

**SURVEILLANCE OF WORK RELATED MORTALITY AMONG  
SEAFARERS EMPLOYED ON BOARD ISLE OF MAN  
REGISTERED MERCHANT SHIPS FROM 1986 TO 2005**

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**ABSTRACT**

**Background:** The Isle of Man is a UK crown dependency able to operate a category 1 shipping register, permitting its marine administration to register vessels of unlimited size and tonnage. Little is known about work related mortality among seafarers who are employed in Isle of Man registered shipping.

**Objectives:** To establish the causes and circumstances of all work related deaths among seafarers who were working on board Isle of Man registered ships during the 20 year period from 1986 to 2005, to compare mortality rates with those in other merchant fleets, and to discuss preventative measures.

**Methods:** A longitudinal population based study, based on examination of death inquiry files, and information from marine investigations of fatal accidents.

**Results:** Over the 20 year study period, there were 65 work related deaths identified among seafarers employed in Isle of Man shipping. These deaths were caused by disease (20), accidents (34), suicide (2) and from unexplained circumstances (9). The mortality rate for accidents occurring at work was 53 per 100 000 seafarer-years for the

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seven years 1990, 1991, 1993-1997. Over the 18 years from 1988 to 2005 it was estimated at 44 per 100 000, while for confirmed suicides the suicide rate was estimated at 1.3 per 100 000.

**Conclusions:** Although the fatal accident rate was higher in Isle of Man shipping than in the national UK fleet; compared with those in other merchant fleets internationally, the fatal accident and suicide rates in the Isle of Man fleet are quite low.

**Key words**

merchant shipping, seafarers, Isle of Man, fatal accidents, mortality rates

## INTRODUCTION

Merchant seafaring has for long been identified as a particularly hazardous occupation,[1-5] and also as a high risk occupation for suicide.[3,6-8] Since seafarers are subject to medical examinations in order to work at sea and also because of the healthy worker effect, they are generally at reduced risks of death from disease at work.[9,10] However since there is a lack of medical facilities and care on board most merchant ships, and because of logistical problems associated with evacuating sick seafarers ashore to hospital, they can be at increased risk of death from very acute disorders,[10] and can also suffer from high case fatality.[9,11]

The Isle of Man shipping registry is a UK crown dependency able to operate a category 1 shipping register, permitting its marine administration to register vessels of unlimited size and tonnage. In 2005 the Isle of Man fleet comprised of 363 ships of 100 gross tonnes or more, mostly cargo carrying ships, which had increased by over three fold from 114 ships in 1988.[12,13] Unlike many maritime registries throughout the world, the Isle of Man Marine Administration (IMMA) records the deaths and investigates accidents that occur among seafarers who are employed in their registered ships. However, there have been no published population based studies of work related mortality among seafarers in the Isle of Man fleet.

The aim of this study was to investigate work related mortality among seafarers who were employed in Isle of Man registered merchant ships during the 20 year period from 1986 to 2005. The first objective was to establish the causes and circumstances of all deaths that occurred among seafarers who were employed in the Isle of Man fleet. Further objectives were to analyse the causes and levels of mortality, to compare fatal accident and suicide rates with those in other merchant fleets throughout the world, and to discuss preventative measures and implications for maritime health.

## METHODS

Details of deaths that occur at work among seafarers who are employed in Isle of Man registered ships are sent by the IMMA to the Registry of Shipping and Seamen (RSS) in Cardiff for the purposes of registering the deaths. In this study, details of all deaths of crew in Isle of Man ships were identified from paper death inquiry files held at the RSS, from electronic and narrative data provided by the principal British marine accident investigative authority, the Marine Accident Investigation Branch (MAIB), and from fatal accident inquiries that were published by the MAIB and the IMMA. Documents that were held in the RSS death files include deaths returns, official log books, post mortem examination reports, death certificates or extracts from deaths registers, marine inquiry reports, summaries of coroners' inquisitions, and various other documents.

