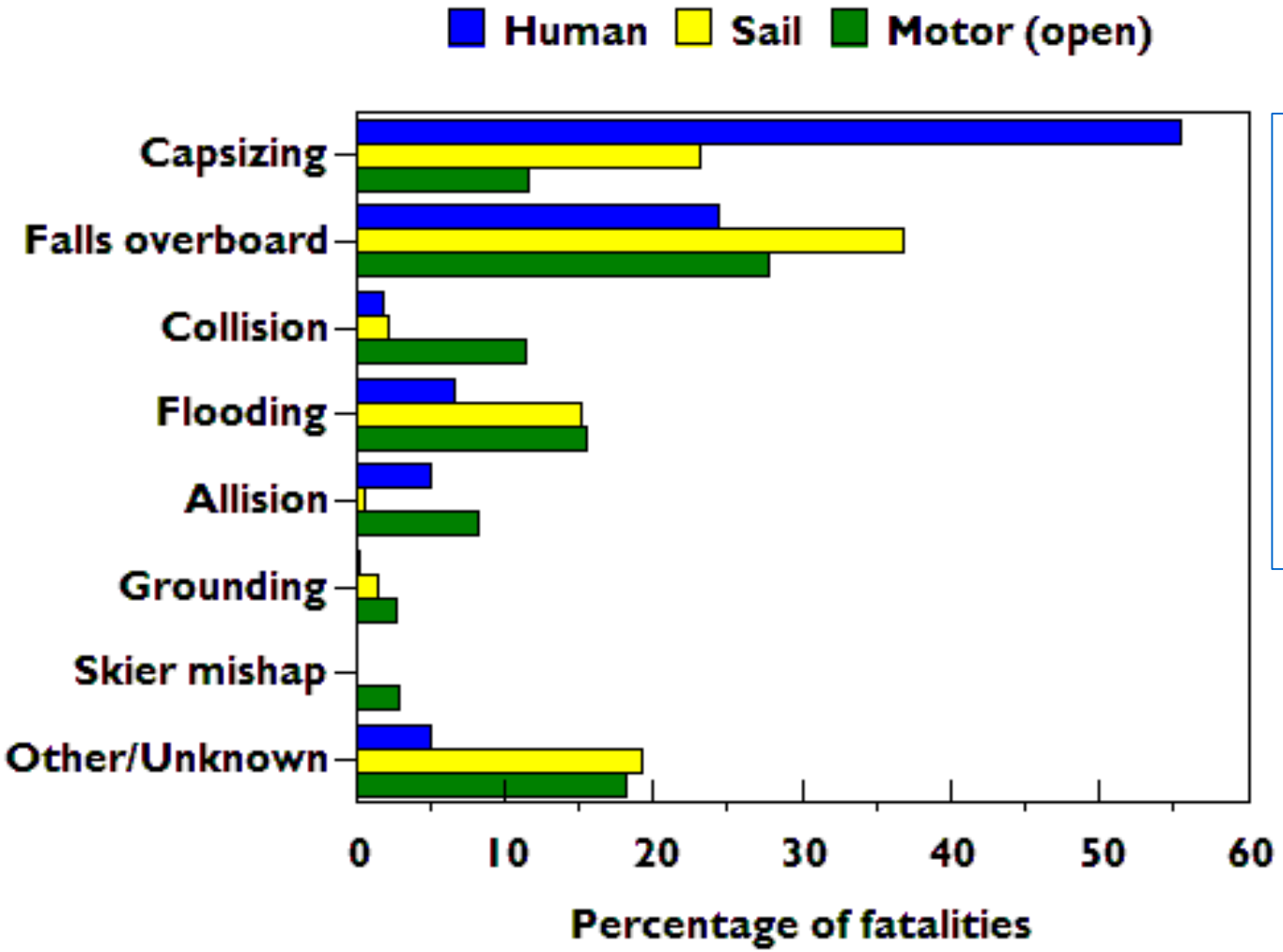
Total: 428

Accident types by boat type Vessels



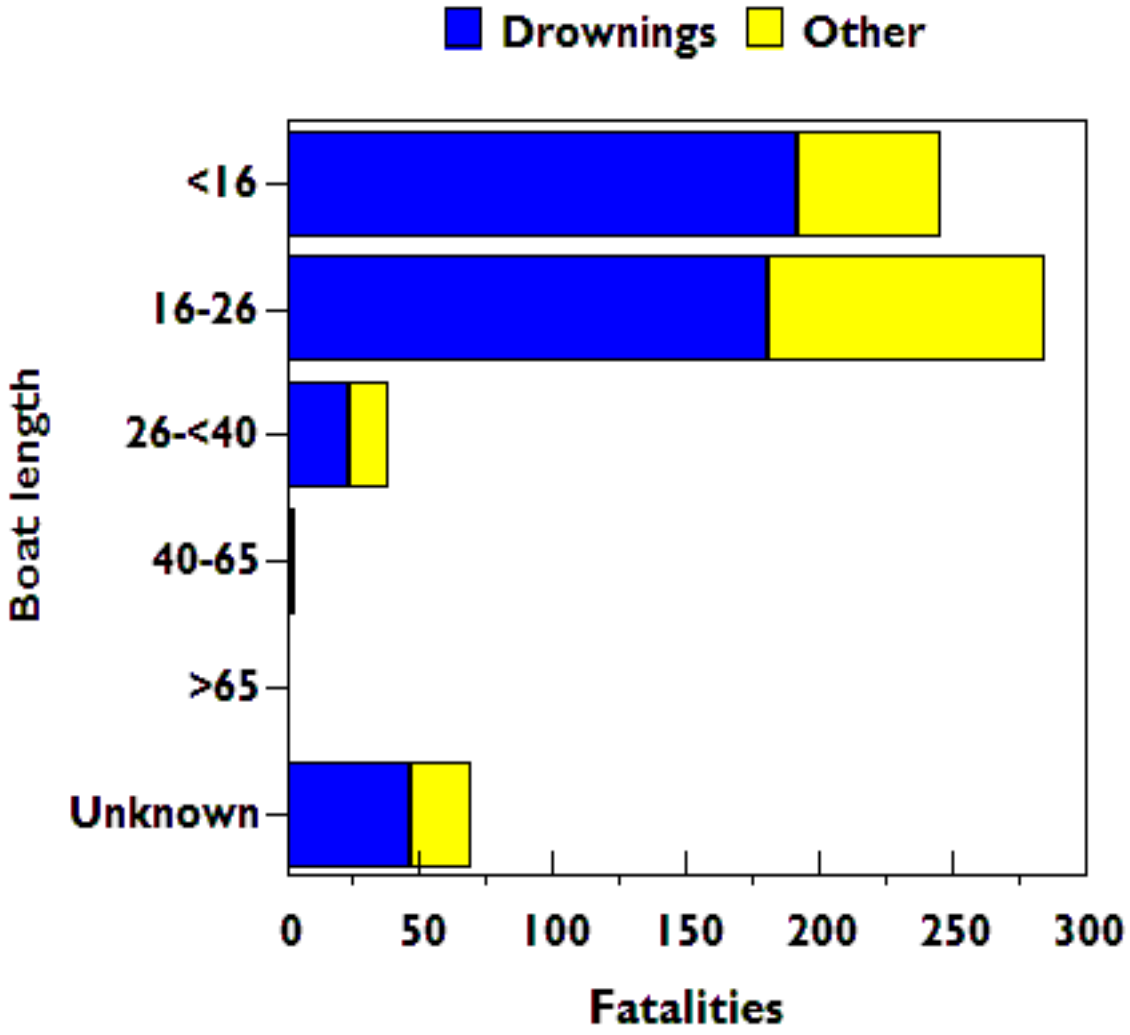
Do intervention strategies need to be customized?

