

**Report on  
Economic Impact  
of the Safety,  
Health and Welfare  
at Work  
Legislation**

*Final Report*

**Prepared for**



An Roinn Fiontar, Trádála agus Fostaíochta  
Department of Enterprise, Trade and Employment

**By**

**Indecon**

**August 2006**

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## **Executive Summary**

### **Introduction**

This report was prepared by Indecon International Economic Consultants for the Department of Enterprise, Trade and Employment. The objective of this study was to undertake an economic assessment of the effect since 1989 of occupational safety, health and welfare law on the Irish economy, particularly on competitiveness, taking into account the current law, the proposals in the new Safety, Health and Welfare at Work Act 2005, the resources devoted to occupational safety health and welfare, the size of the workforce and the statistical data available with a view to ascertaining what benefits both economic and social accrue.

This involved the following tasks:

- To estimate the savings to the economy and the Exchequer, if any, that accrue from reducing occupational injuries - including the impact on costs to the health service, on costs of employers' liability insurance and on general employment costs such as work days lost;
- To estimate the human impact of occupational injuries, including fatalities, and the numbers of people who have benefited from the implementation of health and safety standards;
- To estimate the impact of the implementation of occupational health and safety rules on the competitiveness of Ireland and on companies in the Irish economy.

### **Methodological Approach (Chapter 2)**

To address these issues our proposed approach contained a number of key steps:

- Step One was to estimate costs of accidents and ill-health for the Irish economy;
- Step Two examined the costs of Health and safety legislation for industry and implications for competitiveness; and
- Step Three was to estimate the savings arising from the legislation (i.e. reduction in accidents and associated costs).

A wide range of research techniques were employed including analysis of available data, a review of available research, a detailed consultation programme, econometric analysis and a general survey of industry and a specific survey of the construction sector. The approach adopted has led to a thorough assessment of the costs of work related accidents and ill-health for the Irish economy and the impact of Health and Safety Legislation. However, it should be noted that estimates in this area are subject to considerable uncertainty and the results should be considered as broad indicators of magnitudes and effects. This reflects the data constraints and wider methodological issues in the evaluation of Health and Safety performance.

### **Estimated Costs of Work Related Accidents and Ill-Health for Ireland (Chapter 3)**

We have undertaken two broad approaches to estimating the costs of work related accidents and ill-health for Ireland. The first is a top-down approach using a combination of aggregate data for Ireland and international evidence. The second approach involves a detailed assessment of accidents and assigns costs to different elements.

The overall share of occupational injury and illness costs in a typical developed country economy is large - approximately 2-4% of national income but there is considerable uncertainty and it would be prudent to adopt an estimate towards the lower bound. We assume average costs of approximately 2.5 % of national income based on a review of the international studies. This is a conservative estimate reflecting our concern that a number of these studies may overestimate costs. In today's terms (GNP estimated at €134,190m) this is equivalent to circa €3.3 billion for Ireland.

The second approach is a micro approach which estimates the costs of specific elements using Irish data where possible. The main cost of accidents and ill-health to society is the lost output due to both the temporary and more permanent absences from the workforce. Accidents and ill-health reduces the size of the labour force with a resultant reduction in the economy's potential output. Other significant costs include insurance and health costs.

The cost of permanent absences from the labour force is the more significant element of the costs to the economy as a whole. Two different measures of permanent absences from the labour force are available suggest a cost to the economy of between €0.825 billion and €2.3 billion per annum. Considering temporary absences also we assume a cost of lost output of €1.8 billion. International evidence suggests that other costs such as insurance and health could amount to the same again at €1.8 billion and Irish evidence indicates insurance costs of €1.2 billion which is broadly consistent with this. Accordingly, the bottom-up approach suggests costs of circa €3.6 billion to the Irish economy, which is equivalent to just over 2.5% of national income.

#### **International Review of Costs and Benefits of Health and Safety legislation (Chapter 4)**

As a first step in examining the costs and benefits of the 1989 Health and Safety Act in Ireland we reviewed the international research on costs and benefits of Health and Safety legislation.

The research concludes that the benefits of regulation are difficult to measure and usually underestimated while costs are often clearer. Moreover, the benefits of Health and Safety legislation vary considerably with the approach taken and depend on the nature of the regulatory intervention. The research suggests that success is not just down to a particular regulation but the principles underpinning the whole regulatory framework and how this is perceived by employers. Regulation may have an 'invisible' effect by simply putting Health and Safety legislation on the agenda of employers and cultivating self-regulation in the long-term.

