A 10-year descriptive analysis of UK Maritime and Coastguard on lifejacket use and drowning prevention

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Abstract

The study investigated if incidences of death by drowning in the UK could have been prevented through the use of lifejackets over a ten year period. This study was a retrospective analysis of fatal maritime incident data collected by the Maritime and Coastguard Agency (MCA) between the years 2007 and 2016. A Casualty Review Panel (CRP) met annually to categorise incidents into five groups based on the likelihood of a lifejacket preventing death. Descriptive analyses were performed on the overall fatalities, data were stratified by year, sex, age, and activity. Ten year data were categorised based on the outcome of the CRP, these data were further stratified by year and activity, with trends being reported. Potentially 180 lives (82 % of all cases successfully categorised) could have been saved if a lifejacket had been worn. An 18 % reduction in the number of cases referred to the CRP was observed from the first 5 years (2007 to 2011 = 59 % of all referrals) to the last 5 years (2007 to 2011 = 41 % of all referrals), with 42 % less cases referred in 2016 compared to 2007. The data generated by the CRP over the ten years has provided a unique

insight into coastal deaths, it has provided a clear rationale for the use of lifejackets and has helped target national and activity-specific campaigns for water safety and lifejacket use.

Key words: Casualty Review Panel, Subject Matter Experts, Fatality, Personal Flotation Device.

Introduction

Drowning is the third leading cause of unintentional death worldwide, accounting for approximately 7 % of all injury related deaths (World Health Organization (WHO), 2016). It is suggested that the global annual estimate of 372,000 deaths by drowning may significantly underestimate the associated public health problem (WHO, 2016). Statistics for the United States found that 53 % of all male and 26 % of all female drowning deaths occurred in natural bodies of water, with 48 % more likely to occur at the weekends (Xu, 2014). The data for drowning death ignore the larger numerical problem of those who survive but suffer life-long morbidity.

Prevention has greater potential to save more lives at lower cost than rescue or treatment (Schmidt et al., 2016; Szpilman et al., 2016). One of these interventions is the use of a lifejacket, also commonly known as a personal floatation device or life vest (Cassell & Newstead 2014). The aim of a lifejacket is to prevent drowning and increase the chances of survival and rescue by keeping the wearer afloat and the airways clear of the water (Cassell & Newstead 2014). They can also reduce cardiovascular strain and slow cooling by reducing the need for exercise on immersion

(Golden & Tipton 2002). US Coast Guard data from 2013 showed drowning to be the cause of death in more than 75 % of all fatal boating accidents, of these fatalities 85 % were not wearing a lifejacket (United States Coastguard, 2013). Similarly, data from New Zealand identified that in the fatal boating incidents where it was known if a lifejacket was worn, 76 % of victims did not wear a lifejacket (Water Safety, New Zealand, 2012). Data supporting the function of lifejackets in reducing the number of fatalities caused through drowning is abundant (Bugeja et al., 2014; Cummings et al., 2011; Driscoll et al., 1994; O'Connor & O'Connor, 2005; Quistberg et al., 2014); with one study suggesting lifejackets may halve the number of drowning's (Cummings et al., 2011). Compulsory wear regulations for the use of lifejackets were implemented in Australia in 2005 in the year post-regulation, wearing rate increased from 22 % to 63 % (Bugeja et al., 2014; Cassell & Newstead 2014). Retrospective data analysis before and after the compulsory regulations demonstrated a significant reduction in drowning deaths from recreational boating of 59 in the 6 years preceding the regulations to 16 in the 5 years following the implementation of lifejacket regulations (Bugeja et al., 2014). Therefore it has been strongly recommended that properly fitted lifejackets, meeting regulatory specifications, should be available and worn by individuals engaging in any boating or water sport activities (Schmidt et al., 2016).

In 2007 a Casualty Review Panel (CRP) was set up by the Maritime and Coastguard Agency (MCA) with the aim of annually reviewing fatal incidents and the potential impact of the use of lifejackets in those incidents. The aim of this study was to undertake a 10-year analysis of the conclusions of the CRP.