The story is different for fatalities



Clear differences by boat type, but capsizing and falls overboard account for the major proportion

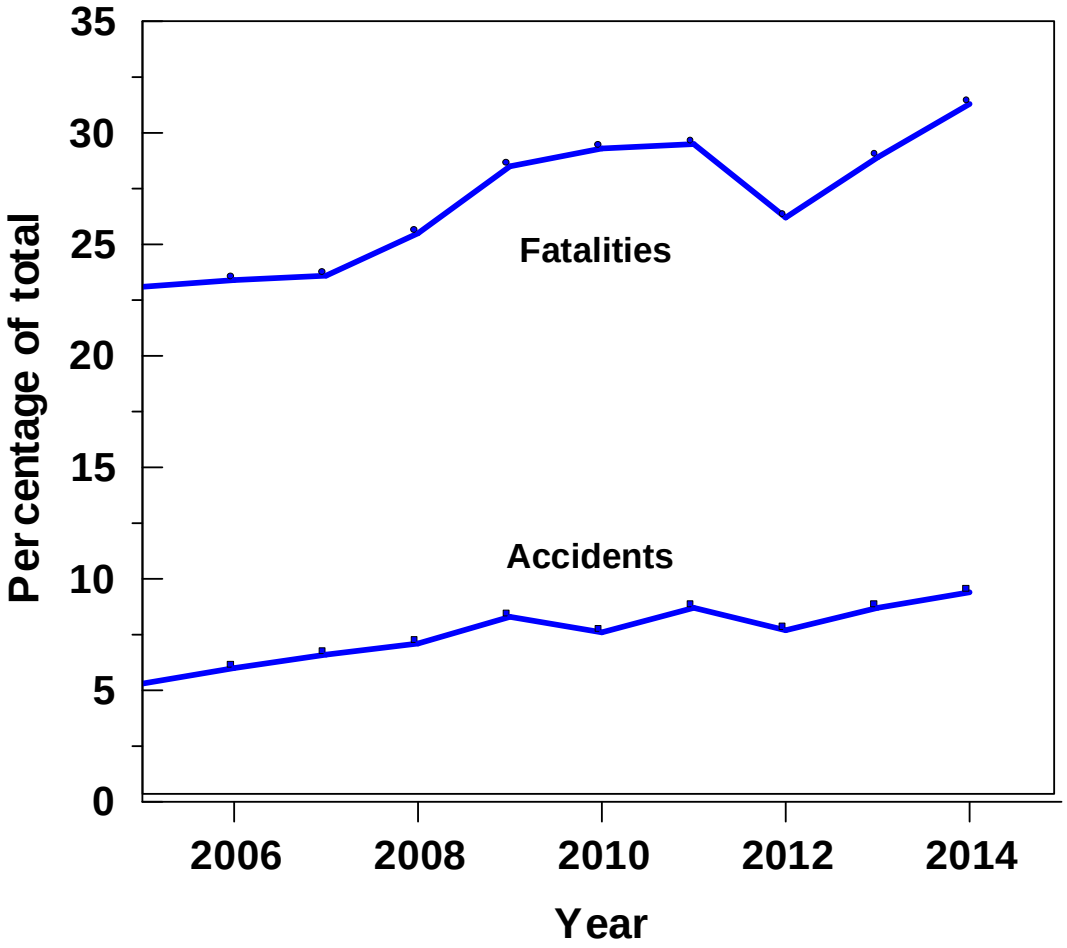
Fatalities by boat length



Fatalities greatest on small boats

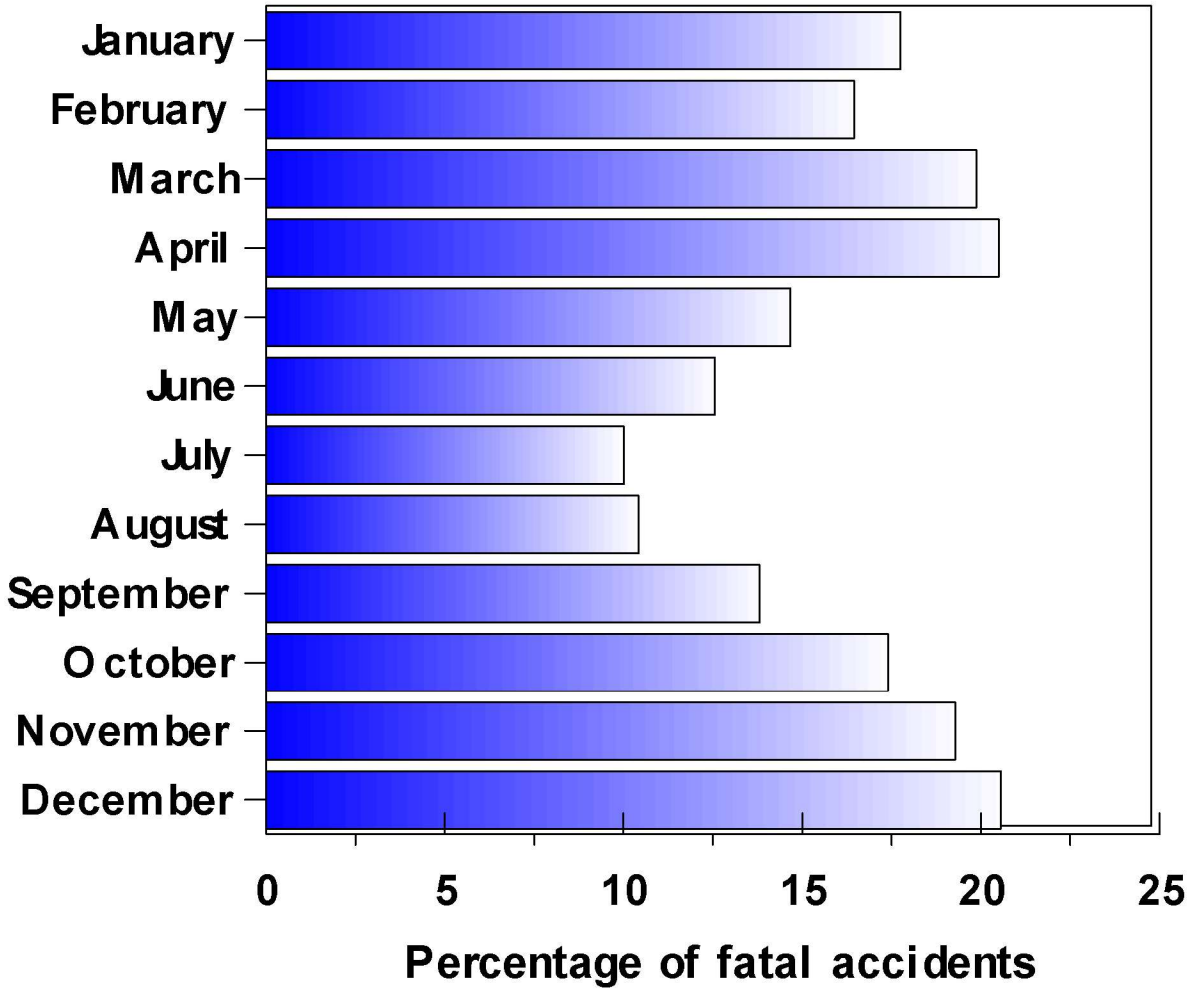
Proportion of drownings greatest on boats < 16 ft.

Non-powered craft accident including sailing vessels underway under sail only trends 2005-2019



