

NASBLA Engineering, Reporting & Analysis Committee (ERAC)

Exploring the numerator used in recreational boating fatality and injury rates: *A first look at the gap between the victim's state of origin and accident location*¹

The Assignment. In the 2017 committee cycle, as follow-up to earlier explorations of what might happen if the basis for the **denominator** used in recreational boating casualty or fatality rate calculations were to shift [from numbers of registered boats to estimates of exposure hours generated by the National Recreational Boating Survey](#),² ERAC turned attention to the feasibility and possible effects of recalculating the rates' **numerator**—the number of boating fatalities or injuries.³ The charge to the committee was to consider the implications for states' rates, particularly for fatalities, if the numerator were to be based on the accident victim's state of origin instead of the current calculation based on where the accident occurred.

Why Consider Modifying the Numerator? Isn't it Enough to Improve the Basis for the Denominator? While exposure hour-based statistics as the denominator in fatality or injury rates may be an improvement conceptually for assessing the risks associated with recreational boating, that change alone would not result in flawless measures of, for example, the effectiveness of a state's safe boating initiatives. As described in a July 2015 ERAC [research brief](#), the rate only accounts for where the fatality or injury occurred, not where the boat was registered or the victim resided. That is a potential issue for states with boating opportunities that attract a lot of boaters from other places; those out-of-state boaters may lack the local knowledge and will be at least partially products of their home states' boating safety cultures.⁴

What are the Challenges Associated with Considering a Change to the Numerator and Assessing the Impact on Fatality or Injury Rates? The primary challenges are the availability of relevant and valid data for a more complete analysis. Currently, only one year's worth of state-level exposure data has been generated via the 2012 [National Recreational Boating Survey](#) (NRBS); that data not

¹ This analysis was conducted in 2017 as a first step toward evaluating the pros and cons of changing the basis for calculating the numerator currently used in recreational boating fatality and injury rates. It was originally released as an [appendix](#) to the [ERAC 2017 cycle report](#) pending further consideration in 2018 by the team assigned to the charge. The original release and this 2018 update were prepared by Dr. Deborah Gona, staff to ERAC. The committee thanks Ms. Susan Weber, U.S. Coast Guard Representative to ERAC, for providing the database used in the analysis, and Ms. Tammy Terry, Associate Member and former Chair of ERAC, for reviewing and preparing the database for creation of the pivot tables and additional tabulations presented in the analysis.

² For more background, see [Breaking Down the Numbers: A Closer Look at Exposure Hours from the 2012 National Recreational Boating Survey, Small Craft Advisory, July-August 2014](#).

³ For years, recreational boating casualty and fatality rates have been one set of markers used to evaluate boating safety. The rates have been figured by taking the numbers of boating injuries or fatalities that occurred in the state (numerator) and dividing them by the reported number of state-registered boats (denominator); to allow comparisons across time and jurisdictions, the results typically have been multiplied by a factor of 100K to standardize them.

⁴ It is important to note that state rates—and comparisons of them—also are likely to be affected by factors other than the efficacy of state boating education and other safety programs and outreach. The composition of vessels or the types of waters involved may vary from state to state.

only serves as a potential basis for recalculating the denominator, but also for assessing the magnitude of exposure hours associated with out-of-state boaters versus their involvement in accidents as described in [preliminary Coast Guard work on recreational boating across state lines](#). Plotting the results from that February 2015 Fact Sheet on the NRBS, the July 2015 ERAC [brief](#) lends at least some credence to the suggestion that out-of-state boaters may be more likely to be involved in accidents⁵; at minimum, the findings offer incentive to conduct more research as additional years of exposure hours are collected through future boating surveys.

However, apart from the challenges associated with exposure data is the challenge associated with the data on the accident victim's state of origin (known place of residence or vessel registration). Some of those challenges were identified in the [2015 Coast Guard work](#); others are described below.

“Recalculating” the Committee’s Assignment. Given that the most current set of exposure hours data was five years old at the time of the assignment, with the next batch of data not expected for release until sometime in the third quarter of 2019, the ERAC charge team had to consider how feasible it would be to proceed with the charge as assigned. During the committee’s March 2017 in-person meeting, the team decided that it might be most appropriate to alter the scope of work as a first step toward possible future work in this area.⁶ The revised workplan would focus on determining the magnitude of the issue—just how much of a gap is there between the victim’s state of residence and the state where the accident occurred (the current basis for the numerator)?

Methodology. The charge team asked the Coast Guard to pull specific fields from the Boating Accident Report Database (BARD) for the 10-year period 2006-2015:

- BARD case number
- State of residence associated with injured victims
- State of residence associated with fatal victims
- State of residence associated with operators
- Registration number
- HIN number of vessel
- Whether the vessel was rented
- Body of water of accident

In order to assemble the project data for the team, the Coast Guard had to seek permissions for the release of these data fields and resulting records from jurisdictions with privacy restrictions.

⁵ The [research brief](#) plots the fraction of out-of-state exposure hours versus the fraction of accidents accounted for by those same boaters in 2012. If accidents matched relative exposure exactly, the points on the plot would appear as a straight line (parity line). The 2012 data indicates that 68 percent of the states lie above the parity line (see pp. 11-13).

