HEALTH AND SAFETY AUTHORITY

Agriculture, Forestry & Fishing

Analysis of Work-related Injury and Illness, 2001 to 2014

ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

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Analysis of Work-related Injury and Illness, 2001 to 2014

Agriculture, Forestry and Fishing Sector

Sectoral Analysis No. 4: Agriculture, Forestry and Fishing Sector
by O. Kenny, B., Maître and H. Russell (April 2018)

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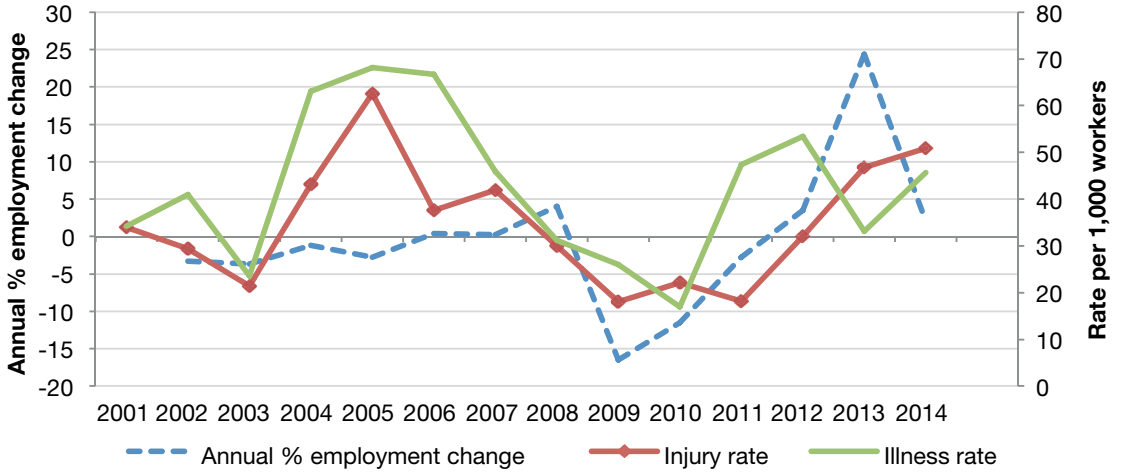
The following analysis draws on the CSO's Quarterly National Household Survey (QNHS) to explore work-related accidents and illnesses in the agriculture, forestry and fishing sector (see Box 1 for details on data sources and measures). The results are based on workers' self-reports of work-related illness and injury. All injuries and illnesses are included, regardless of whether or not they resulted in an absence from work, as many people continue to work while sick or injured. Findings across the economy as a whole are explored in Russell *et al.* (2015 and 2016).[i] This research briefing provides a within-sector picture of the agriculture, forestry and fishing sector over the period 2001–2014.[ii]

Employment in the agriculture, forestry and fishing sector has been in general decline since the 1970s and, despite a brief increase in employment during the late boom years (2006–2008), the decline accelerated during the early recession years. However, rates have been recovering since 2012, when there were about 85,500 workers in agriculture, forestry and fishing. In 2014, about 109,000 people were employed in this sector, accounting for 5.8% of total employment.[iii] The agriculture, forestry and fishing sector has traditionally had one of the highest rates of work-related injuries and fatalities; over the period 2010 to 2014, the average injury rate causing any days off work was 34 per 1,000 workers compared to 22 across other sectors, while between 2009 and 2015, the fatality rate was 10 times higher than that for other sectors, at 23 per 100,000 workers compared to 2.3.[iv]

Figure 1 shows that rates of illness and injury in the agriculture, forestry and fishing sector were very high during the boom period but began falling just prior to the recession and continued to fall with employment from 2008.

Figure 1: Rates of work-related injury and illness, and annual percentage change in employment in the agriculture, forestry and fishing sector, 2001–2014