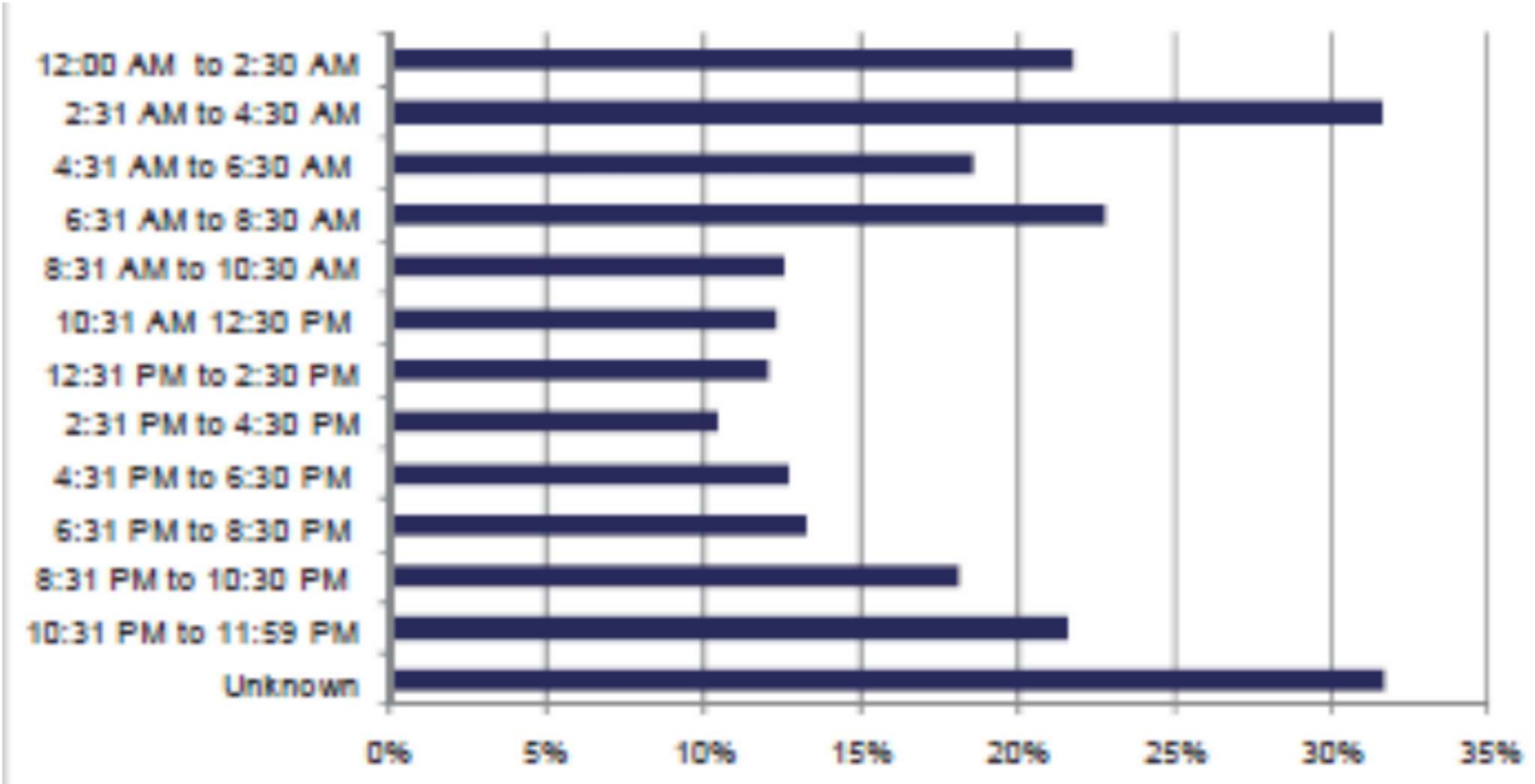
Is it just demographics?

Data non powered and sailing vessels underway (Sailing)



Boating activity peaks in summer months, but % of fatal accidents higher in colder months