Included in this study were all work related deaths among seafarers who were working on board Isle of Man registered merchant ships (of 100 gross tonnes or more) between 1986 and 2005; provided that the deaths arose at work or within 30 days of any discharge ashore to hospital as a consequence of an accident or illness at work. The study excluded deaths among non-crew members such as passengers, dock workers and harbour pilots, as well as deaths that occurred in Isle of Man registered fishing vessels, yachts and small vessels of less than 100 gross tonnes. The study period was from 1st January 1986 to 31st December 2005, inclusive. A total of 65 deaths met the study inclusion and exclusion criteria.

Of the 65 deaths, 20 were caused by disease. Ten of the causes of death for these 20 fatalities (50%) were based on autopsy examination, including six that were performed in the UK. Of the other 10 causes of death, four were obtained from death certificates and another from a ship's doctor, while the other five were obtained through ships' captains or through the Isle of Man Marine Administration.

## POPULATIONS AT RISK

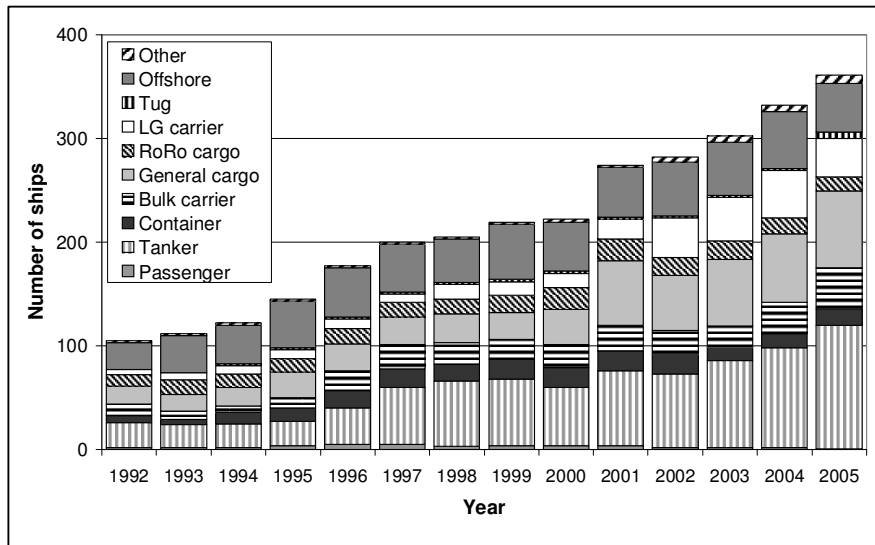
The population of seafarers annually employed in Isle of Man merchant ships was provided by the Isle of Man Marine Administration for the seven years; 1990, 1991 and 1993 to 1997. This amounted to a total of 20 875 seafarer-years, comprising 9368 seafarer-years for officers and 11 507 for ratings.

The population of seafarers employed in Isle of Man shipping was not available during the other years of the study period. However, during the seven years 1990, 1991

and 1993 to 1997 there was a total of 971 ship-years in the Isle of Man fleet corresponding with the 20 875 seafarer-years employed, with an average crewing level of 21.5 seafarer-years per ship.

To provide an estimate of the total population of seafarers in the Isle of Man fleet during the 18 year period for which Lloyd’s Register of Shipping has published details of the size of the Isle of Man fleet (1988 to 2005), the average crewing level was applied to the total number of ship-years during this period. This gave an overall estimate of 75 546 seafarer-years from 1988 to 2005, which has been used as a basis to estimate mortality rates. Figure 1 shows the number of ships in the Isle of Man fleet according to the type of ship; annually from 1992 to 2005.[12,13] Corresponding figures have not been available for the study period years from 1986 to 1991. Although the Isle of Man fleet has expanded considerably over time, it has comprised largely of tankers, general cargo and offshore ships throughout. Therefore as there appears to have been no radical restructuring of the fleet over time, the average crewing level should not have changed greatly, so that the estimated crewing populations at risk should be quite reasonable estimates.

