

## **The health of commercial fishers in England and Wales: Analysis of the 2011 Census**

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### **Abstract**

Studies of commercial fishing have shown that it is a hazardous occupation with high rates of injury and fatal accidents. Research has also identified a range of other health risks faced by fishers, yet the general health outcomes of fishers have not been compared to those of workers in other industries. This study aimed to assess self-reported health outcomes among workers in the fishing industry, and to compare this to those working in other industries. Drawing on 2011 census data for England and Wales we used generalised linear models to compare self-reported measures of 1) general health and 2) limiting long-term illness across industry categories, calculating odds ratios adjusted for age, geographic region and socio-economic profile of local authorities. Of the population working in 87 industry classes, those in category '03 Fishing and aquaculture' had the fifth highest rate of poor general health (2.8% reported 'bad' or 'very bad' health) and the sixth highest rate of reporting limiting long-term illness (10.3% reported their activities to be limited 'a lot' or 'a little'). Odds ratios adjusted for age, geographic region and socio-economic profile of local authorities showed that only two other industries demonstrated statistical evidence for higher odds of poor general health or limiting long-term illness than workers in fishing and aquaculture. This study demonstrates that fishing is among the industries with the poorest general health and limiting long-term illness outcomes in the UK, demonstrating the need for tailored occupational health services to support UK fishing communities.

**Keywords:** fishing; general health; limiting long-term illness; census; self-reported health

### **Introduction**

Commercial fishing is widely recognised as an inherently dangerous occupation. Historically, high rates of injury and mortality among fishers have been documented globally [1,2]. Despite efforts to improve health and safety, fishers remain more vulnerable to accidents and injuries than other

occupational groups because of persistent risks such as unpredictable weather conditions and operation of heavy machinery. Based on rates of fatal work-related accidents, fishing has been identified as Britain's most hazardous occupation [3].

Beyond physical accident and injury, fishers in both small-scale and large-scale fisheries worldwide are exposed to a range of health risks [4]. These health risks include chronic musculo-skeletal problems associated with heavy physical labour [5]; work-related health risks such as fatigue, exposure to contaminants and noise [6,7]; and lifestyle factors such as high levels of alcohol consumption, smoking, and poor diet [8]. Mental health problems such as anxiety and depression are increasingly documented among fishers [9,10]. Furthermore, anecdotal evidence suggests that fishers are less likely than other occupational groups to access healthcare, for example because of organisation constraints and prevalent social norms that discourage help-seeking [11].

Despite the widening focus of research into health in fishing communities, most studies of fishers' health focus on mortality or injury rates [3,12,13] and comparisons to other occupational groups rarely consider other health outcomes. Though some studies have made comparisons of specific health issues, for example HIV risk [14], it remains unclear whether general health outcomes for fishers are significantly worse than for workers in other occupations. Health is a vital asset for fisher wellbeing and underpins productivity in the fishing industry, yet many fishers are self-employed, lack access to benefits such as sick pay, and report working through ill health to meet financial commitments and social obligations [15]. A broader view of health outcomes among fishers is therefore needed to understand how fishers live and work with ill-health.

Identifying the health outcomes of fishers in comparison to other groups is challenging because of limited data availability. Unlike other seafaring occupations, to date there have been no requirements for health screening that cover all commercial fishers in the UK. Mortality studies have drawn on existing data from sources such as death certificates and coroners' files [16]. Some data on accidents and injuries are routinely collected through the reporting of marine casualties or serious

injuries to the UK Marine Accident Investigation Branch (MAIB). However, MAIB defines a serious injury as one that “renders the person unable to perform their usual duties for >72 hours, or requires their admittance to a hospital / medical facility for > 24 hours” [17], and therefore these data are limited in scope. Data on other health issues among fishers are not routinely collected.

Comparison of health outcomes across occupational groups is needed to inform decisions about whether tailored health service provision is needed for fishers. In the UK, some public health services have identified fishers as a group with high risk of poor health outcomes compared to the general population, leading to the development of targeted health services [18]. However, services vary by place, and research has identified gaps in provision [11,16]. This research contributes to addressing this evidence gap by assessing self-reported measures of 1) general health and 2) long-term illness or disability among fishers in comparison to workers in other industries, using 2011 census data for England and Wales.

