Internat. Marit. Health, 2007, 58, 1 – 4

MORTALITY FROM DISEASE AMONG FISHERMEN EMPLOYED IN THE UK FISHING INDUSTRY FROM 1948 TO 2005

STEPHEN E. ROBERTS [1], SARAH E. RODGERS [1], JUDY C. WILLIAMS [1]

ABSTRACT

Background

Although commercial fishing has become established as the most hazardous occupation in Western countries, relatively little has been reported on mortality from disease among fishermen.

Objectives To investigate the causes of work-related mortality from disease in the UK fishing industry from 1948 to 2005, trends in mortality over time and how it varies according to the sector of the fishing industry, to investigate non-work related mortality among fishermen ashore, and to compare it with that in other populations.

Methods Examination of paper death inquiry files, death registers and death returns, as well as GIS mapping for a defined population of 1.45 million fishermen-years at risk.

[1] School of Medicine
Swansea University
Singleton Park, Swansea SA2 8PP
United Kingdom
Correspondence to : Dr Stephen E.Roberts, E-mail: Stephen.E.Roberts@swansea.ac.uk

Results From 1948 to 2005, there were a total of 449 work-related deaths from disease identified in the UK fishing industry, with a corresponding mortality rate of 30.9 per 100 000. The mortality rate increased from about 35 per 100 000 in the late 1940s to 60 in the early/mid 1970s but fell sharply to about 10 by the late 1970s. Most of the deaths were caused by ischaemic heart disease followed by other circulatory diseases, respiratory and gastrointestinal diseases. The highest mortality rates were identified for fishermen employed on board distant water trawlers, particularly those operating in Arctic waters.

Conclusions The study shows that fishermen in distant water trawlers, particularly in Arctic conditions, have the highest risks of mortality from disease. The high risks presumably reflect lifestyle risk factors as well as extremely hazardous and stressful working and sleeping conditions.

Keywords

Fishermen, UK fishing industry, mortality from disease, ischaemic heart disease, distant water trawlers

INTRODUCTION

In the last 40 years, commercial or trawler fishing has increasingly become recognised as the most hazardous occupation in Western countries. The high or excessive fatal accident rates and the unique occupational hazards have been documented quite heavily for fishing industries in the UK,(1-5) Poland,(6-8) Denmark,(9,10) Sweden,(11) Norway,(12) Iceland,(13) Australia,(14) New Zealand,(15) Canada,(16) Alaska,(17,18) and the USA.(19) In the UK fishing industry, fatal accident rates were often higher among the crews of larger distant water trawlers that operated mostly in Arctic waters off Iceland, Greenland, Norway, Bear Island and Newfoundland. For example, from 1958 to 1975, the fatal accident rate was almost twice as high among these trawlermen than among those fishing more locally in other sectors of the UK fishing fleet.(20)

The health of fishermen in the UK fishing industry has also been studied, particularly among those who were engaged in Arctic water fishing during the 1960s and 1970s.(21-24) At this time, MV Miranda, a UK weather advisory and communications ship with a doctor on board, was located in the Denmark Strait from December to April each year. However, there has been little reported on the causes and levels of mortality from disease among fishermen, either at work or when ashore.(5-8,25)

The first aim of this study was to identify the causes of all work-related deaths from disease among fishermen who were employed in the UK fishing industry from 1948 to 2005. Further aims were to investigate long term trends over time in work-related mortality from disease, to investigate mortality in different sectors of the fishing industry – such as Arctic water fishing – to investigate non-work related mortality among fishermen ashore, and to compare mortality among fishermen with those among other populations.

METHODS

Work-related deaths from disease among fishermen in the UK fishing industry are not usually registered with local registrars of deaths. Instead, they are usually registered separately at the Registry of Shipping and Seamen (RSS), previously the Registrar General for Shipping and Seamen (RGSS).

In this study, details of deaths from disease in the UK fishing industry from 1976 to 2005 were obtained through examination of paper death inquiry files and death registers that were held at the RSS. The causes and circumstances of the deaths were established from autopsy reports, death certificates, deaths registers, log books, death return forms and various other documents.

For the earlier period from 1948 to 1975, details of the deaths from disease were obtained from annual death returns that were based on the death files at the RSS. They included summary breakdowns of the numbers of deaths by cause of death and were published variously by the Ministry of Transport, Board of Trade, Department of Industry, Department of Trade and Industry and the Department of Trade.(26-30) For the period from 1965 to 1975, further details of these deaths were obtained from death registers held at the RSS.