#### **Company-based research on the Costs and Benefits of Health and Safety legislation (Chapter 5)**

We also examined the company-based research evidence on the cost and benefits of Health and Safety legislation. The research suggests that a mixture of education, incentives, regulation and enforcement mutually reinforce health and safety standards, although it is difficult to gauge the relative effects of each component.

Numerous evaluations have pointed towards the effectiveness of education and advice in raising awareness and awareness is an important factor in improving health and safety precautions. There is mixed evidence on the efficacy of enforcement through inspections and penalties. These findings suggest that a stricter system of penalties and increased visits could play a role in raising the profile of health and safety within firms through the 'ripple effect' while avoiding costly legislation. It is widely believed that financial incentives and reputational risk are emerging as powerful and recognised incentives.

The international experience on the effectiveness of health and safety legislation is reflected in the 2005 Act. Inter alia, this Act places a greater emphasis on on-the-spot fines, joint safety agreements and increased penalties. In tandem with other measures, this should help the effectiveness of the legislation.

The common perception that health and safety measures are a cost for companies rather than an investment has shifted somewhat for companies. On the whole employers believe that the benefits of regulations equal or outweigh the costs of compliance and a KPMG survey in Australia found that 70% of CEOs and 85% of supervisors agreed that improving health and safety reduces costs.

## **Irish Evidence on Costs and Benefits of Health and Safety Legislation for Firms (Chapter 6)**

The view that Health and Safety legislation may be a net benefit to firms is confirmed by recent evidence from surveys undertaken for this study. Indecon carried out two surveys to ascertain firms' views in Ireland on the impact of Health and Safety legislation on their businesses: a survey of construction companies and a survey of industry in general.

The key findings of the construction industry survey are as follows:

- A majority of respondents (53.8%) believe that the legislation has led to a reduction in the cost of accidents;
- A sizeable minority (39.6%) believe that Health and Safety legislation has led to a reduction in insurance costs, while just 5% felt that they had led to an increase;
- Regarding the gross annual costs of complying with Health and Safety legislation, a majority of firms put the cost at below 3% of annual labour costs. We estimate the median cost for firms to be over 2% of annual labour costs in the construction sector;
- The majority of construction firms believe that there has been a net benefit for their business arising from Health and Safety legislation.

From the survey of industry

- A majority of respondents believe that Health and Safety legislation has reduced accident related costs;
- Regarding the cost of compliance with Health and Safety legislation as a percentage of the total annual wage bill, the largest proportion of respondent firms fall into the 1%-5% range. We estimate the median for this sample to be below the construction sector at about 1%;
- The vast majority of respondents believe that the benefits of Health and Safety legislation outweigh its costs.

## **Impact of Health and Safety Legislation Using Aggregate Data (Chapters 7 and 8)**

The 1989 Act was a significant piece of legislation which changed the nature of Health and Safety in Ireland. It introduced new practices and placed new obligations on employers which have impacted upon behaviour. A key issue is to examine trends in enforcement activity based on the implementation of this legislation and then to establish whether there is a link between this activity and improvements in the rate of accidents.

The number of inspections is one measure of enforcement. The data show that the number of inspections between 1992 and 2004 has increased, albeit unevenly. However, the percentage of inspections in the riskiest sectors of Construction, Quarrying and Mining, and Agriculture, has increased overall from 35% of all inspections in 1994 to 58% of all inspections in 2004, which should improve the overall effectiveness of Health and Safety. Notably, inspections in the construction industry have increased dramatically, more than tripling between 1994 and 2001, from 2084 to 6508, although dropping slightly subsequently. Other indicators such as number of prosecutions and number of companies with safety statements provide evidence of greater activity. For example, the proportion of workplaces with safety statements prepared has shown considerable improvement since 1994, from 38.3% of workplaces in 1994 to 60% in 2003. Once again, this is a positive indication of the impact of the legislation.

It is generally accepted that data on occupational injury benefit is the best available measure of trends in work-related accidents due to the fact that the criteria for accepting claims have not changed for the period in question. The data show significant fluctuations in the number of claims over the period, with the number of claims falling in the period to 1995 and increasing up to 2002. Reflecting the number of people employed there is a significant fall in the number per person employed.

