HEALTH AND SAFETY AUTHORITY

Construction Sector

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

ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

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Construction Sector

Sectoral Analysis No. 2: Construction Sector
by O. Kenny, B. Maître and H. Russell (April 2018)

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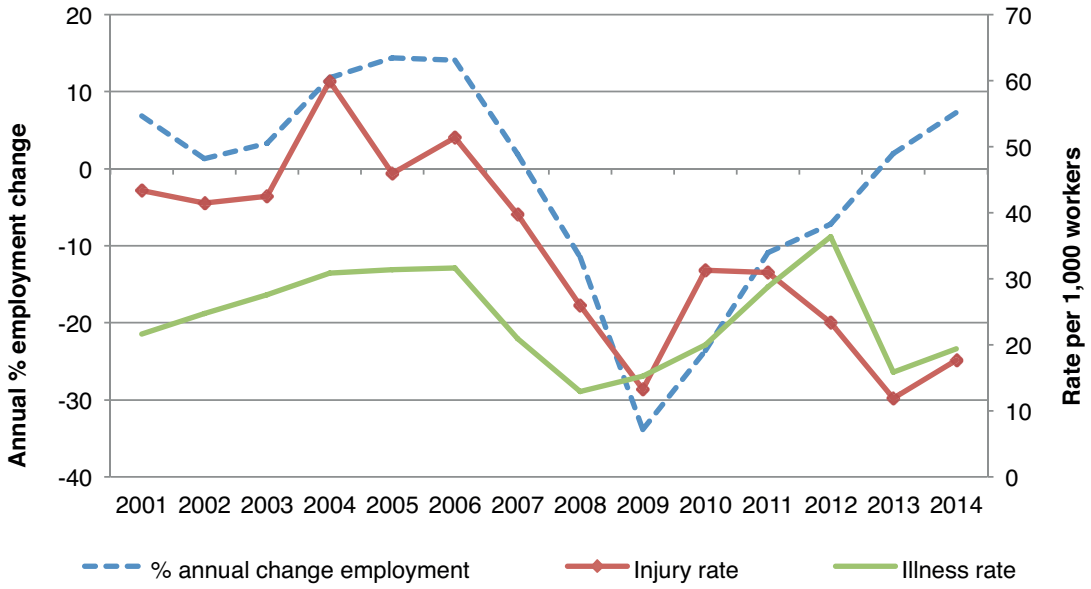
The following analysis draws on the Central Statistics Office's (CSO) Quarterly National Household Survey (QNHS) to explore work-related accidents and illnesses in the construction sector (see Box 1 for details on data sources and measures). The results are based on workers' self-reports of work-related 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 construction sector over the period 2001–2014.

The volume of employment in the construction sector has fluctuated dramatically since the turn of the century, driven by a property bubble and subsequent crash. In 2001, 174,000 people were employed in construction, a figure that rose rapidly to 270,000 in 2007, before falling sharply to a low of 100,000 in 2012. Construction employment began to grow again in 2013–2014. These trends are captured in the annual percentage change in employment displayed in Figure 1.