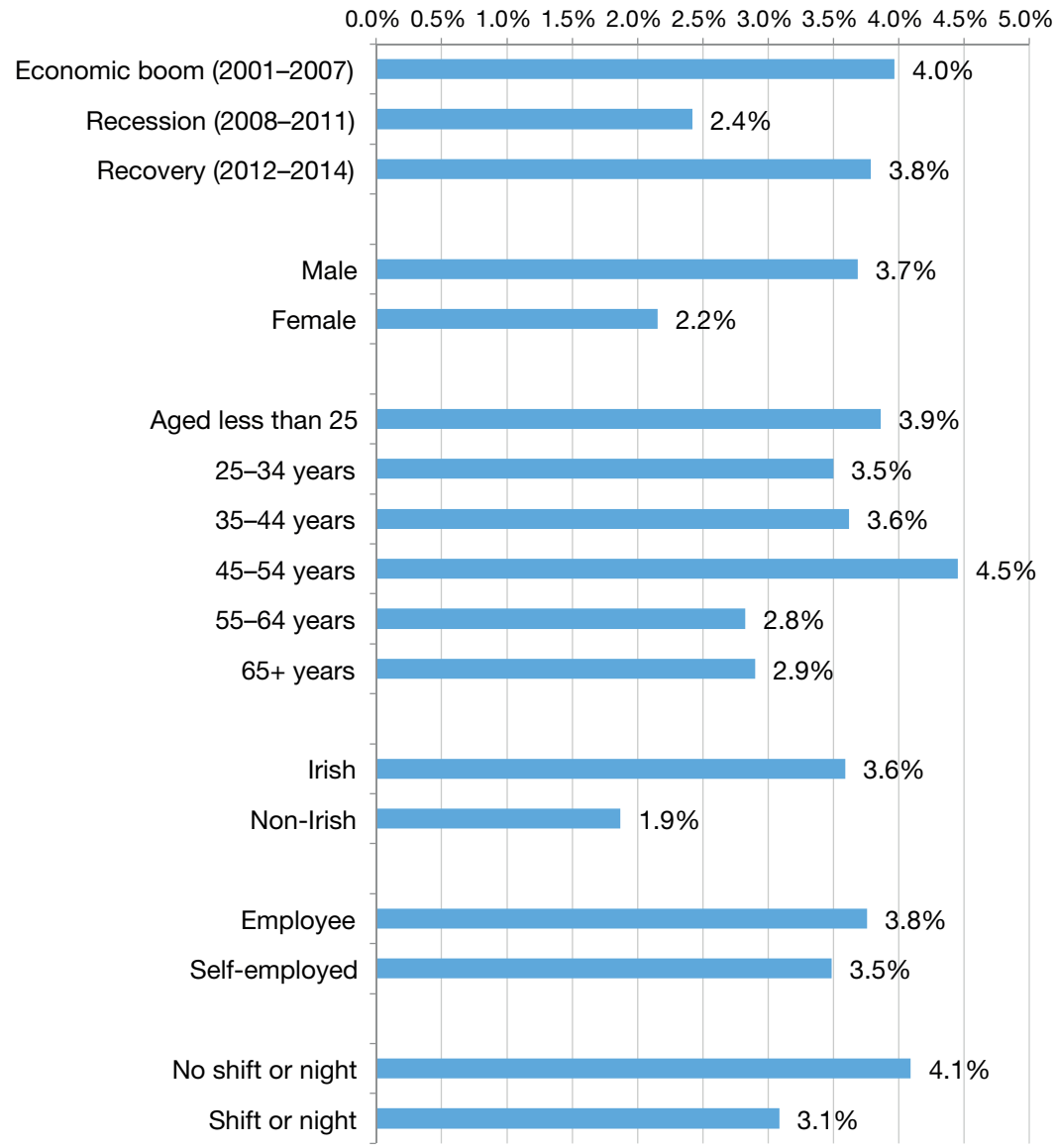
Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: The illness rate in 2011 is not directly comparable to adjacent years due to changes in question wording in 2012.

In 2009, the negative change in employment started to slow, and from 2010 rates of illness and injury started climbing again. In the most recent recovery period, in line with a spike in employment growth, injury rates have exceeded those for illness. Overall, rates had tended to be higher for illness than for injury, unlike the pattern across all sectors, where injury rates mainly exceed those for illness except for a three-year period during the height of the boom and in the more recent recovery years.

Worker and job characteristics and risk of injury

Figure 2 outlines the relationship between the risks of injury among agriculture, forestry and fishing workers and a range of personal and job characteristics. The probabilities are calculated using a logit regression model, which allows us to compare 'like with like'.[v]

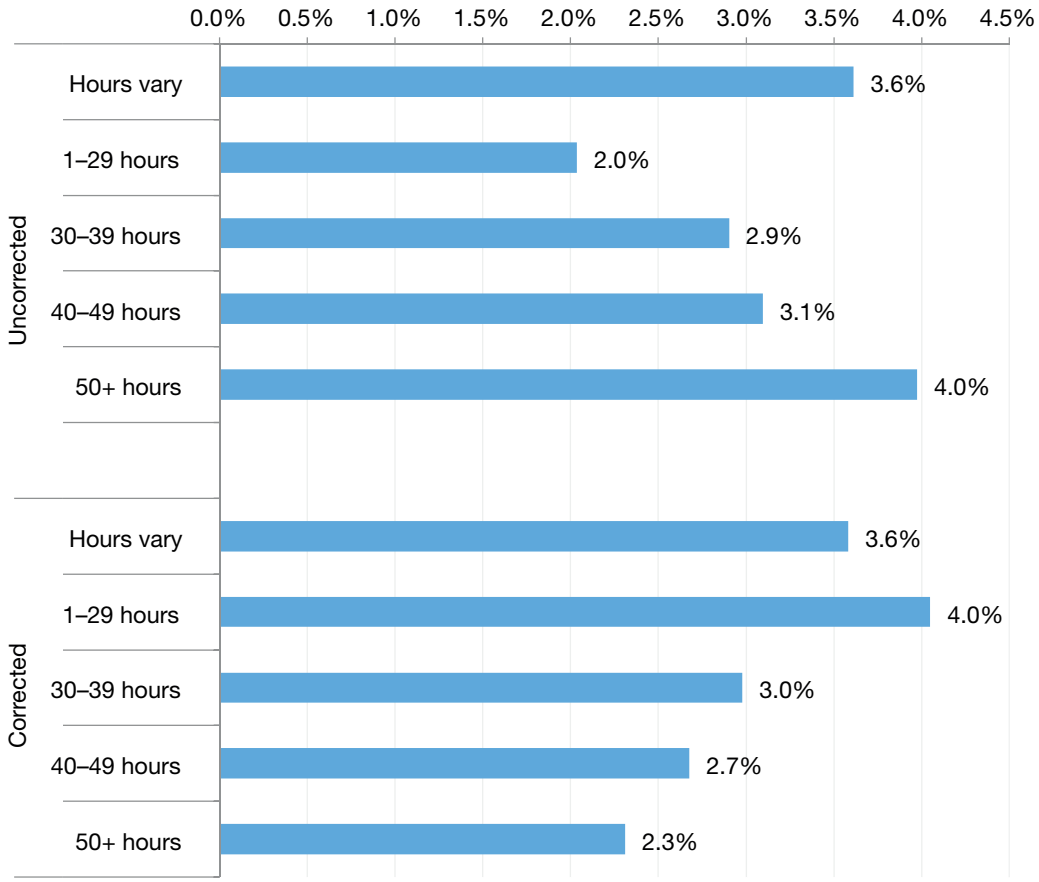
Figure 2: Modelled percentage experiencing injury in the agriculture, forestry and fishing sector, 2001–2014



Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: Results are taken from a logit model in which job tenure and hours of work are also included (see Russell *et al.*, 2015, for an explanation and description of the modelling strategy).

Figure 2 shows that the risk of injury was higher in the boom (4.0%) and recovery (3.8%) periods compared to the recession (2.4%) and that the difference between figures for the boom and recession is statistically significant. This confirms the link between rates of injury and the economic cycle shown in Figure 1. Injury risk in the agriculture, forestry and fishing sector is also significantly higher among men (3.7%) compared to women (2.2%) and among those working shift or night work (4.1%) compared to those not working those hours (3.1%). While other research has found that younger farmers are more likely to take risks (Watson *et al.*, 2017), the differences in injury with age displayed in Figure 2 are not statistically significant.[vi] However, the number of younger agriculture, forestry and fishing workers is small, which is consistent with the literature (ibid.), making it harder to reach statistical significance. Differences between groups of agriculture, forestry and fishing workers based on nationality or employment type were not significant.

Figure 3: Modelled percentage experiencing injury in the agriculture, forestry and fishing sector by working hours, with and without corrections for exposure (per hour worked)

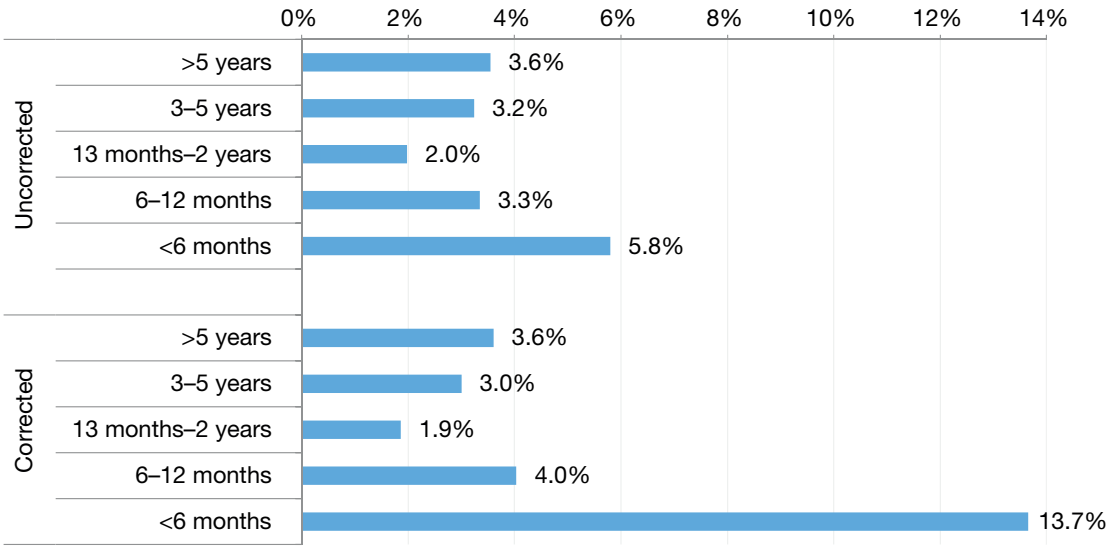


Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: Models include the full set of controls outlined in Figure 2.

Hours, as well as patterns, of work were influential in the economy-wide analysis (Russell *et al.*, 2015). Figure 3 shows that before we make any adjustment for exposure to risk, those working longer hours report proportionately more injuries. However, those working longer hours are exposed to work-related hazards for a longer time.[vii] After correcting for this we find that *per hour worked*, the pattern reverses, and those working fewer hours per week, along with those whose hours vary, report the highest injury risk. However, the difference between workers on variable hours (3.6%) and those working over 50 hours per week (2.3%) is the only one that achieves statistical significance.

Figure 4 examines the risk of injury depending on how long workers have been in the job. We see that there are no significant differences before we adjust for longer exposure to work-related hazards.[viii] When we correct for this exposure, we find that injury risk increases for those with tenures of less than six months (13.7%) but because of the small numbers, they are only significantly more likely to experience an injury than the group with a tenure of one to two years (1.9%).