Night boating is more dangerous

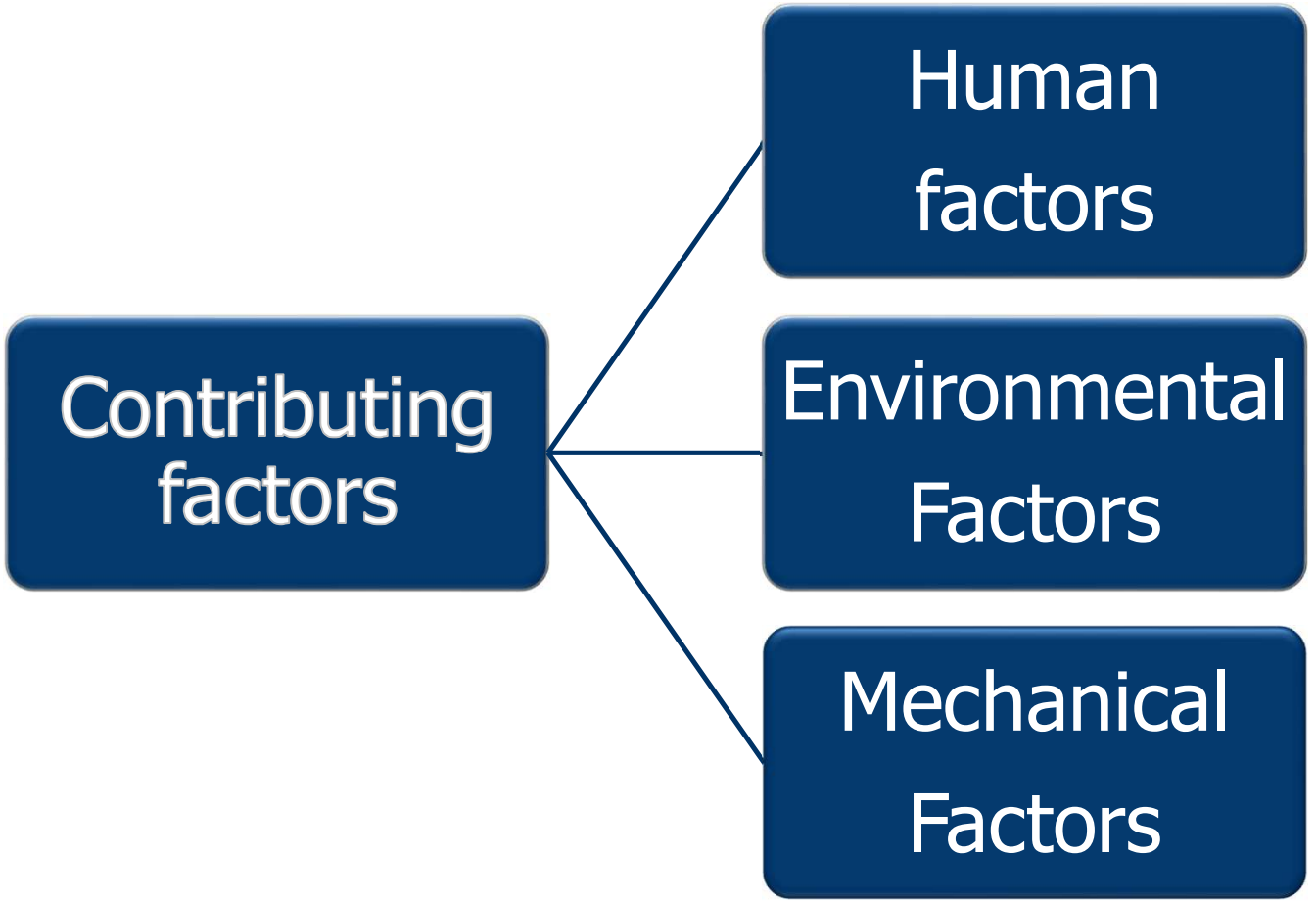


% Accidents that are fatal

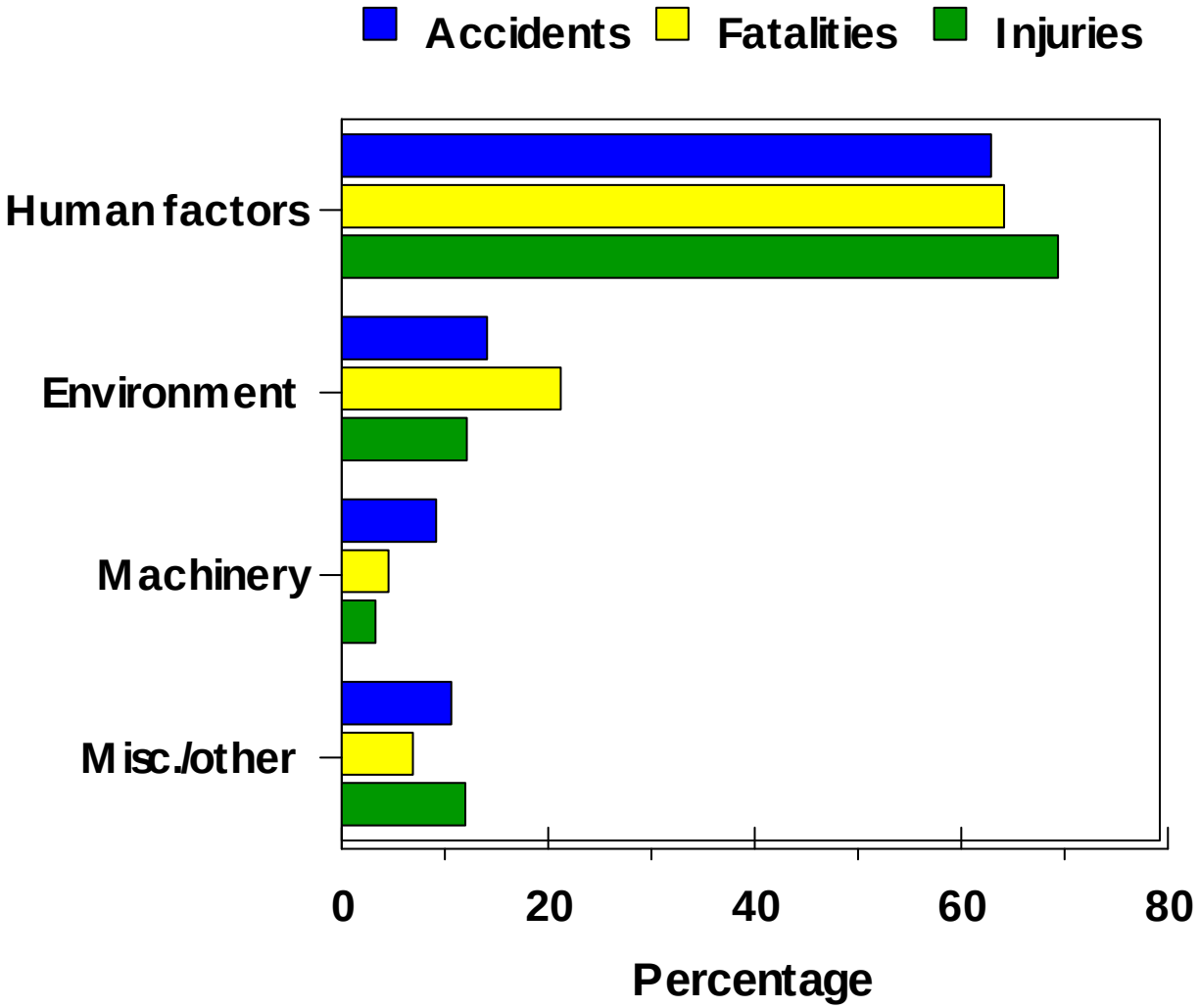
Reasons why night boating is more dangerous

- Visibility impairments (impacts on collisions and allisions)
- Generally lower traffic densities (reduced possibility of external assistance)
- Greater likelihood that operator is boating under the influence (impaired judgment, balance, decision-making, and lower likelihood of wearing a life jacket)

Primary contributing factors for boating accidents

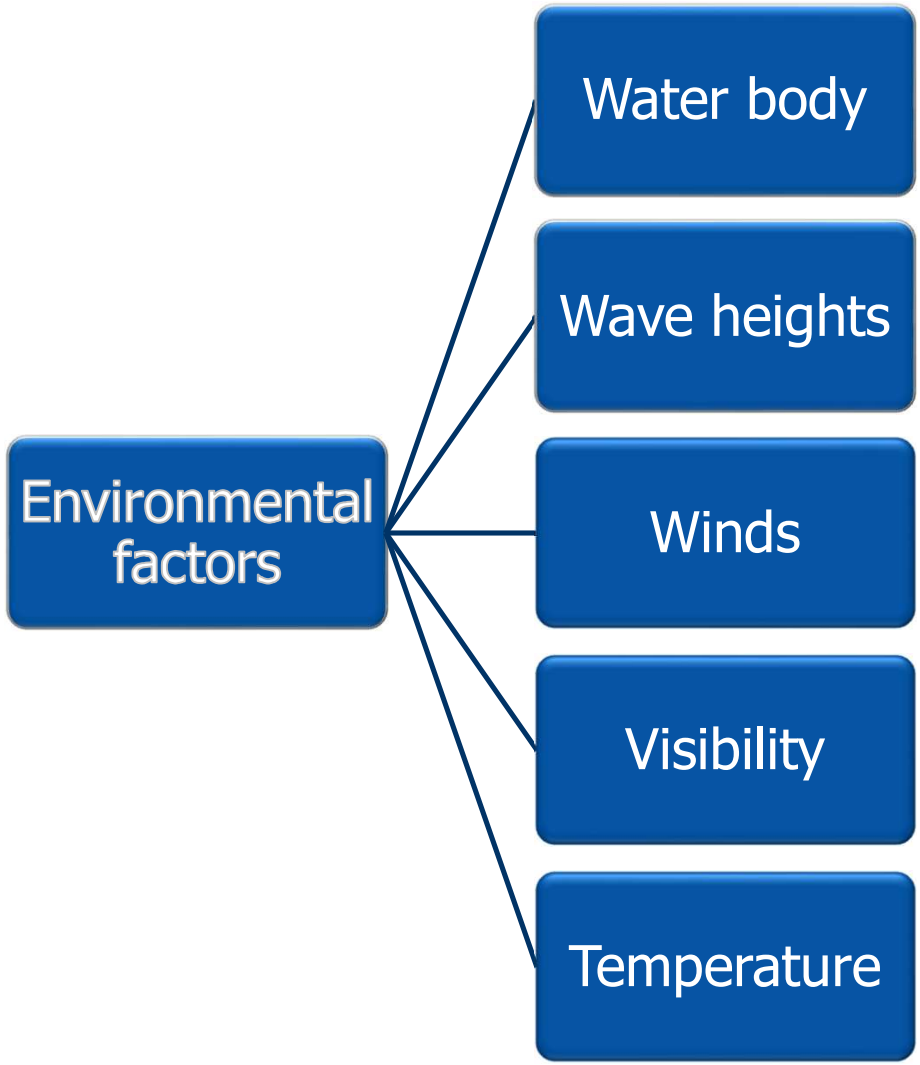


Importance of human factors



Proportions have not changed materially over the years

Environmental factors and drownings



Mental model: most drownings occur in severe conditions, in oceans or bays in high winds/waves or low visibility or low water temperature conditions

Facts relative to environmental factors: drownings

- Nearly 50 percent of drownings occurred on lakes, ponds, reservoirs, dams, and gravel pits—only 8 percent occur on the gulf, Great Lakes, or oceans
- When water conditions were known: 75 percent of drownings occurred on waters with wave heights less than 2 feet—50 percent with wave heights less than 6 inches
- When wind conditions were known: 58 percent of drownings occurred with wind conditions described as none or light (< 6 mph)