**Figure 1 The number of ships in the Isle of Man registered merchant fleet according to the type of ship, annually from 1992 to 2005**



**Notes**

Refrigerated cargo ships are included with general cargo ships

## RESULTS

**Table 1 Causes of work related deaths among seafarers who were employed in Isle of Man registered merchant shipping, 1986-2005**

Cause of death	Number of deaths	(% of all deaths)
Deaths from disease:		
Infectious diseases	2	(3.1)
Circulatory diseases		
- Ischaemic heart disease	15	(23.1)
- Cerebrovascular disease	1	(1.5)
Disease not specified	2	(3.1)
Deaths from external causes:		
Accidents		
- Maritime disasters	9	(13.8)
- Occupational accidents	18	(27.7)
- Off-duty accidents	7	(10.8)
Suicide	2	(3.1)
Unknown circumstances		
- Drowned	3	(4.6)
- Missing	5	(7.7)
- Other	1	(1.5)
All deaths	65	(100.0)
All accidents at work *	33	(50.8)

\* All accidents at work refer to all accidents except traffic-related accidents that occurred ashore, and self-inflicted alcohol or drug intoxication.

Of the 65 deaths, 20 were caused by disease, 34 occurred through accidents and two from suicide (Table 1). The circumstances in which the other nine deaths occurred were inconclusive: five seafarers disappeared at sea, another disappeared from a ship in port,

two were found drowned following disappearances at sea, while the other seafarer died from intoxication with an open verdict recorded at a subsequent coroner's inquisition.

All 65 of the deceased were men. The mean age at death from disease was 48.7 years (SD = 7.5; range = 32-60 years) and the mean age at death from external causes was 40.3 years (SD = 10.5; range = 22-64). Of the 65 deaths, 22 (34%) occurred in port, and 43 at sea. Of the 22 deaths in port, 11 occurred in the UK, nine others in European countries, while the other two occurred in South America and North America respectively. The 43 deaths at sea occurred most frequently in the North Atlantic (15 deaths), the North Sea (5) and the North Pacific (4).

Twenty-two of the 65 deceased (34%) were British nationals, and 27 others (42%) were also European, largely from Poland (12), Russia (three), Latvia, Romania and the Ukraine (two each). Thirteen (20%) were Asian, mainly from the Philippines (nine) and Bangladesh (three), while the others were from Brazil (two) and the Caribbean. During the first 10 years of the study period 18 of the 24 deaths (75%) occurred among British nationals, while from 1996 onwards four of the 41 deceased (10%) were British.

#### DEATHS FROM DISEASE

Of 20 deaths from disease, 16 died from diseases of the circulatory system, two died from infectious diseases, while exact details of the other two causes of death from disease were not provided. The 16 deaths from circulatory diseases refer to ischaemic heart disease in 15 cases and stroke (one).

Of the 15 who died from ischaemic heart disease, nine (60%) were taken ill at sea, five were on board ships in port and one was ashore. Twelve of the 15 (80%) were off-duty at the time of onset. Seven of the 15 were in their cabins, four were in the mess room, three others were respectively on deck, on the quayside and presented at the ship's hospital with symptoms, while this information was not available in the remaining case. Four were found dead while the others died on board ships (10), or on the quayside (one), before they could be evacuated to hospital.

#### DEATHS FROM EXTERNAL CAUSES

Of 45 deaths from external causes, 17 died from injuries; of the head (five), chest (three), multiple injuries (six) and unspecified injuries (three). The other 28 died from drowning (11 cases) or were lost at sea (nine), asphyxiation (six), poisoning (one),

while the cause of death for the other, due prolonged immersion in seawater, was ascertainable at autopsy examination.