## **Method**

### ***Research context***

The UK fishing industry has over 6000 registered vessels and an estimated 11,757 fishers [19]. Despite forming a small percentage of the UK economy (0.05% of GDP) [20], viable fisheries play an important role because they provide substantial benefits beyond their direct economic value [21,22]. Fisheries are critical in supporting the prosperity of coastal communities, and can be a major economic driver in rural areas that experience marginalisation and deprivation. This may be particularly true in England and Wales, where landings are more evenly distributed among ports, catches are more heavily dominated by inshore fisheries and shellfish, and there are a greater proportion of under 10 metre vessels, compared to fleets in Scotland and Northern Ireland [19]. England and Wales together are home to over 50% of individual fishers operating in the UK, accounting for approximately 30% of the weight landed and 35% of the value of landings by UK vessels [19].

### ***Data sources***

Data were obtained from the most recent census for England and Wales (2011), which counted and captured data on approximately 94% of the population [23]. Census data provides two measures of self-reported health. The first is a question on general health, which asks “How is your health in general?”, with the possible responses being: Very good; Good; Fair; Bad; or Very Bad. The second is a question on limiting long-term illness (LLTI), which asks “Are your day-to-day activities limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months? Include problems related to old age”, with the possible responses: Yes, limited a lot; Yes, limited a little; or No. Aggregated data on general health and LLTI for 26,681,568 usual residents aged 16 and over in employment the week before the census were obtained at local authority level for 346 local authorities (or merged local authorities where disclosure issues were encountered) in England and Wales. The Office of National Statistics (ONS) takes action to ensure anonymity of census data, including rounding or suppression of cell counts, adjusting small counts to protect confidentiality, or swapping of small numbers of records between geographical areas [24].

To compare health outcomes among occupational groups we used the UK Standard Industrial Classification (SIC), which classifies employment according to type of economic activity. The UK SIC is a hierarchical five digit system; ‘division’ level was the most detailed data available, comprising 87 industry divisions. Division A03 ‘Fishing and aquaculture’, which contains both marine and freshwater fishing and aquaculture, contained 5,660 people in England and Wales. Though we were unable to separate fishers from aquaculture workers, triangulation with other data sources suggests that in England and Wales there were 6,764 fishers in 2011 [19], and 1,215 employees in finfish and shellfish aquaculture in 2012 [25], together totalling 7,979 of which 85% were fishers. Though higher than numbers recorded in the census, we assume that the overall distribution among the two sectors is similar. This grouping also includes freshwater fisheries but this sector is very small, with only 308 commercial salmon and sea trout net licenses issued in 2011 [26]. Since cross-tabulated

counts of health by SIC division were not available in standard publicly available Census outputs, bespoke tables were commissioned and subsequently published by ONS [27,28].

Age group and geographical region were also sourced from the 2011 census. Socio-economic profile data of local authorities were sourced based on the proportion of people in the lowest ('DE') Approximated Social Grade, a metric calculated by the Office of National Statistics using the standard Market Research Society methodology [29] and based on 2011 census data for people aged 16–64. Sex was not included in the analysis because the majority of UK fishers are male. Though data are not routinely collected on employment by sex in fisheries, 96% of individuals in the UK 2011 census occupation category 5119 'Agricultural and fishing trades' were male [30]; this category contains 43% of individuals working in Division A03 Fishing and Aquaculture [31].

### ***Statistical analysis***

Generalised linear models were employed to identify whether fishers were more likely to report worse general health and LLTI outcomes than workers in other industries. General health and LLTI responses were categorised into binary variables. Across each unique strata of industry, age and local authority, 'Very bad' and 'Bad' general health responses were combined to indicate 'poor health', and 'Limited a lot' and 'Limited a little' were combined to indicate presence of LLTI. Remaining responses were combined to indicate 'good/fair health' and 'not limited' respectively. Counts of poor health and LLTI responses were converted to proportions of the total in each strata (where a strata consisted of all the permutations of local authority, age, and industry) and treated as successes in success/failure binomial models with a logit link function. General health and LLTI were modelled separately. In both models, industry was specified as an explanatory variable with age, geographic region and the proportion of people in Approximated Social Grade DE specified as covariate factors to control for potential confounding [32]. Model coefficients and 95% confidence intervals were transformed to odds ratios. All analysis was carried out in R [33].