⁶ The 2017 charge was carried over into the 2018 committee cycle as ERAC_S&R-2018-1: Continue exploring boating fatality/casualty rate numerators, with intent to make a recommendation to NASBLA’s Executive Board as to whether and how the work should proceed or if the gap analysis suggested other research questions worthy of investigation.

Before delivery to the team, the data pull was further modified to narrow the years for analysis to the five-year period 2011-2015 because the offline Access files used to produce the annual national recreational boating statistics only have victim address data from 2011 on. While prior address data is available online via BARD-Web, substantial additional effort would have been needed to match it to the dataset used to produce the statistics, resulting in further delay of the initial analysis.⁷

Analyzing the Gap between Victim’s Residence and Accident Location. The tables on pages 5 and 6 of this paper—the first presenting tabulations for fatalities, and the second, for injuries—were extracted from Excel workbooks created by the team member who manipulated the original database provided by the Coast Guard. Listed by the state of the fatality or injury accident (i.e., the state claiming the accident), the tables present the grand totals for the 2011-2015 period under consideration, and the following percentages:

- % of fatalities / injuries that were residents of state where fatality / injury occurred
- % of fatalities / injuries that did not have valid residency information available
- % of fatalities / injuries that were out-of-state residents

The data pull and tabulations offer some interesting results and potentially useful information for states that want to take a broader look at the origins of persons involved in the fatality and injury accidents in their jurisdictions:

- In the case of fatalities, based on the available data for 2011-2015, there are 11 jurisdictions for which at least 30 percent of their fatalities involved out-of-state boaters. There are at least three others for which the results are uncertain because of the large percentage of fatalities that did not have valid residency information.
- In the case of injuries, based on the available data for 2011-2015 and employing the same measuring stick, there are 13 jurisdictions for which at least 30 percent of their injuries involved out-of-state boaters. There are at least five others for which the results are uncertain because of the percentage of injuries that did not have valid residency information.
- For the period 2011-2015, a minimum of eight jurisdictions crossed that 30 percent mark for non-residents in both their fatality and injury accidents.

⁷ Additional explanatory notes about the BARD data, particular fields, records, and any restrictions on their use and disposition following completion of this project were included in the original Excel database provided by the Coast Guard. An explanation of the methodology used by a charge team member in the review, clean-up (as needed), and general preparation of the data to facilitate the creation of pivot tables and additional tabulations is included in two Excel workbooks generated from the original—one for fatalities, the other, injuries. The files remain available in the [charge/project area of NASBLA’s Basecamp](#), pending future use solely by ERAC given the restrictions on use stipulated by some of the jurisdictions. Questions may be directed to Dr. Deborah Gona, deb@nasbla.org.

While some states are very much aware of the composition of persons involved in incidents in their states, others might not have viewed their accidents in this way. For states that present a relatively larger percentage of fatalities or injuries involving out-of-state boaters than others, these preliminary results could be used to stimulate additional state-specific analyses as to “why” that might be the case and to initiate further discussion about the most effective forms of boating safety outreach to out-of-state boaters.

Future Considerations. While the ERAC team assigned to the project concurred that this look at the gap between the victim’s state of origin and accident location served as an interesting exploration, members also agreed that little would be achieved in return for the substantial effort that would be necessary to pull additional years to study or additional variables to consider from a national standpoint. And without the additional exposure hour data that will eventually be generated from what is now labeled the National Recreational Boating *Safety* Survey (NRBSS), an evaluation of *how much* out-of-state boaters are on the water in particular jurisdictions compared to resident boaters would not be possible.

The latest version of the NRBSS is under way as of the first quarter of CY 2018. The data from the exposure hours component of the survey is anticipated to be released for public use sometime in the third quarter of CY 2019. When the exposure data does become available the committee will revisit the merits of another charge in this area.