**Table 2 Causes of work related deaths according to the rank of the deceased, among seafarers who were employed in Isle of Man registered merchant shipping, 1986-2005**

Cause of death	Captain	Deck officer	Engineer	Deck rating	Engine room rating	Catering / steward / other	(Total)
Deaths from disease:							
Circulatory diseases	1	1	3	4	4	3	(16)
Other & unspecified diseases	1				2	1	(4)
Deaths from external causes:							
Maritime disasters	1	1	4	1	1	1	(9)
Occupational accidents							
- Asphyxiated in holds		1		3	1		(5)
- Falls on board				3			(3)
- Struck by heavy seas		1		2			(3)
- Struck by other objects		1	1	3			(5)
- Other		1		1			(2)
Off-duty accidents	1		1	2	1	2	(7)
Suicide			1		1		(2)
Unexplained causes		1	2	2	1	3	(9)
Total	4	7	12	21	11	10	(65)

Accidents have been classified into three categories. These are firstly, maritime disasters which refer to an incident involving the ship such as a collision, foundering or

fire; secondly, occupational accidents occurring among individual seafarers through their work duties; and thirdly, off-duty accidents that occurred when seafarers were off-duty. There were nine deaths from maritime disasters, 18 from occupational accidents and seven from off-duty accidents.

The nine deaths from maritime disasters refer to two separate incidents. Firstly, six lives were lost when a general cargo ship, carrying a cargo of steel plates, capsized and foundered in gales north off the Faroe Islands.[14] Five of the 11 crew were rescued. Secondly, three lives were lost when an explosion occurred in the pump room of a large oil tanker in the North Sea.

Of the 18 fatal occupational accidents, five were caused by seafarers being asphyxiated in cargo tanks and holds. These five deaths occurred in two separate incidents. In the first case, two seafarers lost their lives when engaged in tank cleaning operations in a chemical tanker. In the second case, a deck rating was killed after falling into a tank and two colleagues also perished during rescue attempts. One seafarer died after falling overboard and three others from falls on board, two of which were in cargo holds. Three seafarers were killed after being struck by heavy seas on deck, two of these died from injuries and the other was washed overboard. Five other seafarers died after being struck by other moving objects, while the other was killed during a lifeboat testing drill.

All but two of the 18 fatal occupational accidents (89%) occurred among deck ratings and deck officers (Table 2). All but three (83%) occurred in deep sea trading ships of 2000 or more gross tonnage (Table 3), while half occurred among British or Polish seafarers (Table 4). Fourteen of the 18 died on board their ships. The others, respectively, drowned, were lost at sea and died in hospital, while information on the location of one death was not available.

Of the seven fatal off-duty accidents, four were returning to ships in ports after drinking ashore. Two were returning in a dinghy that capsized, while the other two fell into docks when returning by foot. A fifth seafarer died from head injuries sustained through a fall after drinking heavily, another was drowned from a beach, while the seventh was struck by a motor vehicle ashore.

Two seafarers died from suicide, both from hanging. Of nine deaths from external causes in unexplained circumstances, five disappeared at sea. There were reported indications that at least two of these five deaths may have been caused by suicide. Another seafarer disappeared from a ship in port, while two others also went missing but were subsequently found drowned. The ninth was killed by alcohol and drug poisoning; with an open verdict returned at a subsequent coroner's inquisition.



Table 3 Causes of work related deaths according to the type of ship and trading sector, among seafarers who were employed in Isle of Man registered merchant shipping, 1986-2005

Cause of death	Coastal ships				Deep sea ships						(Total)
	General* cargo	Offshore	Other coastal ships*		Tanker *	Bulk carrier	Container ship*	General cargo*	Liquefied gas carrier*	Other deep sea ships*	
Deaths from disease:											
Circulatory diseases	2	1	3		4	1	1	2	1	1	(16)
Other & unspecified disease		1				1		2			(4)
Deaths from external causes:											
Maritime disasters					3			6			(9)
Occupational accidents											
- Asphyxiated in holds					2			3			(5)
- Falls on board						1		1	1		(3)
- Struck by heavy seas									2		(3)
- Struck by other objects		2			2		1				(5)
- Other	1							1			(2)
Off-duty accidents	1	1	2				1			2	(7)
Suicide					1		1				(2)
Unexplained causes		1			2	1	3	1		1	(9)
Total	4	6	5		14	4	8	15	5	4	(65)

\* Coastal ships are defined as of less than 2000 gross tonnes, deep sea ships as of 2000 gross tonnes or more. General cargo ships include one death in a RoRo cargo ship.

