Work-related Musculoskeletal Disorders and Stress, Anxiety and Depression in Ireland: Evidence from the QNHS 2002–2013

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Acronyms

GDP	Gross domestic product
BMI	Body mass index
CSO	Central Statistics Office
DSP	Department of Social Protection
EU-LFS	EU Labour Force Survey
EU-OSHA	EU Agency for Occupational Safety and Health
EWCS	European Working Conditions Survey
HSA	Health and Safety Authority
HSE	Health and Safety Executive
ILO	International Labour Organization
MSD	Musculoskeletal disorders
NACE	*Nomenclature générale des Activités économiques dans les Communautés Européennes* (NACE); industrial classification code used by Eurostat.
OIC	Occupational injury benefit
QNHS	Quarterly National Household Survey
SAD	Stress, anxiety and depression
THOR	The Health and Occupation Reporting network
TILDA	The Irish Longitudinal Study of Ageing
WHO	World Health Organization

Executive Summary

INTRODUCTION

A work-related illness is defined as any physical or mental illness caused or aggravated by work. This is a wider concept than occupational disease, which relates to a set of prescribed physical health problems caused by work that form the basis of compensation systems for occupational illness and injury. Work-related illness affects not only the individuals themselves but also their families, their employers, the health system and therefore the wider economy and society. In 2013, an estimated 55,000 workers in Ireland suffered from a work-related illness and over 790,000 days of work were lost (HSA, 2015). In many countries, including Ireland (HSA, 2015), the two largest categories of work-related illness reported by workers themselves are musculoskeletal disorders (MSD) and stress, anxiety and depression (SAD). Over the period 2002 to 2013, these two types of illnesses accounted for 68 per cent of work-related illness in Ireland; MSD accounted for 50 per cent and SAD for 18 per cent. Over the same period, they accounted for 75 per cent of work-related illness in the EU28. While there has been no cost evaluation of these illnesses in Ireland, in the UK, the Health and Safety Executive (HSE) estimated that the annual cost of MSD in 1995–1996 was £5.7 billion (the equivalent of £10 billion in 2016 prices) and Chandola (2010) estimated that the total annual cost of work-related stress ranged between £7 billion and £13 billion. Therefore, both in terms of prevalence and associated costs, MSD and SAD deserve significant attention and they are the focus of the current study. The study addresses two main questions.

- How did trends in musculoskeletal disorders (MSD) and stress, anxiety and depression (SAD) develop as the Irish economy went through a period of economic growth (2002–2007), recession (2008–2011) and early recovery (2012–2013)?
- What are the contributing factors, socio-demographic and work characteristics, that increase the risk of MSD and SAD?

The report is based on an analysis of the annual special module on work-related accidents and illness from the Quarterly National Household Survey (QNHS) over the period 2002–2013. The QNHS is the main data source for national labour force estimates. This special module is added to the regular QNHS in one-quarter of each year, usually the first. The module on work-related accidents and illness is restricted to persons who are currently in employment (or are temporarily out) and is divided into two sections: one to collect information about work-related injury and one about work-related illness. The questions refer only to illnesses that have occurred over the previous 12 months and specific information about the experience of illness, such as the number of days of absence and the type of illness, is collected. There were a number of changes in question wording over the period, which primarily affect the illness figures for the year 2012 and, to a lesser extent, 2006, due to the harmonisation of the survey for a European-wide survey by Eurostat. For these two years, the survey referred to ‘health problems’ rather than ‘illness’ and in 2012 the question explicitly mentioned ‘mental health problems’ unlike any of the other years, prompting a higher level of reporting of SAD.

TRENDS OVER TIME FOR MSD AND SAD

The report covers a period of exceptional change in the Irish economy, which went from strong employment growth to deep recession, with a peak at 2,169,000 workers in 2007 to a low of 1,825,000 workers in 2012. During that period, the following main features of work-related MSD and SAD were observed.

- Over the period 2002 to 2013, overall work-related illness rates were found to be pro-cyclical – the rates rose with the economic growth and fell with the recession.
- The illness rate rose from a rate of 22 per 1,000 workers in 2002–2003 to a peak of 35 per 1,000 workers in 2006, before falling to a low of 15 per 1,000 workers in 2009.
- MSD rates doubled over the period 2002 to 2006, from 11 per 1,000 workers to 20 per 1,000 workers. It then fell during the recession to a low of 7 per 1,000 workers in 2009, before rising again to reach a rate of 14 per 1,000 in 2013.
- SAD rates did not vary very much over the same period, averaging about 4 per 1,000 workers, with a peak in 2012 due to changes in question wording.
- MSD rates were higher for male workers than for female workers during the period of economic growth. Since the recession, the gender gap has narrowed.
- SAD rates are higher for female workers than for male workers over the period but the gender gap is narrower for MSD.
- In 2012, Ireland had one of the lowest percentages of workers to report a work-related illness across the EU15.
- The composition of work-related illness also differs in Ireland compared to other countries. In 2012, 49 per cent of work-related health problems reported were MSD compared to an average of 56 per cent across the EU15 countries.
- In 2012, Ireland was among the EU15 countries where a higher proportion of health problems (32 per cent) were SAD illnesses.

FACTORS ASSOCIATED WITH WORK-RELATED MSD AND SAD

The trend results are based on simple bivariate analyses, where other personal and job characteristics are not taken into account. For example, we saw that male workers are more likely than female workers to experience MSD but this did not take account of gender differences in employment, such as the low presence of female workers in the construction industry where the risk of MSD is high. Therefore, using formal statistical models we analysed the main factors associated with each of these two illnesses, taking account of all the available worker characteristics and job characteristics as well as the economic environment and the annual inspection rate. We found the following factors to be relevant.

Individual Characteristics

- There is no gender difference for MSD, controlling for other contributing factors, but the higher rates of SAD among female workers persist. This finding mirrors gender differences in the prevalence of SAD in the general population.
- Non-Irish workers are less likely to experience MSD than Irish workers, a finding that is consistent with the ‘healthy migrant effect’. There are no differences for SAD.
- The risks of work-related MSD and SAD are strongly structured by age. Workers aged 35–64 years have the highest risk of MSD and are 2.5 times more likely to experience such illnesses than

workers aged under 25 years. Compared to the same young age group, workers aged 35–44 years and 45–54 years are also about 2.5 times more likely to experience SAD.

Sector of Economic Activity

- There are strong variations in the risk of work-related illness across economic sectors and by type of illness. There is a greater risk of MSD for workers in the construction, agriculture and health services sectors. Workers in these sectors are, respectively, 2.4, 2.2 and 1.6 times more likely to experience this type of illness than workers in the 'other services' sector.
- Workers in the education sector have the highest risk of SAD followed by those in health, public administration, transport and other services. Agriculture, construction, industry and retail and accommodation/food all have significantly lower rates of SAD compared to the reference group (other services).
- The self-employed face a greater risk of MSD. They are 1.3 times more likely than employees to experience MSD but have a lower risk of SAD. Lower SAD rates may be associated with greater autonomy/control of self-employed workers; the demand–control model of work stress suggests that high demands and low level of control are most conducive to stress (Karasek, 1979; Karasek and Theorell, 1990).

Working Patterns

- Long weekly hours are associated with an increased risk of SAD. Those working 30 hours a week or over were more likely to have reported SAD than those working under 30 hours. This was 1.5 times more likely for those working 30–39 hours, 1.7 times more likely for those working 40–49 hours and three times more likely for those working 50 hours and over.
- MSD were not strongly linked to working hours, except that those working 40–49 hours had a lower risk than those working under 30 hours. This may arise because those with MSD reduce their working hours, which is a possibility we cannot rule out with cross-sectional data.
- Both shift work and night work are associated with a greater risk of MSD: shift workers are 1.5 times more likely and night workers 1.2 times more likely to experience MSD than other workers. Shift workers are also 1.3 times more likely to report SAD than other workers.
- Without adjustment for annual exposure, workers with short tenures are found to be less at risk of MSD than those with tenure of five years or more. However, correction for such exposure (months employed over the 12-month reference period) shows that workers with tenure of less than six months have the highest risk of MSD. An identical adjustment reveals that workers with short tenure also face a greater risk of SAD than workers with over five years' tenure.

Economic Environment

- MSD and SAD are both pro-cyclical. Both illness types rise and fall along with the sectoral level of employment (annual percentage change in employment within sectors); however, the relationship is considerably stronger for MSD.
- Annual inspection rates by the Health and Safety Authority (HSA) are associated with lower rates of MSD and SAD, controlling for the economic environment and a range of other worker and job factors. As inspections tend to focus on physical injury rather than on risks to workers' mental health, this association may arise because levels of inspection are positively correlated with other prevention and health promotion activities by the HSA or because the inspection rate is tapping into some other unmeasured effect.

LESSONS FOR THE MEASUREMENT OF WORK-RELATED MSD AND SAD

This report, based on an analysis of the QNHS, highlights the difficulty of measuring work-related illness and has shown that measures are sensitive to the design chosen. This is particularly relevant as researchers and policy makers are interested in having reliable and consistent measures of the prevalence of work-related illnesses over time. We therefore highlight a few changes that would contribute to the improvement of the measurement of work-related illness in general and MSD and SAD in particular.

Measurement

- Self-reported illness is widely used in health research and found to be a good predictor of subsequent mortality. Research in the UK found a high level of reliability between self-reported work-related illness and assessments by a panel of experts and respondents' doctors (Jones et al., 2013). Therefore, self-reported illness should remain as an important measure of work-related illness.
- This study has shown that responses are sensitive to changes in the formatting and wording of the survey questionnaire. This is particularly relevant to the measurement of mental health problems. The 2013 survey, relating to the year 2012, included a reference to mental health in the question, which prompted an increase in the reporting of SAD for that year. This result suggests a possible under-reporting of these health conditions in the other years. Consideration should be given to including an additional question on work-related mental health problems in the questionnaire of future QNHS work-related injury and illness modules.
- Despite the change of wording from 'illness' to 'health problems' in 2012, the rate of MSD in 2012 were consistent with those in adjacent years.
- Consideration should be given to collecting information about the severity of work-related illness, as it is likely to have a strong impact on an individual's health, their length of absence from work (if any) and all associated costs for the employer, as well as wider society.
- The information gathered on work tasks and conditions (working at high speed, tight deadlines, level of job control) in the QNHS is limited, as is that concerning the type of shift work (if any), such as the existence of rotating shift work and length of time working on shift work. Previous research has found that these characteristics contribute to risk of work-related illness; further information on such measures would therefore greatly enhance the explanatory power of the injury and illness module.

LESSONS FOR POLICY

This report identifies individual and workplace factors that are associated with higher risks of MSD and SAD and from which we can draw some lessons for policy that may contribute to reducing work-related illness. Due the cross-sectional nature of the data, we cannot establish causality in the associations found, and conclusions should be interpreted in light of these data limitations.

- The study found that self-employed workers have a high risk of MSD, so policies for monitoring and prevention of MSD should also target the self-employed. This risk is hidden in overall work-related illness rates because the self-employed have a lower risk of SAD and other illnesses.
- New recruits have a higher risk of MSD and SAD (adjusting for exposure). This suggests the need for training for and supervision of this category of workers, as well as management of the

integration of new employees so that they are able to cope, physically and mentally, with the demands of the job.

- With the ageing of the workforce and a higher prevalence of MSD among older workers, there is a need to adapt the working conditions of older workers to prevent and minimise the effects of MSD. This could involve changing the nature of the tasks accomplished by older workers, adjusting working hours and scheduling, or in assisting them with equipment when possible.
- Particular attention in terms of prevention, monitoring and training should be given in firms and organisations where workers are operating on a shift work or night work basis and where it is necessary for the organisation to operate in this manner. This is important for the prevention of both work-related SAD and MSD. Long hours of work should also be minimised given the strong association with SAD. Regulations on hours for employees already exist, though organisational cultures can undermine such regulations for salaried employees, especially those in managerial positions (Worrell et al., 2016; Burchell, 2009). This suggests that attention is needed to enforce existing regulations on working hours and to change organisation cultures.
- It is important to maintain a high level of monitoring in sectors with a traditionally greater risk of MSD, like the agriculture and construction sectors.
- With the increasing proportion of females in the workforce and the greater prevalence of SAD among female workers, there is a need to pay greater attention to these types of work-related risks.
- Recent European-wide research (EU-OSHA, 2016) on work-related stress has highlighted the difficulty that employers have in identifying such risks among their employees: 50 per cent of companies in Ireland acknowledged that they do not have sufficient information on how to assess these risks. There is a need to support employers to conduct audits of stress-related hazards, to evaluate and monitor these risks and identify work organisational changes that would reduce these risks. The HSA has identified these employer needs and has provided some information support to employers for work-related stress (HSA, 2011). Further promotion of this information and targeting of employer groups in the high-risk sectors identified in this study may therefore be useful. Particular attention should be paid to the education sector, where the risk of SAD illness is the highest.
- The HSA has been involved in the development of a tool to audit organisational stress, called the Work Positive Project, which was promoted in the mid-2000s. Given ongoing changes in employment and emerging psychosocial risks identified at the European level, there is scope to renew and expand this programme, following further evaluation of the costs and benefits of previous rounds.

Chapter 1

Work-related Illness in Ireland: Overview and Data Sources

1.1 INTRODUCTION

Work-related illness covers both physical and mental health problems that are caused or aggravated by work. This takes account of a broader range of conditions and experiences than the prescribed conditions that are defined as 'occupational diseases' within national compensation systems. In 2013, an estimated 55,000 workers in Ireland suffered from a work-related illness and over 790,000 days of work were lost due to work-related illness (HSA, 2015). In Ireland and the UK, the two largest categories of work-related illness reported by workers themselves are musculoskeletal disorders (MSD) and stress, anxiety and depression (SAD) (HSA, 2015; HSE, undated). These are also the most commonly identified work-related illnesses in statistical sources using patient data recorded by doctors, such as The Health and Occupation Reporting network (THOR) in the UK (Money et al., 2013). Over the period 2002 to 2013, these two categories accounted for over 60 per cent of all the self-reported work-related illness in Ireland (see Figure 1.1).

Analyses of the costs of work-related illness carried out in the UK and elsewhere also suggest that MSD and SAD entail a high cost for individuals, firms and the state. The estimation of the full costs to society of work-related injuries and illness is complex and difficult to measure and, so far, no such estimates have been made in Ireland. In Britain, the Health and Safety Executive (HSE) (1999) estimated that the overall cost of MSD in 1995–1996 was £5.7 billion, that is, over £10 billion adjusted to 2016 prices. According to the LFS in the UK, both MSD and SAD work-related illness represent the large majority of working days lost, 9.5 and 9.9 million days respectively in 2014–2015 (HSE Statistics). A comprehensive EU-OSHA (2014) literature review on the cost estimates of work-related stress across a range of European countries highlights the complexity of the task. Across the EU15, the European Commission (2002) estimated that the costs of work-related stress were €20 billion a year. In the UK, Chandola (2010), using HSE figures for the total cost of work-related illness estimated that the annual cost of work-related stress varied between £7 billion and £13 billion, that is, 0.5 per cent to 1.2 per cent of the UK's GDP. The wide range of estimates in terms of financial cost and the number of working days lost for MSD and SAD illustrates the difficulty inherent in estimating the total cost to the wider society, as well as the dominance of these illnesses among all work-related health problems.

These two types of illness are the focus of the current study, in which we draw on information from the annual modules on occupational injury and illness in the Quarterly National Household Survey (QNHS) over a 12-year period in order to assess the characteristics of those who experience such illnesses and the characteristics of the jobs that they occupy. We limit the analysis to these two categories of illness not only because they are the two largest groups

in the data and therefore have sufficient cases to allow further analysis, but also because there is reason to believe that other types of work-related illness are not well captured in the type of household survey data on which the study relies. The study covers the period from 2002, when data on work-related illness types was first collected, to 2013, the year to which the most recently available micro-data refers.[1]

This chapter begins with a discussion of the types of illnesses covered in these two categories (section 1.2). Section 1.3 outlines the methodology used and describes the QNHS data in more detail, discussing strengths and weaknesses compared to other sources of information on work-related illness. In sections 1.4 and 1.5 we consider the validity of self-report data and discuss the limitations of the research.

Chapter 2 presents trends in MSD and SAD, based on the QNHS data. It also examines differences across countries based on European data. Chapter 3 presents figures on the composition of workers who experienced MSD or SAD illnesses over the 12-year period, across a number of key demographic and work features; it then goes on to model the factors associated with both types of illness. Chapter 4 summarises the findings and draws out lessons for policy.

1.2 CONCEPTS AND DEFINITIONS

1.2.1 Musculoskeletal Disorders (MSD)

This group of illnesses covers a broad range of health problems, ranging from very specific syndromes with a well-defined pathology and epidemiology to more diffuse conditions and symptoms:

> *'Musculoskeletal disorders' include a wide range of inflammatory and degenerative conditions affecting the muscles, tendons, ligaments, joints, peripheral nerves, and supporting blood vessels. These include clinical syndromes such as tendon inflammations ..., nerve compression disorders ... and osteoarthrosis, as well as less well standardized conditions such as myalgia, low back pain and other regional pain syndromes not attributable to known pathology.* (Punnet and Wegman, 2004, p. 13)

The occupational features that are identified as risk factors for MSD include rapid work pace and repetitive motion, forceful exertions (including lifting, pulling and other manual handling), exposure to cold, non-neutral body postures, and vibration (Bernard, 1997; da Costa and Vieira, 2009). Previous research has identified certain employment sector occupations that have a higher risk of MSD (EU-OSHA, 2010). Certain aspects of work organisation have also been implicated in work-related MSD, for example high demands and a low degree of control or lack of control/autonomy (NRC IOM, 2001) and certain flexible work practices (Brenner et al., 2004). Personal characteristics of workers, such as gender, age and body mass index (BMI), have also been found to be associated with the prevalence of MSD (NRC IOM, 2001; Da Costa

[1] The data come from the modules fielded in q1 2003 and q1 2014 respectively. See section 1.3 for further details.

and Vieira, 2009). The relationship between age and MSD is of increasing interest given the ageing of the working population in Europe (Eurofound, 2012). In Britain, it has been reported that MSD are particularly prevalent among older workers (Silverstein, 2008). Peele et al. (2005) argued that MSD may have a more pronounced effect on older workers than young workers due to superior muscular performance among younger workers and to the lengthening of recovery time for musculoskeletal injuries with age. In a review of the literature, Okunribido and Wynn (2010) conclude that older workers are more susceptible to work-related MSD because of a decrease in functional capacity and the relationship between the demands of work and the workers' capacity. The prevalence of MSD is found to differ by gender across types of problem (for example, whether it affects the back, neck or hands); the role of different occupational exposures, physiological differences and reporting differences in explaining these patterns is not fully established (NRC IOM, 2001). The evidence that high BMI increases the risk of work-related MSD is more firmly established (da Costa and Vieira, 2009).

1.2.2 Work-related Stress, Anxiety and Depression (SAD)

Anxiety and depression are two distinct psychiatric disorders with a defined set of diagnostic criteria (American Psychiatric Association, 2013). However, there is a strong clinical overlap between the two disorders (ibid.). Stress, while not a defined psychiatric disorder, is seen as precipitating episodes of anxiety and depression and has recognised responses, some of which are similar to those produced by anxiety, such as difficulty relaxing, nervous arousal and other responses that are distinctive (Lovibond and Lovibond, 1995). That research also suggests that stress, anxiety and depression can be considered as three negative emotional syndromes. The QNHS groups the three conditions together in one response category, and respondents may or may not have a medical diagnosis of their condition (see below).

The World Health Organization (WHO) defines work-related stress as 'the response people may have when presented with work demands and pressures that are not matched to their knowledge and abilities and which challenge their ability to cope'. There is now a strong body of evidence linking higher work demands, in the form of long hours, job pressure and overload, to psychological illness (Michie and Williams, 2003; Stansfeld et al., 1999; Cherry et al., 2005; Chandola, 2010). Other aspects of job content such as pace of work, organisation of work hours are also risk factors for work stress (WHO, 2004). For example, regarding organisation of work hours, risk factors might include unsocial, strict, inflexible or unpredictable hours. Lack of control over aspects of work (such as tasks and timing) has been associated with a higher risk of both mental (Michie and Williams, 2003) and physical ill health (Marmot et al., 1997). The combination of high demands and low job control are particularly detrimental to mental health (Karasek and Theorell, 1990). Poor personal relations at work have also been implicated in work-related illness (Cherry, et al., 2005; Michie and Williams, 2003). There is also a growing body of research linking job insecurity to poor psychological health (Burchell et al., 2002; De Witte, 1999). Unfair reward and evaluation systems, in particular an imbalance between reward and effort, can also lead to worker stress (Siegrist, 1996).

Previous research suggests that around one-quarter of employees in Ireland described their work as 'always or often stressful' in both 2003 and 2009 (O'Connell et al., 2010). While a

European-wide survey on working conditions carried out in 2010 found that 22 per cent of workers in Ireland said they experienced stress at work 'always' or 'most of the time'. The proportion that always experienced stress was the third highest in the EU15 and was tenth highest among the 34 countries surveyed.[2]

While SAD illnesses are mental health problems, they can also lead to physical symptoms such as headaches, sleep disruption, fatigue and physical illness such as heightened blood pressure and cardio-vascular diseases (Karasek, 1990; Marmot et al., 1997; Siegrist, 1996; American Psychiatric Association, 2013). Therefore it is also likely that some of the 'other' conditions in self-report surveys may in fact involve SAD as a causal antecedent.

Some workers may experience both SAD and MSD. This may be due to a causal relationship; for example, a serious physical health problem may lead to stress, anxiety or depression, or those with SAD may be more likely to experience injury and subsequent MSD. Alternatively, such co-morbidity might arise if environmental conditions give rise to higher risks of both types of illness. For example, the literature discussed above suggests that those working unsocial hours are more exposed to SAD and MSD. Our previous analysis of the European Working Conditions Survey (EWCS) found that those who experienced higher psychosocial hazards had a lower level of psychological wellbeing and a higher risk of occupational injuries (Watson et al., 2015).