Figure 4: Modelled percentage experiencing injury in the agriculture, forestry and fishing sector by job tenure, with and without corrections for exposure (per month worked)

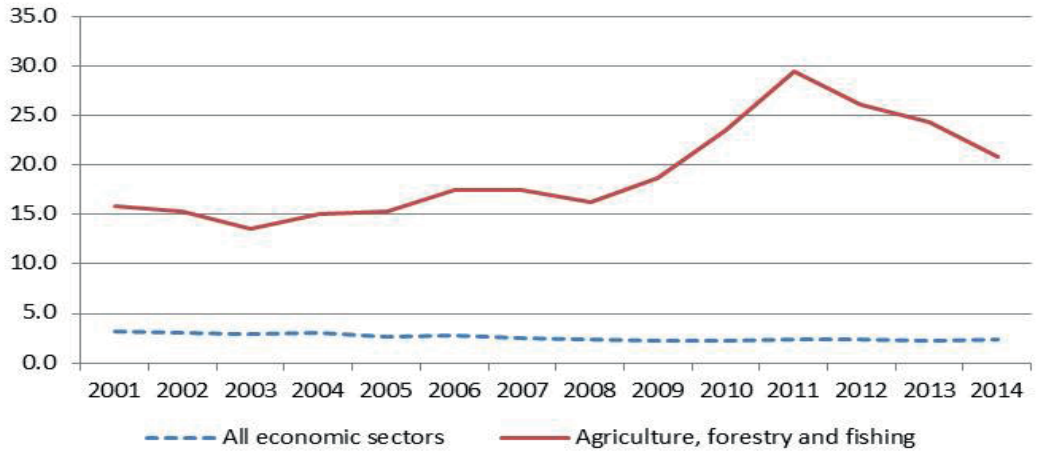


Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: Models include the full set of controls outlined in Figure 2.

Worker fatalities in the agriculture, fishing and forestry sector

There is a good deal of fluctuation in the annual fatality rate for this sector; therefore, we use a rolling average over three years to provide a more accurate overview of the trend. Figure 5 shows that across all economic sectors, the three-year rolling fatality rate declined from 3.2 per 100,000 workers in 2001 to 2.4 per 100,000 workers in 2014. Between 2001 and 2008, the rate in the agriculture, forestry and fishing sector was five to seven times greater than for all sectors and from 2008 onwards it increased sharply, reaching a high of 29.5 in 2011 before falling steadily to 20.9 in 2014. The agriculture, forestry and fishing sector has by far the highest fatality rate, followed by the construction and transport sectors (Russell *et al.*, 2015).

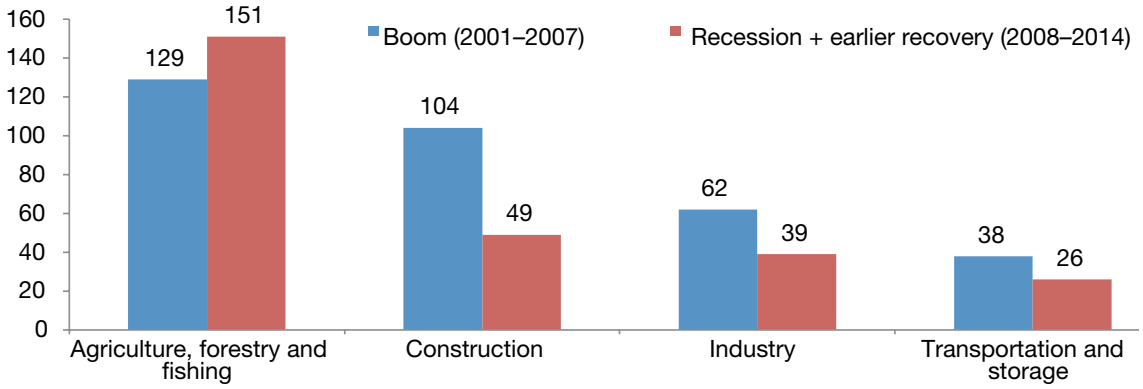
Figure 5: Three-year rolling rate of worker fatalities per 100,000 workers in the agriculture, forestry and fishing sector and all sectors, 2001–2014



Source: HSA data.

The four sectors shown in Figure 6 accounted for 85% of all worker fatalities in 2014. The agriculture, forestry and fishing sector had the largest number of fatalities over the period 2001 to 2014 and, unlike the three other sectors in Figure 6, its number of fatalities increased in the more recent period. While Figure 2 showed that there was no significant differences in injury rates by age, it is worth noting that between 2001 and 2014, one-third of workplace fatality victims in this sector were aged 65 years and over (one in six workers in this sector was aged 65 years and over during that period).