This period of improved working conditions has coincided with an increase in health and safety activity in Ireland, as measured by the number of inspections carried out by the Health and Safety Authority annually. One must be careful however not to assume that it has been the increased activity that has led to the fall in worker injury and fatality rates, as a simple correlation of the variables does not allow us to conclude such a result. In order to understand the underlying relationship between the variables we have undertaken a detailed econometric analysis as part of this study and this is set out in detail in Chapter 8. This econometric analysis tries to establish a relationship between various measures of enforcement and improvements in the rate of accidents. For example, the analysis examines the relationship between the rate of inspections and the injury rate. This could help in assessing the effectiveness of Health and Safety Legislation.

In general, the results generated from the estimation of the four standard regression equations are consistent with recent international research. This suggests that a greater incidence of penalty inspections can be expected to have a greater impact on the rate of both worker injuries and worker fatalities than can similar increases in overall inspection activity. However, the impact of both penalty and total inspections are not found to be statistically significant in this case, a result found by previous research.

Instead of adopting a sectoral approach to the estimation it is possible to conduct an economy wide econometric estimation of the likely impact of an increase in overall health and safety activity on worker injury and fatality rates. This more general approach places more onerous constraints on our model than before due to the small sample size but a number of regression equations have been found to present statistically significant results.

In line with this more general approach we estimated the overall expected impact of an increase in the rate of injury investigations carried out by the Health and Safety Authority on the rate of serious occupational injuries suffered by workers. Our analysis estimates that an annual increase in the rate of injury inspections of 10% is expected to have an overall cumulative impact of reducing the rate of serious injuries in workers by 6.1%, at a 5% level of statistical significance. Similarly, we have estimated that a similar increase in the rate of investigations leading to penalties being imposed is expected to bring about a 9.6% reduction in the rate of serious worker injuries. The results of these regression equations indicate that there are health and safety benefits accruing from enhanced rates of enforcement. However, one should exercise caution in relation interpreting these variables as although they are statistically significant they are based on a small sample size and would benefit from the availability of more and better data.

#### **Recommendations on Data Availability (Chapter 8)**

Given the limitations on this analysis posed by the current level of data available, and collected, in relation to this topic it is recommended that a thorough review of data availability is undertaken and subsequently improved upon in order to facilitate the use of more detailed econometric analysis of the impacts of Health and Safety legislation on workers in Ireland, as part of future studies. In accordance with international best practice such as that already undertaken in Canada and the US, where it first emerged in the 1970s, it is recommended consideration be given to the establishment of a longitudinal plant-level data set.

#### **Conclusions (Chapter 9)**

We have undertaken a detailed examination of each of the issues in the Terms of Reference using a variety of different research techniques. Having regard to the caveats discussed above, we offer the following conclusions:

##### **Issue One: Costs of Work-Related Accidents and Ill-Health**

The research suggests that costs of work-related accidents and ill-health could be as much as €3.6 billion, which is equivalent to just over 2.5% of national income for Ireland. There are uncertainties around this estimate but it is clear from the available evidence that the costs are significant.

### **Issue Two: Benefits of Health and Safety Legislation**

The 1989 Act was a significant piece of legislation which changed the nature of Health and Safety in Ireland. There has been a reduction in work-related accidents and injuries as set out in this report and this period of improved working conditions has coincided with an increase in health and safety activity in Ireland. This is shown by measures such as the number of inspections carried out by the Health and Safety Authority annually.

One must be careful however not to assume that this increased activity that has led to the fall in worker injury and fatality rates, as a simple correlation of the variables does not allow us to conclude such a result. However, there are some econometric results suggesting a link between improved accident rates and health and safety activity. This suggests that the legislation has been effective at increasing health and safety awareness and reducing accident rates. One should exercise caution in interpreting these variables. Nevertheless, this result is consistent with the views of practitioners, survey evidence and the international research on health and safety

### **Issue Three: Impact on Business Costs and Competitiveness**

The common perception that health and safety measures are a cost to business rather than an investment has shifted somewhat. On the whole employers believe that the benefits of regulations equal or outweigh the costs of compliance and the impact on competitiveness may not be significant.

The key findings of the construction industry survey for this study suggested that a majority of firms put the cost at below 3% of annual labour costs and we estimate the median cost for firms to be over 2% of annual labour costs in the construction sector. We estimate the median cost for this for industry as a whole at about 1%.