As will be described in greater detail in chapter 2, this study relies on self-reported work-related illness: illnesses that workers themselves identify as having been caused or made worse by work. This differs from the classification of occupational diseases used for compensations systems for state benefits or private insurance/legal cases. The International Labour Organization (ILO) defines 'occupational disease' in the following manner:

> *Occupational diseases are those that are included in international or national lists, and are usually compensable by national worker's compensation schemes and are recordable under reporting systems. … For occupational diseases work is considered the main cause of the disease.* (ILO, 2005)

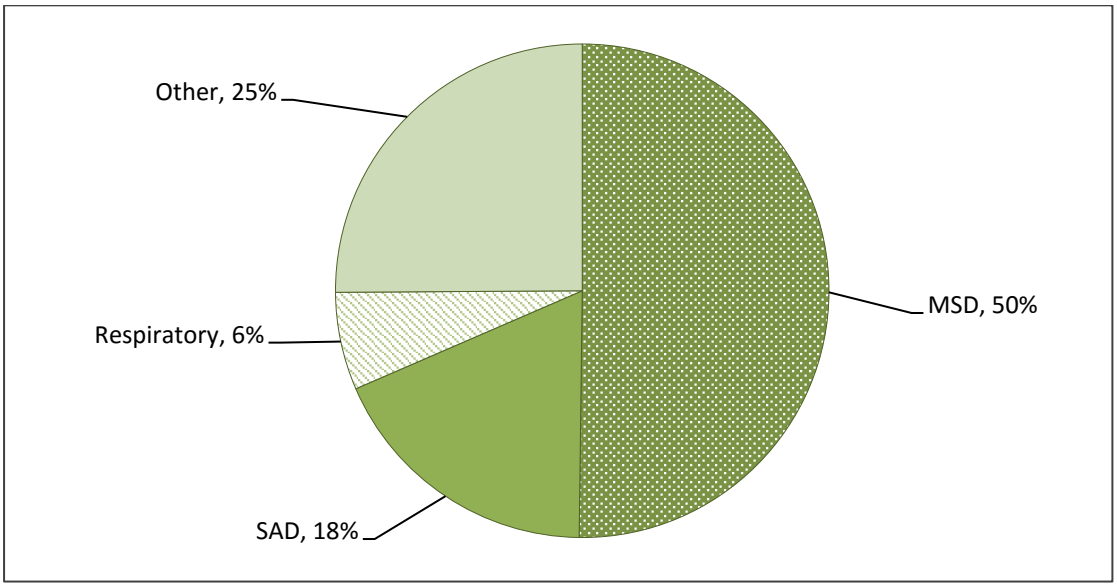
The list of occupational diseases identified by the Department of Social Protection in Ireland is available on the Department of Social protection website.[3] The list includes many MSD (and related injuries), but it does not include SAD. Nevertheless, occupational injury benefit (OIB) statistics show that a small percentage of claims relate to SAD illnesses, suggesting that they are permitted under the scheme in the context of other injuries, although they are not included in the list (see Table A1 in the appendix). This omission of SAD is also true of the European Schedule of Occupational Diseases.[4]

[2] Authors' own analysis of the European Working Conditions Survey, 2010.

[3] See: http://www.welfare.ie/en/Pages/Occupational-Injuries-Benefit---Prescribed-Occupational-Dise.aspx.

[4] See: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003H0670&from=EN.

Figure 1.1 Composition of Self-reported Work-related Illnesses, QNHS (2002–2013)



Note: 'Other' includes hearing problems, skin problems, headache and/or eyestrain, heart disease or attack or other problems in the circulatory system, disease (virus, bacteria, cancer or other type of disease) and other types of complaint.

1.3 DATA AND METHODOLOGY

This report uses data from the annual Quarterly National Household Survey (QNHS) to explore work-related MSD and SAD illnesses in Ireland. As a household survey, the QNHS relies on workers themselves to identify whether they have experienced an illness that is related to work. It is also up to the worker to classify the type of illness into a broad category. This type of self-report data is used widely to investigate work-related illness as well as in epidemiological studies more generally. The following section outlines the nature of these data and their limitations; it also outlines how the data compare to other sources of information on work-related illnesses and why they provide the best available information on MSD and SAD. In 2007 and 2013, the Irish QNHS module formed part of a European-wide survey on work-related illness (and injury), and in the final section of this chapter we present the Irish figures in that broader context.

1.3.1 Quarterly National Household Survey (QNHS) Module on Work-related Accidents and Illness

The main sources of data for the current study are the annual special modules on work-related accidents and illnesses collected as part of the QNHS. The Central Statistics Office (CSO) has provided micro-data for the modules carried out in the years 2002 to 2014, which provide data on work-related illness (and injuries) in the years 2001 to 2013. We do not use the data for the year 2001 because the 'type' of illness was not distinguished for that year. The sample is representative of Irish households across the country. **In the tables and graphs that follow, the year refers to the reference period in which the illness occurred rather than the date on which the survey was fielded.**

Only those who were employed at the time of the survey or who were not currently employed but had worked during the 12-month reference period were asked to complete the module on workplace illness and injury. We excluded answers from proxy interviews from the analysis

to avoid any misrepresentation.[5] The number of respondents for each module ranges from a minimum of 7,000 to a maximum of 45,000 in 2002, with a total of 162,000 cases provided for analysis.[6]

Interviews were carried out in the respondent's home and were not in any way connected to the workplace or the employer. Therefore, respondents had no reason to fear sanctions from their employer about any statement they might make about their experience of injury or illness in the workplace; neither can the employer contradict or confirm the information. All the information collected from each respondent concerning injury or illness, as well as the attribution of the cause, is based on their self-identification and description. The illness may or may not have been assessed by a doctor. We include all reports of MSD and SAD, regardless of whether or not the illness resulted in any absence from work. Therefore, the illnesses reported may never have been disclosed to the employer. Absenteeism is affected not only by the 'seriousness' of an illness but also by the characteristics of the worker and workplace and of the system of sickness compensation (Brooke and Price, 1989). For this reason, only selecting cases where there has been an absence from work would introduce additional biases.

The QNHS module is usually fielded in Quarter 1 of the year in question. It refers to accidents and illnesses that occurred within the 12 months of the preceding calendar year.[7] Over the years the questionnaire included in the QNHS module has been modified; a detailed transcription of the questions used over the period is presented in Table A2 in the appendix.

The precise questions used to measure work-related illness for the years 2008 to 2013 (excluding 2012, European module) were as follows.[8]

- *How many, if any, illnesses or disabilities have you experienced during the 12 months January 20XX to December 20XX, that you believe were caused or made worse by your work?*

- *Now thinking about the time(s) when you were in employment during the 12-month period January 20XX to December 20XX, how many days were you absent from your job as a result of your **most recent** work-related illness?*

[5] During the household interview not all household members were present to answer questions so some household members answered on behalf of the absentee (interview done by proxy). We excluded proxy interviews from the analysis as the reliability of the answers is uncertain, particularly in relation to events such as injury and illness and the number of days of absence from work.

[6] While the range of cases is very wide across QNHS waves, the data are reweighted, so that the number of cases per year is more evenly spread and to correct for other response biases.

[7] Pre-2009 the module referred to the 12 months prior to the interview (CSO personal communication) while since 2009 onwards it has referred to the previous calendar year.

[8] The third question is asked independently of any absence from work as long as the respondent has experienced at least one illness event.

- *Which of the following best describes your most recent work-related illness?*

    1. *Bone, joint or muscle problem*
    2. *Breathing or lung problem*
    3. *Skin problem*
    4. *Hearing problem*
    5. *Stress, depression or anxiety*
    6. *Headache and/or eyestrain*
    7. *Heart disease or attack, or other problems in the circulatory system*
    8. *Disease (virus, bacteria, cancer or other type of disease)*
    9. *Other types of complaint*
    10. *Not applicable.*

Prior to 2009, the first question shown above (about the number of illnesses or disabilities) included this additional qualification: 'Either the work that you are doing at the moment or work that you have done in the past'. For the 2009 survey and all subsequent years, this was omitted. This means that the current illness experienced by the worker might not be related to their current occupation if the worker changed occupation or economic sector.[9]

In the surveys referring to 2006 and 2012, the questionnaire module on work-related accidents and Illness was replaced by a harmonised European questionnaire used by all Member States, resulting in a number of significant changes.[10] First, in both years the field date was changed from Quarter 1 to Quarter 2. Secondly, in 2012 the reference period was changed from 'the previous calendar year' to the 12 months preceding the interview date. Thirdly, in both years the order of the questions about the nature of the illness and the number of days of absence was reversed. Fourthly, in 2012 the wording was changed to the following:

- *In the 12 months prior to this interview and excluding any accidents you might have highlighted already, have you suffered from any physical or mental health problems?*

- *How many of these health problems are caused or made worse by work you are doing or have done in the past?*

These two questions replaced the first two questions asked in the regular CSO module (see Table A2 in the appendix for details). The addition of the phrase 'have done in the past' may mean that respondents are more likely to mention long-standing health problems caused by previous employment. The replacement of the term 'illnesses or disabilities' with 'physical or mental health problems' is also likely to elicit different responses from respondents. The

[9] The economic sector and occupational group refer to the situation of the respondent at the time of the interview and not at the time of the injury or illness.

[10] Due to some misunderstanding, Ireland and three other European countries did not interview people who did not work during the reference week but who had worked in the past (Agilis S.A. Statistics and Informatics, 2015). It is likely to have impacted self-reported illness estimations.

explicit mention of 'mental health' problems, which is not in the question text for other years, means that respondents are more likely to include spells of SAD that were caused or exacerbated by work. The trend figures show a significant increase in this category of illness in 2012 (see Figure 2.3 in chapter 2).[11] On average, between 2002 and 2011, SAD represented approximately 17 per cent of all illnesses reported, while in 2012 it was 31 per cent. So there is a strong suspicion that this large increase is due to the change in the format of the question. In the analysis in chapter 3, we take account of these changes in question wording by running the models with and without the data for the year 2012.

1.4 VALIDITY OF SELF-REPORTED ILLNESSES

How do we know that the illnesses reported by workers in response to a household survey are really 'work-related' and that respondents are not mistaken in their attribution of work as a cause? A recent UK study by the Health and Safety Executive (Jones et al., 2013) has explored the reliability of self-identification of illness during survey interviews. In it, the authors use the Labour Force Survey (see description below) as their main source for annual work-related illness statistics. A sample of respondents (n=814) who reported an illness in the LFS were followed up and re-interviewed by telephone, in over 80 per cent of cases, or by face-to-face interview. Their answers were assessed by a panel of experts including occupational physicians, a psychologist and members of the study team (who also formed part of the panel for the previous review in 1995). The expert panel judged that:

- in 77 per cent of cases their illnesses were plausibly work-related;
- in 10 per cent of cases the illness was not caused by work but exacerbated by work; and
- in 13 per cent it was very unlikely that the illness was work-related.

In 166 cases, information was also received from the respondent's doctor. Where such medical opinion was available:

- 57 per cent agreed that work was definitely a main or contributory cause;
- 27 per cent judged that work was possibly a main or contributory cause;
- 13 per cent judged that there was a symptomatic link only; and
- 3.6 per cent judged that the illness was unlikely to be or definitely not work-related.

There was a relatively high degree of inter-rater reliability. Where information was available from both doctors and the expert panel (n=161), the responses were consistent in 80 per cent of cases. Inter-rater agreement was highest for SAD illnesses (98 per cent), and lower for MSD (73 per cent) and the remaining conditions (66 per cent).

1.5 LIMITATIONS

The QNHS provides the best randomised national sample of work-related injuries and illnesses. In the UK where the set of data sources are very similar to those in Ireland, the Health and Safety Executive has advised that self-report data, of the kind collected in the QNHS and British Labour Force survey, is the best data source for examining MSD and SAD work-related

[11] The 2012 results are drawn from the 2013 European module fielded in Quarter 2.

illness.[12] Nevertheless, the QNHS data have a number of limitations, which are outlined below. These limitations are shared with other cross-sectional surveys in the UK and elsewhere.

The first limitation is that a survey of this kind cannot adequately capture certain occupational diseases such as cancers, respiratory diseases and heart disease, which are multi-factorial in nature and have a long latency period. The latency period between exposure and onset of illness means that respondents are less likely to relate this to their current job (though in some years the QNHS questions prompt respondents to include illness in the last 12 months that might have been caused by work done in the past – see Table A2 in the appendix). Moreover, because of the multi-factorial nature of many of these diseases it is difficult for the individuals affected, as well as medical professionals, to assess the causal role of work.

A number of other sources of information exist on occupational diseases, which are described in greater detail in Appendix 1 (see Drummond, 2007, for a comprehensive review). The OIB statistics provide information on cases of prescribed occupational diseases where a successful claim has been made. One strength of that data is that the information is triple validated – employee applied, employer verified, and medically certified. However, administrative statistics are shaped by the eligibility rules and coverage, and therefore do not include illnesses that occur to workers outside the scheme (such as the self-employed) or cases where employers are non-compliant or individuals do not have access to medical services. Figures on the OIB claims by type of incapacity are outlined in Table A1 (appendix). The National Cancer Registry provides details on the incidence and prevalence of cancer but not of causes; therefore, except regarding cancers that are almost exclusively caused by occupational exposures such as mesothelioma, the number of work-related cancer cases cannot be identified (see Appendix 1). Finally, data are available from The Health and Occupation Reporting (THOR) network, which involves data collection directly from medical and occupational specialists, but this covers a limited number of medical practitioners (see Appendix 1).

The QNHS data on work-related illness do include other cases, such as those relating to heart disease, respiratory disease, skin diseases and eye problems. However, the issue of small numbers as well as the concern that these are not representative of the wider population of cases, led to the decision to restrict analysis to MSD and SAD.[13] A further limitation of the QNHS data, and consequently of the analysis, is that it is cross-sectional. This means that causality cannot be established and findings may be influenced by selection processes. The most well-known of these selection effects is the 'healthy worker effect', whereby the least healthy or most seriously injured workers leave the labour market and the healthier workers remain. Those who have not worked in the 12 months preceding data collection are not included in the QNHS module; therefore, the extent of work-related illnesses and injuries is underestimated. All else being equal, the propensity for 'unhealthy' workers to leave the labour market will depend upon both the extent to which employers accommodate those with

[12] See http://www.hse.gov.uk/statistics/preferred-data-sources.htm.

[13] In the UK where there is a similar set of data sources, the Health and Safety Executive advises that practitioner reports such as THOR and administrative data are better suited than the Labour Force Survey for collecting information on other occupational illnesses and diseases (see http://www.hse.gov.uk/statistics/preferred-data-sources.htm).

disabilities or illness and the level of compensation available through the welfare system. Some of those who have left the labour market will appear in the Department of Social Protection (DSP) figures for receipt of long-term illness benefit or disability benefit; however, it is not possible to identify which of these cases are occupational in origin. Moreover, eligibility requirements mean that this is a selective group; for example, the self-employed and workers with shorter social insurance contribution records are unlikely to qualify for such benefits and therefore will not appear in the benefit statistics. The QNHS also collects information on the proportion of the working age population that are unable to work due to illness or disability. This figure remained stable at about 3–4 per cent for the period 2004 to 2013 (see Table A1.4 in Russell et al., 2015). The data do not distinguish between illness and injury. Neither do they reveal the cause of the injury or illness and whether it was work-related.

A further selection process that may influence the results arises from the tendency of workers with a chronic illness or a disability to change to a less demanding job (Ostlin, 1988). This process may affect the relationship found between work-related illness and occupation, sector and hours of work. The issues of causality and selection can be addressed by using longitudinal research, where workers are followed over a long period and contributory factors at an earlier time point can be linked to later outcomes. The Irish Longitudinal Study of Ageing (TILDA) will provide such data in the future.

A final caveat concerning the QNHS module data is that although the number of respondents is large, occupational injury and illness events are uncommon and therefore the un-weighted numbers are relatively small. This is especially true when the figures are broken down by sector or some other characteristic. The statistical models take the underlying numbers into account when establishing significance but frequency tables for sub-groups should be treated with caution.

Chapter 2

Trends in Illness Types 2002 to 2013

2.1 INTRODUCTION

The QNHS data on illness and illness types covers the period 2002 to 2013. This includes a cycle of economic growth (2002–2007), followed by a recession (2008–2011) and the start of an economic recovery (2012–2013). Over this period, employment peaked at 2,169,000 in 2007 and fell to a low of 1,825,000 in 2012. The period was also marked by substantial changes in the composition of employment, in terms of the balance of employment across different sectors of the economy (see Figure 2.1) and in the gender, age and nationality profile of the workforce. Our earlier research on the QNHS found that the dramatic changes in employment over the period influenced the rates of injury and illness (Russell et al., 2015). Increases in employment were found to be associated with a significant increase, not just in the absolute numbers experiencing work-related injury and illness, which would be expected due to the higher volume of workers, but also in the *rate* of work-related illness and injury. Conversely, the rates of illness and injury (expressed as percentages or per 1,000 workers) declined when employment rates fell. This 'pro-cyclical' pattern was found to persist within sectors, when differences in the sectoral employment trajectories were taken into account (ibid, p. 53).

While the relationship between work-related illnesses and the economic cycle has not been widely studied, research on the influence of macro-economic conditions on the mental health of the broader population provides some relevant insights. Overall we might expect economic recession to lead to a deterioration in the mental and physical health of the population due to factors such as rising unemployment, financial stress and reduction in access to or the quality of health services. There is a wide body of evidence, including longitudinal studies, which shows that unemployment leads to poorer physical and psychological health at the individual level (see McKee-Ryan et al., 2005, for a review). The association between recession and health at the aggregate level is more complex. Several studies have found that total mortality and several specific causes of death decline during recession – a pattern attributed to factors such as healthier lifestyles due to reduced disposable income, fewer cars on the road and a reduction in hazardous working conditions (Ruhm, 2000, 2015). However, the societal effects on health are likely to depend on the standard of living in the country pre-crisis and the extent of the welfare state (Suhrcke and Stickler, 2012). In Ireland, Walsh (2013) examined the relationship between the economic cycle (measured by GDP and unemployment rates) and various objective and self-assessed measures of psychological ill health. He found that over the period from the mid-1960s to 2010 there was only a weak relationship between economic cycle and admission rates to psychiatric hospitals. The unemployment rate was associated with an increase among young men; however, this effect was tempered by reduced alcohol consumption and was also found to have weakened in the most recent recession.

Within the workplace and for those still in jobs, the influence of the economic cycle on mental and physical health is uncertain. On the one hand, higher levels of uncertainty and job insecurity have been found to increase stress among workers who do not lose their jobs, sometimes known as the 'survivor effect' (Pepper et al., 2003; Green et al., 2014). Indeed, the detrimental effects of insecurity on wellbeing are found to be of a similar order as the impact of unemployment (Bohle et al., 2001; Dekker and Schaufeli, 1995; Paugam and Zhou, 2007). This would lead to the expectation of greater stress, anxiety and depression (SAD) among workers during a recessionary period. On the other hand, periods of rapid economic growth may bring longer working hours, increased work intensity and pressure, leading to higher stress in boom periods. Moreover, workers may be reluctant to report any work-related illness during a recessionary period, which would lead to an apparent drop in related SAD illnesses. Such reporting bias may be particularly acute for mental health problems where there may be an additional sense of stigma. The data used in the current study come from household surveys; the report is made to an interviewer and there is no requirement for the illness to have been reported to the employer at the time of interview. Nevertheless, illnesses that involved an absence from work may be more likely to be recalled at the time of the interview, so reluctance to report is not entirely eliminated.[14]

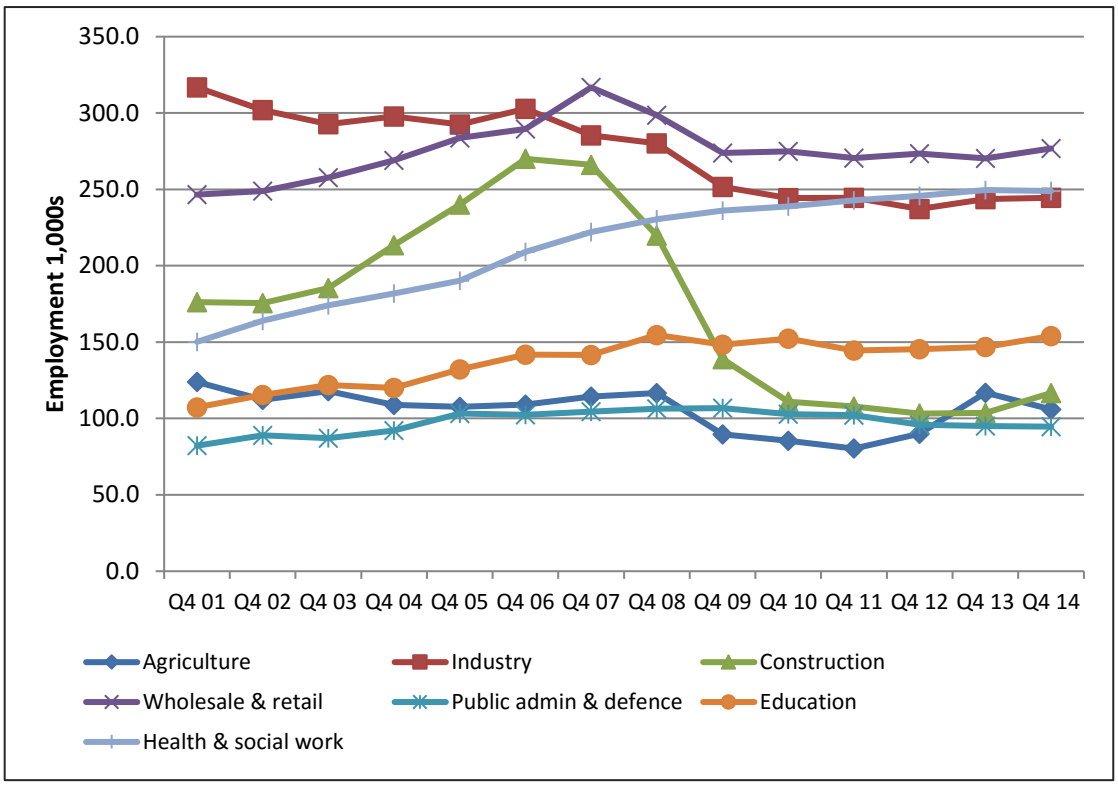
The empirical evidence to date is mixed. Absenteeism tends to fall during a recession, as workers are less likely to take sick leave when they feel insecure in their employment (Shapiro and Stiglitz, 1984; Livanos and Zangelidis, 2013). Robinson and Shor (1989) found that while the rate of illness in manufacturing was pro-cyclical, in the construction sector illness decreased with employment growth.