### **Results**

Overall, 1.5% of census respondents in this analysis (i.e. employed individuals over 16 years old) reported having poor health, with fishing and aquaculture having the fifth highest rate of 87 industrial categories at 2.8% (Table **Error! Reference source not found.**1; see Table S1 for full list). Mining (coal and metal) and manufacturing (clothing, leather and textiles) industries also had high rates of poor general health outcomes, as did industry group 98 'Undifferentiated goods- and services-producing activities of private households for own use' which comprises a variety of subsistence activities.

In total, 7.3% of census respondents included here reported being limited a little or a lot by a long-term illness or disability (LLTI). Fishing and aquaculture ranked sixth highest of 87 industries, with 10.3% reporting LLTI (Table 1; see Table S1 for full list). Similarly to poor general health, people working in mining, manufacturing and subsistence household activities also had high rates of LLTI. Agricultural activities (industry group 01) also had a high incidence of LLTI, ranking third of all industries.

[TABLE 1 HERE]

The results of the generalised linear models for general health and LLTI outcomes among industry groups, controlling for age, region and socio-economic profile of local authorities are shown in Table 2 (see Tables S2 and S3 for full model results). Model diagnostics were performed and accepted. Age, region and socio-economic profile were important explanatory variables in both models.

The findings indicate that only two industry groups are statistically significantly more likely to report poor general health in comparison to fishing and aquaculture. Those employed in mining (coal or lignite) or subsistence household activities had statistically significantly greater odds than those in fishing and aquaculture of experiencing both poor general health and limiting long term illness (Table 2). For general health, five other industries had similar odds to fishers of poor general health outcomes. Seven other industries had odds of LLTI that were not statistically significantly different to the odds of LLTI in fishing and aquaculture (Table 2).

[TABLE 2 HERE]

## Discussion

Our analysis indicates that people working in the fishing industry have amongst the poorest health outcomes of all workers in England and Wales, after accounting for geographic location, age and local socio-economic profiles. Worse outcomes were only found in two other industries: coal mining, the dangers of which are well-documented [34]; and subsistence livelihoods, which comprise a small group about which little is known in the UK. Though fishing has previously been identified as a hazardous occupation with high rates of injury and fatal accidents [3], broader self-reported measures of general health and limiting long-term illness and disability among workers in fisheries have to date not been analysed in comparison to other UK industries.

While our analysis was unable to separate workers in fishing from those in aquaculture, this group is likely to comprise predominantly workers in the fishing industry (see Methods). Aquaculture and fishing are very different occupations, with aquaculture workers typically not facing the risks involved in going to sea, and we are not aware of any existing evidence to suggest that aquaculture is a particularly hazardous occupation. Consequently, this combined grouping may underestimate the extent of health problems among fishers. In the subsequent discussion, we therefore focus solely on fishers. We interpret the findings as suggesting that fishers are more likely than workers in most other industries to experience health problems that they consider to amount to ‘bad’ or ‘very bad’ health, and to experience illnesses or conditions that limit their everyday life to some extent on a long-term basis.

The census data offer two measures of self-reported health, and existing research demonstrates that such measures correlate well with objective clinical measures [35]. In the case of fishers, research suggests that there is some normalisation of ill health, a culture of working through illness or with injuries, and limited access to healthcare [36,37], which may mean that self-reported measures underestimate rates of poor health and LLTI. For example, a recent Australian study found that self-



reported perceived good health among fishers coincided with high levels of reported pain [38].

Normalisation of ill-health may also occur in other male dominated industries that showed high levels of poor general health and LLTI, including mining and agriculture [39].

Census data do not reveal the specific causes of these poor self-reported health outcomes, and there are few studies in the UK that have explored morbidity among fishers, either in general or for specific conditions [16]. UK studies have identified common health issues among fishers to include a range of common injuries, and various illnesses including cardiovascular, gastrointestinal, respiratory and dermatological conditions [16]. Studies elsewhere in Europe have highlighted the importance of common factors such as smoking, diet, long working hours and irregular sleep patterns [40–42]. A global review of health in fishing communities found that the physical complaints, mental health issues and lifestyle factors that have been explored in relation to fishers and fishing communities varied by place, reflecting local determinants of health as well as common occupational hazards [4]. In addition, fishers are a heterogeneous group and health complaints differ based on characteristics such as fishing patterns and working roles (e.g. skipper versus crew) [11,37]. Further research is therefore needed to understand the causes of poor self-reported health among UK fishers, in order to target interventions that support improved health.