Overall the majority of firms believe that there has been a net benefit for their business arising from Health and Safety legislation. The legislation certainly imposes a cost but it also brings substantial benefits in terms of a reduction in the cost of accidents and insurance costs.

## Glossary of Terms

**Ceteris Paribus** – All other relevant factors are held fixed.

**Correlation Coefficient** – A measure of linear association between two random variables that does not depend on units of measurement and is bounded between -1 and +1.

**Dependent Variable** – The variable to be explained in regression model.

**Dummy Variable** – A variable that takes on a value one if a specified related question is true and zero if it is not true. Dummy variables are often used to examine potential differences between males and females where the relevant question may be, is the particular individual male? To which the individual is assigned a value one if male and zero if female. Using dummy variables in this way allows the econometrician to estimate potential differences observed for men relative to women.

**Econometric Model** – An equation relating the dependent variable to a set of one or more explanatory variables and unobserved disturbances, where unknown population parameters determine the *ceteris paribus* effect of each explanatory variable on the dependent variable. Also referred to as **Econometric Equation** and **Regression Equation**.

**Endogeneity** – A term used to describe the presence of an endogenous explanatory variable.

**Endogenous Explanatory Variable** – An explanatory variable in a regression model that is correlated with the error term, either because of an omitted variable, measurement error or simultaneity.

**Error Term** – The variable in a regression equation that contains unobserved factors that affect the dependent variable. The error term may also include measurement errors in the observed dependent or independent variables.

**GDP** – Gross Domestic Product is defined as the market value of all final goods and services produced within a country in a given period of time, usually one year.

**GNP** – Gross National Product is the total value of final goods and services produced in a year by a country's nationals (including profits from capital held abroad). This measure is widely regarded as the preferred measure of output of the Irish Economy due to the importance of large Multi-national companies to the Economy.

**Independent Variable** – A variable that is used to explain variation in the explanatory variable. Also referred to as an **Explanatory Variable**.

**Instrumental Variable (IV)** – In an equation with an endogenous explanatory variable, an IV is a variable that does not appear in the equation, is uncorrelated with the error in the regression, and is (partially) correlated with the endogenous explanatory variable.

**Longitudinal Panel Dataset** – A Longitudinal dataset contains pooled data with both cross-sectional and time series dimensions. The same cross-sectional units (firms, individuals, etc.) are repeatedly surveyed over various time periods. A balanced panel contains the same units in each period, while in an unbalanced panel some units are unobserved in each time period, usually due to attrition.

**Regression Analysis** – The study of the dependence of one variable, the dependent variable, on one or more other variables, the explanatory variables, with a view to estimating and/or predicting the sample mean or average value of the former in terms of the known or fixed values of the latter. This is done by estimating a specified econometric (regression) model.

**Sample Size** – The number of observations (data points) contained in the regression analysis.

**Simultaneity** – A term that means at least one explanatory variable in a linear regression model is determined jointly with the dependent variable.

**Statistical Significance** – A statistic is said to be statistically significant if the value of the test statistic lies within a defined critical region. If the statistic lies outside this region then one fails to reject the null hypothesis that, for example, the statistic is not statistically different from zero. Using the estimated t-Statistic for the statistic one can reject the null hypothesis, in favour of the alternative hypothesis, if the t-Statistic is in excess of a defined critical value given generally at 1%, 5% and 10% levels of significance.

**t-Statistic** – The statistic used to test a single hypothesis about the parameter in an econometric model. It is equal to the estimated coefficient of the parameter divided by its standard error.

**Unobserved Variables** – In a panel data model, these are variables contained in the error term that do not vary over time.

**White Noise Error Term** – An error term that is assumed to be normally distributed and not dependent on error terms in previous time periods, thus minimising measurement errors.

# 1 Background and Terms of Reference

## 1.1 Background

The Safety, Health & Welfare at Work Bill 2004 passed through the Houses of the Oireachtas and was signed into law in June 2005. The Act updates and consolidates the major existing legislation, in particular the Safety, Health and Welfare at Work Act 1989, and introduces new provisions and implements the EU Framework Directive. The main emphasis of the Act is on prevention and on the respective responsibilities of both employers and employees in ensuring a safe workplace. The provisions seek to strike a balance between imposing duties, encouraging better consultation, providing better prevention and increasing fines and penalties. This Act is an important element in the national effort to reduce accidents and illnesses at work.