2.2 WORK-RELATED ILLNESS TRENDS

As noted in Section 2.1, the period 2002–2013 saw exceptional change in both the level of employment and the sectoral composition of employment. It is important to take account of these changes as they impact on the overall number of illnesses and the relative rates because workers in specific sectors have different underlying risks of musculoskeletal disorder (MSD) and SAD illnesses. Of all the sectors presented in Figure 2.1, the construction sector experienced the most dramatic shifts in the level of employment due to the construction boom and subsequent crash. The wholesale and retail sector also saw a large increase in the level of employment in the boom period but falls in recession were less dramatic. The industry sector saw a consistent fall in the level of employment over the entire period while the health sector experienced continuous expansion, even during the recession, with levels stabilising in 2013–2014. Employment in education grew until 2008 and then remained stable until 2014. Finally, the agriculture and public administration and defence sectors experienced more modest variation in employment numbers.

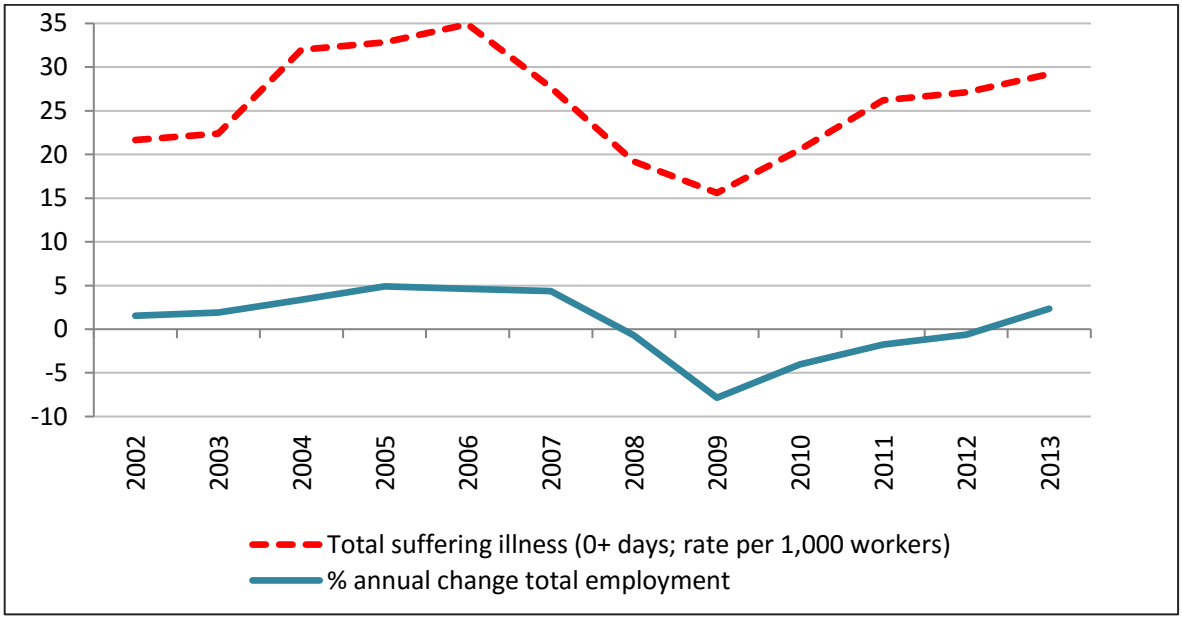
[14] It is expected that reluctance to disclose stress, anxiety or depression to an interviewer may result in under-reporting but this is unlikely to be correlated with the business cycle.

Figure 2.1 Employment Trends in Selected Sectors (2001–2014)



Source: QNHS annual published statistics

Figure 2.2 Change in Work-related Illness per 1,000 Workers and Annual Percentage Change in Employment, 2002–2013



Source: Russell et al. (2015), updated to 2013.
Notes: Due to question changes, the illness figure for 2012 is not directly comparable with other years. 0+ days indicates all work-related illness, including those involving no absence, are counted.

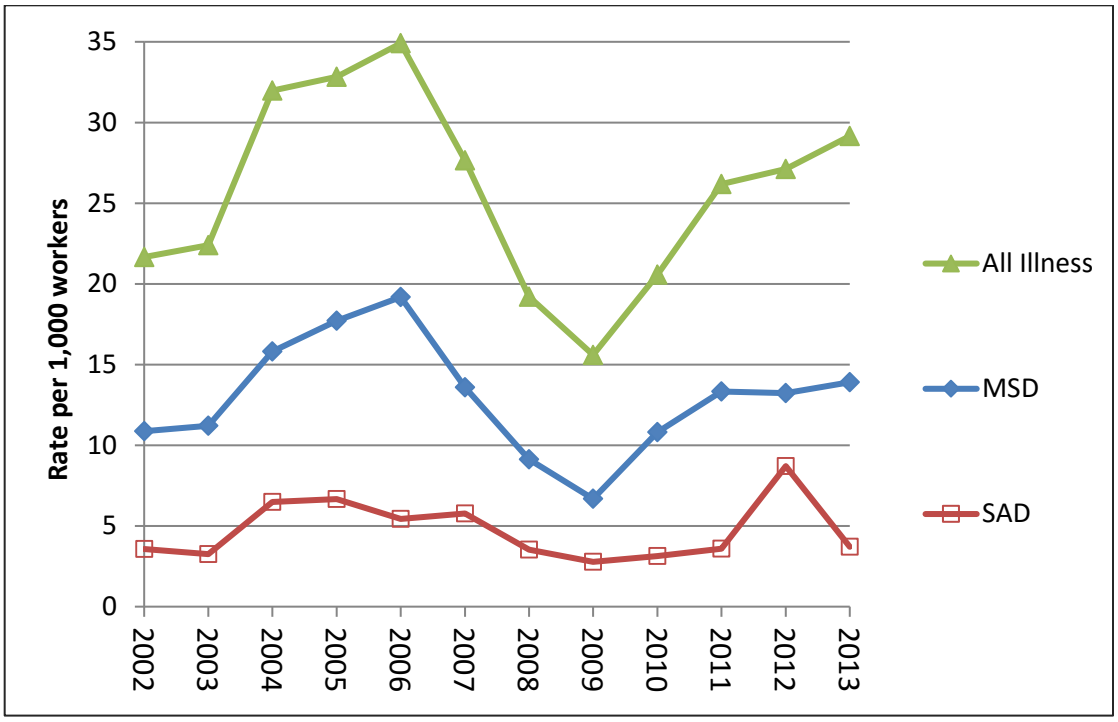
The overall trends in work-related illness rates for the period are reproduced in Figure 2.2. The overall rate of illness among workers was stable at 22 per 1,000 workers for the years

2002–2003, before rising steadily to reach a peak of 35 per 1,000 workers in 2006. This increase in the work-related illness rate mirrored the sharp increase in economic activity, the GDP growth rate, which went from 3.8 per cent in 2003 to 6.1 per cent in 2006, and the increase in employment, which was growing by between 2 per cent and 5 per cent a year (see Figure 2.2). From 2008, the numbers in employment fell sharply, declining by a record 8 per cent between 2008 and 2009 and dropping a further 4 per cent between 2009 and 2010. The GDP growth rate also plunged dramatically, going from 5.5 per cent in 2007, to -2.1 per cent in 2008 and then to -5.6 per cent in 2009. During the same period the illness rate also fell considerably, reaching its lowest level in 2009 at 15 per 1,000 workers. As the economy started to recover slowly, with small but positive GDP growth going from 0.4 per cent in 2010 to 1.4 per cent in 2013, we also observed an increase in the rate of illness among workers. Even though recent economic growth, as shown with the GDP growth figures, is not as high as before the recession, the illness rate among workers in 2013 reached a similar level to that observed during the economic boom, with a rate of 29 per 1,000 workers.

Do these trends hold when we look at the two main types of work-related illness? Figure 2.3 shows how the rates have altered over the period for MSD and SAD. There are higher rates of MSD than there are of SAD illnesses, but both type of illness followed the same trend as overall illness rates: they increased and decreased with the economic cycle. However, variation was sharper for MSD than for SAD illnesses, with greater absolute changes observed for the former than for the latter. The MSD rate went from 11 per 1,000 workers in 2002 to a high of 20 per 1,000 workers in 2006, before falling to a low of 7 per 1,000 workers in 2009, after which it rose steadily again to bring 2013 rates to a similar level to those in 2004. For SAD rates, the variation was much smaller, going from almost 5 per 1,000 workers in 2002 to 7 per 1,000 workers in 2005, before falling to a low of 3 per 1,000 workers in 2009. Excluding 2012, which is affected by question changes, rates have continued to remain at about 4 per 1,000 workers.[15]

[15] See Section 1.3 about modification of the QNHS questionnaire with the EU module and the likely impact this had in terms of a larger estimation of stress, anxiety and depression in 2012.

Figure 2.3 Worker Rates of Overall Illness, MSD and SAD Illnesses in Ireland, QNHS 2002–2013



Notes: 'All illness' includes MSD, SAD and other illnesses. The figures for 2012 are not strictly comparable with other years due to changes in question wording. This especially affects the figure for SAD.

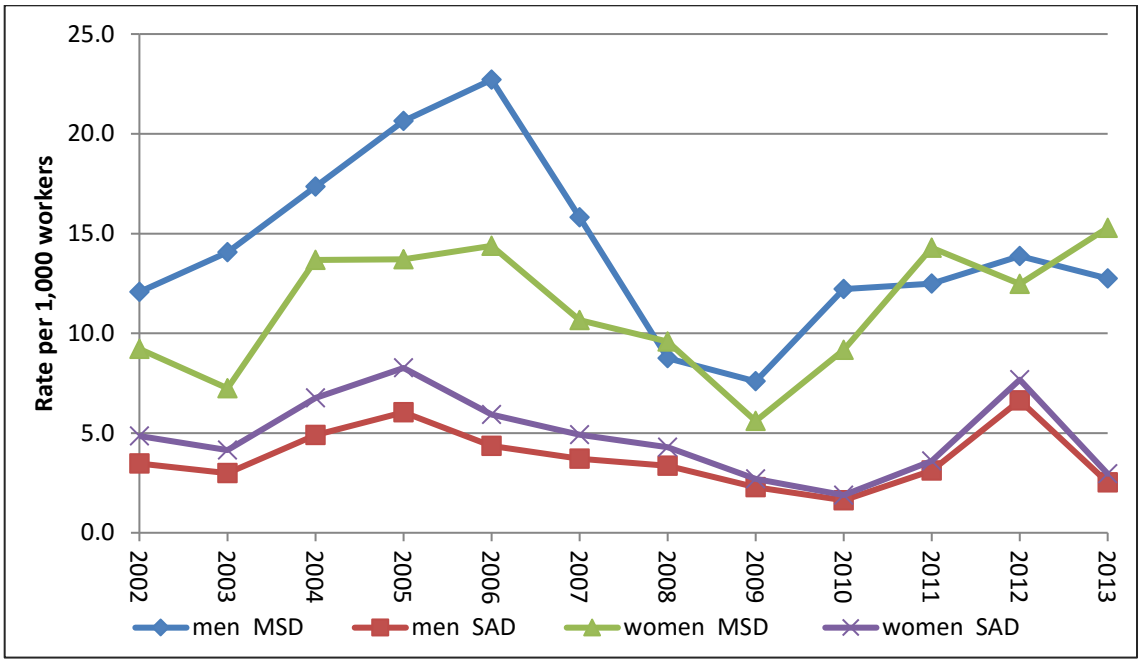
2.3 ILLNESS TYPES BY GENDER

Looking at the MSD rates for male and female workers, we note two distinctive patterns (Figure 2.4). In the first period, from 2002 to 2007, male MSD rates are much higher than their female counterparts; while the male rates went from a low of 12 per 1,000 workers in 2002 to a high of 23 per 1,000 workers in 2006, for female workers, the corresponding rates were 9 and 14 per 1,000 workers. For both male and female workers, the MSD rate fell to its lowest level in 2009 before rising again; however, after 2009 there was no longer a wide gender gap in the MSD rates and in 2013 the female rates overtook male rates.

Trends in SAD rates, for both male and female workers, are less strongly linked to the economic cycle than trends in MSD rates.[16] The peak and the subsequent fall in SAD rates for male and female workers took place earlier than they did for overall illness, before rising again from 2010 onwards (excluding the year 2012, see footnote 15). Throughout the period, the rates of SAD illnesses for male and female workers were much lower than they were for MSD and the gap between the sexes was much narrower. The main gender difference is that women reported a higher rate of SAD illnesses than men, particularly during the period 2002 to 2010. However, since the beginning of the economic recovery, this gap between female and male workers has narrowed considerably as the rate of SAD illnesses began to increase again for both genders.

[16] The pro-cyclical effect on stress, anxiety and depression is confirmed in the statistical model in Chapter 3.

Figure 2.4 Trends in Main Illness Type by Gender, QNHS 2002 to 2013 (Rate per 1,000 Workers)

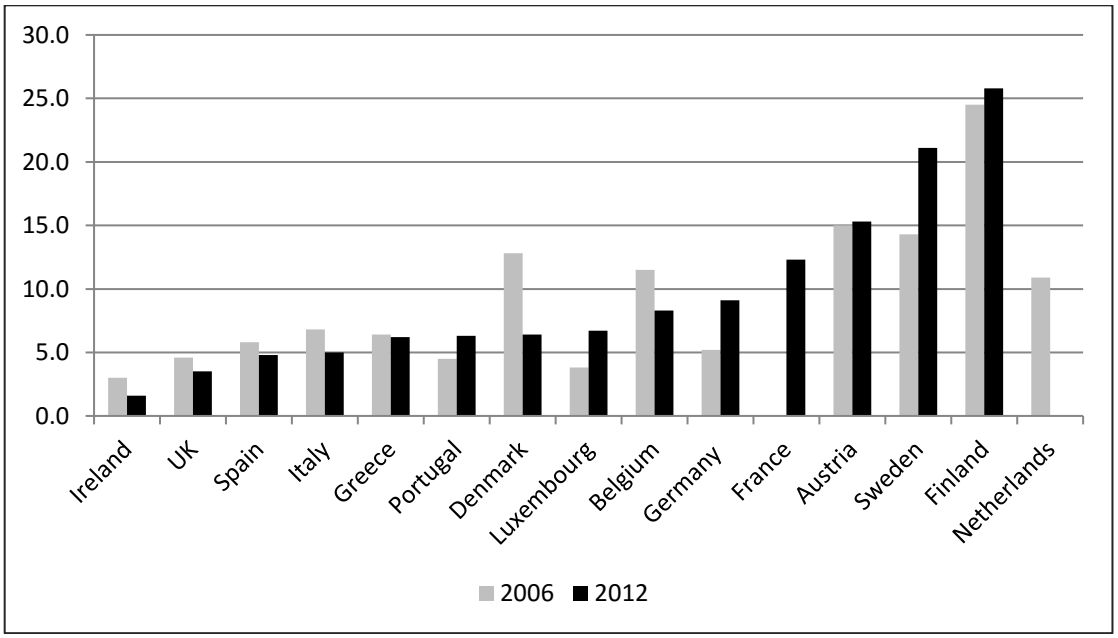


2.4 TRENDS IN ILLNESS IN EUROPE

Over recent years, many European countries have experienced a severe economic downturn as a consequence of the Great Recession that started in 2008. In this section, we report on trends in illness for workers over the period of economic recession in the EU15 countries.[17] Drawing on data from the European Labour Force Survey (EU-LFS), Figure 2.5 shows the percentage of working age adults (15–64 years) that reported a work-related health problem in 2006 and 2012. It shows a very wide variation across European countries in the percentage of workers reporting an illness for both these years. In 2006, illness figures ranged from 3 per cent in Ireland to a high of 25 per cent in Finland. While there is no clear pattern across countries, we observe that the southern European countries have low illness rates, while many north European countries have high rates; this pattern may reflect national differences in the propensity to self-report illness rather than a real difference in risks. In 2012, half of the countries show a fall in the percentages of illness among workers, particularly in Denmark and Ireland where the percentage is half that of 2006. In Luxembourg, Germany and Sweden, the opposite is found, with rates in 2012 more than one and a half those observed in 2006.

[17] For clarity of presentation the graph is limited to the EU15. This group also includes many Ireland's closest comparators in terms of geographical location, GDP, and size. The results for all EU27 countries are available on the Eurostat website.

Figure 2.5 Percentage of Persons Reporting a Work-related Health Problem, EU15, 2006 and 2012



Source: EU-LFS 2007 and 2013. The surveys were fielded in Q2 2007 and Q2 2013 but referred to the previous 12 months, that is 2006 and 2012 respectively.
Note: The Netherlands did not participate in the 2013 LFS ad hoc module on accidents at work and health problems (see Agilis S.A. Statistics and Informatics, 2015).

In Ireland, illness rates differed by gender during the period being studied; male illness rates were higher. Rates also fell over time for both genders. In Table 2.1 we assess whether this was also the case in other EU15 countries. The results are presented in ascending order based on male percentages for 2006. Of all the EU15 countries and at both time points, Ireland has the lowest percentage of illness among male and female workers. In 2006, for the majority of countries, the percentage of illness among male workers was higher than it was among female workers. Overall, the gap between males and females was not very large, barely exceeding 3 percentage points. The highest gaps occurred in France (3.2 per cent) and Austria (2.7 per cent), compared to only 0.8 per cent in Ireland. However, the gap was much larger in countries where female workers had a higher percentage of illness rates than male workers. This is particularly true regarding some of the Scandinavian countries such as Finland (8 per cent), Sweden (5 per cent) and Denmark (4 per cent).

The proportion of male and female workers reporting an illness decreased over time in most of these countries. For male workers, the largest reduction is observed in Denmark, Belgium and Ireland, where the rate almost halved between 2006 and 2012 (though it started from a low base). Only Germany and Sweden saw a large increase in illness rates among male workers. Regarding female workers, Denmark and France saw large reductions in illness rates. Overall, however, reductions in the rates of illness among women were lower than those for male workers; this is because the base figure for female workers in 2006 was lower than the that for male workers. For Ireland, illness rates among female workers fell from 2.5 per cent in 2006 to 1.6 per cent in 2012. Again, as observed for male workers we also see an increase in illness rates for female workers in Germany and Sweden.

Table 2.1 Percentages of Persons Reporting a Work-related Health Problem by Gender, EU15, 2006 and 2012

	Male		Female	
	2006	2012	2006	2012
Ireland	3.3	1.6	2.5	1.6
United Kingdom	4.8	3.5	4.4	3.5
Spain	5.5	4.7	6.0	5.0
Italy	7.3	5.2	6.3	4.8
Portugal	3.5	5.5	5.5	7.0
Denmark	10.8	5.6	14.8	7.2
Luxembourg	4.2	6.0	3.3	7.4
Greece	6.9	6.3	5.7	6.0
Belgium	12.6	8.3	10.3	8.3
Germany	5.6	8.6	4.8	9.7
France	*	11.2	*	13.4
Austria	16.3	15.5	13.6	15.1
Sweden	11.7	17.0	17.0	25.3
Finland	20.6	21.6	28.4	30.0
Netherlands	11.1		10.7	

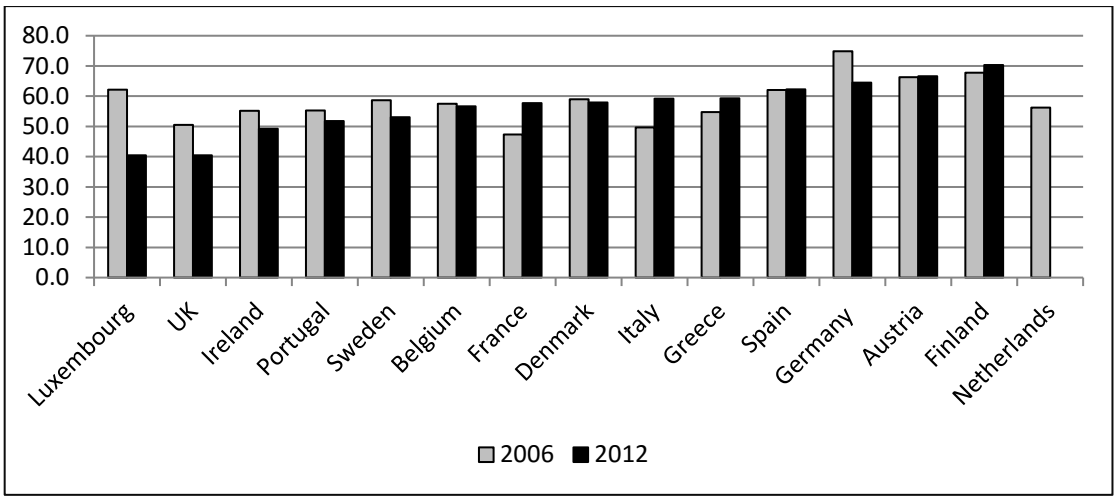
Source: EU-LFS 2007 and 2013. The surveys were fielded in Q2 2007 and Q2 2013 but referred to the previous 12 months, that is 2006 and 2012 respectively.
*Notes: * The French figures in 2006 are not comparable with other countries due to wording differences (TNO, 2009). The estimates produced by Eurostat for Ireland differ from those published by the HSA and Russell et al. (2015). For 2006 our estimate was 3.7 per cent for men and 3.1 per cent for women. In 2012 our estimate was 2.9 per cent for men and 2.5 per cent for women. The discrepancy is due to the use by Eurostat of proxy answers while our data exclude proxies for the purpose of national results. In 2006, 46.4 per cent of the responses for Ireland came from proxies and were shown to under-report health problems (TNO, 2009). The Netherlands did not participate in the 2013 LFS ad hoc module on accidents at work and health problems (see Agilis S.A. Statistics and Informatics, 2015).*

The EU-LFS provides a breakdown of the types of illness reported in each country; this analysis was made available by Eurostat. Here we present the proportion of work-related illnesses in each EU15 country that falls into the categories of (1) MSD and (2) SAD illnesses. It should be noted that these figures do not correct for the occupational or sectoral distribution of workers across countries, which is likely to affect the proportion of workers exposed to different hazards. Neither do the figures take into account factors such as the age profile of workers in different countries.