Facts relative to environmental factors: drowning 2008-2017

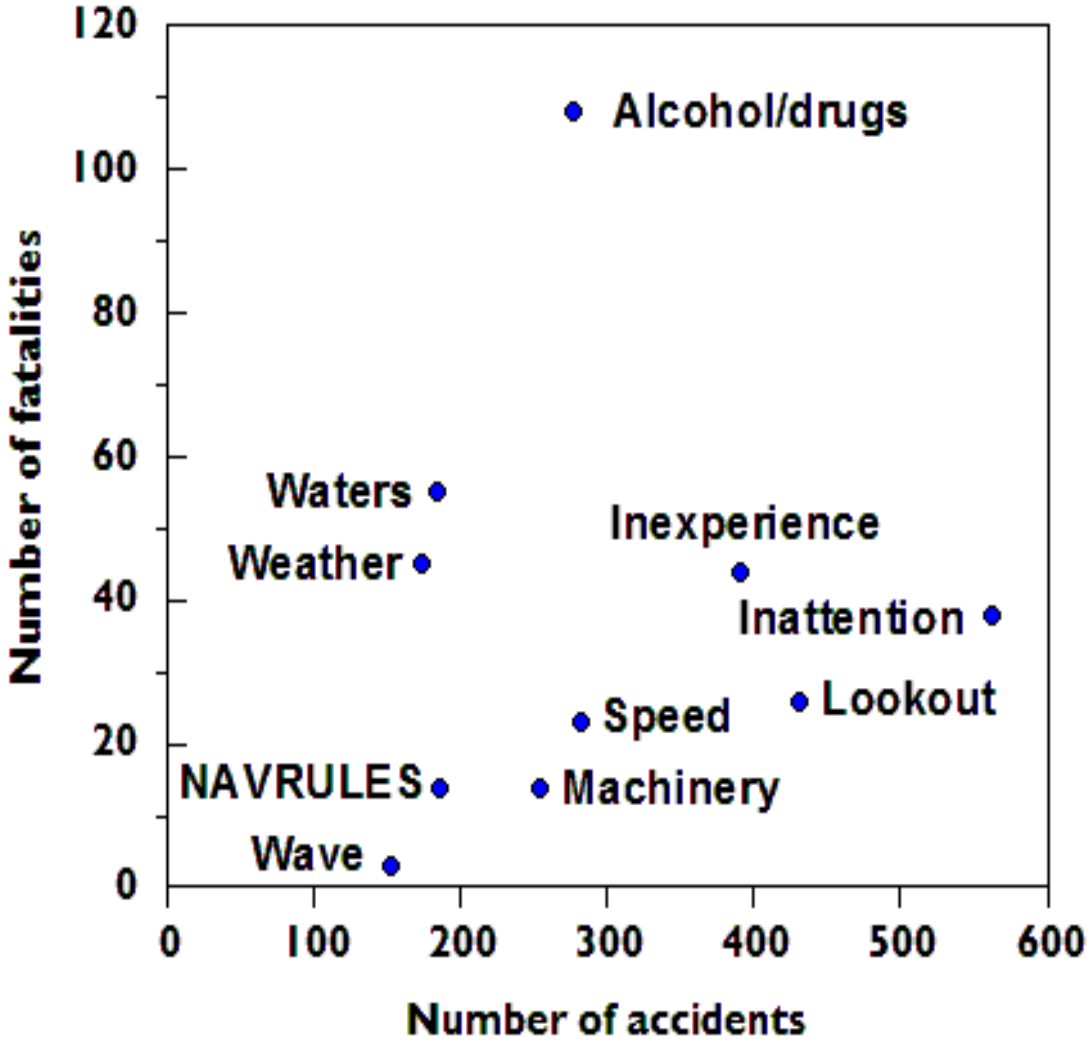
- When visibilities were known: 82 percent of drownings occurred under conditions described as “good visibility,” and
- When water temperatures were known: 61 percent of drownings occurred at water temperatures > 60 degrees Fahrenheit and 45 percent when the temperature was 70 degrees or more; only 2.7 percent when water temperatures were less than 39 degrees

Facts relative to environmental factors

Mental image

Reality

“Top ten” individual contributing factors



Substance impairment is the leading contributing factor in boating fatalities

“Take home” facts

- We have made progress, but more remains to be done
- Drowning is the major cause of fatalities; 85% of victims not wearing life jackets
- Small boats account for majority of fatalities
- Capsizing and falls overboard account for majority of fatalities
- Non-powered craft account for increasing share of fatalities
- Most fatalities occur in relatively benign environmental conditions
- Human error accounts for about 2/3^{rds} of fatalities
- BUI is the largest single contributing factor to fatalities

Implications

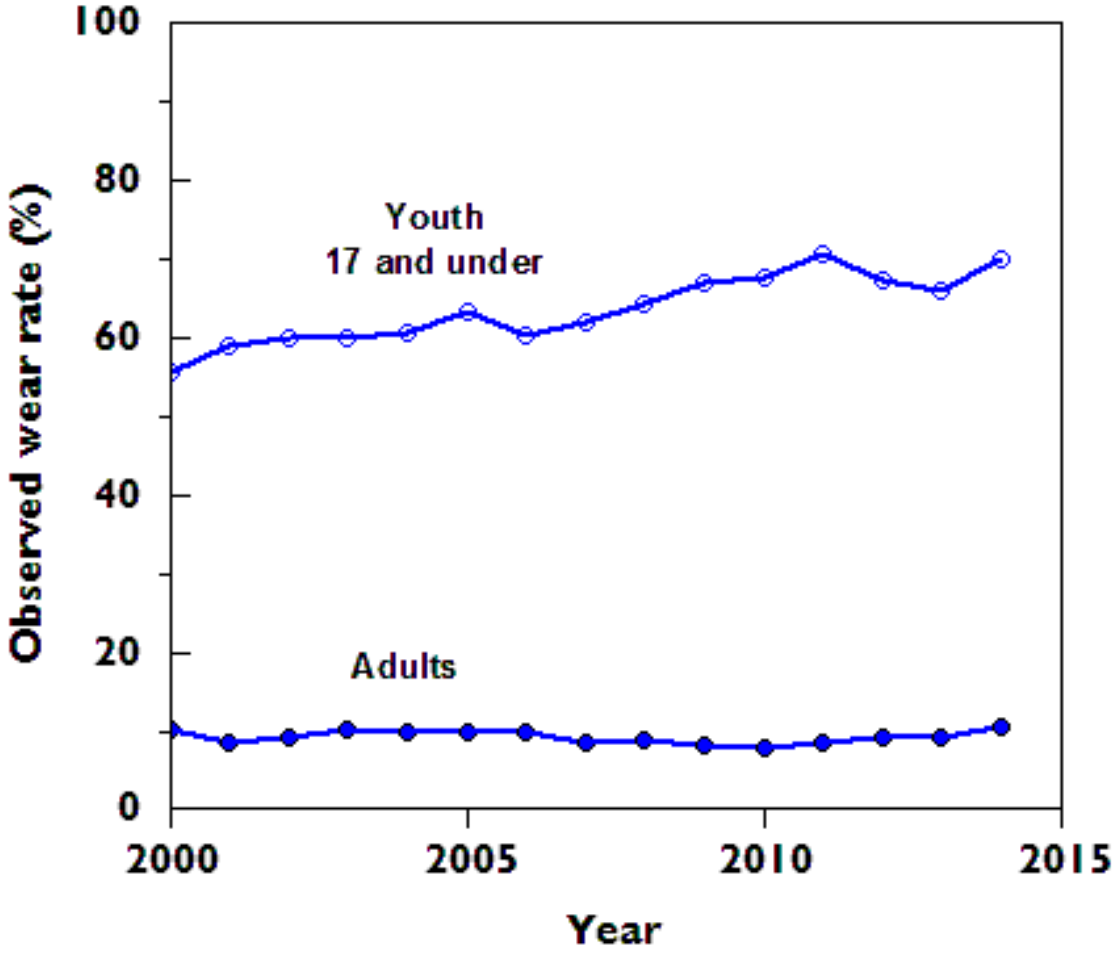
- We need to figure out ways (outreach, regulation) to convince boaters to wear life jackets—at least on smaller boats
- We need to reduce prevalence of alcohol consumption on the water and we need better data on alcohol involved accidents
- We need a better understanding of human factors and paddlecraft accidents

LIFE JACKETS

Life jacket basics

- Life jackets do not prevent accidents, but substantially increase the likelihood of survival in the event of capsizing or falls overboard
- It is difficult to predict the circumstances where life jackets will be required beforehand, and therefore,
- *Life jackets need to be worn, not just carried—particularly for small boats*