Methods

A retrospective analysis of fatal maritime incident data collected by the MCA between 2007 and 2016 was undertaken. In the UK Her Majesty's Coastguard (HMCG) maintains a database of fatal maritime (coastal and inland) incidents in the UK Search and Rescue Region. The information from this database was supplemented by reports from the press, Coastguard, Coroners, Marine Accident Investigation Branch and Police. These data were sifted to exclude: 1. Non UK search and rescue incidents and commercial vessel incidents, with the exception of fishing vessels (Sift 1); 2. Incidents where it was clear that the wearing of a lifejacket would not have been appropriate, for example coastal walkers or swimmers (Sift 2); 3. Any other inappropriate circumstances for example if a Coroner's report stated the cause of death was clearly not drowning (Sift 3). The records of incidents left following Sift 3 were then passed to the CRP to be assessed.

The CRP consists of 12 members selected for their expert knowledge, including in the areas of lifejackets and other protective equipment, maritime accidents and search and rescue; boating, fishing, canoeing, sea survival, human physiology and responses to immersion. The CRP is represented by core individuals from the: Royal National Lifeboat Institution; Royal Yachting Association; Marine Accident Investigation Branch; MCA; University of Portsmouth; the Lifejacket Industry and the British Canoe Union. Other experts that have been in attendance during the 10 years 2007 - 2016 include: the National Water Safety Forum; Angling Trust and the Scottish Fisherman's Federation.

The CRP meet annually to assess the previous year's data. During each meeting panel members were provided with; an incident summary, the incident location (with a picture of the geographical location), a press report, weather conditions and any associated warnings for the incident locations and if appropriate the published Marine Accident Investigation Branch (MAIB) report. All MCA

data provided to the CRP is anonymised, however press reports often contain the personal information of the deceased. That is, all available information on the incidents and the conditions surrounding them. At the annual meeting, each incident is read aloud and discussed, a vote is taken with the majority view recorded. Trends for the year's incidents are examined and discussed by the CRP. Following each meeting a press release is produced summarising the annual meeting findings, including a targeted and general safety message about the importance of wearing a lifejacket.

Following interrogation of each incident, the members of the CRP voted independently on the lifesaving potential of a lifejacket had it been worn. The conclusion of each independent member was recorded and the majority view taken as the result for that incident. Thus, the causal link between an incident and the potential benefit of a lifejacket was determined independently by subject matter experts on the basis of the information available for each incident. The incidents were catagorised according to one of the following:

i. **Probably** - The casualty would *probably* (high likelihood) have been saved by wearing a lifejacket or buoyancy aid that was correctly maintained, correctly worn and fit for purpose.
ii. **Possibly** - The casualty *possibly* would have been saved by wearing a lifejacket or buoyancy aid that was correctly maintained, correctly worn and fit for purpose.
iii. **Unlikely** - It is *unlikely* that the casualty would have been saved by wearing a lifejacket or buoyancy aid that was correctly maintained, correctly worn and fit for purpose.
iv. **No information** - There was not enough information to make a judgement.

v. **Not appropriate** - Wearing a lifejacket was *not appropriate* for the situation i.e. on a houseboat, or the casualty was wearing a lifejacket and still died or it was *not appropriate* for the casualty to have been wearing a lifejacket for the activity taking place.

vi. **Not relevant** - It was not relevant for the case to be included in the review.

Data Analyses

Descriptive analyses were performed on the overall fatalities, data were stratified by year, sex, age, and activity. Ten-year data were categorised based on the outcome of the CRP, these data were further stratified by year, activity and activity by year with trends being reported.

Results

In the last 10 years there have been a total 3957 reported deaths in coastal waters, 1278 of these were maritime accidents, of these: 176 were removed as they were deemed non-UK search and rescue incidents and commercial vessel incidents, with the exception of fishing vessels; 518 were removed as it was evident that the wearing of a lifejacket would not have been appropriate; and 192 were removed as a result of inappropriate circumstances (Figure 1). This left 392 fatalities to be considered by the CRP.