In 2006, MSD accounted for the majority of work-related illnesses across all the countries, ranging from 47 per cent in France to 75 per cent in Germany (Figure 2.6). In Ireland, 55 per cent of illnesses in 2006 were MSD, which was below the average of 58 per cent across all EU28 countries (not shown in Figure 2.6). While there is no clear pattern across those countries with the lowest proportion of MSD, at the other side of the spectrum (those with the highest proportion of MSD) we find three northern European countries: Germany, Austria, and Finland.

In just over half of the EU15 countries, the proportion of work-related illnesses that were MSD fell between 2002 and 2012. The largest decreases occurred in Luxembourg, Germany and the UK. In Ireland, MSD fell from being 55 per cent to being 49 per cent of work-related illnesses. Only in two countries (Italy and France) was there a substantial increase – of 10 per cent – in MSD as a proportion of all work-related illnesses.

Figure 2.6 MSD as a Percentage of All Work-related Health Problems, EU15, 2006 and 2012



Source: EU-LFS 2007 and 2013.
Note: The surveys were fielded in Q2 2007 and Q2 2013 but refer to the previous 12 months, that is 2006 and 2012 respectively. The Netherlands did not participate in the 2013 LFS ad hoc module on accidents at work and health problems (see Agilis S.A. Statistics and Informatics, 2015).

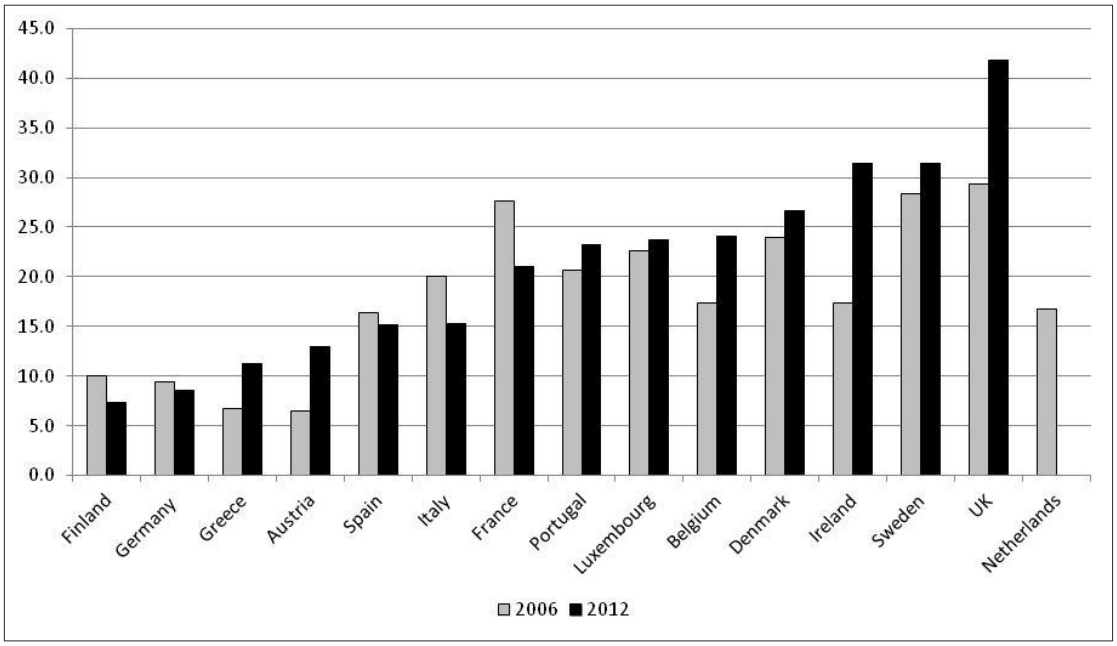
In Figure 2.7 we turn to the reporting of work-related SAD illnesses. These conditions account for a lower proportion of work-related illnesses than MSD but involve even greater variation across countries.

In 2006, SAD illnesses accounted for less than 10 per cent of work-related illness across four countries. In another group, of five countries, the proportion ranged from 10 per cent to 20 per cent, including Ireland at 17 per cent. In the remaining six countries in the EU15, SAD illnesses accounted for between 20 and 29 per cent of work-related illness, with the UK having the highest percentage. Denmark and Sweden are among the countries where SAD accounts for a high proportion of work-related illnesses, at 24 per cent and 28 per cent respectively. It is possible that in the Nordic countries, where there is a strong policy focus on worker wellbeing, there is greater recognition of mental health problems.

More than half of the EU15 countries saw an increase in the proportion of SAD work-related illnesses between 2007 and 2013. By 2013, there was also a much wider range across countries regarding the proportion of SAD work-related illnesses; from 7 per cent in Finland to 42 per cent in the UK. The largest increase in reported SAD illnesses took place in Ireland and in the UK, with respective increases of 14 and 13 percentage points. One possible explanation for this in Ireland is the absence of a clear reference to mental health conditions

in the question wording in 2006, which could have contributed to a lower estimation of this health condition in 2006 (TNO, 2009).[18]

Figure 2.7 SAD Illnesses as a Percentage of All Work-related Health Problems, EU15, 2006 and 2012



Source: EU-LFS 2007 and 2013.
Note: The surveys were fielded in Q2 2007 and Q2 2013 but referred to the previous 12 months, that is 2006 and 2012 respectively. The Netherlands did not participate in the 2013 LFS ad hoc module on accidents at work and health problems (see Agilis S.A. Statistics and Informatics, 2015).

The overall percentages of workers across EU15 countries reporting a work-related illness (Table 2.1) and the composition of illness types (Figures 2.6 and 2.7) can be used to derive the percentage of workers experiencing MSD and SAD illnesses, as shown in Figure 2.8. In nine of the 13 countries shown here, less than five per cent of workers experience MSD; the lowest rates, of approximately one per cent, are found in Ireland and the UK.[19] At the other side of the spectrum, in three countries – Austria, Sweden and Finland – the rate is higher, ranging from 10 per cent to 18 per cent for Finland.

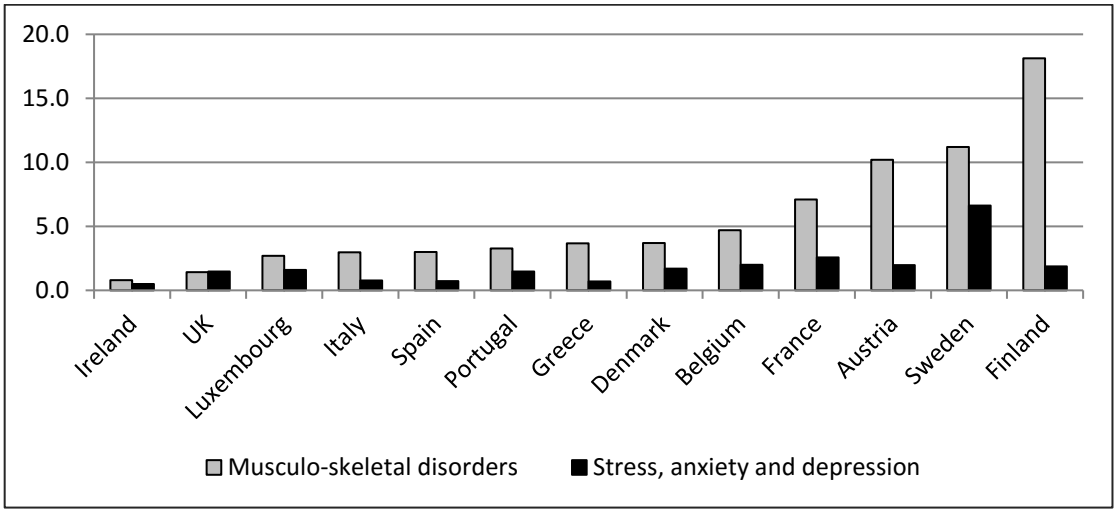
Across these 13 EU countries, the proportion of workers experiencing SAD illnesses is much lower than the proportion with MSD. There is also less variation across countries regarding rates of SAD than MSD. Indeed, in 11 of these countries, no more than two per cent of workers experience SAD illnesses; only in France (2.6 per cent) and Sweden (6.6 per cent) does the rate go exceed two per cent.

[18] In Ireland and Estonia, the respondent was asked if they suffered from 'other health problems' instead of 'other physical and mental problems' (TNO, 2009). Explicit reference to mental health problem was not made in Belgium, Germany or the Netherlands.

[19] As mentioned previously, the Eurostat results for Ireland differ from the national figures as there were some differences in the methodology used by Eurostat and that used by the authors.

Only 0.5 per cent of workers in Ireland experienced SAD illnesses, making Ireland one of the EU15 countries with the lowest percentages of workers reporting MSD or SAD illnesses, while Sweden is characterised with high levels of self-reported rates for both conditions.

Figure 2.8 Percentage of Persons Reporting MSD and SAD health problems, EU15, 2012



Source: EU-LFS 2013
Note: The survey was fielded in Q2 2013 but referred to the previous 12 months, that is 2012.

2.5 SUMMARY

Over the period 2002 to 2014, the rate of illness among workers reflected the Irish economic cycle of rise and fall. Beginning at a rate of 22 per 1,000 workers in 2002–2003, it rose to a high of 35 per 1,000 workers in 2006, then fell to a trough of 15 per 1,000 workers in 2009 before climbing again to 30 per 1,000 workers in 2014. Throughout the period, the two most common forms of illness were MSD and SAD illnesses, with rates for MSD being over twice that of SAD. MSD rates varied from 11 per 1,000 in the earlier period to a high of 20 per 1,000 workers at the peak of the economic boom in 2009, before falling to 15 per 1,000 workers in 2014. There was less variation over the same period for SAD illnesses. The MSD rate was initially higher for males than for females, particularly during the economic boom, but since then the gender gap has narrowed and in 2013 the female rate overtook the male rate. While the gender gap for SAD was much narrower, we observe the opposite phenomenon for these conditions: the illness rate was higher for females than for males in the earlier 2000s, but then narrowed over time so that in recent years, rates were almost identical for men and women.

A European comparison based on the EU-LFS shows that Ireland had the lowest percentage of workers (male and female) reporting a work-related illness across all EU15 countries and that this rate also fell for most of these EU countries over time.[20] However it should be noted that these figures do not take into account any compositional differences across countries, such as the distribution of jobs across sectors and occupations, variation in firm size, or the differences in the characteristics of workers (such as age). In all EU15 countries, MSD comprised the biggest proportion of work-related illness. In Ireland, the proportion of work-related health

[20] Ireland is also among the lowest when all EU28 countries are considered.

problems that were musculoskeletal in nature was low compared to other EU countries: 49 per cent compared to an average of 56 per cent for the EU15. However, when it came to SAD illnesses, the opposite was found: Ireland had, along with the UK, one of the highest proportions of workers experiencing SAD illnesses, at 31 per cent in 2012 (the rate was 42 per cent in the UK). Ireland and the UK also experienced the sharpest increase for this condition from 2006 onwards. This comparative large increase for Ireland between 2006 and 2012 is most likely due to the under-reporting of mental health problems as a consequence of the different wordings in the Irish questionnaire in 2007 (with 2006 as the reference period), which did not mention such conditions.

Chapter 3

Predictors of Work-related MSD and SAD Illnesses

3.1 INTRODUCTION

In this chapter we analyse the main predictors of work-related stress, anxiety and depression (SAD) and musculoskeletal disorders (MSD). As noted in chapter 1, these two categories of illness account for the majority of work-related illness in Ireland and across Europe and also involve the highest costs where this has been investigated. The analysis is confined to these two illness types because self-report surveys among those currently employed are less well suited to collecting information for other occupational diseases. The chapter examines the association between these two illness types and the characteristics of workers and of jobs, such as occupation, sector and working conditions. It asks whether the same types of factors predict the two types of illnesses or whether they tend to affect different groups and have different antecedents. The analysis also considers the relationship between the two illness groups and the economic cycle: are the trends found in Chapter 2 due to changes in the composition of the workforce over the period of boom and bust or does the economic cycle itself play a role?

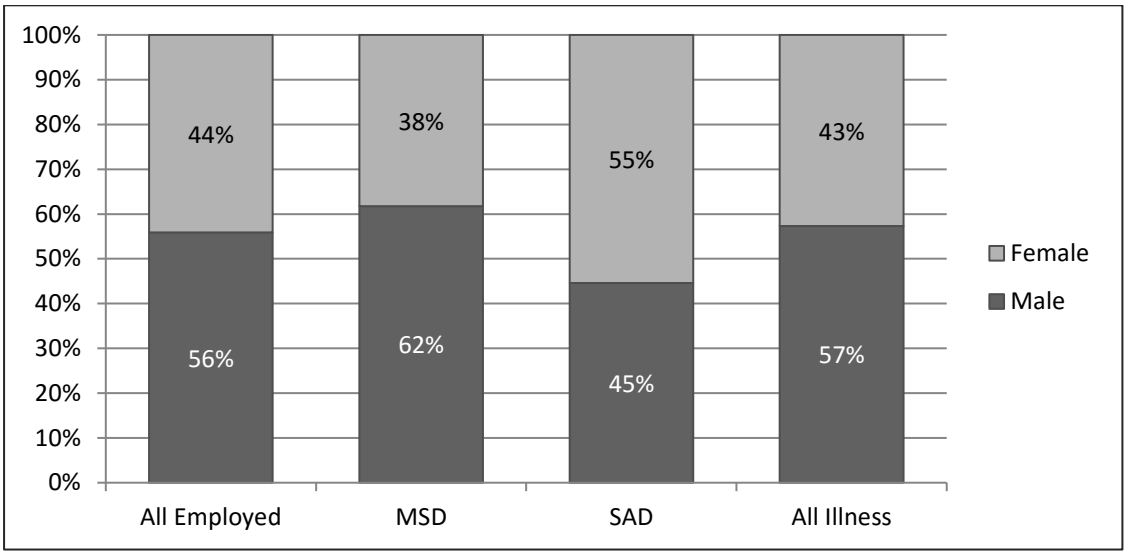
As a first step we examine the characteristics of all those who reported a work-related MSD or SAD illnesses over the period 2002 to 2013. The characteristics of these two groups are compared firstly to all those in employment – the working population – and secondly to all those who reported a work-related illness.[21] In Section 3.3 we provide some descriptive statistics on the length of absence from work for the two illness types. In Section 3.4 we use statistical models to investigate the predictors of MSD and SAD.

3.2 CHARACTERISTICS OF THOSE REPORTING WORK-RELATED MSD AND SAD, 2002–2013

The first set of features examined relate to the characteristics of the individual worker (gender, age and nationality). Over the period in question, 44 per cent of all those in employment were female and 56 per cent were male (Figure 3.1). The sex composition of the two illness groups both differ from this base: 62 per cent of those who experienced an MSD illness were male, while 55 per cent of those reporting SAD were female. The gender composition for all work-related illnesses is close to the distribution of the employed population but previous research has shown that, controlling for job characteristics, women are more likely to have experienced a work-related illness, especially in the most recent period (Russell et al., 2015).

[21] The QNHS sample is representative of the national population.

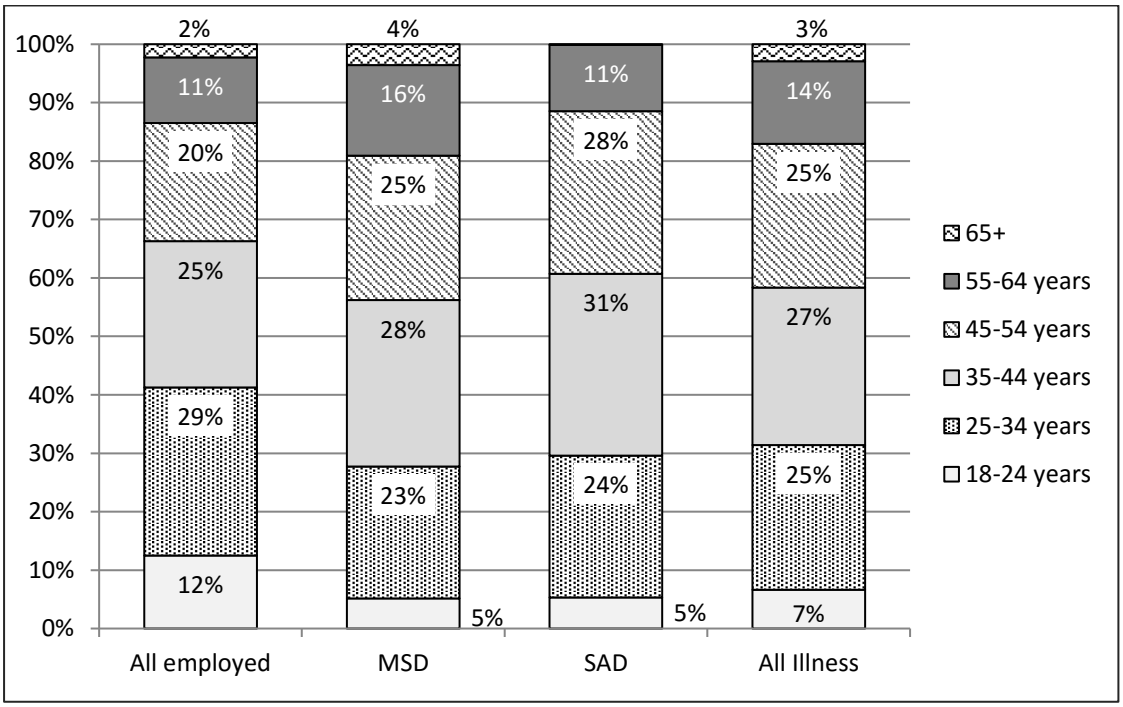
Figure 3.1 Composition of Those Who Experienced Work-related Illness by Gender



Note: Pooled QNHS Injury and Illness Module data 2002 to 2013. All employed: n=204,539; MSD: n=2,565; SAD: n=935; All illness: n=5,400 (this includes the cases of MSD, SAD and all other illnesses).

The age profile of those experiencing MSD or SAD work-related illnesses is somewhat older than the profile for the whole working population. Figure 3.2 shows that 45 per cent of those who reported MSD were aged 45 years or over, compared to only 33 per cent of the employed population. In the case of SAD, 39 per cent of the group were 45 years or over. The mean age of those who reported an MSD illness was 43 years; for SAD illnesses the mean age was 41 years, compared to an average age of 39 for all workers in Ireland over the period. The average age across all those reporting a work-related illness was 42 years.

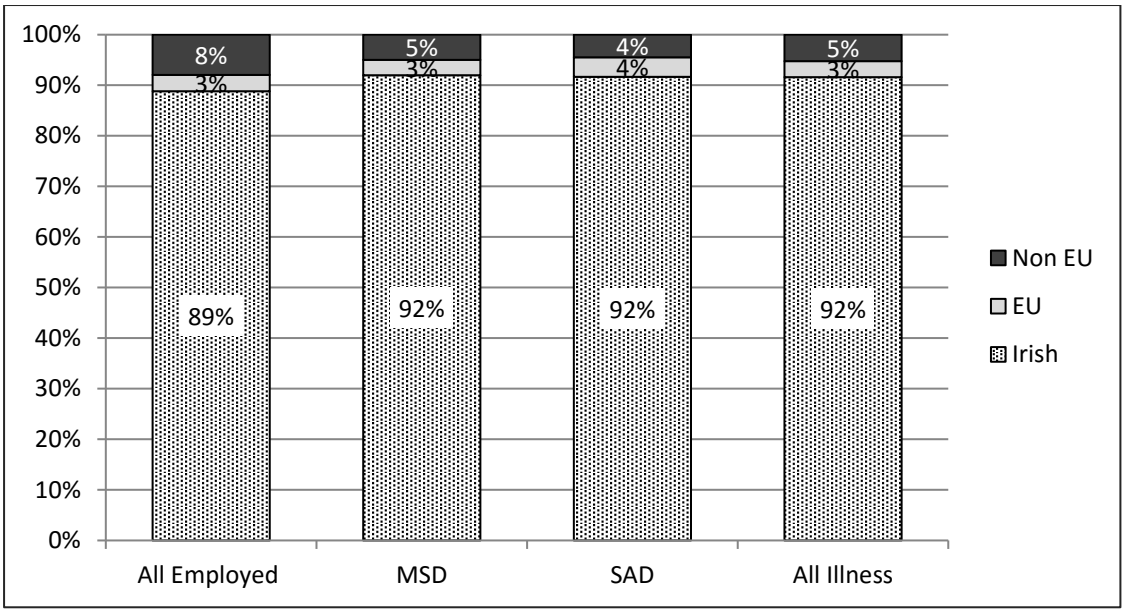
Figure 3.2 Composition of Those Who Experienced Work-related Illness by Age Group



Note: Pooled data for 2002 to 2013. See Notes to Fig 3.1 for numbers.