Figure 6: Number of worker fatalities by sector, 2001–2014



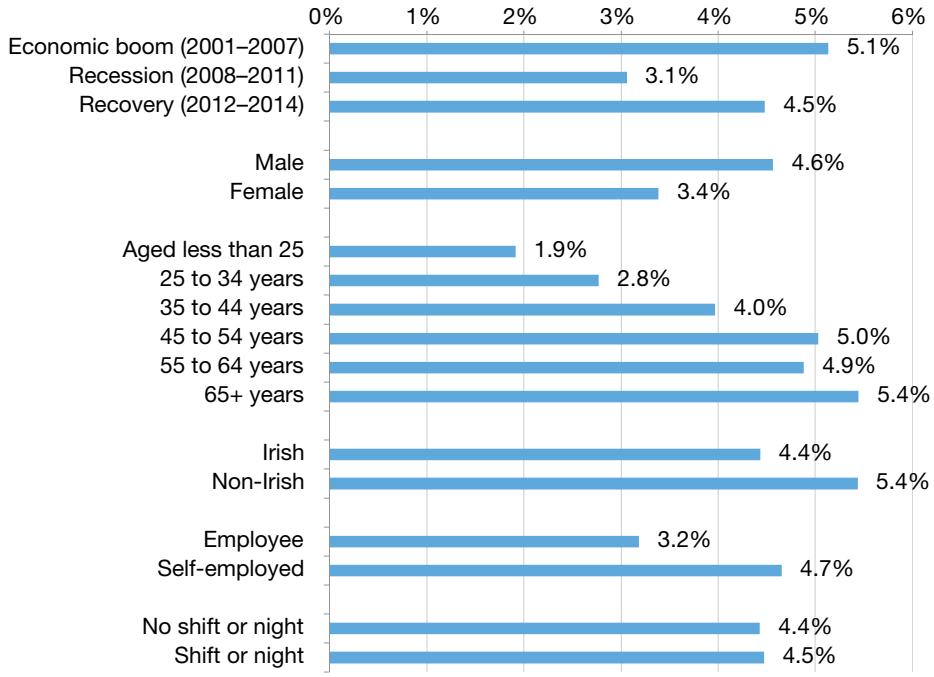
Source: HSA data.

Work-related illness in the agriculture, forestry and fishing sector

This section explores the association between illness and time period, the characteristics of those working in the agriculture, forestry and fishing sector and their job structure. Over the period 2002 to 2014, 63% of all illnesses reported by workers in this sector were due to musculoskeletal disorders, compared to 47% across all sectors. Respiratory problems represented the second most common form of work-related illness in this sector, at 10%. As in the case of injury, the risk of illness was significantly lower in the recession (3.1%) compared to the boom (5.1%) and while this has increased in the recovery period, this is not significant (see Figure 7).

There is an age gradient in the risk of illness. Figure 7 shows that those aged between 45 and 54 years, and those over 65 years, are significantly more likely to report an illness (5.0% and 5.4%), compared to those under the age of 35 years (1.9% to 2.8%). The risk of illness is also significantly higher for those who are self-employed (4.7%) compared to employees (3.2%). The agriculture, forestry and fishing sector has the highest rate of self-employment out of all the sectors; its average rate of self-employment is 75%, compared to an average of 15% across all sectors. In construction, the sector with the second highest self-employment rate, the figure is 32%. Illness rates do not vary significantly depending on gender, nationality or shift work.

Figure 7: Modelled percentage experiencing illness in the agriculture, forestry and fishing sector, 2001–2014



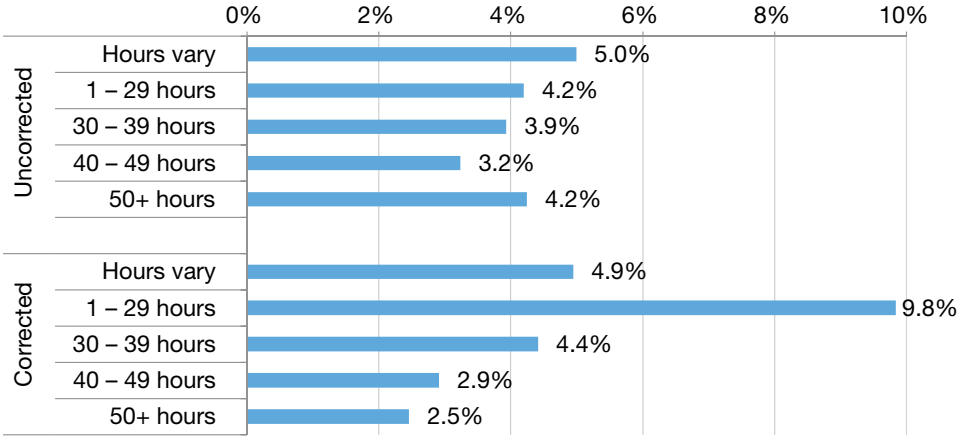
Source: QNHS modules on work-related accidents and illnesses, authors' analysis.

Note: Results are taken from a logit model in which job tenure and hours of work are also included (see Russell *et al.*, 2015, for an explanation and description of the modelling strategy).

Figure 8 shows that before adjusting for equivalent hourly exposure to risk, there are no significant differences in illness rates between groups working different weekly hours. However, once this adjustment is made, those working the least number of hours (1–29) have the greatest risk of illness (9.8%); this is significantly higher than those working from 30 to over 50 hours a week (4.4% to 2.5%) and to those working variable hours (4.9%). This might occur because of reverse causality: those with an illness reduce their hours of work.