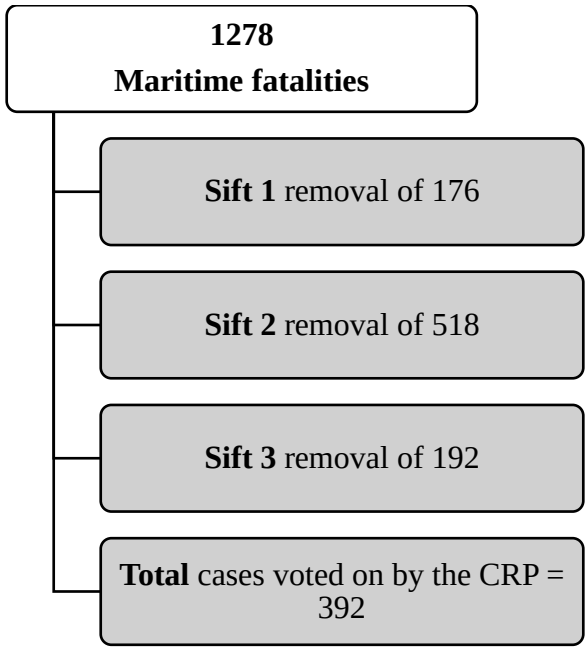


Figure 1. Schematic of the sift process used to determine the number of cases reviewed by the Casualty Review Panel over 10 years.

Annual data

The annual data presented in Table 1 shows the highest percentage of referrals (cases that survived all sifts to be voted on by the CRP) occurred in the first three years (2007 to 2009). An 18 % reduction in the number of cases referred to the CRP was observed from the first 5 years (2007 to 2011 = 59 % of all referrals) to the last 5 years (2012 to 2016 = 41 % of all referrals), with 42 % less cases referred in 2016 compared to 2007. From 2010 to 2016 a fluctuation (5 %, 6 %, 9 % and 8 % respectively) in referred cases to the CRP was demonstrated.

Table 1. Total coastal fatalities in the ten years spanning 2007 to 2016, including numbers remaining following each sift and those assessed by the Casualty Review Panel.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Fatalities	367	330	403	357	410	429	437	429	413	382
Maritime Accident Fatalities	134	96	120	95	120	147	155	162	120	123
Sift 1	23	16	9	12	21	23	15	17	29	18
Sift 2	26	32	52	50	39	47	66	74	69	81
Sift 3	30	3	8	1	16	34	51	47	1	1
No. sent to CRP	59	46	51	32	44	43	23	25	37	32
TF/CRP* (%)	**16**	**14**	**13**	**9**	**11**	**10**	**5**	**6**	**9**	**8**

*** TF/CRP (%) =** Fatalities reviewed by the CRP as a percentage of the total fatalities for that year.

Of the 392 fatalities considered by the CRP in the 10-year span, 24 % (93) were categorised "Probably" i.e. The casualty ***probably*** would have been saved by wearing a lifejacket or buoyancy aid that was correctly maintained, correctly worn and fit for purpose; 22 % (87) were categorised "Possibly" i.e. The casualty ***possibly*** would have been saved by wearing a lifejacket or buoyancy aid that was correctly maintained, correctly worn and fit for purpose and 10 % (40) were categorised "Unlikely" i.e. It is ***unlikely*** that the casualty would have been saved by wearing a lifejacket or buoyancy aid that was correctly maintained, correctly worn and fit for purpose. The remaining 44 % (172) were classified as having 'no information' (not enough information to make a judgement), or not being appropriate or relevant. It was therefore considered appropriate to remove these data (172 cases). The remaining 220 cases demonstrated that a potential of 180 lives

(82 % of cases relevant for consideration, 42 % ‘Probably’ and 40 % ‘Possibly’) could have been saved by the use of a lifejacket. When these data (220) are considered by year, a downward trend is demonstrated until 2012, where a spike is observed, the data then fluctuate from 2013 to 2016, with the lowest number of cases in 2013 (Figure 2).