INCLUSION CRITERIA

The study included all deaths from disease that occurred at work among commercial fishermen who were employed in UK registered fishing vessels between January 1st 1948 and December 31st 2005. From 1976 to 2005, the study also included work-related deaths that occurred ashore provided it occurred within 30 days of any discharge ashore. From 1948 to 1975, the study also included work-related deaths that

occurred ashore, but with no specified cut off period from discharge ashore to death. Deaths among “hobby” fishermen, who do not fish commercially, were excluded; as were all deaths in non-fishing vessels such as merchant ships and yachts.

POPULATION AT RISK

The numbers of fishermen employed annually in the UK fishing industry were obtained from annual publications produced by the former Ministry of Agriculture, Fisheries and Food (MAFF) for the period from 1948 to 1998,(31) and by DEFRA from 1999 to 2005.(32) There was an estimated total population of 1.45 million fishermen-years employed in the UK fishing industry from 1948 to 2005. The numbers of fishermen employed fell from 47 647 in 1948 to about 25 000 by the late 1960s, it remained constant at this level until the mid 1990s, but has fallen since to 12 647 fishermen in 2005. Disaggregated crewing information according to factors such as the age group and nationality of fishermen and type and size of fishing vessel is not known.

SECTOR AND FISHING PORT

Over the years, there has been substantial interest in how mortality among fishermen varies according to the size of fishing vessels and sectors of fishing industries. In the UK fishing industry, the port of Hull – and to a lesser extent Grimsby – have traditionally comprised largely of large distant water fishing vessels (conventionally defined as 140 feet or more in length) that operated in Arctic waters, while most other UK fishing ports have comprised of larger sectors of near and middle water fishing vessels that operated largely in or around UK waters.(31) The study therefore investigated work-related mortality from disease according to the sector of the fishing industry and the vessel’s port of registry. Details of the lengths of the fishing vessels and the ports of registry were obtained mainly from RSS and MAIB files, annual Olsen's Fisherman's Nautical Almanacs,(31) and through help with searching fishing vessel records from Seafish and the Department for the Environment, Food and Rural Affairs (DEFRA). Details of the numbers of fishermen employed in different ports and sectors of the UK fishing industry were obtained from annual death returns and from other published reports.(20,22,34)

FISHERMEN ASHORE

Separately, the study investigated mortality from disease among working-aged fishermen that occurred ashore and was not work-related. This information was obtained from publications produced by the Registrar General for England and Wales,(35) and the Office of Population Censuses,(36) respectively for the periods around the 1961 (1959-1963) and 1981 (1979, 1980, 1982, 1983) censuses. It covered fishermen who were resident in England & Wales in the 1961 census and in Great Britain (England, Wales and Scotland) in the 1981 census. Comparison of mortality with the corresponding male working aged populations of England and Wales was made using standardised mortality ratios (SMRs). Other methods used include using a Geographical Information System,(35) to map the locations of deaths and cause specific mortality rates for various diseases, using the International Classification of Diseases, versions 7 to 10 (ICD-7 to 10).

RESULTS

From 1948 to 2005, there were 449 identified work-related deaths from disease identified in the UK fishing industry, with a corresponding mortality rate of 30.9 per 100 000 fishermen-years. Cause of death information was available from 1965 to 2005 (Table 1). Of the 212 deaths during this period, most (176; 83%) were from circulatory diseases, followed by respiratory diseases (13) and gastrointestinal diseases (5). Of the 212 deaths from circulatory diseases most (69%) were caused by ischaemic heart disease (IHD), while deaths from respiratory diseases were caused mainly by pneumonia and chronic obstructive pulmonary disease (Table 1).

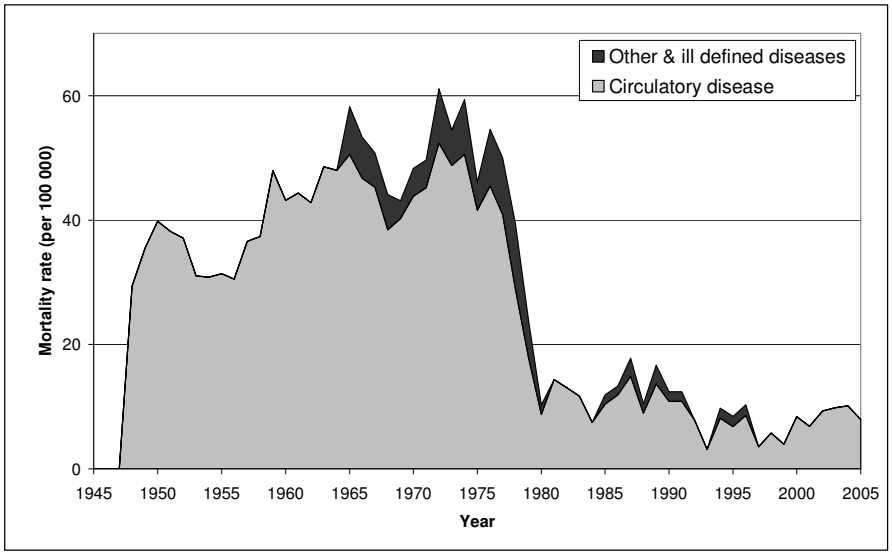
Table 1 Causes of work-related deaths from disease among fishermen employed in the UK fishing Industry, 1965-2005