The nationality composition of workers who experienced SAD illnesses or MSD is broadly similar to that of the employed population as a whole (see Figure 3.3). Non-EU nationals appear to be somewhat under-represented in both types of illness and in the overall figures for work-related illness, making up 4–5 per cent of each illness group compared to 8 per cent of all employed. The chi-square statistic shows that this difference is statistically significant but the models that follow in Section 3.3 examine whether this is the case when factors such as sectors, jobs and ages of EU and non-EU workers are taken into account. This finding is consistent with previous findings of a 'healthy immigrant effect', which regularly show that the health status of immigrants is better than comparable native-born individuals (Domnich et al., 2012), including in Ireland (Nolan, 2012). Explanations for this effect include processes of self-selection, screening by immigrant authorities (not applicable in Ireland), under-reporting of health problems, and 'cultural buffering' due to healthier lifestyles in the country of origin. As the majority of immigrants to Ireland are economic migrants who come to work (McGinnity et al., 2012) the 'healthy immigrant effect' is also linked to the healthy worker effect described in Chapter 1.

Figure 3.3 Composition of Those Who Experienced Work-related Illness by Nationality



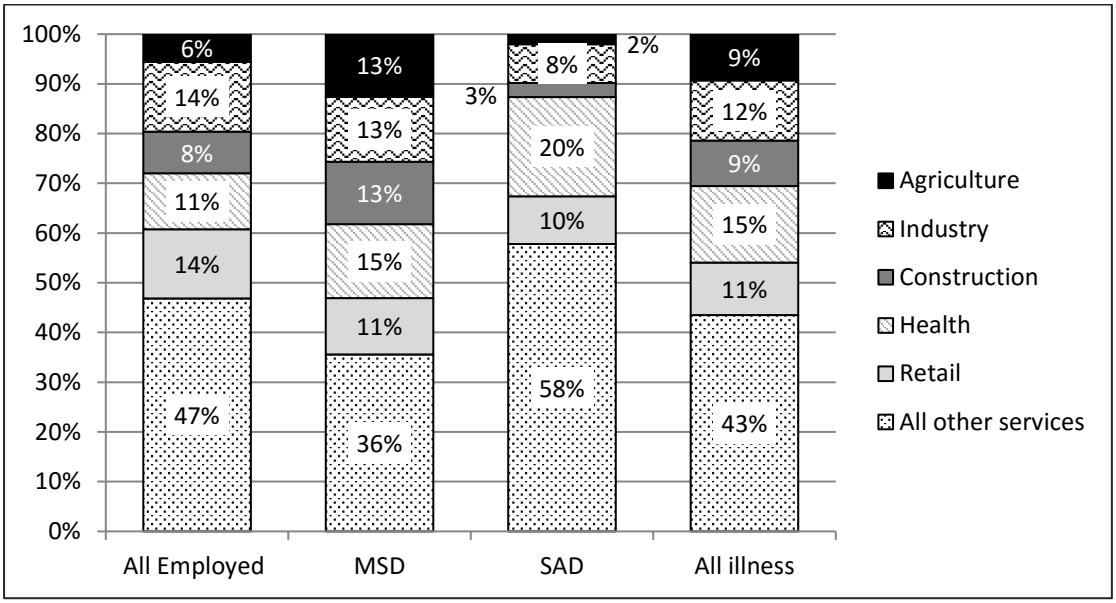
Note: Pooled data for 2002 to 2013 . See Notes to Fig 3.1 for Ns.

We next consider whether the sectoral and job profile of those who have experienced MSD or SAD illnesses differs from the general population of workers. Figure 3.4 shows the NACE sector in which workers with an illness were located.[22] For those with an MSD illness, the figures show that agriculture workers (including forestry, farming and fishing) are over-represented as are those in the construction and health sectors. Retail and other service sector workers are under-represented among those with a work-related MSD. Interestingly,

[22] Nomenclature générale des Activités économiques dans les Communautés Européennes (NACE) is a European statistical classification of economic activities within the European Community.

industrial workers, including manufacturing, utilities and mining, are not over-represented among those with an MSD.

Figure 3.4 Composition of Those Who Experienced Work-related Illness by NACE Sector



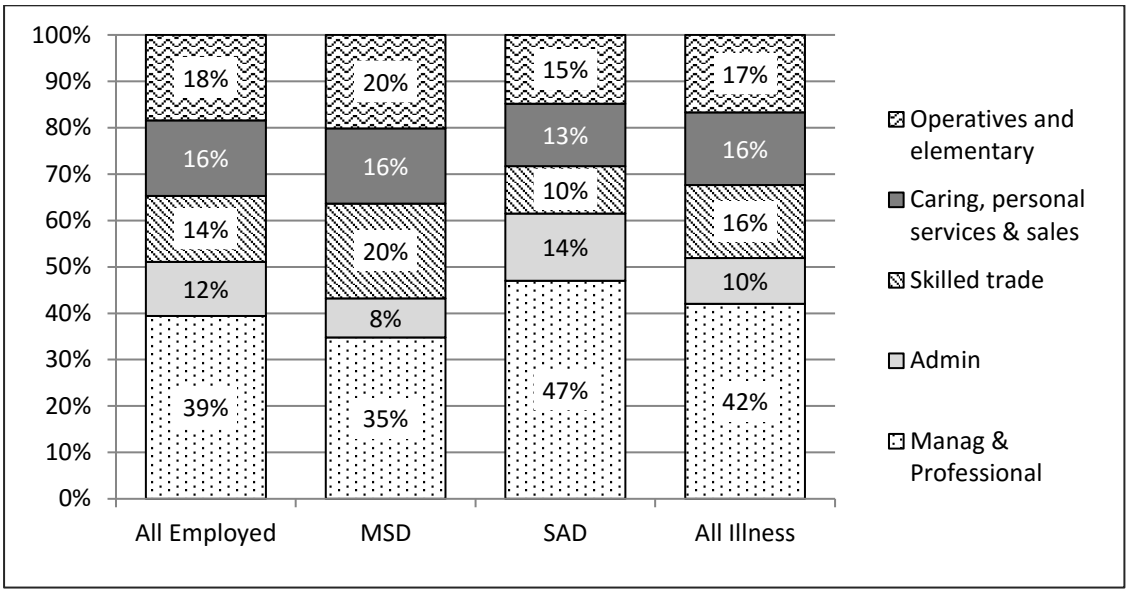
Note: Pooled data for 2002 to 2013. See Notes to Fig 3.1 for numbers.

Workers who experienced SAD as a consequence of work also had a different sectoral profile compared to the total employed population. A much higher proportion of this group came from the 'all other services' sector, which includes services such as education, public administration and finance. Health sector workers are also significantly over-represented, comprising 20 per cent of those with a SAD illness, although they made up only 11 per cent of the workforce.

The occupational profile of those who experienced a work-related illness is also distinctive (Figure 3.5) and this is particularly the case for SAD illnesses. This group consists of a much higher proportion of managerial/professional workers than in the general employed population; administrative workers are also slightly over-represented, while the rest of the occupational groups are under-represented. Among those with MSD illnesses it is the skilled trades that are the most over-represented occupational group, followed by the other predominantly manual group 'operatives and elementary' workers.[23] Due to changes in occupational coding, these figures are presented for the more recent period only (2010–2013).

[23] Note that the elementary category also includes some unskilled non-manual workers.

Figure 3.5 Composition of Those Who Experienced Work-related Illness by Occupation (2010–2013)



Note: Pooled data for 2010 to 2013.

The graphs outlined here demonstrate that those who have experienced an MSD or SAD work-related illness are distinctive across a number of dimensions, such as age, gender and sector, compared to the general employed population. These factors are however not entirely independent; for example, female workers are more likely to be located in the health, retail and other services sectors and it may be sector rather than gender that is driving the difference between men and women. In the following statistical models, we assess the influence of these factors simultaneously, which allows us to assess the independent effect of each factor on a specific illness. The models also include a wider range of work characteristics, including working hours, job tenure, shift work and night work.[24] The effects of the time period or point in the economic cycle seen in the trends graphs in Sections 2.2 and 2.3 are also included in the models, as is a measure of the health and safety inspection rate, which provides a limited indicator of the regulatory regime. The inspection rate for each year of the survey is outlined in Table A3 (Appendix 3).

3.3 DURATION OF ABSENCE

Respondents were asked to record how many days they were absent from their job as a result of their *most recent* work-related illness. The figures in Table 3.1 show that for almost 45 per cent of all work-related illness reported there is no absence from work. The percentage of cases where there is no absence is higher for MSD (50 per cent) and lower for SAD (43 per cent). Both illness types have a higher percentage of zero days absence than the 'all other' illness category. A significantly higher proportion of those who suffered from work-related

[24] The CSO give the following instruction to interviewers about defining shift work: 'Shift work should imply changes in the work schedule. Persons having fixed assignment to a given shift should not be considered as shift-workers, even if their working schedules are defined in their establishment in terms of shift-work.'

SAD record an absence of four days or more (46 per cent) compared to those who experienced MSD (38 per cent).

The mean number of days absent is 15.9 for MSD, 17 for SAD and 12.8 for all other illnesses. Table 3.1 shows that for the period taken as a whole this difference is statistically significant. However, the annual figures indicate that there is a good deal of variation in the average length of absence for both illness types but especially SAD. In a number of years, including the most recent 2013, there was no significant difference in the length of absence between the two illness types, while in 2003 and 2005 those with MSD had longer absences than those with SAD. In 2009 and 2010, at the height of the recession, the duration of absence was exceptionally high for those reporting SAD (see Figure 3.6). The figures in Chapter 2 showed that very few workers reported illnesses in 2009–2010, which suggests that only the more serious cases were reported.

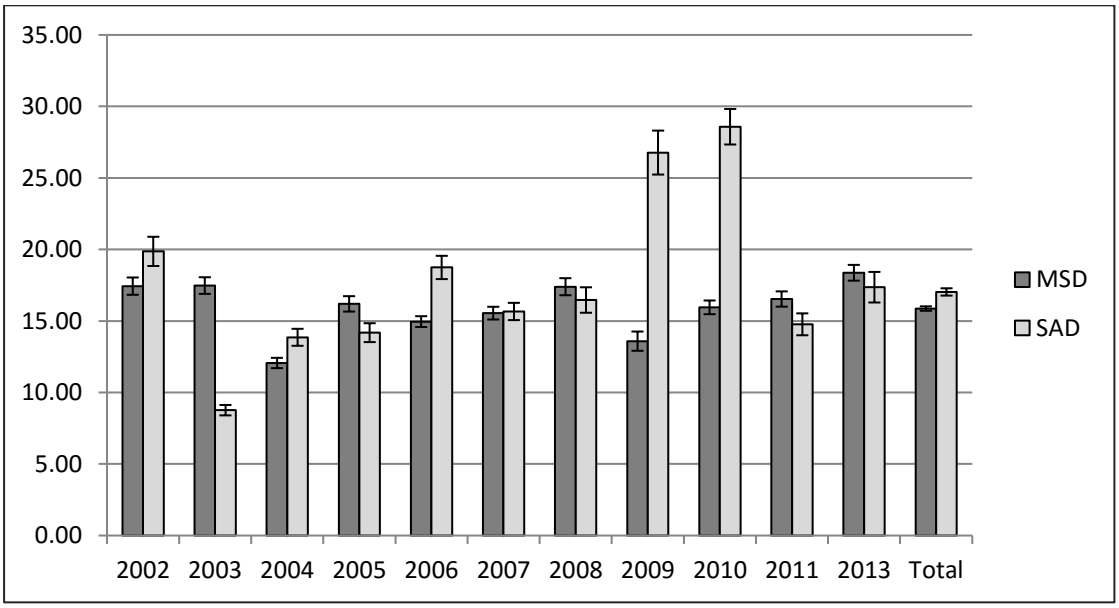
The focus on the most recent illness may mean that the length of absence over the full year is underestimated for recurrent conditions, which is likely to apply in a subset of respondents for both types of illness considered.

Table 3.1 Days Absent from Work by Illness Type (2002–2013)

	MSD	SAD	All other	Total
0 days absence	50.1%	42.7%	37.5%	44.8%
1–3 days absence	11.7%	11.6%	24.0%	15.7%
4+ days absence	38.2%	45.7%	38.5%	39.6%
	100.0%	100.0%	100.0%	100.0%
Weighted N	2,355	794	1,516	4,665
		Chi-sq=142.9 p <.001		
Mean absence days	15.9	17.0	12.8	15.1

Note: The 2012 figures are excluded due to a change in response categories on absence.

Figure 3.6 Mean Number of Days' Absence per Worker with MSD or SAD Illness, 2002–2013



Note: The 2012 figures are excluded. Standard errors bars indicate 95 per cent confidence interval.

3.4 MODELLING THE RISK OF MUSCULOSKELETAL WORK-RELATED ILLNESSES

These analyses use logistic regression models. The analysis includes all those who completed the special modules on occupational illness and injury over the period 2002 to 2013 (see Chapter 1). Only one illness type is recorded for each respondent so the categories are mutually exclusive. In the MSD models, respondents are coded as '1' if they recorded an MSD and as '0' if they do not; this latter group includes those who report no work-related illness and those who report SAD or other illnesses.

The models estimate the odds of each group of workers experiencing the illness compared to the reference group. For example, the chance of someone aged 65 or over having experienced an MSD illness is compared to those in the youngest age group. Odds can only take on positive values. An odds ratio of one means that the group in question has the same chance of experiencing an illness as the reference group (a ratio of one to one). Odds ratios with a value greater than one indicate that the group has a higher chance of work-related illness, while ratios less than one indicate a lower chance of illness. The models 'control' for a range of other factors, which means that in the age example we are comparing the effect of age for individuals in the same sector, of the same gender, working the same hours etc. The results presented in Table 3.2 are odds ratios and an alternative presentation for model 3 is shown in Figure A1 (Appendix 3), where we report the expected percentage risk of experiencing MSD for each of the characteristics presented when all other characteristics in the model are held constant.

Table 3.2 Model of MSD (2002–2013)

		Model 1: Dummy period effects	Model 2: Rate of emp. growth	Model 3: Add inspect rate	Model 4: Add occupation (2010–2013)
		Exp(B)	Exp(B)	Exp(B)	Exp(B)
Ref: Boom (2002-2007)	Recession (2008–2011)	0.66***			
	Recovery (2012–2013)	0.87			
	Annual % emp. change by sector		1.02***	1.01**	
Ref: Male	Female	1.01	1.01	1.01	1.36**
Ref: Age 18–24 years	Age 25–34	1.90***	1.86***	1.88***	1.75
	Age 35–44	2.48***	2.41***	2.45***	1.84*
	Age 45–54	2.50***	2.42***	2.46***	1.56
	Age 55–64	2.66***	2.54***	2.59***	1.90*
	Age 65 plus	2.33***	2.22***	2.28***	0.86
Ref: Irish	Non-Irish	0.84**	0.81**	0.82**	1.05
Ref: Other services	Agriculture	2.11***	2.24***	2.17***	
	Industry	1.32**	1.47***	1.40***	
	Construction	2.29***	2.43***	2.36***	
	Retail	1.30**	1.34**	1.32**	
	Transport	1.44***	1.50***	1.47***	
	Accomm. and food	1.00	1.02	1.01	
	Health	1.67***	1.60***	1.64***	
	Public admin and defence	1.23**	1.25	1.24	
	Education	0.91	0.90	0.91	
Ref: Employee	Self- employed	1.28***	1.27***	1.28***	1.49***
Ref: Tenure > 5 years	Tenure < 6 months	0.82**	0.82	0.82	0.51**
	Tenure 6- 12 months	0.61***	0.62***	0.61***	0.59*
	Tenure 1 to 2 years	0.86*	0.86	0.86	0.57**
	Tenure 3- 5 years	0.91	0.92	0.92	0.87
Ref: Less than 30 hours	Hours vary	1.08	1.12	1.11	1.18
	Hours 30-39	0.91	0.93	0.93	0.93
	Hours 40-49	0.83**	0.85*	0.84*	0.89
	Hours 50 plus	1.04	1.08	1.07	1.21
Ref: No shift work	Shift	1.45***	1.44***	1.45***	1.65***
Ref: No night work	Night	1.21**	1.21**	1.21**	1.15
	Annual inspection rate			0.90***	
Ref: Professional and managerial	Assoc. profess				1.29
	Admin				0.93
	Sales				1.09
	Personal service				1.78***
	Skilled manual				1.46**
	Operatives/Element				1.45**
	Constant	0.01***	0.00***	0.01***	0.00***

*Notes: *** p<0.01, ** p<0.05, * p<0.1; Models 2, 3, and 4 use corrected standard errors to take account of correlation of errors within groups of percentage employment change.*

3.4.1 Time Trends and Economic Cycle

Our previous research (Russell et al., 2015) found that work-related illness rates follow a pro-cyclical pattern, increasing in boom time and declining in the recession. The graphs in Sections 2.2 and 2.3 suggest that MSD follow the same pro-cyclical pattern. The figures regarding SAD illnesses show a somewhat flatter trajectory over the period but nevertheless the lowest rates are recorded during the recession: 2008 to 2011. The jump in SAD illnesses in 2012 is likely to be related to the change in question wording (as described in Chapter 2); therefore, checks must also be made to ensure the findings are not unduly influenced by the inclusion of 2012 data. In the appendices, we present results from statistical models for MSD (Table A6) and SAD (Table A7) excluding the year 2012; these results confirm that the statistical models presented in the next sections are not altered by the inclusion of the year 2012.[25]

We incorporate time period in two different ways. As a first step we analyse the effects of three periods, boom (2002–2007), recession (2008–2011) and recovery (2012–2013). Secondly, we substitute time period with a variable identifying the annual rate of employment growth (or decline) in the sector of employment in which the respondent is located. The growth rate is expressed as a percentage change compared to the previous year (see Figure 2.2 for the economy wide figure). This constructed variable allows us to investigate whether MSD and SAD rates are related to the effects of the economic cycle as played out in the sector in which the individual was employed.

In Table 3.2, model 1 for MSD shows that there is a significantly lower chance of experiencing illness in the recession period than in the boom period. As other factors are controlled, it is possible to conclude that this is not due to the different composition of employment (or of the employed) during that period. However, we saw in Figure 2.1 that the recession hit rather differently across sectors; therefore, a more accurate way of capturing economic cycle is to include annual employment change within the respondent's sector of employment.

Model 2 shows that MSD is positively related to employment growth: the risk or rate of illness is higher in years where employment change was positive. A one per cent increase in employment within sector led to a two per cent increase in the odds of experiencing MSD. The effect of employment growth remains significant when the annual inspection rate is added to the model (model 3), though the strength of the effect is weakened, which indicates a correlation between these two measures.

3.4.2 Personal Characteristics and MSD

While the bivariate analysis suggested that men were more at risk of MSD, the model shows that the gender difference is not significant when other factors are taken into account. In other words, men's higher overall rate of MSD is due to their location in jobs that have a higher risk (because of sector and hours for example) or because men have other higher risk characteristics (such as an older average age than female workers).

[25] Where changes occur, the exclusion of 2012 makes the associations stronger. See Tables A6 and A7 in the appendix for further details.

The age effect is strong but not completely linear. Compared to the youngest age group, older workers have progressively higher chances of having experienced an MSD illness. The risk peaks for those aged 55 to 64 and then drops somewhat for those aged 65 and over. It seems that only those in better health continue to work past retirement age and/or those of retirement age are more likely to withdraw from the labour market if they experience a work-related illness.

Non-Irish workers are significantly less likely to have experienced an MSD illness than Irish workers. While migrant workers have some features that might reduce their likelihood of such illnesses (such as higher average education, younger age profile and being generally healthier than the general population), it is possible that this group are more unwilling to report a work-related illness even in a household survey. Moreover, the QNHS is known to underestimate migrant workers and therefore the group responding may not be representative of the whole group in terms of issues such as working conditions.

3.4.3 Industrial Sector and MSD

The results in model 1 show a strong relationship between MSD risk and sector of employment. The reference group for the model is 'all other services', which consists of financial and insurance services, real estate, information and communication services, professional and technical activities, administrative services, arts and other services (NACE categories J, K, L, M, N, R, S; see Table A4 in Appendix 3 for a full listing). The risks of MSD in the remaining sectors are compared to this group. Agriculture and construction have over double the risk of MSD as the reference category. While the bivariate analysis did not show a heightened risk for workers in industry, this effect is detected in the models when other factors are taken into account, including exposure to recession and growth.

Among service sector workers, a number of groups are identified as having a higher risk of MSD compared to the 'all other services' group.

- Health sector workers: 1.6 times greater risk.
- Transport sector workers: 1.4 times greater risk.
- Retail sector workers: 1.3 times greater risk.
- Public administration and defence: 1.2 times greater risk.

Those working in the education sector and in the accommodation and food sector do not significantly differ from the other services group, when worker and job characteristics are taken into account. Models 1 to 3 do not contain occupation due to changes in definitions over the period; however, this is tested in a restricted model in model 4 in Table 3.2 above. When occupation is taken into account, all but one of the sectoral effects remain significant and the size of the effects are only reduced marginally. While the accommodation and food sector becomes marginally significant, the public administration and education effects stay non-significant.

3.4.4 Self-employment and MSD

The self-employed are found to experience a significantly higher rate of work-related MSD (1.3 times higher than employees), which is independent of the risk associated with their greater concentration in sectors with a higher rate of such illnesses (like construction and agriculture). The self-employment effect was also robust to controls for occupation (Table 3.2), which means that within occupational groups the self-employed have a higher risk of MSD than employees. Previous analyses that looked at all forms of work-related illness together found no independent effect of self-employment (Russell et al., 2015).

3.4.5 Occupation and MSD

As outlined above, changes in occupational coding mean that the model including occupation is applied to a sub-set of the sample for the years 2010–2013 (Table 3.2, model 4). To avoid collinearity we remove sector controls from the model. Three occupational groups stand out as having significantly higher risks of MSD: skilled manual workers, operatives/elementary workers and personal service workers. These occupations involve more manual labour and are therefore more physically demanding.