Table 4 Causes of work related deaths according to the nationality of the deceased, among seafarers who were employed in Isle of Man registered merchant shipping, 1986-2005

Cause of death	British	Polish	Other European	Asian	Other	(Total)
Deaths from disease:	6	1	6	6	1	(20)
Deaths from external causes:						
Maritime disasters	2		6		1	(9)
Occupational accidents	4	5	2	6	1	(18)
Off-duty accidents	5	2				(7)
Suicide	1		1			(2)
Unexplained causes	4	4		1		(9)
Total	22	12	15	13	3	(65)

#### MORTALITY RATES

During the seven years 1990, 1991 and 1993 to 1997 there were 11 fatal accidents that occurred at work among seafarers employed in Isle of Man registered merchant shipping; excluding one fatal non-work related traffic accident that occurred ashore. The corresponding fatal accident rate was 53 per 100 000 seafarer years. Four of these 11 fatal accidents occurred among officers (fatal accident rate = 43 per 100 000 seafarer-years) and seven among ratings (fatal accident rate = 61 per 100 000). During the same seven years, there were no suicides in the Isle of Man fleet.

Over the 18 year period from 1988 to 2005, there were 33 fatal accidents at work among seafarers in the Isle of Man fleet with a corresponding estimated fatal accident rate of 44 per 100 000 seafarer years. This estimated fatal accident rate fell non-significantly from 59 per 100 000 in 1988-1995 to 22 per 100 000 in 1996-2000, but increased non-significantly to 45 per 100 000 in 2001-2005. There was one confirmed suicide in the Isle of Man fleet during the period from 1988 to 2005, with a corresponding estimated suicide rate of 1.3 per 100 000.

When comparing fatal accident rates with those from studies of other merchant fleets, for improved comparability it is better to include deaths from drowning in

unexplained circumstances as fatal accidents. In the large majority of cases these deaths are most likely caused by accidents rather than by homicide or suicide. In the Isle of Man fleet there were three drowning in unexplained circumstances, two of which occurred in 1990. Therefore, for comparative purposes, the fatal accident rates were 62 per 100 000 for the seven years 1990, 1991, 1993-1997 and an estimated 48 per 100 000 from 1988 to 2005.

## DISCUSSION

This study, a 20 year investigation of 65 work related deaths in a defined population of about 80 000 seafarers is the first in-depth population based study of mortality identified for the Isle of Man merchant fleet. The study is based on deaths that are reported from the IMMA to the RSS in Cardiff: it is expected that almost all deaths in Isle of Man shipping would have been included in the study. The fatal accident and suicide rates identified in this study are quite low when compared with those in other merchant fleets. However, it should be recognised that comparing mortality rates across studies can be affected by variation in study inclusion criteria and in the measurement of the populations of seafarers at risk.

This study identified a fatal accident rate of 53 per 100 000 seafarer years for the seven years 1990, 1991 and 1993 to 1997, and estimated a fatal accident rate of about 44 per 100 000 for the 18 year period from 1988 to 2005. After including drowning in uncertain circumstances with fatal accidents, for the purposes of improved comparison of fatal accident rates with other studies, the corresponding fatal accident rates were respectively 62 (during 1990, 1991, 1993-1997) and an estimated 48 per 100 000 (from 1998 to 2005). These figures are substantially lower than rates of about 100 to 160 in the Hong Kong and Singapore fleets between 1981 and 1995.[15] They are more similar to or slightly lower than figures of 60 to 90 per 100 000 in Danish shipping between 1986 and 1993,[16] in Polish shipping from 1960-1999 and from 1990-1995,[4,17] and (estimated) for all British seafarers employed on board non-UK ships between 1986 and 1995.[18] However, the fatal accident rates in the Isle of Man fleet are slightly higher than rates of about 15 to 40 in the national UK fleet from 1986-2002,[8] and in Swedish shipping from 1984-1988,[19] although a higher percentage of seafarers in the UK and Swedish fleets were employed in passenger ships, which typically carry lower risks of fatal accidents than cargo carrying ships.[8,20]