Cause of death	ICD-10 code	No. of deaths	(Mortality rate per 100 000 fishermen-years)
Circulatory diseases:			
- Ischaemic heart disease	I20-I25	147	17.2
- Stroke	I61-I69	6	0.7
- Subarachnoid haemorrhage	I60	3	0.4
- Other circulatory diseases	I00-I19, I26-I60, I61-I99	20	2.3
Respiratory diseases:			
- Pneumonia	J12-J18	7	0.8
- Chronic obstructive pulmonary disease	J40-J44, J47	3	0.4
- Other respiratory diseases	J00-J11, J19-J39, J45, J46, J48-J99	3	0.4
Gastrointestinal diseases	K00-K93	5	0.6
Malignancies	C00-C97	4	0.5
Diseases of the nervous system	G00-G99	3	0.4
Endocrine and metabolic disorders	E00-E90	2	0.2
Ill defined diseases	R99	9	1.1
Total		212	24.8

TRENDS IN MORTALITY

Figure 1 shows the trend in the mortality rate for disease in the UK fishing industry from 1948 to 2005. This shows an increase from about 35 per 100 000 fishermen-years in the late 1940s 1948 to about 60 per 100 000 in the early 1970s, but then a very sharp reduction to about 10 per 100 000 by the late 1970s. Since then the mortality rate has levelled-off. From the early/mid 1970s there was a sharp reduction in mortality from both circulatory and non-circulatory diseases.

Figure 1Trends in work-related mortality from disease among fishermen employed in the UK fishing industry, 1948-2005



Note: It was not possible from the available information sources to distinguish deaths from circulatory disease with those from other diseases for the years from 1948 to 1964

GEOGRAPHICAL LOCATIONS OF DEATHS

Figure 1a and 1b show the geographical locations of all work-related deaths from circulatory diseases and from other and ill defined diseases in the UK fishing industry, separately for the two periods 1965 to 1979 and 1980 to 2005. During the earlier period from 1965 to 1979, the UK fishing fleet comprised of a large distant water trawler sector. During these years, many of the deaths occurred in or near Arctic waters, particularly off Iceland (Figure 2a). From 1980 to 2005, when the UK fishing fleet comprised largely of near and middle water vessels, there was much less mortality from disease and fewer of the deaths occurred in distant waters from the UK.

Figure 1a The locations of work-related deaths from disease among fishermen employed in the UK fishing industry, 1965-1979