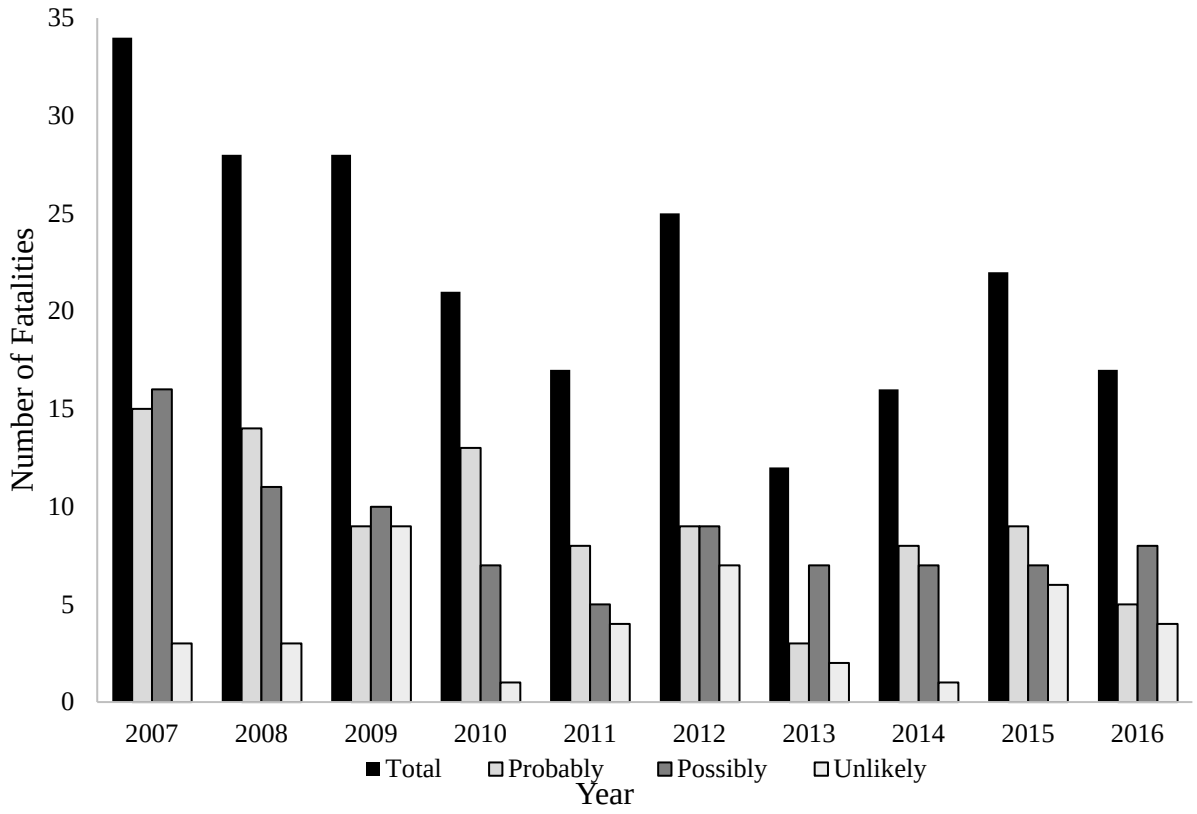


Figure 2. Number of fatalities categorised by outcome (“Probably”, “Possibly”, “Unlikely” and “Total” = the sum of the three categories) and year (n = 220). *NB: The remaining fatalities not reported in Figure 2 relate to cases deemed ‘no information’, ‘not appropriate’ or ‘not relevant’.*