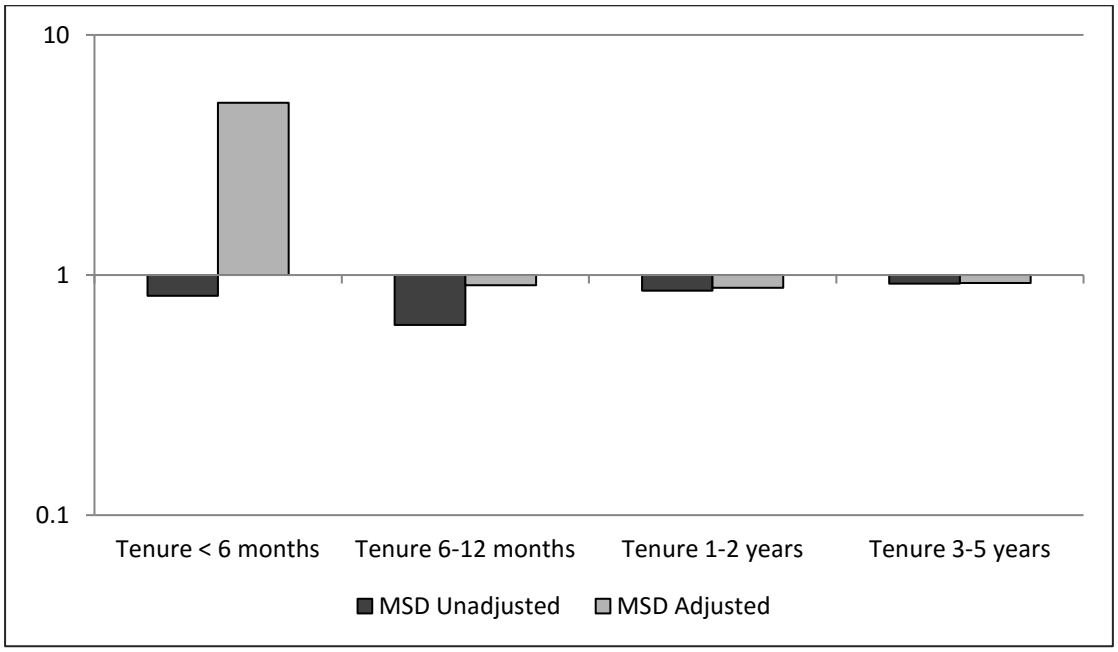
3.4.6 Job Tenure and MSD

Job tenure indicates the length of experience that respondents have in their current job. Economic analysis shows that all else being equal, longer job experience is associated with better working conditions including pay (Dustmann and Meghir, 2005). Longer job experience is also associated with higher skill levels due to on-the-job learning. Our hypothesis therefore is that those with longer job experience will experience fewer work-related injuries and consequently have fewer work-related MSD. Our previous research found that new recruits did indeed have a higher risk of work-related injury and illness and this picture became even more pronounced when full-year equivalent rates were calculated (Russell et al., 2015). The model suggests that workers with shorter tenures have fewer MSD than those workers with over five years of experience. However, this does not take account of differences in exposure.

Following the method used by Davies and Jones (2005), we produce an annual equivalence rate for those with job tenures of under one year.[26] We find that those with less than six months' tenure have a significantly higher risk of experiencing an MSD; however, due to the nature of the illness question we cannot rule out the possibility that the condition was caused in a previous job, and aggravated by the current work.

[26] We put this annual equivalent rate into the models by adjusting the sample weights for those who experienced a work-related illness and had a job tenure of less than 12 months. Further description of the method can be found in Russell et al. (2015).

Figure 3.7 MSD and Job Tenure Unadjusted and Adjusted (Full-year Equivalent)



Note: The scale shown on the Y axis is a logarithmic scale. Figures are taken from models with a full set of controls. Full-year equivalent estimates are illustrative only.

3.4.7 Job Characteristics and MSD

We analyse the influence of a set of working conditions on MSD risks. These include hours of work, shift work and night work. All else being equal we would expect work-related illness to increase with hours of work due to longer exposure. Longer hours of work might also influence the risk of illness due to fatigue. The models' results do not show this pattern. Those working above-average hours (40–49 hours per week) experience a lower risk of MSD than those in part-time jobs (less than 30 hours per week) who form the reference group. Those working variable hours, 30–39 hours and those with the longest work hours (50 plus) do not differ from part-time workers. As the data is cross-sectional we cannot rule out the possibility that those who experienced work-related MSD (or injury) reduced their hours of work, which could lead to such a pattern.

If we calculate a full-time equivalent rate to adjust for exposure (so the rate for those working less than average hours are adjusted upwards and the rates of those working longer hours are adjusted downwards), then we find that those working part time (less than 30 hours per week) have a significantly higher risk of MSD *per hour worked* than workers in all the other hours' categories (see Table A5 in Appendix 3).

The literature outlined above suggests that shift workers and night workers are at greater risk of a variety of work-related illnesses (including gastro-intestinal diseases, problems in pregnancy and cardio-vascular diseases). We find that both shift work and night work lead to an increased probability of MSD, even when a range of other job characteristics, including sector, are controlled. There is a somewhat higher risk associated with shift work than night work.

3.4.8 Inspection Rate and MSD

The final factor tested is the annual inspection rate by health and safety inspectors. We find that the rate of work-related MSD is negatively related to the inspection rate: the illness rate declines as the inspection rate increases. The figures in Table A3 (in Appendix 3) show that the inspection rates do not follow the economic cycle although the peak inspection rate did occur in 2009–2010 at the height of the recession. The inspection effect persists despite the controls for employment growth rate; however, it is possible that the inspection variable is picking up another time trend or other confounding factor.

3.5 MODELLING THE RISK OF WORK-RELATED SAD ILLNESSES

We adopt the same analytical strategy to assess the factors associated with work-related SAD. We estimate a model including personal characteristics, job factors and macro/institutional effects (Table 3.3). The literature on work-related stress suggests that job quality factors, such as autonomy, task discretion, work pressure and job security, play a key role in levels of work stress. A combination of high work demands and low autonomy has proved to be particularly conducive to stress. However, these aspects of the work environment are not well captured in the QNHS; instead we can investigate proximate causes, such as working hours and scheduling, and can identify the groups of workers that are most prone to work-related stress. In addition to the results presented in Table 3.3, in Figure A2 (in Appendix 3) we report the expected percentage risk of experiencing SAD for each of the characteristics presented when all other characteristics in the model are held constant.

3.5.1 The Economic Cycle and SAD Illnesses

Alternative hypotheses have been proposed for the relationship between the economic cycle and work-related SAD. High levels of job insecurity during a recession lead to an expectation of an anti-cyclical pattern (SAD higher during the recession and lower in the boom); however, a pro-cyclical pattern is hypothesised by potentially increased intensity during periods of high demand and inhibited reporting in recessionary periods (see Chapter 1). Model 5 (Table 3.3) uses a three period classification to assess the impact of the economic cycle. This shows that all else being equal, there was a 40 per cent reduction in the chances of SAD illnesses during the recession period (2008–2011) compared to the period of economic boom (2002–2007). There was no difference in the recovery period (2012–2013) compared to the boom period, despite considerable differences in employment and GDP growth for the two periods. This is driven by the spike in SAD illnesses in 2012 due to questionnaire changes, when the 2012 data is removed.

The continuous measure of annual percentage employment change within sector is less affected by the 2012 peak, as there are multiple observations for each year. Model 6 suggests that rates of SAD illnesses increase modestly with employment growth, which favours the increased intensity and inhibited reporting explanations.[27] However, this relationship is not robust to the inclusion of the annual inspection rate (model 7); this is likely to arise because the economic cycle effect is weak and there is a correlation between the annual inspection rate and the economic cycle.

[27] This effect persists if we drop the year 2012, when there was a spike in SAD illness reports.

3.5.2 Personal Characteristics and SAD Illnesses

The models in Table 3.3 show that female workers are significantly more likely to have experienced work-related SAD illnesses than male workers, even when other job and personal characteristics are controlled. This gender pattern for work-related SAD mirrors the gender pattern for such illnesses in the general population (Brown and Harris, 1978; American Psychological Association, 2010).

Work-related SAD is strongly related to age. However, in this case the peak risk occurs for those aged 45–54 years. Compared to the youngest workers, those aged 45–54 are 2.6 times more likely to have experienced work-related SAD illnesses in the past 12 months. Those aged 35–45 years are around 2.4 times more likely to have experienced SAD than the youngest group. After 64 years, the pattern reverses so that those over retirement age who are still in employment have the lowest risk of SAD illnesses. This is likely to be due to selection effects, whereby those with health problems or those in stressful working environments are more likely to retire from the labour market and the most healthy group (mentally and physically) and those with better working environments are more likely to continue to work beyond retirement age.

There is no significant difference between the Irish and non-national population in the likelihood of experiencing SAD when other factors are controlled for in the models.

3.5.3 Industrial Sector and SAD Illnesses

The bivariate analysis (Figure 3.4) showed that before correcting for any worker or job characteristics those working in the 'other services' sectors were over-represented among those with SAD illnesses. The models distinguish a wider range of service sectors (Table 3.3) and find that those in the combined service reference group (including financial services, administrative services and communication services) do indeed have a significantly higher risk of SAD illnesses. Taking the results from model 5:

- Construction and agricultural workers have less than one-third of the risk compared to 'other service' sector workers;
- Workers in industry and in accommodation/food have half the risk;
- Retail sector workers have two-thirds the risk;
- Public administration and defence, transport sector workers and health sector workers do not differ from the 'other service' category; and
- Education sector workers have the highest risk of SAD; they are 1.5 times more likely than those in 'other services' to have had such illnesses.

3.5.4 Self-employment and SAD Illnesses

In model 5 we find that the self-employed are less likely to report work-related SAD. The self-employed have a high level of work autonomy and task discretion and it may be that this level of control is what drives the low prevalence of work-related SAD illnesses for this group despite the severe financial pressures the self-employed experience during the recession

(Russell et al., 2012). The finding is only significant at the 10 per cent level and are not significant in models 6 and 7.

3.5.5 Occupation and SAD Illnesses

The relationship between SAD and occupation is investigated for the most recent period (Table 3.3, model 8). Despite the strong association between occupation and job quality factors, such as job control, autonomy, security and rewards, the occupational effects are weak. Only skilled manual occupations are found to have a significantly lower prevalence of SAD compared to those in professional/managerial occupations. The restriction of the analysis to 2010–2013, may mean that occupational differences are not detected due to small numbers.

3.5.6 Job Tenure and SAD Illnesses

We expect that all else being equal, those with longer job tenures will have a lower risk of work-related SAD because within jobs, skill and working conditions should increase over time. More experienced workers should have greater control over their work compared to new recruits; moreover, job security, another determinant of work stress, is likely to be greater for those with longer job tenures. Models 5–7 show instead that workers with shorter job tenures (less than six months) and those with one to two years' experience in the job are less likely to report SAD illnesses than those with tenures of over five years. When an adjustment is made to take account of the lower exposure of those with shorter tenures, we find that the anticipated pattern emerges: those with less than 12 months' job experience have a significantly higher risk of SAD illnesses than the most experienced group. However, the low rates of SAD illnesses for those in the one to two year category are unaffected.

Table 3.3 Logistic Regression of Work-related SAD Illnesses (2002–2013)

		Model 5: Dummy period effects	Model 6: Rate of emp. growth	Model 7: Add inspect. rate	Model 8 Add occupation (2010–2013)
		Exp(B)	Exp(B)	Exp(B)	Exp(B)
Ref: Boom (2002–2007)	Recession (2008–2011)	0.58***			
	Recovery (2012–2013)	1.02			
	Annual % emp. change by sector		1.02**	1.01	
Ref: Male	Female	1.47***	1.48***	1.47***	2.32***
Ref: Age 18-24 years	Age 25–34	1.65***	1.60	1.64*	3.58*
	Age 35–44	2.45***	2.37***	2.44***	5.40**
	Age 45–54	2.65***	2.57***	2.65***	5.54**
	Age 55–64	2.04***	1.95**	2.02**	3.71*
	Age 65 plus	0.07**	0.07**	0.07**	
Ref: Irish	Non-Irish	0.82*	0.80	0.81	1.10
Ref: Other services	Agriculture	0.28***	0.31***	0.29***	
	Industry	0.44***	0.49***	0.45***	
	Construction	0.31***	0.33***	0.32***	
	Retail	0.63***	0.65**	0.64**	
	Transport	1.00	1.05	1.02	
	Accomm. and food	0.49***	0.50***	0.50***	
	Health	1.20*	1.15	1.19	
	Public admin. & defence	0.84	0.85	0.84	
	Education	1.53***	1.50*	1.51*	
Ref: Employee	Self-employed	0.82*	0.80	0.81	0.99
Ref: Tenure > 5 years	Tenure < 6 months	0.69**	0.70*	0.69*	0.74
	Tenure 6–12 months	1.14	1.17	1.15	1.10
	Tenure 1–2 years	0.64***	0.64**	0.64**	0.54
	Tenure 3- 5years	1.05	1.04	1.04	0.94
Ref: Less than 30 hours	Hours vary	2.00***	2.07***	2.04***	0.72
	Hours 30–39	1.53***	1.55***	1.54***	1.51**
	Hours 40–49	1.78***	1.79***	1.78***	1.56*
	Hours 50 plus	2.95***	3.03***	2.98***	2.82***
Ref: No shift work	Shift	1.34**	1.33**	1.33**	1.16
Ref: No night work	Night	1.16	1.15	1.15	1.07
	Annual inspection rate			0.85***	
Ref: Professional and managerial	Assoc. profess.				1.41
	Admin.				1.02
	Sales				1.13
	Personal service				1.00
	Skilled manual				0.55*
	Operatives/element				0.99
	Constant	0.00***	0.00***	0.01***	0.00***

*Notes: *** p<0.01, ** p<0.05, * p<0.1; models 5, 6 and 7 use corrected standard errors to take account of correlation of errors within groups of percentage employment change.*

3.5.7 Working Hours, Work Scheduling and SAD Illnesses

Long hours of work are expected to increase the risk of work-related SAD, as it is an indicator of high job demands and of high job intensity. The results in models 5 to 7 are consistent with this expectation; those working 30–39 hours per week have a significantly higher risk of SAD; this increases again for those working 40–49 hours and peaks for those working 50 hours or more per week. Those with highly variable work hours are twice as likely to have experienced SAD compared to those working under 30 hours per week, suggesting that schedule uncertainty contributes to work-related SAD. Those working longer hours also have a longer exposure to other psychosocial hazards than those working short hours, so it would be possible to adjust the figures to calculate a full-time equivalent risk, or a risk rate per hour worked for those with above or below average hours. However, since there is strong evidence that long working hours in themselves pose a risk to mental health, which would be removed by such a calculation, we do not make this adjustment.

Shift workers have a significantly higher likelihood of experiencing work-related SAD, controlling for other personal and job characteristics. This is consistent with other research findings. Night work did not have an additional negative effect.

3.5.8 Inspection Rate and SAD Illnesses

A higher inspection rate is found to be associated with a significant reduction in the risk of SAD illnesses (controlling for economic growth rate), which suggests that a more intensive inspection regime may have positive benefits for workers' health. Since inspections tend to focus on physical health and safety issues rather than on risks to workers' mental health, it is possible that this measure is acting as a proxy for other activity undertaken by the Health and Safety Authority (HSA), or the variable may be tapping into another unmeasured effect.

3.6 SUMMARY

This chapter has investigated the factors associated with the two most commonly self-reported categories of work-related illness: MSD and SAD illnesses. Both types of illness are strongly patterned by age. Those aged between 35 and 64 years are 2.5 times more likely to have experienced work-related MSD in the last year than workers aged under 25 years. The risk of work-related SAD peaks for those aged 35–54 years but there are significantly higher risks for all age groups compared to those aged under 25 years, with the exception of those aged over 64 years.

Gender differences in MSD seen at the descriptive level disappear once other factors are controlled. The higher rate of SAD for female workers persists, however, and reflects gender differences in these illnesses in the general population. Non-Irish workers have a significantly lower rate of MSD than native Irish workers, controlling for sector, job and personal characteristics.

The analysis shows that there are strong sectoral influences on work-related illness but that these patterns differ depending on the specific type of illness. The highest risk sectors for MSD are construction, agriculture, and health services. These are followed by a medium risk group consisting of transport, industry and retail services. The sectors with the highest risks also have higher levels of occupational injury (Russell et al., 2015) and there are likely to be shared

hazards for both outcomes (such as manual handling, working with heavy equipment or machines, or working outside).

By contrast, the risk of work-related SAD is highest in the services sector (with the exception of accommodation and food), with the education sector having a distinctively high rate among these sectors. Levels of SAD are particularly low among agriculture, industry and construction, controlling for the gender profile of these groups and working conditions such as hours, shift work and employment contract (employee/self-employment).

The lower risk in the accommodation and food sector for both illness types (MSD and SAD) was unanticipated. This sector has above-average rates of occupational injuries (Russell et al., 2015), which we would expect to be correlated with MSD; moreover, across Europe as a whole it was found to have a higher risk of poor health, controlling for compositional factors (Watson et al., 2015). The result may be due to unobserved characteristics of workers in this sector or unmeasured job characteristics (like social support, autonomy and flexibility). Alternatively, a greater proportion of workers with an illness in this sector may stop working.

Occupational position also plays a role for MSD but appears to have only a weak relationship with SAD; this finding may arise due to the small number of cases available for occupational analysis. The self-employed have a significantly higher risk of MSD and lower risk of SAD (compared to employees in the same sectors and with similar characteristics).[28] Analysis of total work-related illness risk did not identify a higher risk for the self-employed (Russell et al., 2015), because of the divergent patterns for the two main types of illness.

The associations found between MSD, SAD and working conditions are consistent with previous research findings. Long hours increase SAD risk, consistent with literature linking stress to high work demands. Little association was found between hours of work and MSD. Shift work and night work both increase the risk of MSD and shift workers also experience a higher risk of SAD, which may be associated with poor work–life balance and low control over working schedule (Eurofound and EU-OSHA, 2014).

We anticipated that both MSD and SAD would decrease with the length of job tenure, due to greater skill and experience, increased security and job control, but this does not emerge. In the case of work-related SAD illnesses, the benefits of increased experience could be counter-balanced by increased job demands. When we adjust for exposure, to create a full-year equivalent risk, we find that those with the shortest job tenures (less than six months) have a significantly higher risk of both MSD and SAD.

Both types of work-related illness were found to be pro-cyclical, increasing with employment growth and decreasing with employment decline. The annual inspection rate was also associated with lower rates of both MSD and SAD illness, although the mechanism for the latter association is unclear and suggests that another confounding factor may be at play.

[28] The SAD effect is only significant at the 10% level.

Chapter 4

Conclusions and Lessons for Policy, Practice and Measurement

4.1 MAIN FINDINGS

Musculoskeletal disorders (MSD) and stress, anxiety and depression (SAD) illnesses are found to be the two most common forms of self-reported work-related illness in Ireland and elsewhere. Over the period 2002 to 2013, these two groups of illnesses together accounted for 61 per cent of work-related illness in Ireland and 75 per cent of work-related illness in the EU28. Over that period of time the overall trends in work-related illness rates followed the Irish economic cycle of boom and downturn. This was also true for MSD and, to a lesser extent, for SAD illnesses. At a descriptive level male workers are more likely to report MSD than female workers; however, when we take account of other personal and job characteristics, this gender gap no longer exists, suggesting that differences in job sector, occupation and working patterns drive the gender difference. By contrast, female workers were more likely to report work-related SAD illnesses, even after taking account of personal and job characteristics. Gender differences in SAD illnesses are also found in the general population, and are likely to reflect wider social roles and physiological differences between men and women.

Non-Irish workers have a significantly lower rate of MSD than native Irish workers, controlling for sector, job and personal characteristics. A similar 'healthy immigrant' pattern has been found for general self-assessed health in Ireland (Nolan, 2012) and in international studies of morbidity and mortality. However, no such effect is found for SAD once other personal and job characteristics are controlled.

Both of the illness types are strongly related to age. All those aged over 25 have a significantly higher risk of MSD compared to workers aged under 25 years. However, the effect is non-linear. There is a heightened risk for those aged over 35, but the risk is very similar for the three age groups; 35–44, 45–54 and 55–64 years. The risk drops somewhat for those aged over 64 years, which is likely to be due to selection processes whereby those with fewer health problems are likely to remain in employment after retirement age.

The risk of work-related SAD peaks for those aged 35–54 years. This higher risk for prime-aged workers may relate to both increased demands in work (that are not offset by greater autonomy) and to increased demands outside work, including greater financial and caring commitments. Workers aged over 64 years have an extremely low risk of SAD. Comparing the finding for those over 64 years for MSD and SAD suggests that SAD illnesses may be associated with a greater tendency to exit the workforce. Further longitudinal analysis could examine whether transitions out of employment differ across illness types and would add significantly to knowledge on the impacts of work-related illness.

Industrial sector has a strong association with MSD and SAD illnesses, but the pattern varies by illness types. The risk of MSD is highest for workers in the construction, agriculture and health sectors. These sectors are also those where there is the highest risk of exposure to physical hazards (Watson et al., 2015). The risk for SAD is highest in the service sector and particularly in the education sector. Service sector workers have greater exposure to a number of psychosocial risks such as adverse social behaviour (like verbal abuse, sexual harassment and physical violence), which are particularly strongly associated with negative health and wellbeing outcomes including work-related stress (Eurofound and EU-OSHA, 2014). Occupational health and safety experts have also identified high emotional demands for workers in the health and services sectors as an important emerging psychosocial risk. These working environment factors are not measured in the QNHS and may account for some of the sectoral differences in SAD identified in our analysis.

Two occupational groups are found to have a higher risk of MSD: personal service workers and skilled manual workers. No significant occupational effects were found for SAD but this may be due to the smaller number of cases for the occupational analyses. The self-employed had a higher risk of MSD which is in addition to (and independent of) the greater risk associated with the concentration of self-employment in sectors such as construction and agriculture and their longer average working hours. The higher levels of MSD among the self-employed could arise from a selection effect: compared to employees, the self-employed with MSD may be more likely to remain in the workforce because they do not qualify for welfare benefits such as OIB or social insurance based unemployment benefits. It is notable that such a process is not evident for SAD, as self-employment is (weakly) associated with *lower* SAD risk.