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



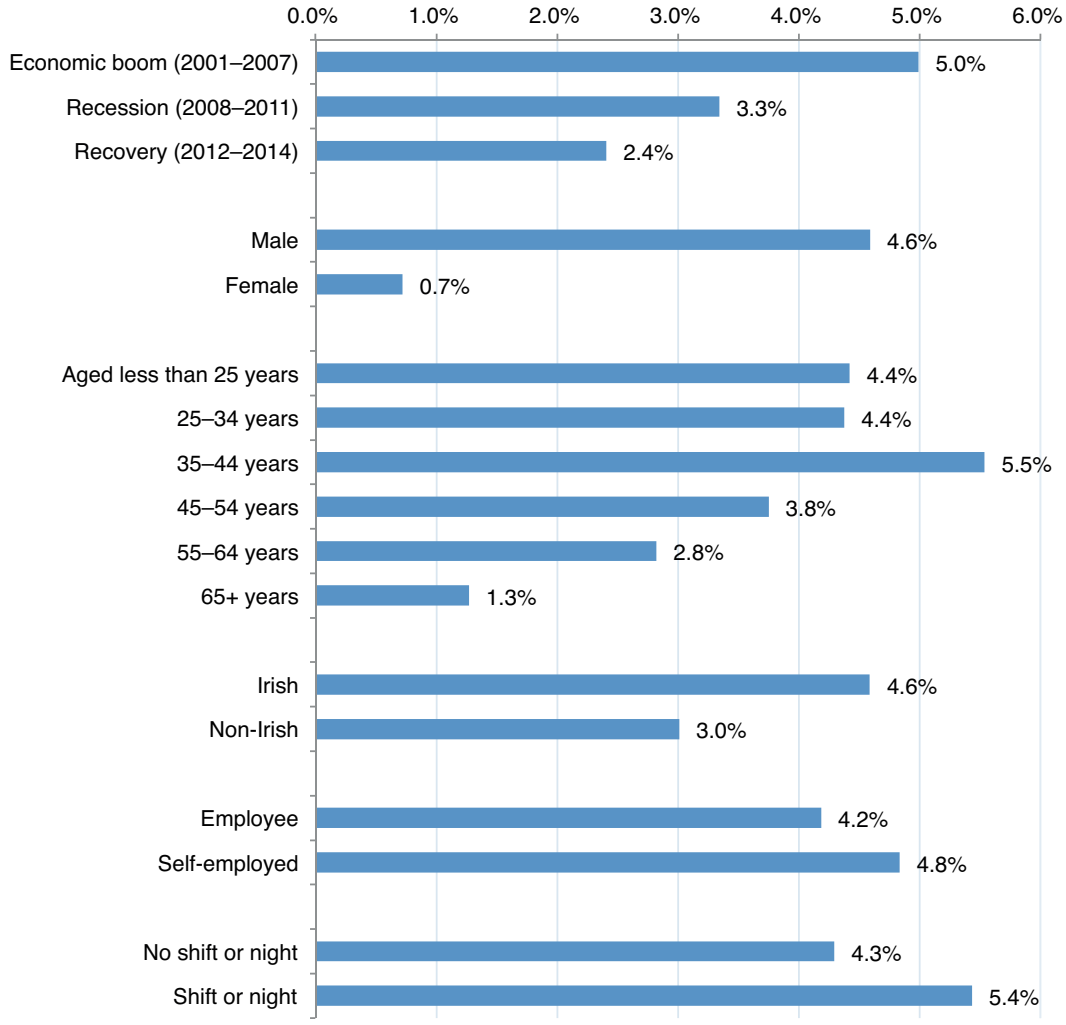
Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: The illness rate in 2012 is not directly comparable to prior years, due to changes in question wording.

The rates of work-related injury in construction closely follow the trends in employment up to 2013–2014. Rates of injury per 1,000 workers rose in the boom period but fell rapidly during the recession, reaching a low of 13.3 per 1,000 workers in 2009. Rates rose somewhat in 2010 but subsequently continued to fall again, when we might have expected an increase in line with employment levels. This could be linked to a shift in the nature of construction projects, as the economy moved from the boom to the recession. Rates of work-related illness in the construction sector also rose and fell with the economic cycle, though this relationship is weaker.

Worker and job characteristics and risk of injury

Figure 2 describes the relationship between risk of injury in the construction sector and a range of worker and job characteristics.

Figure 2: Modelled percentage experiencing injury in the construction sector, 2001–2014