Activity data

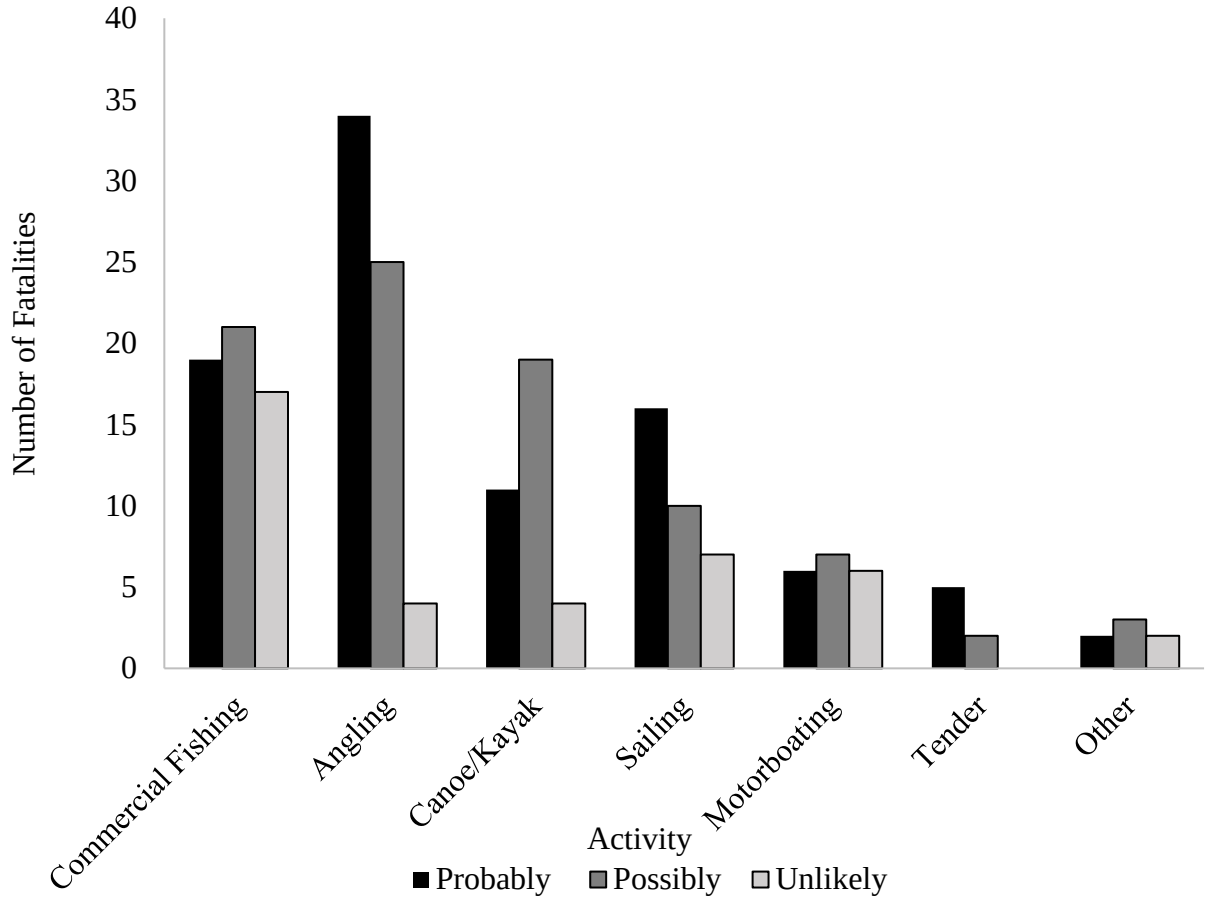
22 % (87) of all fatalities over the 10-year period occurred as a result of commercial fishing incidents (Table 2). Angling had the second highest fatality rate with 19 % (75) and Tender (a small boat used to service or support other boats or ships, generally by transporting people and/or supplies to and from shore or another ship) demonstrated the lowest with two fatalities occurring in 2015 and 2016. The number of fatalities in each category fluctuated across the 10-year period (Table 2). The category ‘Other’ in Table 2 includes fatalities resulting from: Unknown activity, Canal boating, Beach activities, Rowing, Inflatables, Waterside activity, Tombstoning, Water-skiing, Wakeboarding, Windsurfing, Kitesurfing, Misadventure, and Swimming.

Table 2. Total coastal fatalities (2007 - 2016), categorised by activity, and year reviewed by the Casualty Review Panel.

		Years										
Activity	**Outcome**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
Commercial Fishing	Probably	2	2	6	0	3	0	2	1	2	1	
	Possibly	4	4	2	3	1	0	0	1	2	4	
	Unlikely	0	1	4	1	1	4	1	0	4	1	
	Unclassified	1	5	3	1	2	4	1	3	4	6	
	Total	7	12	15	5	7	8	4	5	12	12	**87**
Angling	Probably	6	5	0	4	2	5	1	4	4	3	
	Possibly	2	2	7	1	2	4	4	2	0	1	
	Unlikely	1	0	0	0	0	1	0	1	0	1	
	Unclassified	0	0	2	1	2	0	1	1	4	1	
	Total	9	7[1]	9	6	6	10	6	8	8	6	**75**
Canoe/Kayak	Probably	2	NRC	2	5	0	1	0	1	0	1	
	Possibly	3		0	0	2	5	3	4	1	1	
	Unlikely	0		3	0	1	0	0	0	0	0	
	Unclassified	1	1	0	3	6	3	0	NRC	4	4	
	Total	6	1	5	8[3]	9	9	3	4	5	6	**57**
Sailing	Probably	3	7	1	3	1	1	0	1	1	0	
	Possibly	2	3	1	1	0	0	0	0	2	1	
	Unlikely	1	1	1	0	0	2	1	0	1	0	
	Unclassified	6		2	0	2	6	5	0	2	1	
	Total	8	10	5	4[1]	3	9[1]	6	1	6[2]	2	**59**
Motor boating	Probably	2	0	0	1	0	2	NRC	1	2	0	
	Possibly	4	2	0	0	0	0		0	1	0	
	Unlikely	1	0	1	0	2	0		0	1	1	
	Unclassified	1	0	1	0	4	5	4	4	1	2	
	Total	8[4]	2	2	1	6[2]	7	4[1]	5	5[2]	3	**43**
Tender	Probably									0	0	
	Possibly								NRC	1	1	
	Unlikely									0	0	
	Unclassified									0	0	
	Total									1	1	**2**
Other	Probably	0	0	NRC	0	2					0	
	Possibly	1	0		2	0				NRC	0	
	Unlikely	0	1		0	0					1	
	Unclassified	16	12	15	6	11			1		1	
	Total	17[2]	13	15	8[1]	13			1		2	**69**
	Total each year	**59**	**46**	**51**	**32**	**44**	**43**	**23**	**25**	**37**	**32**	**392**