While this analysis has the advantage of assessing the self-reported health status of the vast majority of people employed in fishing in England and Wales, a key limitation is that it is cross-sectional and only includes those employed in the week prior to the census. It therefore does not include people previously employed in fishing that have had to change industry, or those that have stopped working entirely due to poor health, long-term illness or disability. Given that qualitative evidence suggests there is an expectation among fishers that their activity will eventually be limited by ill health [11,15], the prevalence values reported here are likely to be underestimates. In addition, the census data captures only residents of England and Wales, and does not capture fishers who are not ordinarily resident in the UK. Non-UK workers filled 6% of jobs for English-registered vessels and 3%

for Welsh-registered vessels in 2017 [43]. Non-EEA fishers in particular may face challenges to accessing healthcare [44], and consequently may experience worse health than those represented in the census data. EU, EEA and non-EEA fishers form a particularly significant proportion of workers in the sector in Scotland and Northern Ireland, which are not included in this analysis. Further research is warranted to explore the health of fishers in Scotland and Northern Ireland, who make up 48% of UK sea fishers overall [19].

A comparative assessment across different industries is useful to help determine whether or not there is a need for occupational health support in the UK fishing industry. While health and safety improvements to prevent accidents and injuries have been recommended in UK fisheries, calls for specific occupational health support and medical screening have not been widely acted upon [16]. Taking further action to support the physical and mental health of fishers could help support fisheries productivity [45]; reduce fishers' vulnerability to changes and shocks [46]; and help to avoid unintended health impacts of fisheries policies and management interventions [9,10,47]. The findings of this study are therefore of relevance to both fisheries management and public health sectors.

Currently, the burden of ill health among fishers is often shouldered by families and communities, particularly women, who play an important role in encouraging others to seek healthcare and in making practical arrangements such as booking appointments [11,48]. Conventional delivery of public health services faces challenges in supporting fishers, both because service provision is not always compatible with the working practices of fishers, and because attitudes and norms among fishers can lead to reluctance to seek help [11]. Transdisciplinary collaborations to address these challenges are emerging from within the third sector, and can be informed by those in other male-dominated industries such as farming, seafaring and construction [49–52]. For example, farming industry bodies play an important role in bridging the gap between workers and healthcare providers by integrating health advice and resources with wider industry information [48]. A growing

number of local and national initiatives are emerging to support fishers, including specialised physiotherapy, quayside health checks, mobile dental services, online tools to support mental health, and priority access to National Health Service elective treatments [18,53,54]. Many of these are collaborative efforts involving fishers' welfare groups, mental health charities and public health bodies. The findings of this research strengthen the case for more widespread provision of such tailored occupational health support targeting fishers across England and Wales.

Though fishers represent a small proportion of the working population in England and Wales (<1%), fishing is an economically, socially and culturally important industry. Fisheries provide benefits to coastal regions that have faced rising in-work poverty, deprivation and socio-economic inequality over recent decades. This research is timely in the context of broader changes in the fishing industry, which include an ageing population of fishers, challenges in recruiting crew members and relative poverty among fishermen [55], policy uncertainty associated with the UK's exit from the European Union [56], and the risk that changing storminess in UK waters poses to fisher working conditions [57]. Many of these challenges may be associated with increased stress, anxiety and financial insecurity, and have the potential to encourage behavioural responses that may exacerbate health risks (e.g. employing fewer crew members, fishing in hazardous conditions). At the same time, the implementation of the Work in Fishing Convention (International Labour Organisation 188) is imminent, and will for the first time require all working fishers on commercial fishing vessels to hold a valid medical fitness certificate [58]. While this is a welcome measure to safeguard fishers' safety at sea, it must be supported by measures that promote good health, prevent limiting illness, and widen access to healthcare. In this context, a holistic understanding of long-term health outcomes in the fishing industry is essential to support a viable fishing industry in the future.

In summary, our findings indicate that poor health outcomes among fishers extend beyond the risk of fatal accidents to general health status and illnesses or disabilities that can impede everyday life. The findings support the argument for more widespread, tailored occupational health services to

support fishers, and highlight the need for further research to understand the specific causes of ill health among UK fishers.