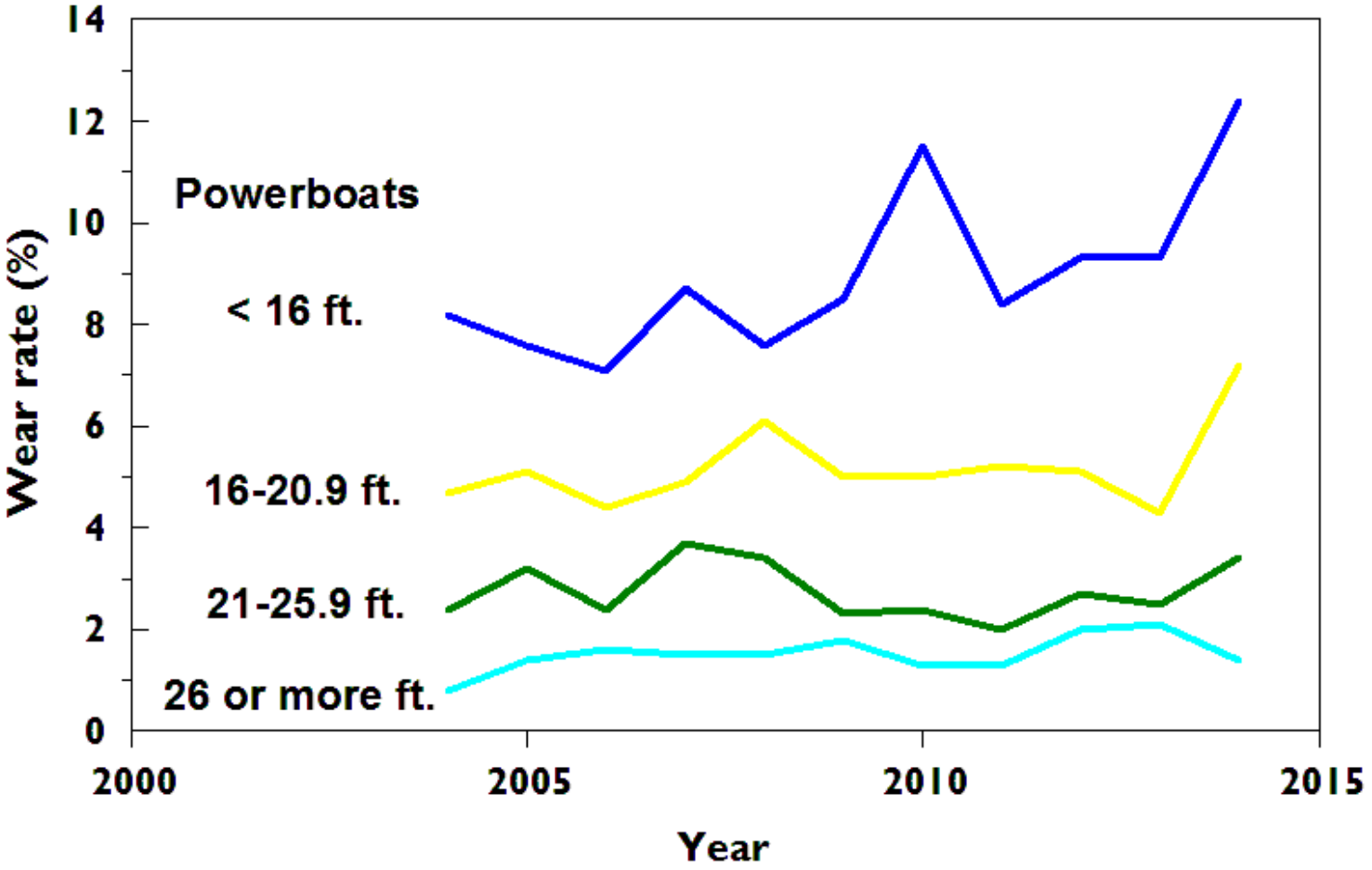
Life jacket wear rates: all boats excluding PWCs



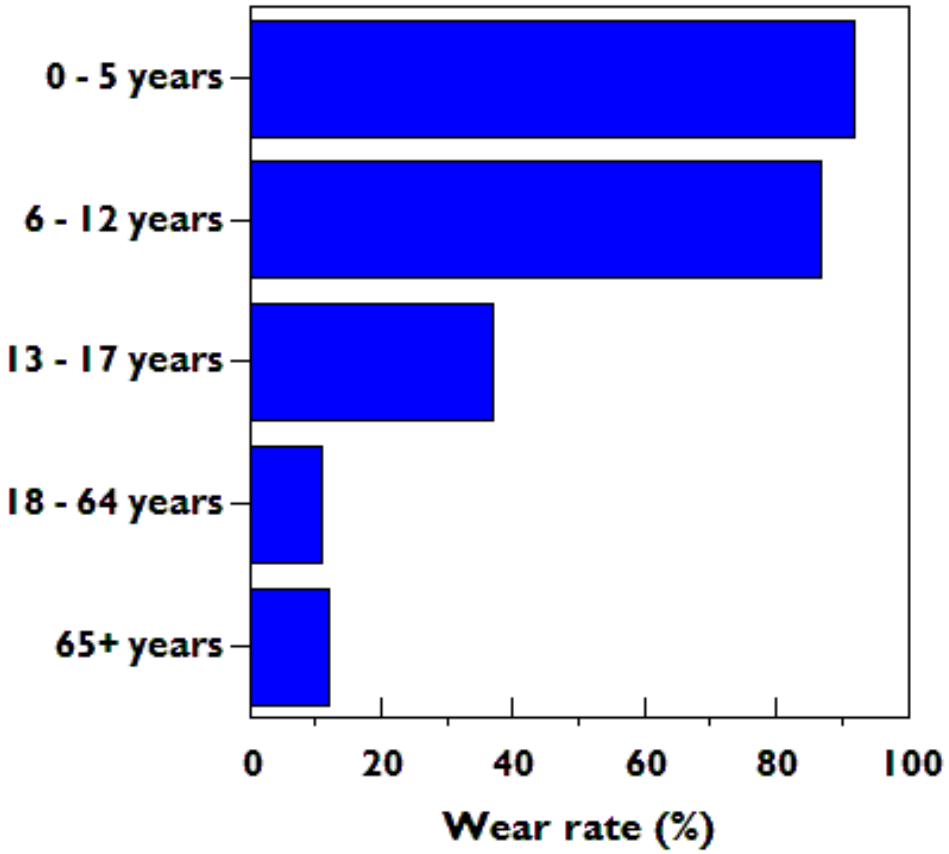
What will it take to move the needle for adults?

Life jacket wear: glimmers of hope

Results for adults (PWC excluded)



Wear rates by age 2015 (excluding PWCs)



- Children subject to mandatory wear requirements
- Do teen-agers view freedom from legal wear requirements a “rite of passage?”
- Adults: the primary behavioral target group

Studies show that increased wear rates could reduce boating fatalities dramatically

Efficacy of life jacket wear supported by numerous studies

- Cummings et al. (2010) matched cohort design U.S.: authors estimated that wearing a life jacket reduced the risk of drowning by 49% (95% CI 26% to 65%)
- Maxim (2010) U. S.: For open motorboats, canoes, kayaks, and rowboats the incremental lives saved if wear rates could be increased to 70% were estimated to be approximately 125 annually, a 34% reduction

Efficacy of life jacket wear supported by numerous studies

- Gungor and Viauroux (2014) U. S.: the expected number of drownings per vessel would decrease by about 80% if the operator wears a life jacket
- O'Connor and O'Connor (2005) Australia: probability of surviving was 34/50 = 0.68 (95% CI 0.5317 - 0.8007) if the person was wearing a life jacket compared to 128/257 = 0.50 (95% CI 0.4355 - 0.5607) if not
- Bugeja et al., (2014) Victoria Australia: 67% decrease in drownings after regulation requiring life jacket wear went into effect

Studies on attitudes towards life jacket wear

MCA Lifeja
Behaviou

Client: Maritime C
& the Royal Nation

Sally Turner E
Julie Wyld
Dr. Martin
Suzy Sharp
Karen Jacks

Final report sub

Original article

Barriers to lif
boaters

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ABSTRACT

Objective To identify barrie
Design Cross-sectional surv
Setting Nine public boat ra
State, USA, August–Novembe
Participants 675 adult boa
boats <26 feet long.
Main outcome Low or no
time) versus high life jacket u
Results Low/no life jacket u
associated with longer boat l
[RR] 1.03, 95% CI 1.02 to 1
95% CI 1.01 to 1.20), perce
'uncomfortable' (RR 1.29, 95
perceived greater level of swi
95% CI 1.03 to 1.53 for 'exp
with lack of confidence that
from drowning (RR 1.13, 95
jacket use was less likely whe
was the primary life jacket us
95% CI 0.63 to 0.94), a chil
95% CI 0.79 to 0.99) or if
boating safety class (RR 0.94
Conclusions Life jacket use
comfortable devices, such as
with increased awareness of
drowning. Boater education
with increased life jacket use

INTRODUCTION

Drowning remains an impo
Over the past decade, there
the annual US drowning
recreational boating drown
registered boats. In 2012, 4
recreational boating incidents
wearing a life jacket.[1] In
Washington State, 22% of
deaths among adults be
boating related.[2] Non-fatal
high, thus it is important to
for improving prevention
Life jackets are Unite
(USCG)-approved flotation
personal flotation devices
associated with a 50% red
All recreational boats in
carry one USCG-approved
fits for each person abo
surveys, however, suggest
regularly wear life jackets.
jacket use have targeted al
gest efforts directed towa
include legislation mand

Linked

http://dx.doi.org/10.1136/injuryprev-2013-041022
http://dx.doi.org/10.1136/injuryprev-2013-041005

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Low life jacket use among adult recreational boaters: A qualitative study of risk perception and behavior factors

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ABSTRACT

Background: Life jackets may prevent one in two drowning deaths, however, 85% of recreational boating-related drowning victims in the United States in 2012 did not wear a life jacket. This study explored behavioral factors and strategies to encourage consistent life jacket use among adult recreational boaters.
Methods: We conducted a qualitative study among boat owners who boat regularly, and explored factors associated with life jacket use by adults and child or adolescent passengers. Sixteen boaters participated in four focus groups.
Results: Most boaters reported inconsistent use of life jackets, using them only when conditions were poor. Each described episodes of unpredictable boating risk which occurred despite favorable conditions. Most required younger child passengers to wear a life jacket, but reported resistance among older children. Barriers to consistent life jacket use included discomfort and the belief that life jacket use indicated inexperience or poor swimming ability. Participants stated that laws requiring life jacket use would change behavior especially for children. The only demonstrated behavior change among group members was associated with use of inflatable life jacket devices.
Conclusions: Boating risk is inherently unpredictable; therefore interventions should focus on strategies for increasing consistent use of life jackets. Passage and enforcement of life jacket legislation for older children and adults is likely a promising approach for behavior change. Designing more comfortable, better-fitting, more appealing life jackets will be paramount to encouraging consistent use.