				Count of BARDID 2011-2015
Grand Total 2011-2015	% of Fatalities that were residents of state where fatality occurred*	% of Fatalities that did not have valid residency information available*	% of Fatalities that were out of state residents*	STATE OF FATALITY ACCIDENT (STATE CLAIMING ACCIDENT)
65	73.85%	7.69%	18.46%	AK
80	77.50%	15.00%	7.50%	AL
55	80.00%	0.00%	20.00%	AR
37	35.14%	8.11%	56.76%	AZ
225	80.89%	15.11%	4.00%	CA
41	75.61%	7.32%	17.07%	CO
27	77.78%	11.11%	11.11%	CT
1	0.00%	0.00%	100.00%	DC
6	66.67%	0.00%	33.33%	DE
291	84.54%	4.81%	10.65%	FL
78	74.36%	5.13%	20.51%	GA
6	83.33%	16.67%	0.00%	GU
23	56.52%	30.43%	13.04%	HI
28	85.71%	3.57%	10.71%	IA
51	56.86%	5.88%	37.25%	ID
82	90.24%	0.00%	9.76%	IL
31	54.84%	3.23%	41.94%	IN
22	90.91%	0.00%	9.09%	KS
52	78.85%	1.92%	19.23%	KY
116	88.79%	4.31%	6.90%	LA
49	89.80%	2.04%	8.16%	MA
79	68.35%	10.13%	21.52%	MD
35	62.86%	2.86%	34.29%	ME
106	85.85%	8.49%	5.66%	MI
75	84.00%	1.33%	14.67%	MN
79	83.54%	2.53%	13.92%	MO
49	79.59%	12.24%	8.16%	MS
35	65.71%	2.86%	31.43%	MT
113	78.76%	5.31%	15.93%	NC
15	80.00%	0.00%	20.00%	ND
18	72.22%	0.00%	27.78%	NE
12	66.67%	0.00%	33.33%	NH
34	76.47%	2.94%	20.59%	NJ
5	100.00%	0.00%	0.00%	NM
32	50.00%	15.63%	34.38%	NV
115	88.70%	5.22%	6.09%	NY
74	90.54%	1.35%	8.11%	OH
54	81.48%	0.00%	18.52%	OK
63	79.37%	1.59%	19.05%	OR
75	84.00%	5.33%	10.67%	PA
12	16.67%	83.33%	0.00%	PR
10	50.00%	0.00%	50.00%	RI
91	91.21%	1.10%	7.69%	SC
12	75.00%	8.33%	16.67%	SD
90	75.56%	4.44%	20.00%	TN
183	76.50%	21.31%	2.19%	TX
38	65.79%	0.00%	34.21%	UT
71	81.69%	5.63%	12.68%	VA
3	0.00%	100.00%	0.00%	VI
5	80.00%	20.00%	0.00%	VT
113	83.19%	7.08%	9.73%	WA
86	73.26%	0.00%	26.74%	WI
20	75.00%	5.00%	20.00%	WV
11	72.73%	0.00%	27.27%	WY
26	NA	NA	NA	OFFSHORE (CG)
3205				Grand Total
	*Methodology notes in Excel file 2011-2015Data_Fatalities review_Not for Distn_ERAC use only			

				Count of BARDID 2011-2015
Grand Total	% of Injuries that were residents of state where injury occurred*	% of Injuries that did not have valid residency information*	% of Injuries that were out of state residents*	STATE OF INJURY ACCIDENT (STATE CLAIMING ACCIDENT)
38	86.84%	7.89%	5.26%	AK
241	71.78%	8.30%	19.92%	AL
166	72.29%	0.00%	27.71%	AR
440	46.14%	8.86%	45.00%	AZ
1331	77.46%	17.36%	5.18%	CA
157	82.17%	12.74%	5.10%	CO
145	75.17%	12.41%	12.41%	CT
6	0.00%	50.00%	50.00%	DC
28	50.00%	3.57%	46.43%	DE
1943	72.72%	9.78%	17.50%	FL
360	81.67%	6.39%	11.94%	GA
8	75.00%	25.00%	0.00%	GU
25	48.00%	40.00%	12.00%	HI
106	74.53%	5.66%	19.81%	IA
156	67.31%	5.13%	27.56%	ID
291	84.88%	3.44%	11.68%	IL
142	59.86%	8.45%	31.69%	IN
79	89.87%	1.27%	8.86%	KS
151	67.55%	9.27%	23.18%	KY
453	86.09%	3.75%	10.15%	LA
206	77.18%	8.74%	14.08%	MA
586	52.39%	13.31%	34.30%	MD
125	45.60%	12.80%	41.60%	ME
317	73.50%	9.15%	17.35%	MI
282	81.56%	4.26%	14.18%	MN
438	58.90%	1.83%	39.27%	MO
115	61.74%	12.17%	26.09%	MS
53	77.36%	9.43%	13.21%	MT
448	73.66%	3.13%	23.21%	NC
20	80.00%	0.00%	20.00%	ND
143	81.12%	0.70%	18.18%	NE
113	45.13%	7.96%	46.90%	NH
332	66.27%	3.92%	29.82%	NJ
59	72.88%	1.69%	25.42%	NM
173	39.88%	9.25%	50.87%	NV
545	64.77%	25.69%	9.54%	NY
320	89.69%	2.19%	8.13%	OH
214	81.31%	5.61%	13.08%	OK
175	77.71%	14.29%	8.00%	OR
226	82.74%	3.98%	13.27%	PA
8	0.00%	100.00%	0.00%	PR
82	59.76%	2.44%	37.80%	RI
384	68.49%	4.43%	27.08%	SC
40	85.00%	0.00%	15.00%	SD
368	76.36%	2.45%	21.20%	TN
539	79.22%	16.88%	3.90%	TX
292	70.21%	8.56%	21.23%	UT
282	78.01%	4.26%	17.73%	VA
7	0.00%	100.00%	0.00%	VI
19	42.11%	36.84%	21.05%	VT
293	84.30%	6.14%	9.56%	WA
354	62.43%	2.26%	35.31%	WI
67	55.22%	0.00%	44.78%	WV
59	72.88%	3.39%	23.73%	WY
38	NA	NA	NA	OFFSHORE (CG)
13988				Grand Total

*Methodology notes in Excel file 2011-2015Data_Injuries review_Not for Distn_ERAC use only