Independent of sector, the hours and scheduling of work have significant implications for workers' risk of SAD and MSD. Shift workers and night workers have a higher risk of experiencing MSD and shift workers also face a higher risk of SAD.

Despite strong hypotheses suggesting that work-related SAD illnesses would increase during the recession, we found that both MSD and SAD were pro-cyclical: the chance of experiencing both types of illnesses increased with the level of employment growth within the sector in which the respondent was employed, though the relationship was weaker in the case of SAD. The pro-cyclical relationship was also found for all work-related illnesses in our earlier research (Russell et al., 2015). It is likely that factors such as a higher proportion of new recruits in the workplace and high work demands (intensity) play a role in this pro-cyclical pattern. Reluctance to declare an illness during the severe recession may also have restricted reports even in a household survey, since illnesses that did not result in an absence may be more difficult for respondents to recall. Workers with MSD or SAD illnesses may also have been more likely to lose their jobs, and this selection effect could contribute to a pro-cyclical pattern. This is not to say that factors such as job insecurity and organisational change do not affect workers' wellbeing at an individual level during recessionary periods, as this has been found repeatedly in previous research (e.g. Green et al., 2014), though these studies rely on different measures of psychological wellbeing and job satisfaction rather than specifically on

work-related illness. The QNHS does not contain measures of perceived job security, or of changes at organisational level and therefore these mechanisms could not be tested.

The QNHS does not collect information on the severity of the illness but the length of absence associated with the illness is recorded. The duration of absence is slightly longer for those who experienced SAD (17 days) compared to those with MSD (16 days); this gap is statistically significant. It is also substantially narrower than the gap found in the UK, where in 2014–2015 the mean number of days lost for MSD was 17 compared to 23 days for SAD (HSE, 2016). This difference could be due to greater retention of workers with SAD conditions by British employers (including those with the most severe conditions) or could be associated with variations in compensation systems or medical diagnosis and treatment.

A European comparison based on the EU-LFS showed that Ireland had the lowest percentage of workers reporting a work-related illness across all the EU15 countries.[29] However, these figures do not take into account any compositional differences across countries such as the distribution of jobs across sectors and occupations, variation in firm size, or the differences in the characteristics of workers (such as age profile). The Irish figures are also deflated by the inclusion of proxy responses in the Eurostat figures. Previous research has also found that Irish respondents rate their subjective health more highly than those in other countries, which is partly due to cultural differences in response styles (Zimmer et al., 2000; Jurges, 2007). These caveats mean that despite the favourable international comparisons there is still a strong case for strategies to further reduce work-related illness.

The results of the research raise a number of lessons for policy and for the measurement of work-related illnesses. These are considered in the following sections.

4.2 LESSONS FOR MEASUREMENT OF WORK-RELATED MSD AND SAD ILLNESSES

The QNHS data on which this study is based come from self-reports from workers as part of a household survey on employment and unemployment. The context of the survey means that the respondents do not face any constraints from reporting a work-related illness that may arise in the workplace. Neither is the identification of a work-related illness in the QNHS contingent on eligibility for sickness-related benefits, ease or difficulty in taking time off work due to illness or access to health services.

While such evidence may appear to lack the rigour of statistics based on medical assessments, self-reports are widely used in epidemiological studies for a whole range of illnesses and health behaviours (Punnett and Wegman, 2004) and self-assessments of health are significantly related to subsequent mortality (Idler and Benyamini, 1997). Moreover, issues such as administrative eligibility requirements and differential access to health services, trends in diagnostic and prescribing practices and social and organisational differences in absenteeism mean that ‘objective’ measures of illness also suffer from a range of shortcomings.

[29] Ireland is also among the lowest when all EU28 countries are considered.

The way in which survey questions are worded can have a considerable effect on responses. Changes to the question wording in the EU harmonised QNHS 2013 (relating to the year 2012), included a specific prompt for respondents to include mental health problems, whereas modules for other years mention only 'illness or disability'. This led to a jump in the number of cases of SAD reported. This suggests that there is an under-reporting of mental health problems in the regular injury and illness module. Consideration should be given to including a prompt to respondents to include mental health problems in future QNHS work-related injury and illness modules. This could be included as a separate question after the existing work-related illness question so that trends over time based on the existing survey questions might also be continued.

The annual British Labour Force Survey question on work-related illness explicitly mentions mental health problems; there, SAD illnesses account for a much higher proportion of all self-reported illnesses.[30] Indeed, SAD illnesses routinely exceed MSD cases in the UK. However the European-wide data for 2013 suggest that the UK may be an outlier in this respect: 42 per cent of work-related illnesses in the UK were accounted for by SAD compared to the EU average of 16 per cent.

In addition to the importance of the wording and its consistency over time, the format of the QNHS questionnaire can also impact the estimation of different types of illnesses. The current format of the QNHS questionnaire asks respondents about the number of illnesses experienced but only collects further information such as illness type for the most recent illness (see Table A2). This question format might therefore underestimate other 'secondary' illnesses, which may be particularly relevant for SAD conditions. However, only a minority of respondents report more than one illness.[31] Furthermore, no information is collected on the severity of the work-related illness as this could have important impacts on the person's health, their length of absence from work and the associated cost for the employer and wider society.

More generally, the QNHS contains only broad indicators of the job type (occupation) and sector, and does not contain detailed information on the nature of tasks or exposure to occupational hazards, or, for example, details on shift work or night work patterns, how long workers have participated in such shifts or the exact shift rotation. Such factors have been found to be important in laboratory studies of shift and night work effects. Such detailed information on working conditions can only be collected in dedicated working conditions surveys. While the European Working Condition Survey collects data on some of these factors, the sample numbers (approximately 1,000 per country) limit examination within sub-groups and the survey does not include a specific question on work-related illness. A new round of the National Employee Survey, which was previously carried out in 2005 and 2009, could provide much needed evidence on these issues and their relationship to self-assessed health and work-related illness.

[30] 'Within the last 12 months have you suffered from any illness, disability or other physical or mental problem that was caused or made worse by your job or by work you have done in the past?'

[31] The figure varies across year but between 9 per cent and 18 per cent report more than one illness.

The cross-sectional nature of the QNHS data means that it is not possible to say whether the relationships found between illness and sectors, work patterns and worker characteristics are causal. It also means that the findings are likely to be influenced by selection factors such as the 'healthy worker effect'. Those with the most severe work-related illnesses will have left employment, others may have moved to less physically demanding work (leading to errors in the association between illness and the sector/occupation) or have reduced their hours of work (distorting the relationship with working time). The only solution to this shortcoming is to conduct longitudinal research, where the work histories of individuals are collected (whether prospectively through a cohort study or retrospectively) and can then be related to subsequent health outcomes. As successive waves of The Irish LongituDinal Study on Ageing (TILDA) survey are collected this will become a more useful source of data to examine work-related illness and the longer term effects of work environment and conditions.

4.3 LESSONS FOR POLICY AND PRACTICE

The identification of different high-risk groups, sectors, occupations and work practices for MSD and SAD highlights potential target groups for intervention. The current study does not investigate the efficacy of different policy responses but a variety of responses are discussed, including possible changes to work practices, working environment, work organisation, training policies, inspection and monitoring policies, and health information for employers and employees.

As the most common form of work-related illness, there is a need for an ongoing focus on monitoring and preventing MSD in the workplace. There are a number of initiatives in Ireland to raise awareness of risk factors for MSD and to highlight prevention strategies. This includes both general advice and guidance (HSA website) and guidance targeted at specific sectors and occupations (HSA, 2007). While the high-risk sectors for MSD were already known, this report provides information on the scale of the differences between sectors over a substantial time period. It also identifies high-risk groups that were suspected but not previously verified, such as the self-employed, where additional efforts for prevention may now be focused. The adjusted calculations for 'full-year equivalence' among workers who were in their jobs for less than 12 months suggest that new recruits have a heightened risk of MSD. This result is consistent with our previous finding of a higher work-related injury risk among new recruits when length of exposure is taken into account and underlines the need for training and supervision of newly appointed employees.

The ageing of the workforce, together with the higher prevalence of MSD for older workers, means that efforts to minimise the risks of MSD and to accommodate workers with such conditions are becoming increasingly important (Eurofound, 2012; Okunribido and Wynn, 2010). The mean age of the population in Ireland is rising and this has implications for the age profile of the working population. The ageing workforce is already evident in recent trends, for example the proportion of the employed aged over 55 increased from 11 per cent in 1998 to 16 per cent in 2013 (Russell et al., 2015). The ageing workforce is likely to be particularly salient in some sectors and occupations such as farming (McGill, 2010). Adjusting working conditions and demands to reflect the capacity of an ageing workforce is likely to be crucial. The current study suggests that attention needs to be paid to factors such as hours, shift work

and night work. The physical demands of work are not measured directly in our data; however, the results suggest that occupations such as skilled manual work and sectors such as agriculture and construction will require greater action to reduce the risk of MSD in an ageing workforce.

The analysis found that higher rates of inspection per 1,000 workers were associated with reduced levels of MSD, suggesting that the inspection regime may be an important element in prevention, though the measure may also capture more general activity by the regulatory authority (the Health and Safety Authority), which may be associated with inspection activity.

The changing nature of employment, including the long-term shift from manufacturing and agriculture to the service sector, means that an increasing proportion of the workforce are engaged in employment which is less physically demanding but which brings with it a range of stress-related and psychosocial risks. There has also been a significant increase in the female share of the workforce. These trends, combined with the findings in the current research, lead to the expectation of a higher incidence of SAD illnesses in the future. The EU-OSHA (2007) has identified work intensification, high emotional demands, and poor work–life balance as key emerging psychosocial risks for the occupational health and safety of workers. The latter two risk factors are particularly relevant to mental health problems such as stress, anxiety and depression.

Long hours of work are strongly associated with SAD, which suggests that action to minimise very long working hours should be taken. There are already regulations imposing maximum work hours for employees, though not for the self-employed. Moreover, organisational cultures including 'presenteeism' can undermine such regulation for employees, especially those in managerial positions (Worrell et al., 2016; Burchell, 2009). Comparative research for the mid-2000s suggests that Irish rates of long working hours (over 48 hours per week) were higher than the EU27 average. This suggests attention is needed to enforce existing working time regulation and to change organisation cultures.

Monitoring and addressing psychosocial risks can be challenging as they are often invisible, complex and dynamic (Jespersen et al., 2016). While we found an association between a higher inspection rate and lower rates of SAD, health and safety inspections tend to focus on physical health and safety issues rather than on risks to workers' mental health. The tools for assessing health and safety risks and compliance can often neglect or inadequately capture risks to employees' mental health (ibid; Leka et al., 2011). For sectors and occupations where a higher risk of SAD has been identified, there is value in conducting audits of stress-related hazards, such as work demands, organisation of work hours (long hours, shift work, night work), control over work, work–family spillover or conflict, and work relationships (support/conflict). The identification of such risks could support changes in the work organisation, thus reducing these risks.

Supporting employers by raising awareness and improving risk assessment of psychosocial risks is important. Unlike more traditional risks, employers find psychosocial risks more difficult to manage. Results from the ESENR-2 survey (EU-OSHA, 2016) found that 40 per cent of employers across the EU28 found such risks difficult to manage. The same study found also

that a large percentage of firms – 50 per cent in Ireland and 40 per cent in the EU28 – did not have sufficient information on how to assess psychosocial risks within their organisation and this varied markedly by firm size (EU-OSHA, 2016). In Ireland, while 80 per cent of participating firms in the ESENR-2 survey had an action plan for prevention and procedures in relation to bullying, harassment and violence, this is true for just over 40 per cent for stress (EU-OSHA, 2016).

The Health and Safety Authority (HSA) has already identified such information needs among employers and released a work-related stress guide to employers (HSA, 2011). Additional promotion of this guidance, perhaps targeted at the higher risk groups identified, should be considered in light of the survey results cited above.

The HSA has also been involved in promoting a stress audit tool for organisations called Work Positive. The tool was developed by NHS Health Scotland and the Health and Safety Authority (HSA, Ireland) and aims to help organisations identify the potential causes of stress at work. It is based on the UK-based Health and Safety Executive's (HSE) six identified factors of primary precursors to stress: demands; control; support; relationships; role; and change.[32] Two rounds of the project were implemented by the HSA in the Republic of Ireland and by the Health and Safety Executive in Northern Ireland (HSENI) (in 2005–2007and 2008–2009). The first phase involved six volunteer organisations and the second round involved 20 organisations; the tool remains available on the HSA website and by 2014 had been completed by 30 organisations employing 6,000 employees (Murray, 2014).

The use of this audit tool has not been evaluated in Ireland; however, a preliminary evaluation was conducted in Scotland (McGregor and Cummins, 2004), mainly focusing on the distribution and uptake of Work Positive. While there was a low response rate to the study's self-completion questionnaires from recipients of the programme (<4 per cent), this study found overall positive results.[33] However, there has been no evaluation of the cost effectiveness of the programme. The majority of respondents saw the programme pack as straightforward, easy to use and relevant to their organisation. However, responses show that recipients were mainly from larger organisations (>250 employees), with a disproportionate number of health board employees; this along with further analysis pointed to evidence that these organisations are more likely to actually implement the programme.

Given the ongoing changes in employment and emerging psychosocial risks identified at the European level, there is scope to renew and expand (after evaluation of the previous rounds) the Work Positive project. Other forms of communication and information (workshops, lists of occupational psychologists on work-related stress) for employers and employees could be

[32] See: http://www.hsa.ie/eng/Workplace_Health/Workplace_Stress/Work_Positive/Work_Positive_Project_2005-2007/.

[33] A self-completion questionnaire was forwarded by the evaluators to all Scottish employees (5,000 in total) who had received a Work Positive pack. The Work Positive packs had been distributed between 2002 and 2004 by either a network of professional bodies, via health promotion departments across Scotland, or on request directly from NHS Health Scotland. In total, 176 completed evaluation questionnaires were returned to the study team. Follow up research was conducted to identify reasons for non-response; this was achieved through 67 telephone interviews and 126 completed questionnaires.

explored to promote awareness, appropriate risk assessment, prevention and management of psychosocial risks.

The link between work patterns such as shift work and night work for MSD and long hours and shift work for SAD highlights the role of work organisation in preventing work-related illness. Long or irregular working hours as a key factor for psychosocial risks was also found for Ireland in the ESENR-2 survey (EU-OSHA, 2016). These findings suggest that there is some scope that organisational change in the firm could assist in the prevention of these risks. Further exploratory analysis could be done to look at the mechanisms associated with shift work and MSD. The literature suggests that some of the negative mental health effects of high work demands can be tempered by greater control and autonomy for workers in relation to their work tasks and organisation of their work. Previous research has also found that employee flexibility in work scheduling (for example in start and finishing time) can reduce work-related stress, though not all forms of flexibility reduce work pressure.[34]

The pro-cyclical relationship between employment growth and work-related MSD and SAD means that without a countervailing effort from employers, employees and the State, the rates of both these illnesses will increase with the economic recovery. This emphasises the continued need for vigilance in preventing work-related illness.

[34] For example, Russell et al (2009) found that working from home was associated with increased work pressure. Employer driven flexibility, such as zero hours contracts and working overtime at short notice, are likely to be detrimental to workers' well-being and their ability to balance work and family and financial commitments.

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Appendices

APPENDIX 1: ALTERNATIVE SOURCES OF INFORMATION ON WORK-RELATED ILLNESS

Department of Social Protection Occupational Injury Benefit (OIB)

In Ireland the Department of Social Protection is responsible for receiving claims by employees in relation to occupational injury and illness benefits. Occupational Injury Benefit is payable only to those who are injured at work (or while travelling directly to or from work) or who have one of a list of prescribed occupational diseases.[35] A medical certificate is required to apply for OIB (MC1 form) and weekly thereafter for the duration of the claim (MC2 form). The list of prescribed occupational diseases does not include stress, anxiety or depression; therefore, only cases of SAD arising from an injury are covered by OIB. Claimants must also be aged under 66 years and satisfy the PRSI conditions. Up until December 2013, receipt of the benefit was conditional on being absent from work for four or more days.[36] In January 2014 this period was extended to seven or more days, resulting in the number of claims falling from 11,428 in 2013 to 9,768 in 2014 and the figures from 2014 onward being more selective of illnesses and injuries that involve longer absences (HSA, 2015). This is likely to have consequences for the composition of illnesses and injuries captured.

The Department of Social Protection has provided annual aggregated statistics on the number of claims awarded from 2009 to 2015 and on the type of incapacity. The OIB figures do not distinguish between illness and injuries and are limited to prescribed illnesses; therefore, they are not an ideal source of information on work-related illness. Claimant statistics are shaped by eligibility requirements and so are influenced by factors such as social insurance coverage, employer compliance with welfare regulation, and changes to criteria for qualification. Nevertheless, we have used the data supplied by the Department of Social Protection to identify the two categories of interest: musculoskeletal disorders (MSD) and stress, anxiety and depression (SAD). The first group – MSD – covers both injury and illness, while the second group – SAD – only contains cases that arise from a work-related injury. With the exception of 2015, the MSD category represents 85–86 per cent of all OIB claims and SAD illnesses account for only 3–4 per cent. We note that the MSD category has declined slightly over time. It is important to highlight that the numbers communicated by the Department of Social Protection do not include self-employed persons as OIB is not available to this group. The Department of Social Protection registers over 70 types of injuries and illnesses annually and we have grouped these into four categories.

[35] See Department of Social Protection (https://www.welfare.ie/en/Pages/Occupational-Injuries-Benefit---Prescribed-Occupational-Dise.aspx) for more details about the prescribed conditions.

[36] The QNHS has the advantage that it collects information with fewer than four days of absence.

Table A1 Occupational Injury Benefit – Composition of claims by illness/injury type (2009–2015)

	2009	2010	2011	2012	2013	2014	2015
MSD	86.4%	87.5%	86.3%	85.0%	85.9%	85.54%	82.1%
SAD	2.9%	2.8%	2.6%	3.6%	3.6%	3.8%	3.7%
Respiratory	0.3%	0.3%	0.3%	0.4%	0.3%	0.2%	0.2%
Other	10.4%	9.5%	11.1%	11.0%	10.2%	10.5%	14.0%
	100.0	100%	100%	100%	100%	100%	100%
Total N	11,516	12,289	11,616	10,927	11,421	9,768	10,182

Notes: Claims in 2014 and 2015 refer to cases where there were absences of seven or more days. Claims from 2009 to 2013 were allowable for cases of four or more day's absence. Data was provided by the Department of Social Protection and grouped into the four categories by the authors.

National Cancer Registry Ireland (NCRI)

During the course of their professional activities, some workers (employees and the self-employed) can be exposed to carcinogens, which might lead to the development of cancer. The National Cancer Registry Ireland (NCRI) is a public body that collects information about all cancer cases in Ireland. It gathers statistics about the number of cases by type of cancer as well as some demographic information about the persons diagnosed with a cancer. The data available from the NCRI does not include information about causes of the cancer, which are in many cases multi-factorial. However, mesothelioma, is almost exclusively work related. A recent UK study by Parkim (2011) found that 97 per cent of male mesothelioma cases were due to occupational exposure to asbestos. The NCRI shows that there were between nine and 51 cases of mesothelioma a year between 1994 and 2013 (an average of 29 per year), which translates into an age standardised rate of 1.28 for men over the period and 0.2 for women (NCRI).

For other cancers, approximations of work-related illness often use estimates of the proportion of cases that are likely to be caused by occupational exposure based on epidemiological studies; this is known as the *attributable fraction.*

Doll and Peto (1981) estimate that 4 per cent of cancer deaths are attributable to occupational exposures but Landrigan and Baker (1995) argue that Doll and Peto's results are underestimates, due to the limitation of the data they used. In Ireland there is very little information about the extent of other occupational cancer and there are no recent data on occupational exposures, outside the research by Kauppinen et al. (2000) across the EU (including Ireland) based on the CARcinogen Exposure database (CAREX). Kauppinen et al. (2000) estimated that over the period 1990–1993, 24 per cent (260,000) of the workforce were exposed to listed carcinogenic agents, mostly exposure to solar radiation and tobacco smoke in the working environment, while approximately 6,000 workers were exposed to asbestos.

The Health and Occupation Reporting (THOR) Network

The Health and Occupation Reporting (THOR) network is a network that collects information about occupational-related illness from medical specialists or specially trained general practitioners. Originally based solely in the UK, in 2005 Ireland joined THOR with the support of the Health and Safety Authority. It began with two schemes – EPIDERM and SWORD – which involved dermatologist consultants and chest physicians collecting information about occupational skin disorders (EPIDERM) and respiratory (SWORD) diseases. The project was then extended in 2007 with the Occupational Physicians Reporting Activity (OPRA) scheme to collect information from medical and occupational physician specialists about any work-related illnesses. During the medical consultation with a patient the information is collected anonymously and relates only to gender, age, the patient's general location, their occupation title, the industry in which they work and finally what has (or might have) caused the illness. The data are limited because only a small sample of physicians participate in THOR; a total of 50 physicians were enrolled in THOR in Ireland in 2014. Moreover, while information provided by doctors is likely to have a high level of validity, the data are influenced by patient access to health services, which in Ireland is highly socially structured (Layte et al., 2007; Layte and Nolan, 2004). In the UK, SWORD is identified as the best available source for work-related asthma and EPIDERM for skin disorders (see www.hse.gov.uk/statistics/preferred-datasources.htm).

European Union Labour Force Survey (EU-LFS)

The European Union Labour Force Survey (EU-LFS) dataset is the main European harmonised data source to report statistics on employment and unemployment across European countries. The EU-LFS is drawn from national surveys of private households and collects information about the labour force participation of household members aged 15 and over, as well as the situation of those outside the labour force. In Ireland, the Central Statistics Office (CSO) carries out the QNHS, which is the source for the EU-LFS. In addition to regular information about the labour force collected for the EU-LFS, Eurostat organises the collection of additional information through 'ad hoc modules' that look at a specific labour market issue every year. The themes vary from year to year; in recent years, for example, there have been modules on transition from work into retirement (2012) and on employment of disabled people (2011). Many of these ad hoc modules are repeated regularly, enabling an analysis of European trends on specific topics. The module, 'Accidents at work and work-related health problems' was carried out in 2007 and repeated in 2013.[37] In this report, we therefore focus on European analysis for the years 2007 and 2013. The data analysis in the EU-LFS-based section of this report is drawn from output tables from the Eurostat website. While the measurement of illness rate in the analysis of the QNHS data was based on 'per 1,000 workers', Eurostat's output tables are expressed in percentages.