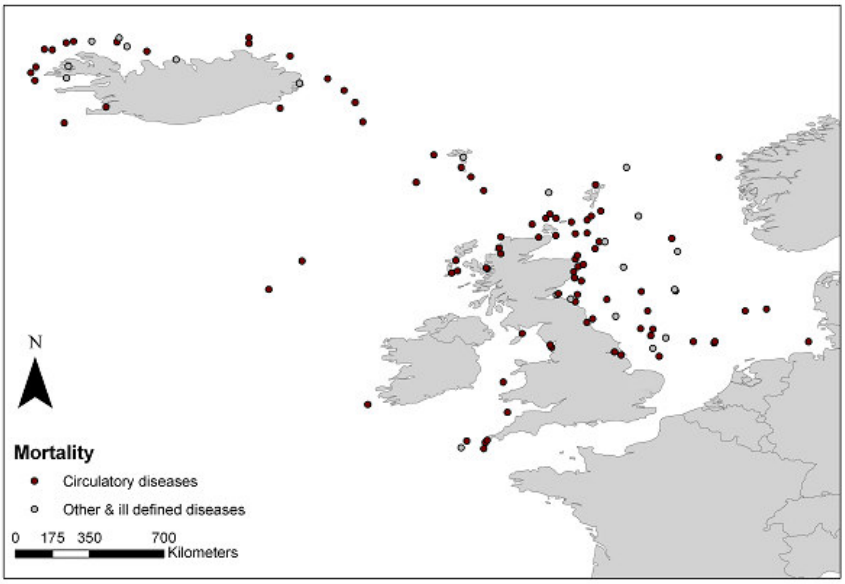
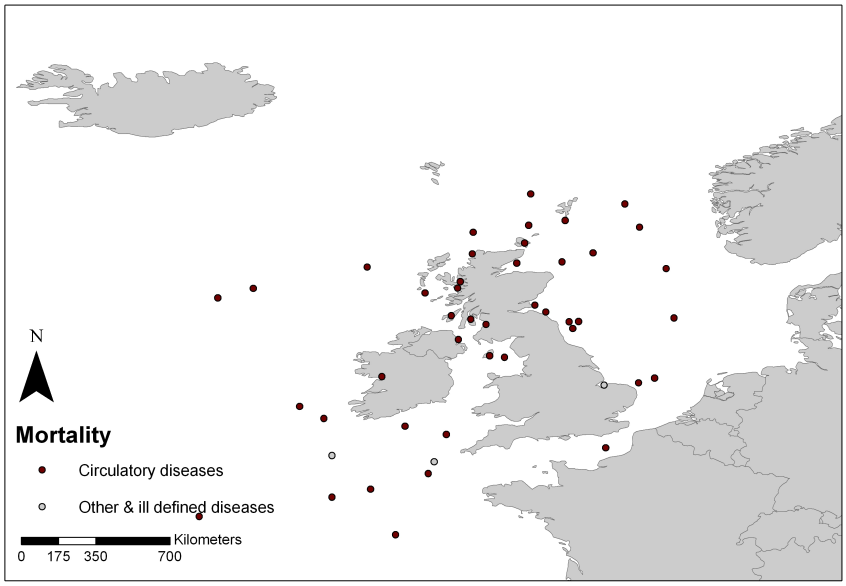


Figure 1b The locations of work-related deaths from disease among fishermen employed in the UK fishing industry, 1980-2005



Note: The locations of 16 deaths at sea from 1965 to 1975 were not available.

MORTALITY ACCORDING TO SECTOR AND FISHING PORT

During the period from 1965 to 1975 when Arctic water trawling was prevalent, a total of 124 deaths from disease arose in the UK fishing industry. A majority of these fatalities (66; 53%) involved the crews of distant water trawlers (>104 foot) and 36 (29%) occurred in or near Arctic waters (latitude > 63 O north).

Based on a population of 2,900 fishermen employed on board distant water trawlers in 1975,(19) from 1965 to 1975 the overall mortality rate was 207 per 100 000 fishermen-years for all diseases among distant water fishermen, 132 per 100 000 for IHD and 13 per 100 000 for cerebrovascular disease, for all other circulatory diseases and for pneumonia. These figures are very much higher than corresponding figures for the near and middle water sectors of the UK fishing industry; all diseases (26 per 100 000), IHD (18), cerebrovascular disease (0.4), all other circulatory diseases (4.0) and

pneumonia (0.4).

During the 1960s and the early 1970s the Hull fishing fleet comprised almost exclusively of distant water trawlers, including most of the UK distant water fleet that operated in Arctic waters. From 1965 to 1975, there were 29 deaths from disease among Hull trawlermen, including 16 from IHD and four from stroke. Based on a population of 2049 Hull trawlermen in 1973,(22) corresponding mortality rates from 1965 to 1975 were as follows; all diseases (129 per 100 000), IHD (71 per 100 000) and cerebrovascular disease (18 per 100 000). In contrast to Hull's distant water trawlers, the Lowestoft fleet comprised largely of near and middle water trawlers,(29) with seven deaths from disease identified among their crews from 1965 to 1975. Based on a population of 1200 Lowestoft fishermen in 1966,(34) their mortality rates were more modest at 53 per 100 000 for all diseases and 38 for IHD.

MORTALITY AMONG FISERMEN ASHORE

Table 2 shows the numbers of non-work related deaths from disease that occurred ashore among working-aged fishermen who were resident in England and Wales during the five years from 1959 to 1963 and in Great Britain during the four years 1979, 1980, 1982 and 1983. The SMRs show that the fishermen had high risks of mortality for many diseases although, because of low numbers of cases, these risks were not always significantly higher than in the general population.