1. Introduction

Open-water drowning is an important public health problem in the US and around the world as the fourth leading cause of global burden of disease among injuries (Lozano et al., 2012; Lozano et al., 2012). In the US in 2012, the United States Coast Guard (USCG) reported that 459 people drowned in 4515 recreational boating incidents. Only 15% of drowning victims were known to have been wearing a personal flotation device (life jacket) (USCG, 2013). Personal flotation devices may reduce the risk of drowning by half (Cummings et al., 2011), and US federal law requires all recreational boats to carry a life jacket for each passenger (USCG, 2005).

As with seat belts and bicycle helmets, the existence of a highly effective intervention alone does not necessarily lead to increased implementation of that intervention. Life jackets are rarely used by most adults on motorboats. The national prevalence of observed life jacket use among US adult recreational boaters on open motorboats (e.g., power boats without a cabin, skiffs, and motorized rafts) was 5.3% in 2010 (USCG and JSI, 2011), a level generally consistent since 1998 (Mangione and Rangel, 2004; Mangione et al., 2012). Observed life jacket use is higher for children and adolescents (USCG and JSI, 2011). Observational studies of life jacket use report that adult life jacket use is highly predictive of child life jacket use, suggesting the importance of adults modeling consistent safety behaviors while boating (Quan et al., 1998; Chung et al., 2013).

There are limited data and few peer-reviewed published studies regarding behavioral factors associated with life jacket use by recreational boaters. Most of what is known on behavioral factors of adult recreational boaters and life jacket use comes from non-peer reviewed reports sponsored by the US Coast Guard or government agencies (Responsive Management, 2001; Groff and Ghadiali, 2003; USCG, 2003; Center for Social Marketing, 2010; Isaacs and Lavergne,

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Why don't adults wear life jackets?

- Boating is believed to be "safe enough"
- Life jackets are not comfortable
- Life jackets are un-attractive
- Wearing a life jacket is a sign of fear
- I'm a good swimmer
- I can anticipate situations where life jackets might be needed—or don one in the water if I fall overboard
- Life jackets won't save my life
- Many of these are factually incorrect!

What's been done to date?

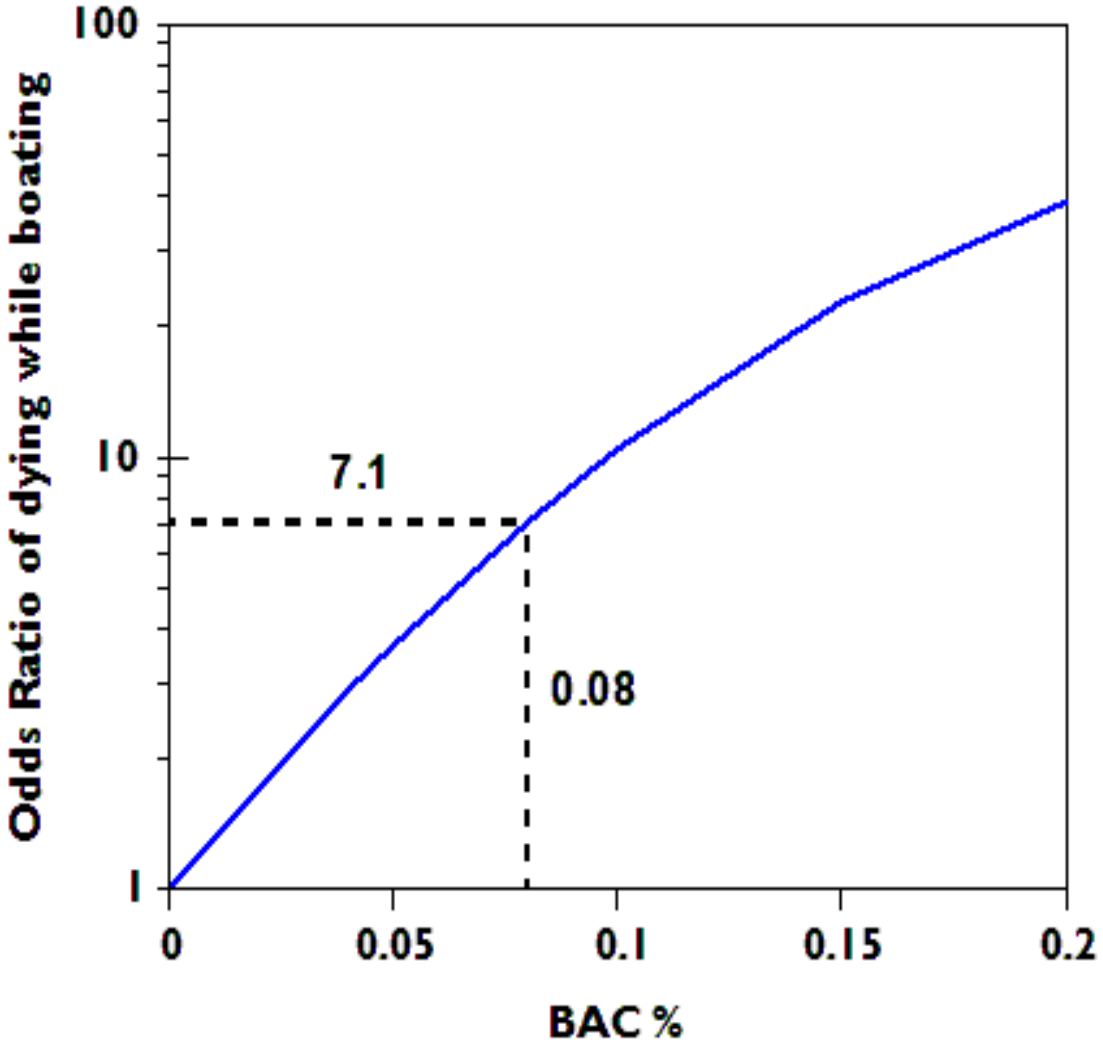
- Mandatory life jacket wear policies
  - In Australia and Ireland
  - In certain seasons in seven US states (CT, MA, MD, ME, NY, PA, and WV)
  - In certain bodies of water (e.g., USACE)
  - For certain types of craft (PWC)
  - For people of certain ages (youth)
- Outreach programs (e.g., PSAs, life jacket loaner stations, social media)

BOATING UNDER THE INFLUENCE

BUI basics

- Alcohol consumption impairs balance, judgement, coordination and slows reaction time
- Alcohol consumption increases the likelihood of an accident and lowers the chance of survival after an accident
- Alcohol consumption lowers likelihood of wearing a life jacket
- Alcohol consumption increases the risk ratio for fatalities at levels well below present BUI legal limits (Smith et al., 2001)

Risk ratios (Smith et al., 2001)



ORIGINAL CONTRIBUTION

Drinking and Recreational Boating Fatalities
A Population-Based Case-Control Study

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Context Alcohol is increasingly recognized as a factor in many boating fatalities, but the association between alcohol consumption and mortality among boaters has not been well quantified.

Objectives To determine the association of alcohol use with passengers' and operators' estimated relative risk (RR) of dying while boating.