[37] There is also a European module, carried out in 1999, called 'Accidents at work and occupational diseases' but we do not use this as it is outside the recent period of interest for the purpose of this analysis.

APPENDIX 2: QUESTION WORDING IN QNHS MODULE

Table A2 QNHS Questions from the 'Accidents at Work and Other Work-related Health Problems' Modules, Q1 2003 to Q1 2015

National Questionnaire	National Questionnaire	Eurostat Module	National Questionnaire	Eurostat Module
2002–2003	**2004–2005, 2007**	**2006**	**2008–2011, 2013–2014**	**2012**
Field date: Q1 of 2003, 2004	**Field date: Q1 of 2005, 2006, 2008**	**Q2 of 2007**	**Q1 of 2009, 2010, 2011, 2012, 2014, 2015**	**Q2 of 2013**
How many, if any, illnesses or disabilities have you experienced in the past 12 months, that you believe were caused or made worse by your work (either the work that you are doing at the moment or work that you have done in the past)?	How many, if any, illnesses or disabilities have you experienced in the past 12 months, that you believe were caused or made worse by your work (either the work that you are doing at the moment or work that you have done in the past)?	How many, if any, illnesses, disabilities or other health complaints have you experienced in the past 12 months, that you believe were caused or made worse by your work (either the work that you are doing at the moment or work that you have done in the past)?	How many, if any, illnesses or disabilities have you experienced during the 12 months January 20XX to December 20XX, that you believe were caused or made worse by your work?	In the 12 months prior to this interview and excluding any accidents you might have highlighted already, have you suffered from any physical or mental health problems? How many of these health problems are caused or made worse by work you are doing or have done in the past?
How many working days were lost as a result of your most recent illness which was work-related?	Now thinking about the time(s) when you were in employment during the last 12 months, how many days were you absent from your job as a result of your most recent work-related illness?	How many days, if any, did you take off from work due to your most serious work-related illness in the past 12 months?*	Now thinking about the time(s) when you were in employment during the 12 month, period January 20XX to December 20XX, how many days were you absent from your job as a result of your most recent work-related illness?	How much time were you unable to work as a result of the health problem?* 1.Still off work because has not yet recovered from the health problem, but expects to resume work later 2.Expects never to work again because of this health problem 3.< 1 day or no time off 4.At least 1 day but < 4 days 5.At least 4 days but < 2 weeks 6.At least 2 weeks but < 1 month 7.At least 1 month but < 3 months 8.At least 3 months but < 6 months 9.At least 6 months but <9 months 10.Between 9 and 12 months

What was your most recent work-related illness?*	What was your most recent work-related illness? (If respondent has had an illness)*	How would you describe your most serious work-related illness suffered in the last 12 months?*	Which of the following best describes your most recent work-related illness?*	From the list provided please describe the nature of the most serious health problem?*
1.Bone, joint or muscle problem 2.Breathing or lung problem 3.Skin problem 4.Hearing problem 5.Stress, depression or anxiety 6.Headache and/or eyestrain 7.Heart disease or attack, or other problems in the circulatory system 8.Disease (virus, bacteria, cancer or other type of disease) 9.Other types of complaint 10.Not applicable	1.Bone, joint or muscle problem 2.Breathing or lung problem 3.Skin problem 4.Hearing problem 5.Stress, depression or anxiety 6.Headache and/or eyestrain 7.Heart disease or attack, or other problems in the circulatory system 8.Disease (virus, bacteria, cancer or other type of disease) 9.Other types of complaint 10.Not applicable	1. Bone, joint or muscle problem 2. Breathing or lung problem 3. Skin problem 4. Hearing problem 5. Stress, depression or anxiety 6. Headache and/or eyestrain 7. Heart disease or attack, or other problems in the circulatory system 8. Infectious disease (virus, bacteria or other type of infection) 9. Other types of complaint 10. Not applicable	1. Bone, joint or muscle problem 2. Breathing or lung problem 3. Skin problem 4. Hearing problem 5. Stress, depression or anxiety 6. Headache and/or eyestrain 7. Heart disease or attack, or other problems in the circulatory system 8. Infectious disease (virus, bacteria or other type of infection) 9. Other types of complaint 10.Not applicable	1.Bone, joint or muscle problem which mainly affects neck, shoulders, arms or hands 2 Bone, joint or muscle problem which mainly affects hips, knees, legs or feet 3 Bone, joint or muscle problem which mainly affects back 4 Breathing or lung problem 5 Skin problem 6 Hearing problem 7 Stress, depression or anxiety 8 Headache and/or eyestrain 9 Heart disease or attack, or other problems in the circulatory system 10 Infectious disease (virus, bacteria or other type of infection) 11 Stomach, liver, kidney or digestive problem 12 Other types of health problem

** Note that in 2006 (Q1 2007) and in 2012 (Q2 2013), the question on the type of illness preceded the question on the duration of the illness. This effectively means that in 2012 the respondent answered the duration question about the most serious problem.*

APPENDIX 3: ADDITIONAL TABLES AND FIGURES

Table A3 Characteristics of the Irish Health and Safety Inspectorate 2001–2013

Year	Inspections	N at work	Rate per 1,000 at work	N of inspectors	Average inspection per inspector	Grant €	Per capita Grant €
2001	13,940	1,749,625	8.0	90	154.9	N/A	N/A
2002	12,896	1,776,525	7.3	87	148.2	N/A	N/A
2003	10,704	1,810,075	5.9	100	107.0	13,453,000	7.4
2004	11,382	1,871,100	6.1	100	113.8	14,384,000	7.7
2005	13,552	1,962,775	6.9	100	135.5	18,149,000	9.2
2006	15,365	2,053,550	7.5	115	133.6	20,998,000	10.2
2007	13,631	2,143,075	6.4	120[1]	113.4	22,962,167	10.7
2008	16,009	2,128,400	7.5	128	133.2	24,235,450	11.4
2009	18,451	1,961,350	9.4	123	157.3	22,561,000	11.5
2010	16,714	1,882,225	8.9	121	148.0	19,984,000	10.6
2011	15,340	1,849,100	8.3	115	141.9	19,968,000	10.8
2012	13,835	1,837,825	7.5	112	133.4	19,146,000	10.4
2013	12,244	1,881,150	6.5	107	123.6	18,780,000	10.0

Source: Reproduced from Russell et al., 2015 (Table 1.2)
Notes: N at work based on the QNHS figures; N/A = Not Available; [1]The N of inspectors figure for 2007 was an estimate based on the information for the surrounding year.

Table A4 Classification of Economic Activities NACE Rev2

NACE Rev2 Code	NACE Rev2 Description
A	Agriculture, Forestry And Fishing
B	Mining and quarrying
C	Manufacturing
D	Electricity, gas, steam and air conditioning supply
E	Water supply; sewerage, waste management and remediation activities
F	Construction
G	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	Transportation and storage
I	Accommodation and food service activities
J	Information and communication
K	Financial and insurance activities
L	Real estate activities
M	Professional, scientific and technical activities
N	Administrative and support service activities
O	Public administration and defence; compulsory social security
P	Education
Q	Human health and social work activities
R	Arts, entertainment and recreation
S	Other service activities
T	Activities of households as employers; undifferentiated goods and services-producing activities of households for own use
U	Activities of extra territorial organisations and bodies

Table A5 Model of MSD Including Full-time Equivalent Hours

		Exp(B)	Sig.
	% change in emp. in sector	1.02	.000
Ref: Male	Female	1.00	.935
Age	Age 25–34	1.73	.000
Ref: Under 25	Age 35–44	2.31	.000
	Age 45–54	2.24	.000
	Age 55–64	2.45	.000
	Age > 65	2.01	.000
Ref: Irish	Non-Irish	0.87	.056
Sector	Agriculture	2.12	.000
Ref: Other services	Industry	1.32	.000
	Construct	2.22	.000
	Retail	1.22	.005
	Transport	1.55	.000
	Accommodation and food	1.11	.254
	Health	1.65	.000
	Public administration	1.21	.050
	Education	0.76	.003
Tenure	Tenure < 6 months	0.75	.001
Ref: Over 5 years	Tenure 6- 12 months	0.56	.000
	Ten LT 2yrs	0.83	.016
	Ten 3- 5yrs	0.92	.121
Hours	Hours vary	**0.48**	**.000**
Ref: <30 hours	Hours 30–39	**0.41**	**.000**
	Hours 40–49	**0.33**	**.000**
	Hours 50 plus	**0.29**	**.000**
Ref: No shift work	Shift work	1.34	.000
Ref: No night work	Night work	1.16	.007
Ref: Employee	Self-employed	1.35	.000
	Constant	0.01	0.000

Table A6 Model MSD Excluding 2012 Data

		Model 1:	Model 2:	Model 3:
		Dummy period	Rate of emp. growth	Inspect. Rate
		Exp(B)	Exp(B)	Exp(B)
Ref: Boom (2002–2007)	Recession (2008–2011)	0.663***		
	Recovery (2012–2013)	0.889		
	Annual % emp. change by sector		1.019***	1.011**
Ref: Male	Female	0.995	0.997	0.995
Ref: Age 18–24	Age 25–34	1.923***	1.881***	1.911***
	Age 35–44	2.556***	2.492***	2.535***
	Age 45–54	2.641***	2.566***	2.617***
	Age 55–64	2.791***	2.692***	2.754***
	Age 65 plus	2.539***	2.416***	2.487***
Ref: Irish	Non-Irish	0.785**	0.756***	0.770**
Ref: Other services	Agriculture	1.975***	2.123***	2.054***
	Industry	1.314**	1.473***	1.406***
	Construction	2.102***	2.241***	2.178***
	Retail	1.162	1.203*	1.184
	Transport	1.418***	1.480***	1.459***
	Accomm. and food	0.950	0.974	0.965
	Health	1.651***	1.581***	1.615***
	Public admin and defence	1.217	1.245	1.239
	Education	0.896	0.892	0.895
Ref: Employee	Self-employed	1.287***	1.281***	1.284***
Ref: Tenure > 5 years	Tenure < 6 months	0.831	0.840	0.833
	Tenure 6- 12 months	0.639**	0.649**	0.643**
	Tenure 1 to 2 years	0.875	0.882	0.878
	Tenure 3- 5 years	0.938	0.943	0.943
Ref: Less than 30 hours	Hours vary	1.093	1.121	1.110
	Hours 30-39	0.965	0.978	0.974
	Hours 40-49	0.872	0.883	0.878
	Hours 50 plus	1.063	1.090	1.080
Ref: Not shift	Shift	1.378***	1.370***	1.376***
Ref: No night work	Night	1.224**	1.228***	1.225***
	Inspection rate			0.897***
	Constant	0.005***	0.004***	0.009***
Observations		148,295	148,295	148,295
Reduction on log likelihood		471.0	451.0	500.8

*Notes: *** p<0.01, ** p<0.05, * p<0.1*

Excluding data for the year 2012 has the following effect on results compared to Table 3.2 in Chapter 3:

- age coefficient stronger without 2012;
- migrant coefficient stronger without 2012;
- construction effect weaker without 2012;
- retail effect no longer significant without 2012; and
- hours 40–49 no longer significant (but coefficients similar).

Table A7 Model SAD Excluding 2012 Data

		Model 1: Dummy period	Model 2: Rate of emp. growth	Model 3: Add inspect. rate
		Exp(B)	Exp(B)	Exp(B)
Ref: Boom (2002–2007)	Recession (2008–2011)	0.585***		
	Recovery (2012–2013)	0.618**		
	Annual % emp. change by sector		1.025**	1.010
Ref: Male	Female	1.418***	1.415***	1.413***
Ref: Age 18–24	Age 25–34	1.627	1.552	1.600
	Age 35–44	2.425***	2.295***	2.370***
	Age 45–54	2.583***	2.443***	2.529***
	Age 55–64	2.118**	1.991**	2.067**
	Age 65 plus	0.0900**	0.0839**	0.0873**
Ref: Irish	Non-Irish	0.704*	0.671**	0.689*
Ref: Other Services	Agriculture	0.206***	0.230***	0.216***
	Industry	0.426***	0.501***	0.457***
	Construction	0.356***	0.385***	0.372***
	Retail	0.668*	0.699*	0.678*
	Transport	1.043	1.114	1.079
	Accomm. and food	0.527***	0.542***	0.534***
	Health	1.348	1.272	1.324
	Public admin. and defence	0.884	0.914	0.904
	Education	1.654**	1.641*	1.653*
Ref: Employee	Self-employed	0.813	0.808	0.813
Ref: Tenure > 5 years	Tenure < 6 months	0.674*	0.688	0.678*
	Tenure 6- 12 months	1.149	1.190	1.164
	Tenure 1 to 2 years	0.645**	0.658**	0.652**
	Tenure 3- 5 years	1.022	1.042	1.042
Ref: Less than 30 hrs	Hours vary	2.122***	2.165***	2.124***
	Hours 30–39	1.533***	1.556***	1.546***
	Hours 40–49	1.767***	1.784***	1.766***
	Hours 50 plus	2.844***	2.940***	2.888***
Ref: Not shift	Shift	1.272	1.273	1.282
Ref: No night work	Night	1.274	1.269	1.268
	Inspection rate			0.831***
	Constant	0.002***	0.001***	0.005***
Observations		148,295	148,295	148,295
Reduction on log likelihood		423.7	367.9	400.9

*Notes: *** p<0.01, ** p<0.05, * p<0.1*

Excluding data for the year 2012 has the following effect on results compared to Table 3.3 in Chapter 3:

- the recovery period, which now only contains the year 2013, has significantly lower level of SAD than in boom period;
- annual employment change now not significant in model with inspection rate;
- age 25–34 not significant;
- migrant effect becomes significant without 2012;
- education effect stronger without 2012;
- stronger effect of variable work hours without 2012;
  stronger effect of very long hours without 2012;
- shift effect stronger without 2012.

Figure A1 Adjusted Percentage Experiencing MSD by Personal and Work Characteristics, 2002–2013

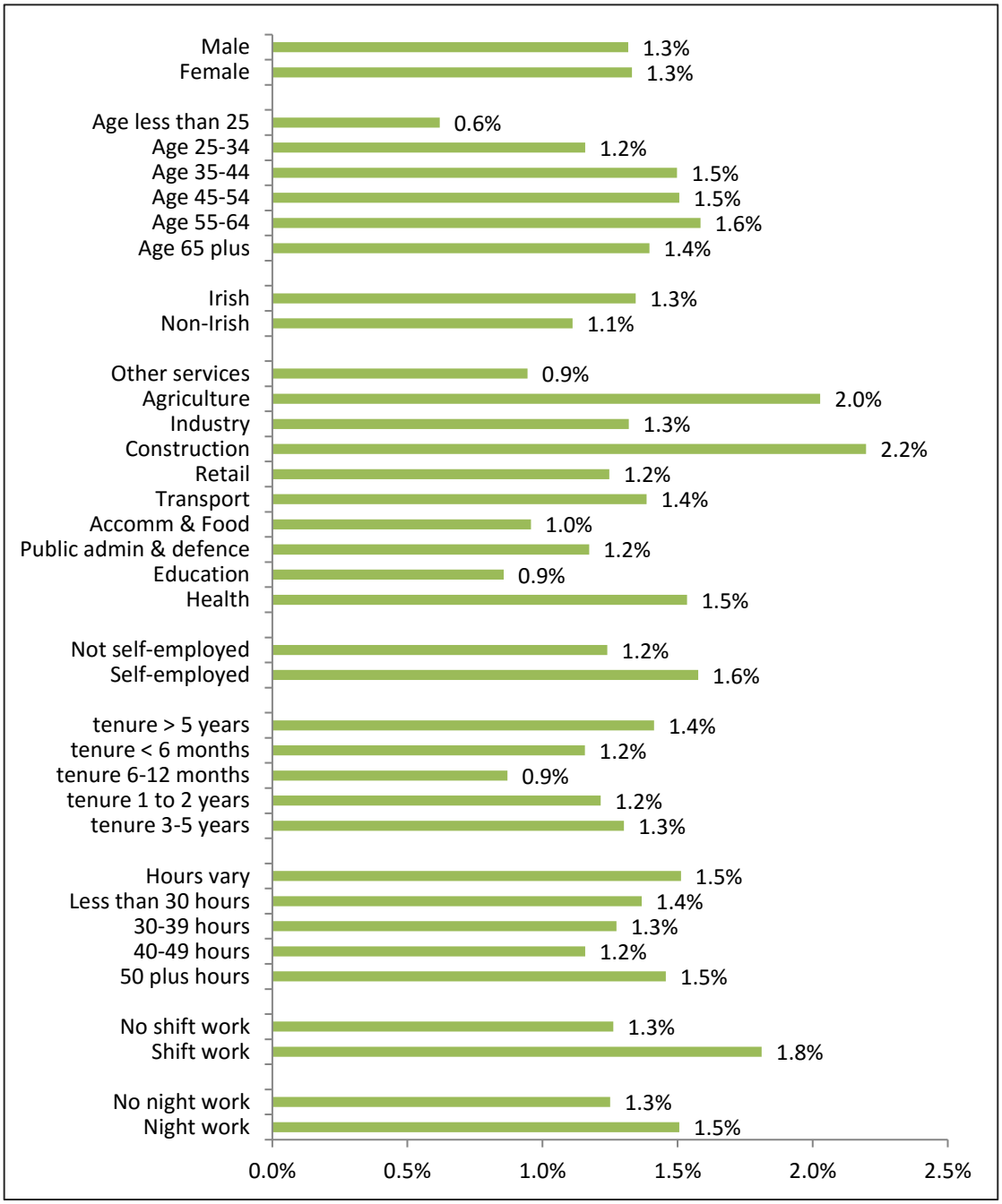
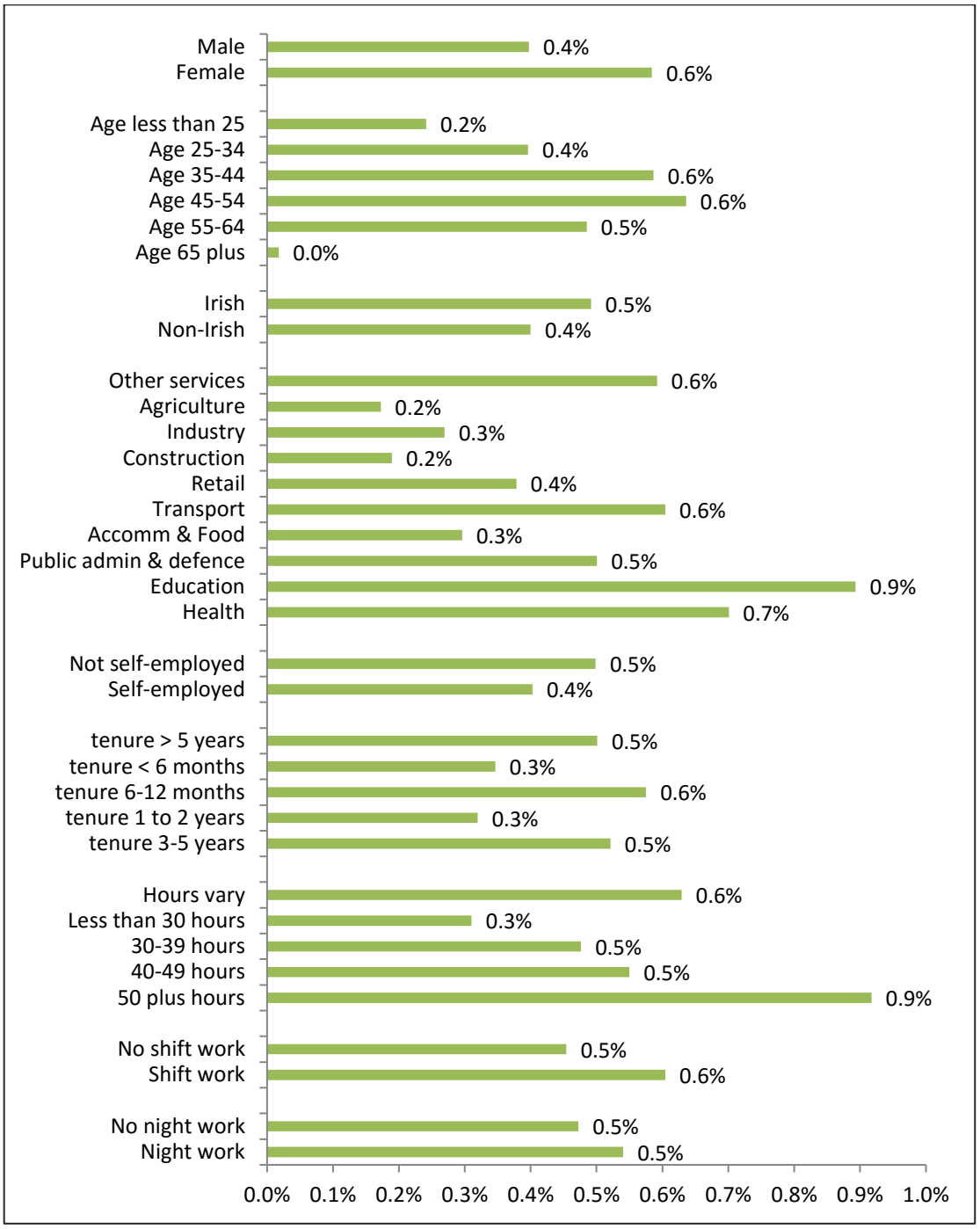


Figure A2 Adjusted Percentage Experiencing SAD by Personal and Work Characteristics, 2002–2013



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