Table 2 Numbers of (non-work related) deaths from disease and corresponding standardised mortality ratios (SMRS) for working-aged fishermen in England and Wales (1959-1963) and in Great Britain (1979, 1980, 1982, 1983)

		1959-1963			1979, 1980, 1982, 1983	
Cause of death	ICD-9 code	No. of deaths	SMR		No. of deaths	SMR
Infectious diseases						
- Tuberculosis	001-018	12	2.00		-	-
- Syphilis	090-097	5	5.00		-	-
Neoplasms						
- All malignant neoplasms	140-239	178	1.56 *		-	-
- Gastric malignant neoplasms	151	29	1.93 *		-	-
- Respiratory malignant	162,163	96	1.88		73	3.38 *
- Genitourinary malignancies	179-189	-	-		9	1.93
- Leukaemia	204-208	3	1.00		0	0
Endocrine and metabolic diseases						
- Diabetes	250	3	1.50		-	-
Circulatory diseases						
- Chronic rheumatic heart	393-398	10	1.25		-	-
- Ischaemic heart disease	410-414	129	1.15 *		25	1.45
- Haemorrhagic stroke	431,432	-	-		11	4.14 *
- Ischaemic stroke	433,434	-	-		3	2.03 *
- Sub-arachnoid haemorrhage	430	-	-		3	1.21
- Aortic aneurysm	441	-	-		2	1.18
Respiratory diseases						
- Influenza	487	7	2.33		0	0
- Pneumonia	480-486	21	1.75		11	2.75 *
- Bronchitis	491,492	46	1.48		8	2.06
Gastrointestinal diseases						
- Gastric ulcer	531	4	2.00		-	-
- Liver cirrhosis	571	2	1.00		-	-
- Diseases of the pancreas	577	-	-		1	1.88
Genitourinary diseases						
- Nephritis and nephrosis	580-589	4	0.80		-	-

* Denotes significance at the 5% level

\- Denotes that this information was not available

During the earlier period, fishermen had significantly increased mortality from ischaemic heart disease (SMR = 1.15), respiratory (1.88) and all malignancies (1.56), and during the later period they had significantly increased mortality from haemorrhagic stroke (4.14), ischaemic stroke (2.03), respiratory malignancies (3.38) and pneumonia (2.75). Based on smaller numbers of deaths (four to 10 cases), the fishermen also had substantial (SMR>=2.0) but non-significantly increased risks of mortality from syphilis (SMR=5.00), tuberculosis (2.00) and influenza (2.33) during the earlier period, and chronic bronchitis (2.06) during the later period.

DISCUSSION

A major strength of this study is that it is one of the largest investigations of work-related mortality from disease among fishermen, covering over 400 deaths in a defined population of almost 1.5 million fishermen-years at risk. It covers a long 58 year study period from 1948 to 2005 to assess long term trends in mortality, it is based on extensive examinations of detailed death files for the last 30 years of this period, it uses standardised definitions of mortality and it is based on reliable information sources. The study also incorporates investigation of non-work-related mortality from disease among fishermen that occurred ashore

A limitation of the study is that there have been minor changes in the study inclusion criteria. From 1976 onwards, the study included work-related deaths ashore provided that they occurred within 30 days of discharge from the trawler. From 1948 to 1975, it is unclear as to any cut off time period that was used. Although most of the identified deaths were sudden or rapid deaths from ischaemic heart disease that occurred at sea, it is likely that some deaths from disease that occurred within 30 days of discharge ashore would not have been reported to the RSS and would not therefore have been picked up in this study of work-related mortality. Although this would probably amount to a relatively small number of cases, there is likely to have been some under case ascertainment of deaths, particularly in less acute situations.

It is also likely that there was some duplication of deaths that were registered or reported to the RSS with those that were registered by the local registrars of deaths ashore. However, this would almost certainly amount to a very small number of deaths. A further limitation is that the ages of the populations of the fishermen employed in the UK fishing industry was not known throughout the study period. It was therefore not possible to standardise mortality rates for age when investigating trends over time in mortality. However, most of the fishermen that were employed in the UK fishing

industry would have been relatively young throughout the entire study period.

The main causes of work-related death in this study were IHD, followed by cerebrovascular and other circulatory diseases, respiratory diseases and gastrointestinal disorders. Cardiovascular disease was the cause of most or all of the deaths from disease in studies of Polish deep sea, Baltic and small scale fishing.(6,7) Gastrointestinal and respiratory diseases were also the second and third leading causes of referral from disease after dental problems to the UK fishing hospital ship Miranda in Arctic waters from 1970 to 1976,(24) while gastrointestinal, cardiovascular and respiratory diseases have variously been reported as leading causes of morbidity among Grimsby fishermen,(21) Spanish fishermen,(38) and fishermen operating in seas around the Orkney,(39) and Shetland Islands.(40)