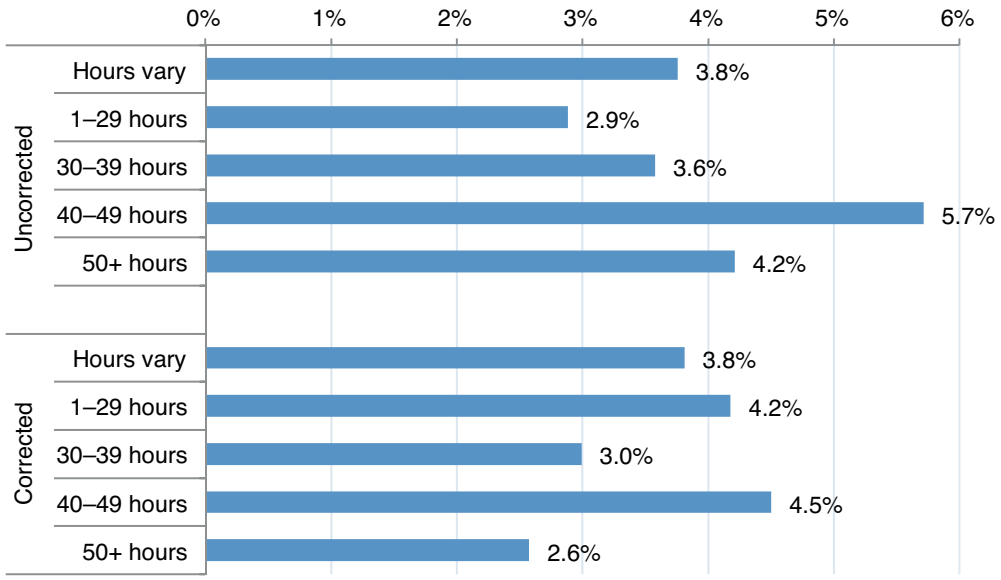
Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: Results are taken from a logit model in which job tenure and hours of work are also included (see Russell *et al.*, 2015, for an explanation and description of the modelling strategy).

The probabilities are calculated using a logit regression model and the results show the percentage of each group that reported an injury controlling for all other factors in the model. This allows us to compare 'like with like'. For example, the figure for non-Irish versus Irish construction workers removes any difference in injury rates between these two groups of workers due to differences in factors such as their age or hours of work.[ii]

Controlling for worker and job characteristics, the models confirm that compared to the boom (5.0%), the level of injury in construction was significantly lower in the recession (3.3%) and lower again (2.4%) in the recovery period, though the difference between the recession and recovery is not statistically significant. Women in the construction sector are much less likely to have experienced an injury, (0.7%) compared to men (4.6%), which is likely due to the types of jobs occupied by women within the sector (i.e. white-collar rather than manual). Injury risk is highest among construction workers in the 35–44 age group (5.5%), a significant increase on the risk for those aged over 45 (between 1.3% and 3.8%). The declining injury risk with age may be associated with greater experience and skill or perhaps with workers moving into less physically demanding jobs within the sector as they get older.

Non-Irish workers are found to have significantly lower injury levels (3.0%) than Irish workers (4.6%). A similar result was found in the economy-wide analysis; a range of mechanisms were suggested, including the 'healthy migrant' effect and potential differences in reporting behaviour (see Russell *et al.*, 2015). In terms of work characteristics, neither shift/night work (both practices being relatively unusual in the construction sector) nor self-employment were associated with significantly higher injury risks.