As in other merchant fleets,[8,16] the large majority of fatal occupational accidents occurred among deck ratings and deck officers. They were also characterised by the recurrence of similar types of accidents, such as falls into or inside cargo holds, falls

overboard, being struck by heavy seas on deck, asphyxiation in cargo holds and through a lifeboat testing drill. Lifeboat testing drills are a recurring cause of both fatal and non-fatal injuries among many seafarers generally,[15,21-24] and are an area where safety procedures have been subject to clarification recently. As recommended previously,[8,16] prevention of fatal falls overboard and on board from heights would be improved by a more widespread use of personal flotation devices and safety harnesses; while asphyxiation in holds should be prevented by following the recommended enclosed space entry guidelines and by use of safety lines. Prevention of deaths from seafarers being struck by heavy seas on deck should be aimed at ensuring that ships are watertight on departure from port.[8,16]

Six of the seven fatal off-duty accidents were linked to alcohol consumption, and four of the seven occurred when seafarers were attempting to return to their vessels from ashore. In general, prevention of fatal accidents should be directed towards improved safety awareness among seafarers and shipping companies, observation of safety guidelines for various working procedures, reductions in hazardous working practices, the use of risk assessment, and improvements in the ship-shore access to small vessels in port.

Although full crewing population was not available for the entire study period, this study found limited evidence of a reduction in the fatal accident rate over time in Isle of Man registered shipping. In the national UK fleet there has been a sharp decline in the fatal accident rate since the late 1970s.[8] As consistent with studies of other populations of seafarers,[8,25-27] the fatal accident rate for ratings (61 per 100 000) was higher than for officers (43 per 100 000) during the seven years for which crewing information was available for the Isle of Man fleet. Over the entire 20 year study period, although crewing population was not available, a majority of fatal accidents (58%) occurred among ratings; indicating that the fatal accident rate would also have been slightly higher among ratings over the 20 years.

During the study period there were only two confirmed suicides in the Isle of Man fleet; with a corresponding work related suicide rate of 1.3 per 100 000 seafarer-years over the 18 year period from 1988 to 2005. However, since two or three of the disappearances at sea may well have also been caused by suicide, this indicates a suicide rate of about 1.3 to 4.2 per 100 000. This figure is relatively low when compared with those reported from other studies. For example, suicide rates ranging from 0 to 30 per 100 000 have been identified for the UK, Danish, Hong Kong, Polish, Singapore and Swedish merchant fleets in the last 30 years.[8,15,16,19,28], while an earlier study of Swedish shipping from 1945 to 1954 reported a work related suicide of 120 per 100 000,[3] and a study of Finnish seafarers from 1964 to 1977 reported an overall suicide rate (including deaths when signed-off the ship on shore leave) of 54 per 100 000 for

officers and 120 per 100 000 for ratings.[7] However, work related suicide rates appear to be much higher in deep sea inter-continental trading ships than in coastal and offshore trades,[8] as well as among ratings and catering crew compared to officers,[8,25-27] and they vary greatly between countries internationally and by latitude.[29] Therefore, suicide rates in a given merchant fleet are influenced by a number of pre-disposing factors, including the nationality of the seafarers and the predominant trading patterns.

In summary, although the fatal accident rate for seafarers employed in Isle of Man registered shipping is higher than in the national UK fleet, the fatal accident and suicide rates in Isle of Man shipping appear to be quite low when compared with those in other merchant fleets internationally.

## CONCLUSIONS

1. There were a total of 65 deaths identified for merchant seafarers who were employed in Isle of Man registered shipping from 1986 to 2005.
2. The fatal accident rate in the Isle of Man fleet is quite low when compared with those in other merchant fleets internationally. However, it was higher than in the national UK fleet.
3. Unlike the national UK fleet, there was limited evidence of a reduction in the fatal accident rate in Isle of Man fleet from 1988 to 2005.
4. The suicide rate in the Isle of Man fleet is low when compared with those in other merchant fleets.

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