NB: Subscripted numbers indicate the number of female fatalities.

184 Angling reported the highest number of cases falling into the categories ‘Probably’, ‘Possibly’,
185 and ‘Unlikely’ (63/75). Of these cases 54 % (34) were classified as ‘Probably’ 40 % (25) as
186 ‘Possibly’ and 6 % (4) as ‘Unlikely’ (Figure 3). All of the activities reported in Figure 3
187 demonstrate a similar trend with the cases classified as ‘Probably’ or ‘Possibly’ exceeding an
188 ‘Unlikely’ categorisation. The group ‘Other’ had the same number of ‘Probably’ and ‘Unlikely’
189 cases (Figure 3).



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192 **Figure 3.** Number of fatalities categorised by outcome (“Probably”, “Possibly”, “Unlikely”) and
193 activity for the 10 year period (n = 220). *NB: The remaining fatalities not reported in Figure 3 are*
194 *cases deemed ‘no information’, ‘not appropriate’ or ‘not relevant’.*

Age and sex

Of the total number of fatalities considered by the CRP, 79 % (309) were male, 5 % (20) female and in 16 % (63) sex was not reported. The activities in which the female fatalities occurred are highlighted in Table 2. Age was available for 63 % (245) of the fatalities reported to the CRP (Figure 4). Table 3 details the age categories with respect to the activity in which the fatality occurred.