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**Table 1.** Ten industry groups ranked by the highest percentage of workers reporting (a) poor health (PH), and (b) limiting long-term illness (LLTI) in the 2011 England and Wales census. Size of industry group is indicated as a count of individuals recorded in the census and as a percentage of the total census respondents recorded in employment. Health outcomes are indicated by a count of respondents reporting poor health and limiting long-term illness, and as a percentage of the respondents from each industry group.

Rank	Industry	Count (%)	Count PH/LLTI (%)
<b>(a) Poor health (PH)</b>			
1	05 Mining of coal and lignite	7,522 (0.03%)	529 (7.0%)
2	98 Undifferentiated goods- and services-producing activities of private households for own use	1,387 (0.01%)	57 (4.1%)
3	14 Manufacture of wearing apparel	45,881 (0.17%)	1586 (3.5%)
4	15 Manufacture of leather and related products	10,126 (0.04%)	293 (2.9%)
5	03 Fishing and aquaculture	5,660 (0.02%)	158 (2.8%)
6	13 Manufacture of textiles	52,648 (0.20%)	1262 (2.4%)
7	49 Land transport and transport via pipelines	667,603 (2.50%)	15850 (2.4%)
8	80 Security and investigation activities	143,113 (0.54%)	3345 (2.3%)
9	81 Services to buildings and landscape activities	538,444 (2.02%)	12177 (2.3%)
10	07 Mining of metal ores	463 (<0.01%)	10 (2.2%)
<b>(b) Limiting long-term illness (LLTI)</b>			
1	05 Mining of coal and lignite	7,522 (0.03%)	1569 (20.9%)
2	98 Undifferentiated goods- and services-producing activities of private households for own use	1,387 (0.01%)	212 (15.3%)
3	01 Crop and animal production, hunting and related service activities	226,237 (0.85%)	26542 (11.7%)
4	14 Manufacture of wearing apparel	45,881 (0.17%)	5372 (11.7%)
5	15 Manufacture of leather and related products	10,126 (0.04%)	1116 (11.0%)
6	03 Fishing and aquaculture	5,660 (0.02%)	616 (10.9%)
7	87 Residential care activities	480,839 (1.80%)	48131 (10.0%)
8	81 Services to buildings and landscape activities	538,444 (2.02%)	53634 (10.0%)
9	49 Land transport and transport via pipelines	667,603 (2.50%)	64869 (9.7%)
10	13 Manufacture of textiles	52,648 (0.20%)	4965 (9.4%)

**Table 2.** Generalised linear model coefficients presented as adjusted odds ratios (OR) and confidence intervals (CI) for poor general health and limiting long-term illness outcomes by industry in the 2011 England and Wales census (showing only industries statistically significantly worse or equivalent to fisheries and aquaculture). Odds ratios are adjusted for age, region and socio-demographic profile of local authority. Statistically significant differences at  $\alpha=0.05$  are shown in bold.

Industry	Adjusted OR	95% CI
<b>Poor general health</b>		
05 Mining of coal and lignite	<b>1.74</b>	<b>1.45-2.09</b>
98 Undifferentiated goods- and services-producing activities of private households for own use	<b>1.49</b>	<b>1.09-2.04</b>
14 Manufacture of wearing apparel	1.07	0.91-1.27
03 Fishing and aquaculture (Reference)		
92 Gambling and betting activities	0.97	0.82-1.14
15 Manufacture of leather and related products	0.95	0.78-1.15
80 Security and investigation activities	0.89	0.76-1.05
07 Mining of metal ores	0.72	0.37-1.39
<b>Limiting long-term illness (LLTI)</b>		
98 Undifferentiated goods- and services-producing activities of private households for own use	<b>1.64</b>	1.37-1.95
05 Mining of coal and lignite	<b>1.51</b>	1.36-1.68
81 Services to buildings and landscape activities	1.01	0.92-1.10
03 Fishing and aquaculture (Reference)		-
14 Manufacture of wearing apparel	1.00	0.91-1.09
88 Social work activities without accommodation	0.98	0.90-1.07
92 Gambling and betting activities	0.98	0.90-1.07
95 Repair of computers and personal and household goods	0.95	0.87-1.04
87 Residential care activities	0.94	0.86-1.03
15 Manufacture of leather and related products	0.94	0.84-1.04
80 Security and investigation activities	0.94	0.86-1.02