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

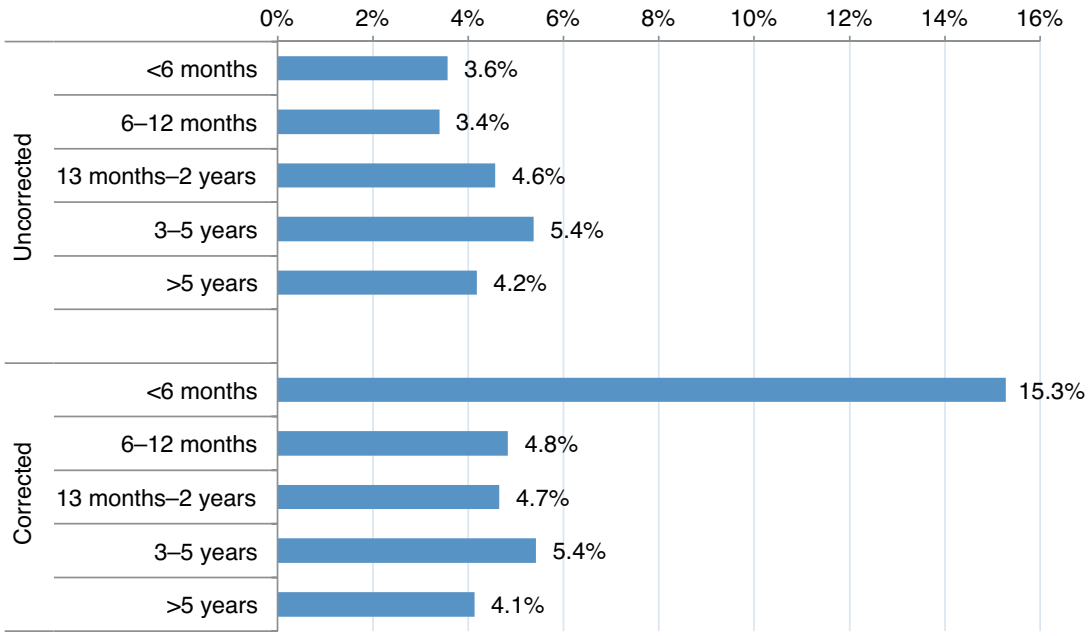


Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: The same factors that were controlled for in Figure 2 are controlled in this model.

The remaining work characteristics examined are hours of work and job tenure. Figure 3 shows that injury risk is highest among those working more than 40 hours per week (between 4.2% and 5.7%) and lowest for those working less than 30 hours (2.9%). Perhaps those working fewer hours are more alert than those working long hours. However, we make an adjustment to account for the fact that those working longer hours are exposed to work-related hazards over a longer time.[iii] Following this correction, we see that *per hour worked*, the injury rate for those on less than 30 hours increases to 4.2%. However, this is not significantly different to the other categories – perhaps due to a relatively small number of cases and the weighting process, which leads to wide errors around the estimates. Those working between 40 and 49 hours retain the highest risk (4.5%), which is significantly different to those working 30 to 39 hours (3.0%) and those working more than 50 hours (2.6%).

Turning to length of time in the job (Figure 4), we see that those with shorter tenures tend to have a slightly lower risk of injury. However, as in the case of hours worked, risk of injury may be affected by amount of time exposed, so, again, an adjusted rate was calculated.[iv] This has the effect of increasing the risk for those with less than six months' job tenure to 15.3%, a rate that is significantly higher than all other tenure categories, which range from about 4% to 5%.

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

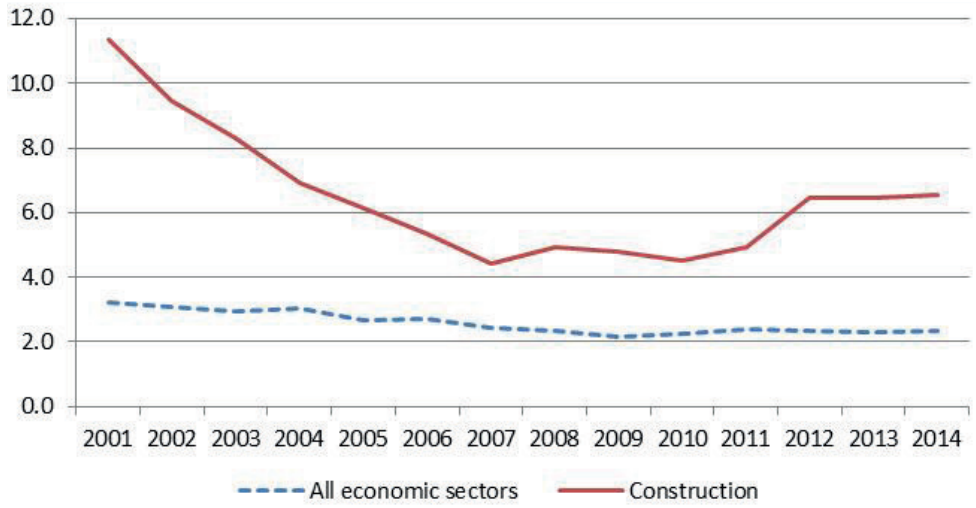


Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: The same factors that were controlled for in Figure 2 are controlled in this model.

Worker fatalities in the construction sector

This section looks at worker fatalities in the construction sector for the period 2001 to 2014. 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. The fatality rate for the construction sector was considerably above the all-sector average in this period. However, it exhibited an exceptionally sharp decline between 2001 and 2007, dropping from 11.3 per 100,000 workers to 4.4 per 100,000 workers, before rising to a post-recession high of 6.6 per 100,000 workers in 2014.

Figure 5: Three-year rolling rate of worker fatalities per 100,000 workers, the construction sector and all sectors, 2011–2014



Source: HSA data.