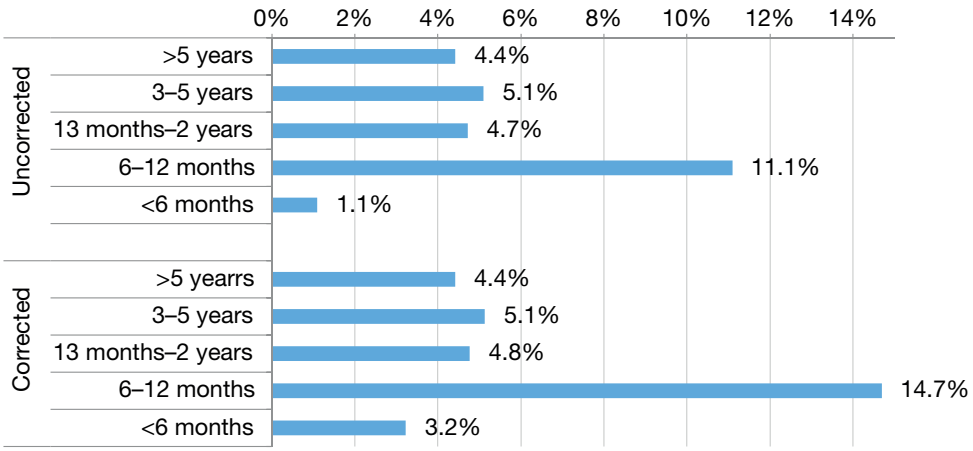
Finally, in Figure 9 we examine the relationship between job tenure and work-related illness. We might expect a higher risk of musculoskeletal disorders among those with longer job tenures due to the cumulative effect of years of physically demanding work. Alternatively, new recruits may be exposed to greater risk due to less training and experience (see Russell *et al.*, 2016, for more detail on types of work-related illnesses).

Figure 8: Modelled percentage experiencing illness in the agriculture, forestry and fishing sector by working hours, with and without corrections for exposure (per hour worked)



Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: Models include the full set of controls outlined in Figure 7.

Figure 9: Modelled percentage experiencing illness in the agriculture, forestry and fishing sector by job tenure, with and without corrections for exposure (per month worked)



Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: Models include the full set of controls outlined in Figure 7.

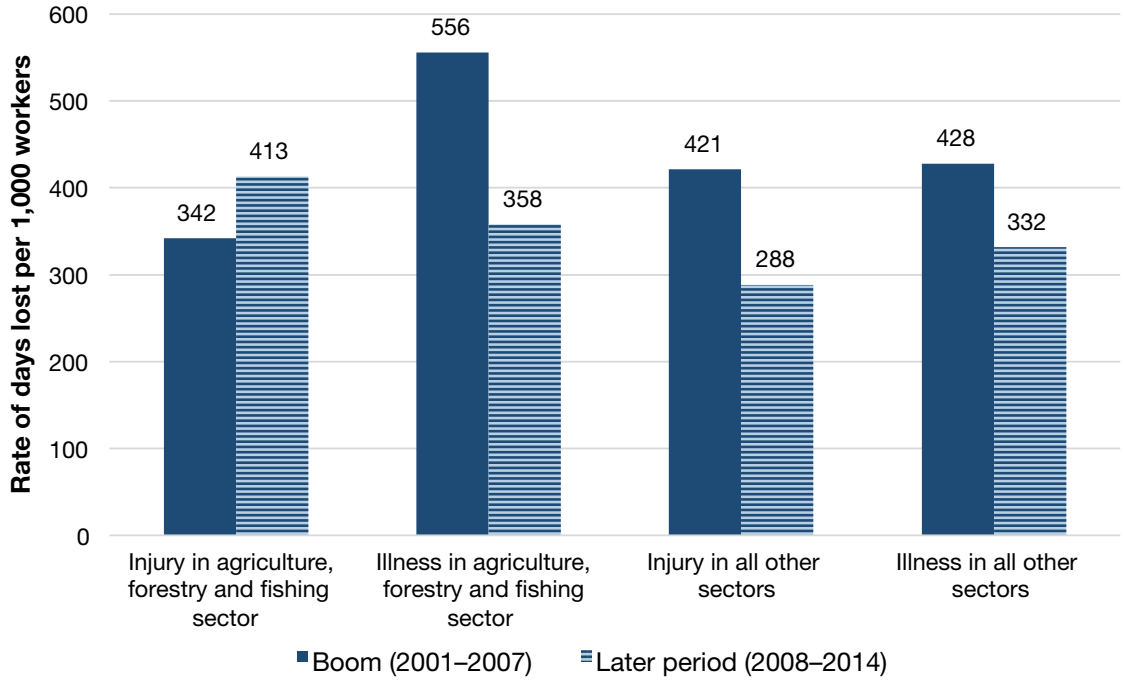
The findings indicated in Figure 9 show that before adjusting for risk exposure, those with between six to 12 months' job experience had the highest rates of work-related illness (11.1%), and this was significantly different to the group with less than six months' experience (1.1%) and the group with more than five years' experience (4.4%). When we make an adjustment for exposure among workers who are in employment for under a year, we find that the monthly rate of illness is even higher for the group with six to 12 months' tenure (14.7%), and that this is significantly higher than for those with over five years of service (4.4%).

Days lost due to illness and injury

Over the period 2001–2014, the number of days lost in the agriculture, forestry and fishing sector due to injury and illness fluctuated significantly. The annual average rate rose from just under 40,000 in the 2001–2007 period to nearly 47,000 in 2008–2014, while for illness it decreased from nearly 64,000 in 2001–2007 to about 41,000 in 2008–2014.[ix] In the economy-wide analysis, the annual average number of days lost for both illness and injury declined during the recession years before rising again in the recovery period to overtake the number of days lost in the boom.