IHD, cerebrovascular disease and other circulatory diseases are often associated with lifestyle risk factors such as smoking, high saturated fat diets and obesity, as well high levels of stress. Heavy smoking,(41-44) obesity,(41,42) and high cholesterol levels,(41) have all been associated with European fishermen. Deep sea fishermen are also subjected frequently to high levels of work-related pressure and stress. This includes noisy, uncomfortable and cramped sleeping and working conditions on board trawlers, frequently heavy sea states as well as economic pressures to catch often dwindling stocks of fish that would sometimes jeopardise the trawlermens' livelihoods. Arctic water trawling, especially when undertaken using side trawlers in the Denmark Strait, presented a further set of severe hazards and challenges that have been documented heavily.(21,24,45-47) These include freezing conditions, sometimes accompanied by gales and storms, that left trawlers susceptible to "ice up" on deck, become top heavy and capsize. Many major disasters involving Hull trawlers occurred in freezing Arctic storms, including the Kingston Peridot (lost with 20 men, 1968), the Ross Cleveland (18 men, 1968), the Lorella (20 men, 1955), the Roderigo (20 men, 1955) and the Saigon (11 men, 1948). It is unsurprising that distant water trawlermen, usually operating in Arctic waters, had the highest rates of mortality from coronary artery disease in this study.

The causes of some deaths in this study are often linked directly to heavy alcohol consumption. These include gastrointestinal disorders such as liver cirrhosis, chronic and acute pancreatitis and upper gastrointestinal bleeds, and circulatory diseases such as stroke and subarachnoid haemorrhage, while prognosis for pneumonia is poorer among people who drink heavily. Heavy alcohol consumption,(7,48) and high rates of hospitalisation or treatment for alcoholism have been identified among Northern European fishermen.(49,50) Historically, heavy alcohol consumption among fishermen has been linked to fishing companies' provision of liquor on board UK fishing

'smacks'.(45) The profiles of increased non-work related mortality among fishermen ashore also appear to be associated with lifestyle risk factors.

The work-related mortality rates for disease in this study of the UK fishing industry (about 10 to 60 per 100 000 annually from 1948 to 2005) are much lower than mortality rates among the general population of working aged men ashore. For example, the overall mortality rate among working aged men in England and Wales is currently about 400 to 500 per 100 000 population. Similarly, a significantly reduced SMR of 0.46 was identified for acute MI at work among Polish deep-sea fishermen from 1985 to 1994.(25) The lower work-related mortality among fishermen is largely because of the healthy worker effect, whereby most unfit or sick fishermen would have left the fishing industry, either for other employment ashore or for incapacity benefits. Their deaths would not be included in this study. A complete picture of mortality from disease among fishermen would therefore have to be achieved by other means. Two options include a prospective study that follows up all fishermen after they leave the fishing industry or, alternatively, record linkage of fishermen's records at sea to national death certificates. Both options would require substantial resources and would have to overcome methodological hurdles, including identifying the crews of the increasing numbers of Anglo Spanish fishing vessels that operate in the UK fishing fleet.

The lower mortality rates among the crews of near and middle water fishing vessels than among those employed in distant water trawlers are consistent with findings from Polish studies.(6,7) These identified lower mortality rates from disease among fishermen employed in the Polish small-scale industry (3 per 100 000 fishermen-years) than in the deep sea (17 per 100 000) and Baltic Sea sectors (65 per 100 000). A study of both work-related and non-work-related deaths from disease among Grimsby fishermen in 1963 reported a very high mortality rate (407 per 100 000) although this was a bad year.(21)

The sharp reduction in work-related mortality in the UK fishing industry during the mid 1970s was caused mainly by the sharp decline in the distant water fishing sector at this time. As these trawlermen were typically at sea for at least three or four weeks at a time, this led to a large reduction in the exposure time at sea as well as sharp reductions in the hazards of operating side trawlers in Arctic conditions. Although the use of larger stern factors trawlers today reduces some of these hazards, with lifestyle risk factors, distant water trawling remains potentially a high risk occupation for major diseases.

CONCLUSIONS

1. From 1948 to 2005, there were a total of 449 work-related deaths from disease identified in the UK fishing industry, with a corresponding mortality rate of 30.9 per 100 000 fishermen-years.
2. The mortality rate increased from about 35 per 100 000 in the late 1940s to 60 per 100 000 in the early 1970s but, following a sharp decline in the distant water sectors during the mid 1970s, it fell sharply to about 10 per 100 000 by the late 1970s.
3. Elevated mortality rates were identified for trawlermen employed on board distant water trawlers, particularly those operating in Arctic waters. The high risks presumably reflect lifestyle risk factors as well as the particularly hazardous and stressful sleeping and working conditions on board side trawlers that operated in or around Arctic waters.
4. Although the replacement of side trawlers over time with larger stern trawlers has reduced some of the hazards of distant water fishing, with lifestyle risk factors, it is potentially a high risk occupation for major diseases.