The four sectors shown in Figure 6 accounted for 85% of all worker fatalities in 2014. In the construction sector, there were 104 worker fatalities during the seven-year boom period (2001–2007), falling to 49 fatalities in the following seven-year period (2008–2014). This development reflects the dramatic reduction in the number of people working in the construction sector, following the recession.

Figure 6: Number of worker fatalities by sector, 2011–2014

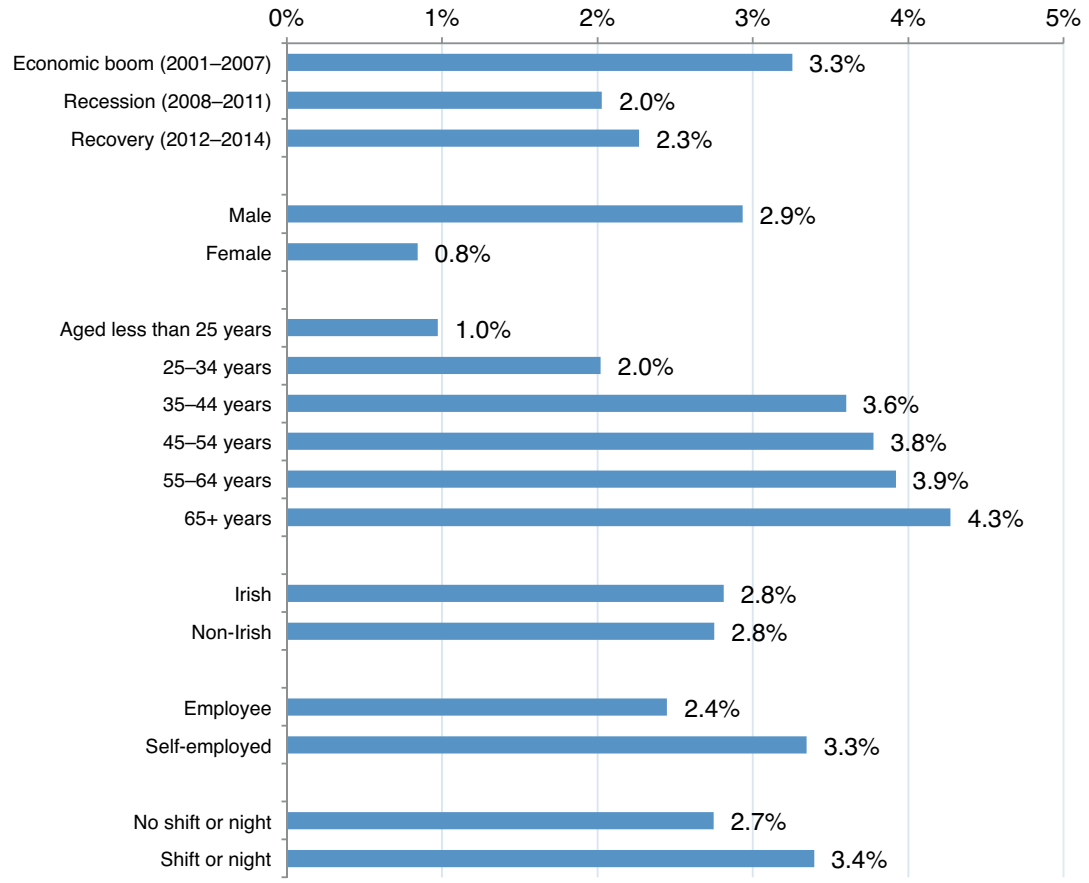
Source: HSA data.

Work-related illness in the construction sector

This section examines illness rates by time period, the characteristics of those working in the construction sector and their job structure.[v] Over the period 2002 to 2014, 66% of all illnesses reported by workers in the construction sector were due to musculoskeletal disorders (MSD), compared to 47% across all sectors. While rates of work-related illness fluctuated over time (Figure 1), Figure 7 below confirms that differences in illness rates by time period are small and that only the change between the boom period (3.3%) and the recession period (2.0%) is significant.