Some of this change in days lost to injury and illness may be a result of fluctuation in employment within the agriculture, forestry and fishing sector, as outlined in Figure 1. To account for this, Figure 10 shows the annual average number of days lost to injury and illness per 1,000 workers in the agriculture, forestry and fishing sector, for both time periods.

Figure 10: Annual average number of days lost to injury and illness per 1,000 workers in agriculture, forestry and fishing and all other sectors, 2001–2007 and 2008–2014



Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: 'All other sectors' excludes the agriculture, forestry and fishing sector for total number of days lost to injury and illness and for numbers employed.

In the boom period (2001–2007), the average rate of days lost to injury in the agriculture, forestry and fishing sector was 342 per 1,000 workers, which was lower than the rate across all other sectors excluding agriculture, forestry and fishing (421 per 1,000 workers). However, this increased between the boom and the later period of 2008–2014, so that the rate was higher than that for all sectors (288 per 1,000). The boom period saw a much higher rate of days lost to illness per 1,000 workers in agriculture, forestry and fishing (556) compared to the rate across all sectors (428). While this dropped to 358 per 1,000 in the later period, so that there were fewer days lost to illness than injury in agriculture, forestry and fishing, it remained slightly higher than the rate across all sectors (332 per 1,000 workers).

Inspections

Table 1 outlines the number of health and safety inspections carried out per 1,000 workers in the agriculture, forestry and fishing sector between 2003 and 2015.

Table 1: Health and safety inspections in the agriculture, forestry and fishing sector, 2003–2015

Year	Inspections in agriculture, forestry and fishing sector	Employed in agriculture, forestry and fishing ('000s)	Inspection rate per 1,000 workers	Inspection rate all sectors
2003	867	114.7	7.6	5.9
2004	999	113.4	8.8	6.1
2005	1,191	110.2	10.8	6.9
2006	1,468	110.7	13.3	7.5
2007	1,377	110.9	12.4	6.4
2008	1,480	115.4	12.8	7.5
2009	1,601	96.3	16.6	9.4
2010	1,754	85.2	20.6	8.9
2011	3,222	82.9	38.9	8.3
2012	3,341	85.8	38.9	7.5
2013	2,967	106.8	27.8	6.5
2014	2,851	109.0	26.2	5.6
2015	3,056	109.9	27.8	5.5

Source: Number of inspections taken from HSA annual reports (these are only available from 2003 onwards). Numbers employed taken from QNHS, averaged across four quarters.

The number of inspections carried out in the agriculture, forestry and fishing sector increased by more than three and a half times between 2003 and 2015. Up to 2008, the growing number of inspections was in line with rising or steady employment, so that the inspection rate per 1,000 workers increased quite modestly, from 7.6 in 2003 to 12.8 in 2008. From 2008 onwards, the employment rate began to fall but inspection numbers continued to rise, resulting in the inspection rate tripling to 38.9 per 1,000 workers by 2011–2012. Since 2012, a levelling off in the number of inspections, coupled with rising employment rates, has brought the inspection rate for 2013–2015 to between 26 and 28 per 1,000 workers, which is still more than twice the 2008 rate.

While the overall economy-wide research found that higher inspection rates were associated with a lower risk of work-related injury and illness, the strong correlation between inspection rates and employment levels in the agriculture, forestry and fishing sector ($R=0.802$; $p<.000$), means that we cannot estimate the independent effects of inspections within this sector.[x]

Summary

- Rates of work-related injury and illness followed the economic cycle and statistical models show that when other factors are controlled for, injury and illness rates were significantly higher in the boom (4.0% and 5.1% respectively) compared to rates in the recession (2.4% and 3.1% respectively).
- Controlling for other factors, significant differences in injury rates were found among agriculture, forestry and fishing workers, depending on gender and job composition. There was a higher risk of injury for men (3.7%) compared to women (2.2%) and for shift or night workers (4.1%) compared to non-shift/night workers (3.1%).
- When a correction for exposure to hazards is made, those working variable hours are significantly more likely to report an injury (3.6%) compared to those working over 50 hours per week (2.3%), while new recruits with less than six months' job experience have a higher injury risk (13.7%) compared to workers with a tenure of between one and two years (1.9%).
- The agriculture, forestry and fishing sector has the highest worker fatality rate, five to seven times greater than that for all sectors. Unlike other high-risk economic sectors, the number of fatalities has increased in the recent period compared to the boom period.
- Illness rates in this sector differed significantly depending on worker age, with those aged 45–54 years and over 65 years more likely to experience illness (5.0% and 5.4%) compared to those under 35 years (1.9% to 2.8%).
- Illness rates also differed depending on certain job characteristics. Rates of self-employment are higher in agriculture, forestry and fishing than any other sector and the risk of illness for self-employed workers is higher (4.7%) compared to employees (3.2%).
- After adjusting for exposure, the risk of illness was higher for those working less than 30 hours per week (9.8%) compared to those working any other pattern of hours (2.5% to 4.9%), and for those with job tenures of six to 12 months (14.7%) compared to those with five or more years' experience (4.4%).
- The rate of days lost per 1,000 workers in the agriculture, forestry and fishing sector as a result of injury increased between the boom and the 2008–2014 period, while the rate of days lost to illness fell during the same period.
- There is a much higher rate of inspections per 1,000 workers in the agriculture, forestry and fishing sector compared to other sectors. In 2015, the rate in the agriculture, forestry and fishing sector was five times that of all sectors. Although we cannot estimate an independent effect of inspections in this sector due to correlation with other factors, it was found to lower injury and illness rates across all sectors together.