Design, Setting, and Participants Case-control study of recreational boating deaths among persons aged 18 years or older from 1990-1998 in Maryland and North Carolina (n=221), compared with control interviews obtained from a multistage probability sample of boaters in each state from 1997-1999 (n=3943).

Main Outcome Measure Estimated RR of fatality associated with different levels of blood alcohol concentration (BAC) among boaters.

Results Compared with the referent of a BAC of 0, the estimated RR of death increased even with a BAC of 10 mg/dL (odds ratio [OR], 1.3; 95% confidence interval [CI], 1.2-1.4). The OR was 52.4 (95% CI, 25.9-106.1) at a BAC of 250 mg/dL. The estimated RR associated with alcohol use was similar for passengers and operators and did not vary by boat type or whether the boat was moving or stationary.

Conclusions Drinking increases the RR of dying while boating, which becomes apparent at low levels of BAC and increases as BAC increases. Prevention efforts targeted only at those operating a boat are ignoring many boaters at high risk. Countermeasures that reduce drinking by all boat occupants are therefore more likely to effectively reduce boating fatalities.

JAMA. 2001;286:2974-2980 www.jama.com

MORE THAN 43 MILLION people reported using a motorboat in the United States in 1994,[1] and about 800 people died in 1998 from recreational boating.[2] Alcohol is commonly involved in drownings and other unintentional injury fatalities[3-7] and is increasingly recognized as an important factor in many boating fatalities.[8,9] Data from 4 states with high testing rates for 1980 to 1983 suggest that 51% of people involved in boating fatalities had a blood alcohol concentration (BAC) of at least 40 mg/dL, and 30% had a BAC higher than 100 mg/dL.[8,10] Other countries such as Canada[11] and Finland[12] have an even higher proportion of boating fatalities linked to alcohol use.

Alcohol use while boating affects the probability not only of ending up in the water but also of survival once that happens. Because of this apparent double jeopardy, alcohol use may actually be more hazardous on a boat than in other settings, with even low BACs greatly increasing relative risk (RR).[8,13,14] Although these and other studies[4,8,15,16] suggest that alcohol increases the RR of dying while boating, this relationship has not been well quantified.

This study sought to better define the relationship between alcohol use and the RR of death while boating. We conducted a large population-based case-control study of alcohol use and recreational boating fatality risk in 2 states, Maryland and North Carolina. These states include a diversity of waterways on which recreational boating takes place. We sought to determine the magnitude of the estimated RR of dying associated with alcohol use, adjusting for known or potential risk factors for drowning and other boating deaths. We also examined whether RRs were different for passengers and operators and whether low BACs pose a significant RR.

METHODS

Identifying and Selecting Boating Fatalities

We searched official state boating fatality records and medical examiner files in each state to identify all recreational boating deaths classified as "accidental" that occurred from 1990 to 1998 in Maryland and North Carolina. Only boating deaths that occurred from April through October (n=403 of 502 deaths) were included in the study. Boating activity declined markedly outside these months, making control interviews pro-

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This will happen this year

- Increased enforcement
- More publicity of enforcement efforts
- Prohibitions on certain waters
- Outreach efforts
- Research
- Target All Vessels

OPERATION DRY WATER

Why is it a hard problem?

- Social acceptability of drinking and boating
- Lack of success of certain strategies (e.g., utility of “designated driver”)
- Difficulty of enforcement efforts—you can’t have enforcement 24/7 on all bodies of water
- Emerging issue—drug use

Challenges

- Life jacket wear:
  - There is strong evidence that fatalities could be substantially reduced if wear rates were higher
  - Regulatory options may be difficult to implement on national level
  - USACE and several states efforts noteworthy
  - Outreach efforts; limited success for adults—how can we make these more effective?

Challenges

- BUI:
  - BUI is largest single contributing factor to recreational boating fatalities
  - Difficult to measure accurately—we need better data on alcohol as contributing factor in accidents/fatalities (ERAC efforts useful)
  - Role of alcohol probably understated
  - Better data on drugs necessary

Other issues/topics

- Can we increase the extent and effectiveness of boater education?
  - Not all boaters required to take boating courses
  - Presently no requirements for on-the-water skills training
  - Should content of boating courses be changed to include or focus on risk management?

Federal Law Change

Effective; April 1, 2021

Recreational Boat Engine Cutoff Switch Requirements

Over the last three years (2018-2020), Congress has passed two laws requiring, first, that manufacturers install engine cut-off switches on recreational vessels and, second, that recreational vessel operators use those engine cut-off switches.

The laws that have placed these requirements on recreational vessel manufacturers and recreational vessel operators are found in:

United States Code (USC)

as *opposed* to the

Code of Federal Regulations (CFR) where these types of requirements are typically found.

These are federal laws and not enforceable by state and local marine officers at this time.

PURPOSE:

These new laws will improve safety for all recreational boaters by reducing the potential for propeller injuries to recreational vessel operators, other users of the nation's waterways, and marine law enforcement officers responsible for responding to runaway boats.

What do they look like ?

More specifically, Section 503 of the LoBiondo Coast Guard Authorization Act of 2018
created 46 USC 4312 to require a manufacturer, distributor, or dealer
that installs propulsion machinery and associated starting controls on a
covered recreational vessel
(less than 26 feet long and capable of 115 pounds of static thrust = appx. 3 HP)
to equip the vessel with an ECOS per compliant with ABYC Standard A-33.

This law went into effect on December 4, 2019 one year after the 2018 CGAA was enacted and is referred to as the “installation requirement.” Section 8316 of the National Defense Authorization Act of 2021 amended 46 USC 4312 to require individuals operating those recreational vessels covered by the installation requirement to use ECOS links, except if the main helm is within an enclosed cabin or the vessel does not have and is not required to have an ECOS.

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was enacted and is referred to as the “installation requirement.”
Section 8316 of the National Defense Authorization Act of 2021 amended 46 USC 4312 to require individuals operating those recreational vessels
covered by the installation requirement to use ECOS links, except if the main helm is within an enclosed cabin
or the vessel does not have and is not required to have an ECOS.

It provides a penalty of **$100, $250,** and **$500** for the *first, second,* and *third* offenses, respectively.

The law goes into effect on April 1, 2021.
This requirement is referred to as the “use requirement.” The seven States listed below have ECOS laws:

- Alabama
- Arkansas
- Illinois
- Louisiana
- Nevada
- New Jersey
- Texas

The Coast Guard will be contacting those states to discuss those laws this coming month.
Federal law preempts States from enacting or enforcing a law on a subject that is different from a federal law on the same subject.
However, the Coast Guard has the authority to provide an exemption from preemption if recreational vessel safety is not adversely affected, as when a state law is close enough to the federal law and does not adversely affect recreational vessel safety.

How can the date of manufacture be determined?

HIN

(Hull Identification Number)

12 Characters in Length

The HIN is usually found on the starboard outboard side of the transom,

but can also be found on the boat's certificate of number (*i.e.,* registration).

Characters 11 and 12 of the HIN represent the model year.
Characters 9 and 10 represent the date of certification of the boat.
Character 9 represents the month, A-L for January-December, respectively.
The 10th character represents the year of certification,
with the last digit corresponding to the last digit of a specific year (*e.g.*, “0” = 2020).

For a model year 2020 boat to be required to have an ECOS installed, it would have an “A0” – “G0” certification date for the 9th and 10th characters of the HIN, and “20” for the 11th and 12th characters of the HIN. Please note that a “0” as the 10th character of the HIN could represent 2010 or any other year ending in a “0” including 2020, which is why the model year represented by the 11th and 12th characters must be considered (*e.g.*, “A010” would represent a boat certified in January 2010, and “E000” would represent a boat certified in May 2000.)

Want to Learn More About the Law

Google

- LII U.S. Code Title 46 Subtitle II Part B CHAPTER 43 § 4312
- 46 U.S. Code § 4312 - Engine cut-off switches

HOW DO WE FIND YOU SO RESCUE HAPPENS

USCG APP


United States Coast Guard
U.S. Department of Homeland Security
Home
Profile
State Boating Information
Request Safety Check
Review Safety Equipment
File Float Plan
Rules of the Road
NOAA Buoys
Report Hazard
Report Pollution
Report Suspicious Activity
Emergency Assistance

Another way is Search Patterns