As found in the economy-wide analysis, the rate of work-related illness increases with age. Those aged under 25 years are significantly less likely to have had an illness in the preceding 12 months (1.0%), compared to all other age groups (between 2.0% and 4.3%). Unlike the pattern found across all sectors where women are more likely to report work-related illness (this was particularly so during the recessionary period), men in the construction sector are more than three times as likely to experience work-related illness (2.9%) as their female counterparts (0.8%); as with risk of injury, this is likely to be linked to job type differences between genders. The self-employed also report higher illness rates (3.3%) compared to employees (2.4%). There are no significant differences in illness rates by nationality or work shift patterns.

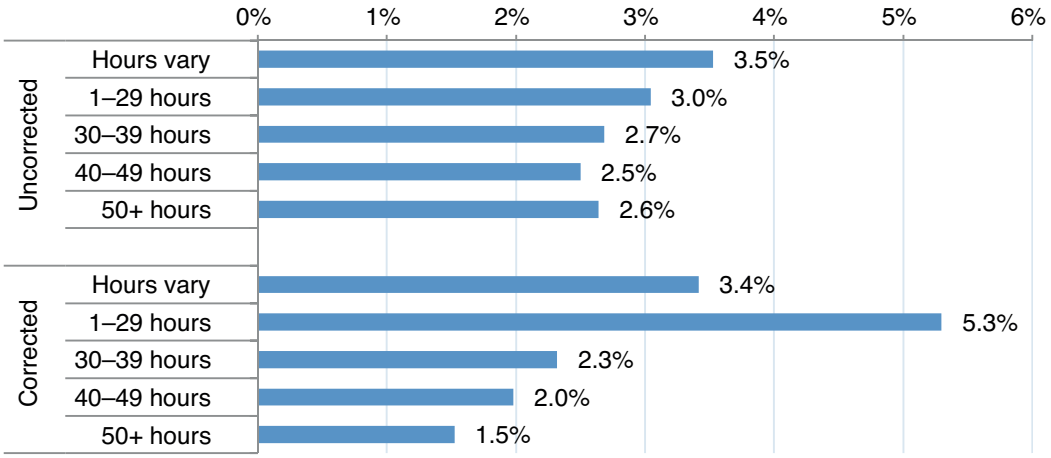
Figure 7: Modelled percentage experiencing illness in the construction sector, 2001–2014



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).

We also looked at whether illness in the construction sector was associated with hours of work and job tenure. Figure 8 shows that, before adjusting for the greater exposure faced by full-time workers on account of their increased time on site, there are no significant differences between the various work hours categories. When this adjustment is made, however, we see that *per hour worked*, there is a significantly higher risk of illness among those working less than 30 hours a week (5.3%), compared to those working 30 or more hours per week (between 1.5% and 2.3%). Workers with variable weekly hours also have a significantly higher risk of illness (3.4%), compared to those working 40 or more hours per week (1.5% to 2.0%).

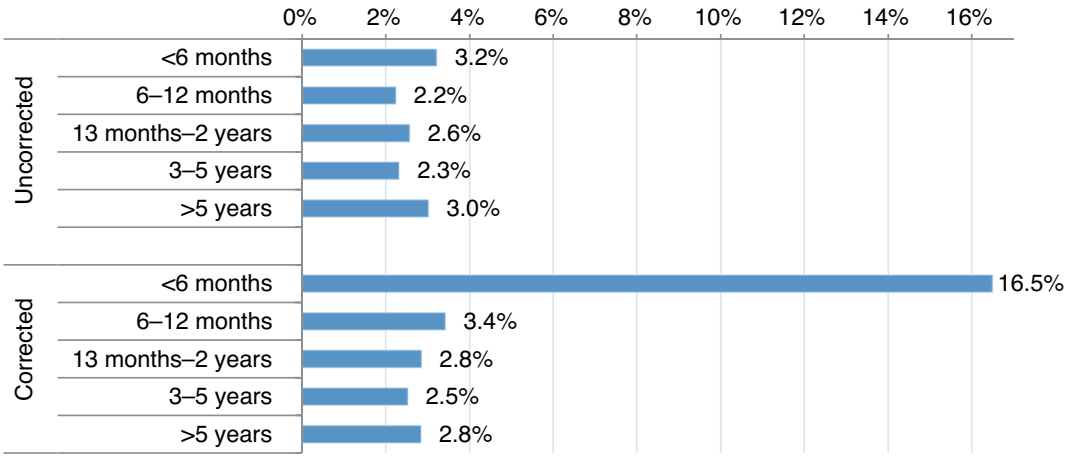
Figure 8: Modelled percentage experiencing illness in the construction sector, by working hours, with and without corrections for exposure (per hour worked)



Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: The same factors that were controlled for in Figure 2 are controlled in this model.