ACKNOWLEDGEMENTS

The authors are grateful to the RSS for providing access to their death inquiry files, Alan Dean of Seafish, the Marine Accident Investigation Branch and DEFRA for help and advice with tracing UK fishing vessels. This study was supported by funding from the Maritime and Coastguard Agency. The views in this paper are those of the authors and not necessarily those of the Maritime and Coastguard Agency.

REFERENCES

1. Schilling RSF. Trawler fishing: an extreme occupation. Proc R Soc Med 1966; 59: 405-10.
2. Holland-Martin D. Trawler safety: final report of the committee of inquiry into trawler safety. London: HMSO, 1969.
3. Schilling RSF. Hazards of deep-sea fishing. Br J Ind Med 1971; 28: 27-35.
4. Reilly MSJ. Mortality from occupational accidents to United Kingdom fishermen 1961-80. Br J Ind Med 1985; 42: 806-14.

5. Roberts SE. Occupational mortality in British commercial fishing, 1976-95. Occup Environ Med 2004; 61: 16-23.
6. Jaremin B, Kotulak E, Starnawska M. Comparative study of the death during sea voyages among Polish seamen and deep-sea and boat fishermen. Bull Inst MaritTrop Med Gdynia 1997; 48: 5-22.
7. Jaremin B, Kotulak E. Mortality in the Polish small-scale fishing industry. Occup Med 2004; 54: 258-60.
8. Jaremin B, Rozprawa habilitacyjna (PhD Thesis) Zgony polskich marynarzy i rybaków podczas pracy na morzu w latach 1960-1999 - analiza zjawiska i wpływu środowiska pracy ze szcególnym uwzględnieniem orzecznictwa lekarskiego i możliwości prewencji. Annales Academae Medicae Gedanensis 2005; suppl 1.
9. Jensen OC. Analyse af anmeldte fiskeriulykker til Søfartsstyrelsen, 1988-1992 [Analysis of the reported fishing injuries to the Danish Maritime Authority, 1988-1992]. Esbjerg: Institute of Maritime Medicine, South Jutland University Centre, 1994.
10. Jensen OC. Health hazards while fishing in heavy weather. Occup Environ Med 1997; 54: 141.
11. Törner M, Karlsson R, Sæthre H, Kadefors R. Analysis of serious occupational accidents in Swedish fishery. Safety Science 1995; 21: 93-111.
12. Aasjord HL. Tools for improving safety management in the Norwegian fishing fleet. Occupational accidents analysis period of 1998 – 2006. Int Marit Health 2006; 57: 76-84.
13. Rafnsson V, Gunnarsdottir H. Fatal accidents among Icelandic seamen: 1966-86. Br J Ind Med 1992; 49: 694-9.
14. Driscoll TR, Ansari G, Harrison JE, Frommer MS, Ruck EA. Traumatic work related fatalities in commercial fishermen in Australia. Occup Environ Med 1994; 51: 612-6.
15. Norrish AE, Cryer PC. Work related injury in New Zealand commercial fishermen. Br J Ind Med 1990; 47: 726-32.
16. Hasselback P, Neutel CI. Risk for commercial fishing deaths in Canadian Atlantic provinces. Br J Ind Med 1990; 47: 498-501.
17. Schnitzer PG, Landen DD, Russell JC. Occupational injury deaths in Alaska's fishing industry, 1980 through 1988. Am J Public Health 1993; 83: 685-688.
18. Lincoln JM, Conway GA. Preventing commercial fishing deaths in Alaska. Occup Environ Med 1999; 56: 691-695.
19. National Institute for Occupational Safety and Health. Preventing drownings of commercial fishermen. Cincinnatti, USA: US Department of Health and Human Services, National Institute for Occupational Safety and Health, 1994.
20. Department of Trade. Shipping casualties and deaths: vessel registered in the United Kingdom, returns for 1975. London: HMSO, 1976.