Box 1: Description of data sources and measures

Data sources

The main data source for these sectoral analyses is the annual special modules on work-related accidents and illnesses that form part of the QNHS carried out by the CSO. It is carried out in private households and the responses are unconnected to any workplace reporting. The module is restricted to those who are employed at the time of the survey or who are not currently employed but worked during the 12-month reference period. For example, in 2015, in the case of injuries, respondents were asked:

'How many, if any, injuries did you incur at work (excluding commuting) during the period January 2014 to December 2014?'

For illnesses, the following question was asked:

'How many, if any, illnesses or disabilities have you experienced during the 12 months January 2014 to December 2014, that you believe were caused or made worse by your work?

Respondents were also asked how many days they had taken off work as a result of these injuries or illnesses.

In 2013, the module was part of a European-wide labour force survey and a number of changes were introduced, including a change in question wording, to allow the data to be harmonised across the EU (see Russell ***et al***., 2016, for further detail). This means that caution is needed when interpreting trends over time in the injury and illness rates based on the QNHS data.

While the QNHS provides the best randomised national sample of work-related injuries and illnesses, a number of limitations should be borne in mind. One is the 'healthy worker effect', whereby the least healthy or most seriously injured workers leave the labour market, while the healthier workers remain. The likelihood of 'unhealthy' workers leaving the labour market depends both upon the extent to which employers accommodate those with disabilities or illness, which may vary by sector, and the level of compensation available through the welfare system. A further limitation is that those who have not worked in the previous 12 months are excluded from the QNHS module, leading to an underestimation of the extent of work-related illnesses and injuries.

An additional difficulty with the illness statistics arises from the fact that there may be a significant time lapse between exposure to a workplace hazard and the emergence of an illness. This is particularly the case for many cancers and for musculoskeletal problems (Drummond, 2007). The tendency of workers with a chronic illness or a disability to change to a less demanding job may also influence the association between work-related illness and sector or hours of work found in the data.

A final caveat concerning the QNHS module data is that, despite a large number of respondents, work-related injuries and illnesses are uncommon and therefore the actual case numbers are relatively small. This is especially true when the figures are broken down by sector or other characteristics such as nationality or shift work status. The statistical models take this issue into account but descriptive tables, for example on the number of days lost, should be treated with caution.

Employment rates

As the recorded accidents, illnesses and days lost occur over a 12-month period, and because employment levels fluctuate seasonally, employment rates were calculated using the average employment level across the four quarters of the relevant year. This provides a better basis for calculating the incidence rate than any one particular quarter. Rates of injury, illness and days lost are derived from the numbers experiencing injury and illness in each sector, divided by the number employed in that sector and multiplied by 1,000 to give an incidence rate per 1,000 workers.

Endnotes

[i] H. Russell, B. Maître and D. Watson (2015). *Trends and patterns in occupational health and safety in Ireland*. Dublin: ESRI; Russell, H., B. Maître and D. Watson (2016). *Work-related musculoskeletal disorders and stress, anxiety and depression in Ireland: Evidence from the QNHS 2002–2013*. Dublin: ESRI. Please see full reports for further details and reference lists.

[ii] Census 2011 showed that 96.1% of those working in this sector were involved in agriculture with the remaining 4% split between forestry and logging (2.2%) and fishing and aquaculture (1.7%).

[iii] Health and Safety Authority (2016). *Summary of workplace injury, illness and fatality statistics 2014–2015*. HSA: Dublin.

[iv] Where relevant, all the results in the charts have been tested for statistically significant difference. Any in-text references to statistically significant (or not) differences in results can be taken to mean that statistical models were applied to reach such conclusions.

[v] Watson, D., O. Kenny, B. Maître and H. Russell (2017). *Risk taking and accidents on Irish farms*. Dublin: ESRI and HSA.

[vi] Following methods used by Davies and Jones (2005, p. 54), we constructed full-time equivalent (FTE) injury rates using annual average working hours per week (overall sample mean of 35.5 hours per week). A full list of references can be found in Russell *et al*., 2015 and 2016.

[vii] We adjust the rates for those employed for less than one year to produce an annual equivalent rate. These adjusted figures should be seen as illustrative as they assume that the monthly or hourly risk and other factors remain stable.

[viii] Due to a smaller number of unweighted cases, where any days were lost in the agriculture, forestry and fishing sector, figures cannot be presented separately for the recession (2008–2011) and recovery (2012–2014) periods. In addition, there is no information for 2012 due to a change in question wording.

[ix] As there is only one observation of the inspection rate per year, it is difficult to disentangle this effect from other changes that have followed the same pattern. The economy-wide models include a continuous variable that records annual employment change within sectors; this within-year variation allows us to apply a more robust test of the inspection rates.

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