Similarly, before adjusting for those who had not been exposed to one full year's employment, we see very few differences in illness risk on the basis of job tenure (Figure 9). Once this adjustment is made, however, we find that those with the least experience on the job have a significantly higher risk of illness (16.5%), compared to all other tenure groupings, whose risk of illness is about 3%.

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



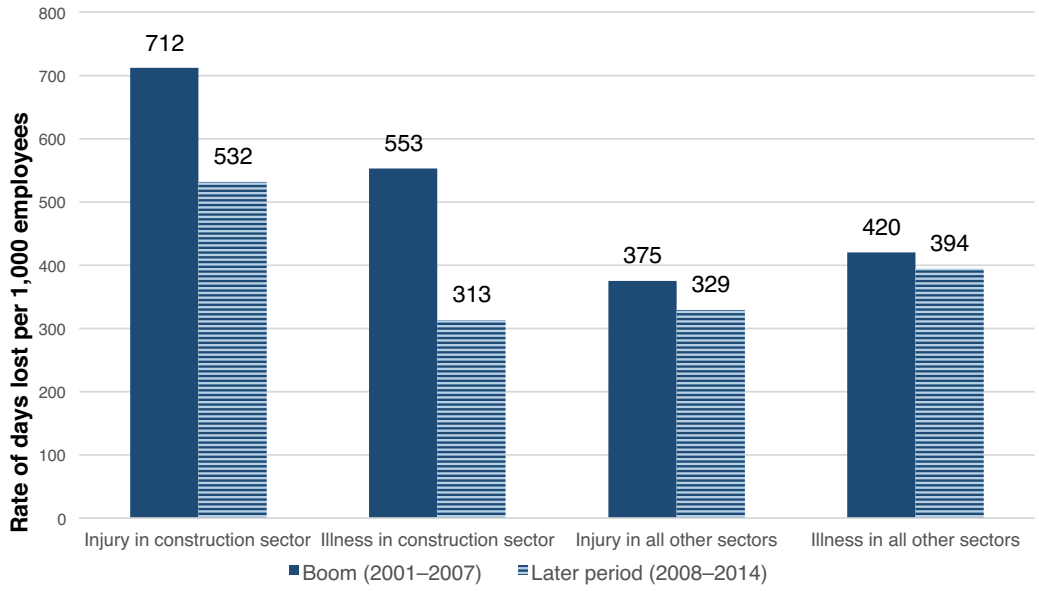
Source: QNHS modules on work-related accidents and illnesses, authors' analysis.
Note: The same factors that were controlled for in Figure 2 are controlled in this model.

Days lost due to illness and injury

The number of days lost in the construction sector due to injury and illness over the years 2001 to 2014 fluctuated significantly. The annual average numbers of days lost during the boom period in this sector, to injury at 152,206 and to illness at 118,166, are the second highest after the industry sector. These numbers dropped dramatically between the boom and later period of 2008–2014.[vi] In the case of injury, the number of days lost more than halved, to 71,384, in this later period, while the number of days lost to illness reduced by nearly one-third, to 42,073. The pattern across the economy-wide analysis showed that the annual average numbers of days lost to illness and injury declined during the recession, before rising again in the recovery period to overtake the number of days lost in the boom.

Some of this reduction in days lost to injury and illness may be a result of the dramatic fall in employment in the construction sector during the recession period, as outlined above. To account for this, Figure 10 shows the annual average numbers of days lost to injury and illness per 1,000 workers in the construction sector, for both the 2001–2007 and 2008–2014 periods.

Figure 10: Annual average number of days lost to injury and illness per 1,000 workers in construction and all other sectors for two time periods, 2001–2014



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

During the boom period (2001–2007), in the construction sector, an average of 712 days per 1,000 workers were lost to injury, and a further 553 per 1,000 workers were lost to illness. The corresponding rate was 375 and 420 across all other sectors (excluding construction). While average days lost to injury in the construction sector fell to 532 per 1,000 workers in the period that followed (2008–2014), there was a sharper decline in days lost to illness, which fell to 313 per 1,000 workers. This means that by 2008–2014, days lost to illness in the construction sector were lower than those lost across all other sectors.