21. Moore SR. The mortality and morbidity of deep sea fishermen sailing from Grimsby in one year. Br J Ind Med 1969; 26: 25-46.
22. Richardson WT. Morbidity, diseases and accidents among fishermen. Bull Inst Marit Trop Med Gdynia 1975; 26: 165-74.
23. Grainger CR. Some mortality data for Grimsby "lumpers" and fishermen. Bull Inst Marit Trop Med Gdynia. 1992; 43: 51-5.
24. Cross T. The health of British trawlermen on the Arctic fishing grounds. J Soc Occup Med 1985; 35: 55-61.
25. Jaremin B, Kotulak E. Myocardial infarction (MI) at the work-site among Polish seafarers. The risk and the impact of occupational factors. Int Marit Health 2003; 54: 26-39.
26. Ministry of Transport. Shipping casualties and deaths: vessels registered in the United Kingdom, returns for 1949-63. London: HMSO, 1950-1964.
27. Board of Trade. Shipping casualties and deaths: vessels registered in the United Kingdom, returns for 1964-68. London: HMSO, 1965-1969
28. Department of Trade and Industry. Shipping casualties and deaths: vessel registered in the United Kingdom, returns for 1969-71. London: HMSO, 1970-1972.
29. Department of Industry. Shipping casualties and deaths: vessel registered in the United Kingdom, return for 1972. London: HMSO, 1973.
30. Department of Trade. Shipping casualties and deaths: vessel registered in the United Kingdom, returns for 1973-75. London: HMSO, 1974-1976.
31. MAFF (Ministry of Agriculture, Fisheries and Food). United Kingdom sea fisheries statistics, 1948-1998 [annual reports]. London: HMSO, 1949-1999.
32. DEFRA (Department for Environment, Food and Rural Affairs). United Kingdom Sea fisheries statistics, 1999-2005 [annual reports]. London: HMSO, 2000-2006.
33. Olsens Fisherman's Nautical Almanac (annuals from 1965 to 1990). Scarborough: Dennis, 1966-1991.
34. Newhouse ML. Dogger Bank itch: survey of trawlermen. BMJ 1966; 1(5496): 1142-5.
35. Registrar General. The Registrar General's Decennial Supplement, England and Wales, 1961: Occupational Mortality Tables. London: HMSO, 1971.
36. Office of Population Censuses and Surveys. Occupational mortality: decennial supplement, 1979-80, 1982-83, Great Britain, part II [microfiche tables]. Series DS no.6, HMSO, London, 1986.
37. ESRI, 2002 ESRI, ArcGIS 9.2. Redlands, California: ESRI, 2006.
38. Morales-Suárez-Varela M, Llopis-González A, Garcia-Andrés J, Jiménez-López MC. A study of the health of seafaring workers of Valencia, Spain. Int J Occup Environ Health 1997; 3: 132-43.

39. Collacott RA. Risks to trawler fishermen: Orkney waters. J R Coll Gen Pract 1977; 27: 482-5.
40. Cadenhead R. Hospital admissions of fishermen from the fishing grounds around the Shetland Islands. J Soc Occup Med 1976; 26: 127-31.
41. Tomaszunas S. Smoking habit in fishermen and seafarers. Bull Inst Marit Trop Med Gdynia 1989; 40: 13-20.
42. Tomaszewski R, Dymnicki P, Flasinski J, Kliz J, Skwarlo B, Kapiszka T, Sokolowski A, Goljan J, Winnicka A. Studies on the risk of ischaemic heart disease in fishermen, seafarers and dockers. Bull Inst Marit Trop Med Gdynia 1990; 41: 21-6.
43. Heetveld MJ, de Visser W, Veerman DP, Bilo HJ, Montfrans GA. Increased risk of heart and vascular diseases in fishermen from Urk. Ned Tijdschr Geneeskd 1992; 136: 1251-5.
44. Lawrie T, Matheson C, Ritchie L, Murphy E, Bond C. The health and lifestyle of Scottish fishermen: a need for health promotion. Health Educ Res 2004; 19: 373-9
45. Tunstall J. The fishermen. London: MacGibbon & Kee, 1962.
46. Pugh LG. Isafjordur trawler disaster: medical aspects. BMJ 1968;1(5595): 826-9.
47. Gill A. Lost Trawlers of Hull: Nine hundred losses, 1835-1987. Beverley: Hutton, 1989.
48. Casson FF, Zucchero A, Boscolo Bariga A, Malusa E, Veronese C, Boscolo Rizzo P, Chiereghin F, Boscolo Panzin C, Mancarella P, Mastrangelo G. Work and chronic health effects among fishermen in Chioggia, Italy. G Ital Med Lav Ergon 1998; 20: 68-74.
49. Rix KJ, Hunter D, Olley PC. Incidence of treated alcoholism in north-east Scotland, Orkney, and Shetland fishermen, 1966-70. Br J Ind Med 1982; 39: 11-7.
50. Blaxter M. Shetland survey of alcohol problems in general practice. Shetland: Shetland Health Board and Medical Committee, 1979.