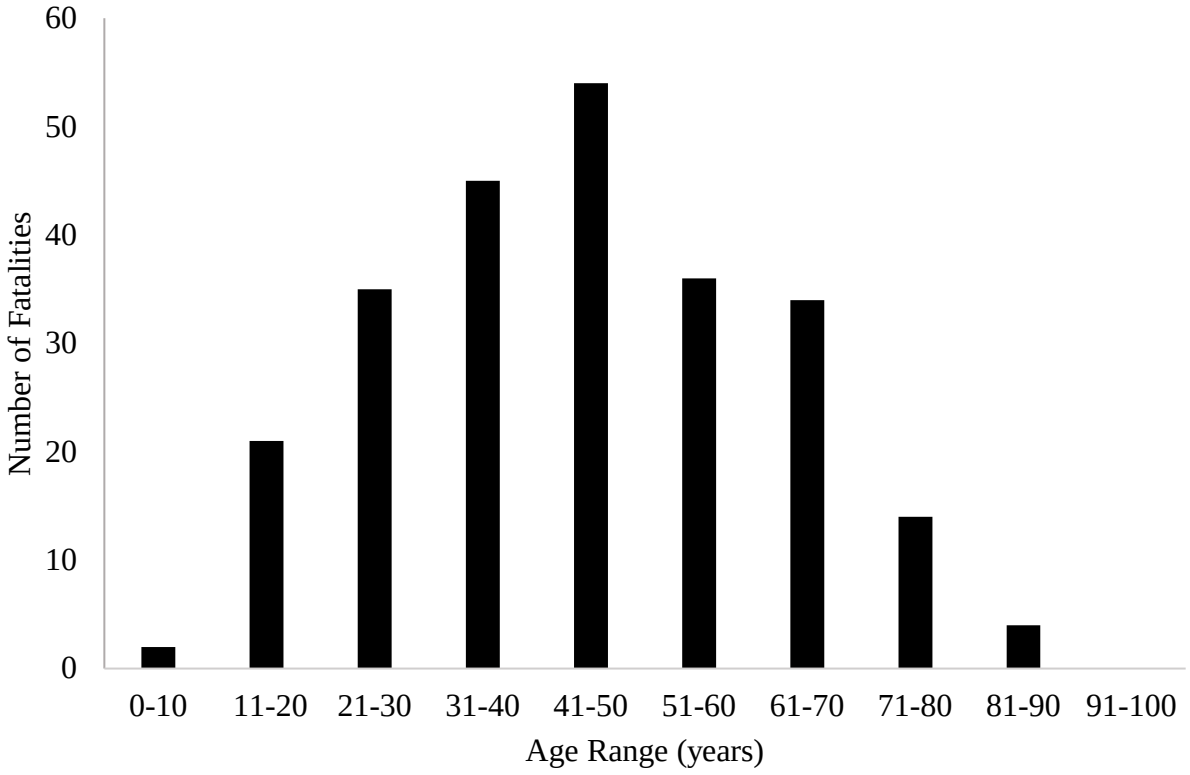

Figure 4. Age range of fatalities (n = 245).

Table 3. Age categories with respect to the activity in which the fatality occurred (n = 245).

	Age (years)									
Activity	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Sailing	2	2	1	4	5	8	9	8	0	0
Commercial Fishing	0	2	11	16	14	3	3	0	0	0
Canoe/Kayak	0	3	7	4	11	10	1	0	0	0
Angling	0	2	6	11	10	9	10	1	1	0
Motor boating	0	5	3	4	7	4	4	3	0	0
Tender	0	0	0	0	2	0	0	0	0	0
Other*	0	7	7	6	5	2	7	2	3	0

Discussion

The data generated by the CRP provides a unique insight into coastal deaths in the UK. It provides details of the number of deaths, the range of activities and relative risk of different maritime activities and the ages of those who died. It also provides an informed estimation of the number of people who would have survived an immersion had they been wearing a lifejacket in a situation where it was appropriate. In the 10 years that the CRP has been running this estimation suggests that 180 lives could have been saved by the use of a lifejacket. This number accounts for 47 % of *all cases* reviewed, which is similar to earlier data that suggested 50 % of all fatalities could be prevented with the use of a lifejacket in recreational boaters (Cumming *et al.* 2011). The corresponding figure for just the 220 cases that were relevant and had sufficient information to make an informed decision is 82 % (42 % ‘Probably’ and 40 % ‘Possibly’).

In agreement with Schmidt et al., (2016) the CRP acknowledge that the preservation of life is not solely reliant on the use of a lifejacket and other interventions such as the: ability to communicate the location of an accident; addition of a dry suit and personal locator beacons would contribute to increase survival rates.

Angling was reported to have the highest number of fatalities over the 10-year period; this higher absolute number most likely corresponds with the high participation rates reported in the UK. Participation rates are estimated at 9 % of the population (4.2 million); with approximately 134,000 participating once a week and 980,000 once a month. Angling is the 16th highest participation sport in England in terms of weekly participation and 6th in monthly participation (Brown *et al* 2012). In terms of sports where a lifejacket could be implemented it is number one. Thus, the number of fatalities occurring in Angling as a percentage of participation is approximately the same as that in canoeing/kayaking where is estimated that participation in 2013 was approximately 1.3 million people (Arkenford Ltd 2013).

A limitation of this study was the fact that 43 % of cases referred to the CRP did not have enough information *i.e.* not recorded, or were not appropriate or relevant and, therefore, it is not known whether a lifejacket could or could not have saved a life. As a consequence, it is possible that the true figure for preventable fatalities lies somewhere between 47 % and 82 %. Improvements in the quality and completeness of the data obtained will enable this percentage to be determined with increased confidence.

It is concluded that, although a time-consuming and laborious process, the data generated by the CRP over the ten years it has been in existence has proved invaluable. It has provided a unique insight into coastal deaths, it has provided a clear rationale for the use of lifejackets and has helped target national and activity-specific campaigns for water safety and lifejacket use.

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