Inspections

Table 1 shows the number, and rate per 1,000 workers, of inspections completed in the construction sector between 2003 and 2015. Compared with inspection rates across all sectors, a substantially higher rate of inspections is carried out in the construction sector, because of the higher risks it presents. Throughout the boom years (2001–2007), inspection rates were between 25 per 1,000 workers and 30 per 1,000 workers. The rate peaked in 2010, at 47.1 per 1,000 workers, as the number of inspections did not decline as rapidly as the precipitous fall in employment. Inspection rates have since declined gradually.

Table 1: Health and safety inspections in the construction sector, 2003–2015

Year	Inspections in construction sector	Employed in construction (,000s)	Inspection rate per 1,000 workers	Inspection rate all sectors
2003	4,615	181.80	25.4	5.9
2004	5,048	203.23	24.8	6.1
2005	6,203	232.53	26.7	6.9
2006	7,706	259.50	29.7	7.5
2007	6,496	270.33	24.0	6.4
2008	7,019	239.35	29.3	7.5
2009	6,378	158.33	40.3	9.4
2010	5,705	121.00	47.1	8.9
2011	4,409	107.80	40.9	8.3
2012	3,932	101.80	38.6	7.5
2013	3,622	102.00	35.5	6.5
2014	3,328	109.425	30.4	5.6
2015	3,932	125.425	31.3	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 overall economy-wide research found that higher inspection rates were associated with a lower risk of work-related injury and illness. In relation to the construction sector, however, the strong correlation between inspection rates and employment levels ($R=0.636$; $p<.000$) means that we cannot estimate the independent effects of inspections in this sector.[vii]

Summary

- Overall rates of injury per 1,000 workers in the construction sector had a stronger relationship with the recent economic cycle than rates of illness.
- Controlling for worker and job characteristics, rates of injury in construction were significantly lower in the recession (3.3%) and lower again in the recovery period (2.4%) compared to the boom (5.0%).
- When we account for the characteristics of workers and jobs, women (who in the construction sector are mainly white-collar workers), older workers and migrant workers are less likely to experience injuries.
- When we adjust for worker and job characteristics plus exposure time, we find that working between 40 and 49 hours a week and being a new recruit significantly increases the likelihood of injury.
- The construction sector has the second highest worker fatality rate. Overall, the fatality rate was reduced over time and the number of fatalities in 2008–2014 was approximately half that of the boom period.
- Rates of illness were higher during the boom period (3.3%), compared to the recession (2.0%), when other factors were controlled for.
- Compared to injury rates, the age pattern was reversed when we looked at illness rates: younger workers are much *less likely* to experience a work-related illness but, as found with injury, illness rates are higher among men (2.9%) compared to women (0.8%). Those who are self-employed also have a higher risk of illness (3.3% versus 2.4%).
- Adding an adjustment for exposure time, we see that those working variable hours, or fewer than 30 hours a week, and new recruits have a higher risk of illness.
- There was a sharp drop in the average numbers of days lost (per year) due to injury and illness between the periods 2001–2007 and 2008–2014. While employment in the construction sector also fell dramatically between these two time periods, this pattern of declining annual days lost holds even when we consider it as a rate per 1,000 construction workers.
- Overall, a higher rate of inspections is carried out in the construction sector compared to other sectors. However, due to the strong relationship between inspection rates and employment levels in this sector, we cannot measure the independent impact that inspections have on injury and illness rates.

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 who 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] Russell, H., 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] 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.

[iii] 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). The adjusted results should be seen as illustrative as they assume other characteristics remain unchanged.

[iv] 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/hourly risk and other factors remain stable.

[v] The CSO figures do not pick up illnesses with a longer latency period, for example, illnesses due to exposure to asbestos. This is likely to lead to an underestimate of the illness rate in this sector.

[vi] Due to a smaller number of unweighted cases where any days were lost in the construction sector, figures cannot be presented for the recession (2008–2011) and recovery (201–2014) periods separately. In addition, there is no information for 2012 due to a change in question wording.

[vii] 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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