In the course of debates in Dáil Éireann on the bill, the Minister for Labour Affairs, Tony Killeen TD, gave an undertaking to carry out a study on the impact of the Bill on competitiveness and the economy in Ireland. The current study has been commissioned in order to fulfill this undertaking.

## 1.2 Terms of Reference

The Terms of Reference for the study are as follows:

"To carry out an economic assessment of the effect since 1989 of occupational safety, health and welfare law on the Irish economy, particularly on competitiveness, taking into account the current law, the proposals in the new Bill, the resources devoted to occupational safety health and welfare, the size of the workforce and the statistical data available with a view to ascertaining what benefits both economic and social accrue."

More precisely, this involves the following tasks:

- To estimate the savings to the economy and the Exchequer, if any, that accrue from reducing occupational injuries - including the impact on costs to the health service, on costs of employers' liability insurance and on general employment costs such as work days lost;
- To estimate the human impact of occupational injuries, including fatalities, and the numbers of people who have benefited from the implementation of health and safety standards;

- To estimate the impact of the implementation of occupational health and safety rules on the competitiveness of Ireland and on companies in the Irish economy.

### **1.3 Acknowledgements**

Indecon would like to acknowledge the valuable inputs of members of the Steering Committee: Daniel Kelly, Sabha Greene, Roni Hawe of the Department of Enterprise, Trade and Employment and Martin O'Halloran, Marie Dalton of the Health and Safety Authority.

We would also like to thank the number of construction companies and firms in the industrial sector who responded to our surveys. We also acknowledge the valuable inputs received from representatives of the social partners including ICTU, CIF and IBEC. The usual disclaimer applies and the views and analyses contained in this document are the sole responsibility of Indecon.

### **1.4 Report Structure and Methodological Approach**

A number of research approaches were adopted for this study, as set out below:

- Review and analysis of available data
- Review of Irish research
- Review of international research
- Consultation programme
- Econometric analysis
- Survey of industry
- Survey of the construction sector

In summary, our approach involves three general phases:

- Step One of the approach is to estimate costs of accidents and ill-health for the Irish economy;
- Step Two is to estimate the savings arising from the legislation (i.e. reduction in accidents and associated costs); and

- Step Three is to consider the costs of Health and Safety legislation for industry and implications for competitiveness.

The structure of the report is as follows. Section Two sets out methodological issues and international estimates regarding the economic cost of accidents and ill-health, followed by a more detailed discussion regarding this cost in an Irish context. Section Four examines the costs and benefits of Health and Safety legislation, Section Five deals with these costs and benefits at a company level and Section Six examines the impact of Health and Safety legislation on firms in Ireland. In Section Seven we discuss trends in health and safety enforcement and activity in Ireland and in Section Eight we outline some benefits of this legislation.

## 1.5 Data Constraints

An important aspect of estimating costs of accidents is to establish the number of people who suffered a work-related injury or illness. CSO estimates are based on a special module of the Quarterly National Household Survey (QNHS), administered in the first quarter of each year. The CSO surveys 3000 households each week, giving a total sample of 39,000 households per quarter.

In the Accidents and Illness Module, the CSO ask persons aged 15 or over to indicate if they have suffered an injury incurred at work or an illness that the respondent believes was caused or made worse by their work in the past 12 months. The injury and illness data relies on self-reporting and thus may be subject to sampling or other survey errors. The numbers presented by the CSO are therefore indicative of trends and of broad orders of magnitude rather than definitive figures.

There are additional issues since the 2003 survey which led the CSO not to publish data on days lost for the Q1 2005 survey. Accordingly, data presented in this report, with the standard caveat, relate principally to the Q1 2003 Survey.

## **2 The costs of accidents and ill-health**

### **2.1 Introduction**

In this section we provide a brief overview of international research on the costs of work related accidents and illness. This review acts as a starting point to our assessment of the extent to which health and safety legislation in Ireland since 1989 has helped to moderate these costs. A key question for the Study is how different would these costs be in the absence of Health and Safety legislation.

### **2.2 Methodological Issues**

An important issue for this study is to assess and quantify the benefits to the economy of current and proposed legislation and the benefits of preventing accidents. This would specifically address:

- The savings to the economy and the Exchequer, if any, accruing from reducing occupational injuries;
- The human impact of occupational injuries, including fatalities, and an estimate of the numbers of people who have benefited from the implementation of health and safety standards.

A key element is to estimate the costs of occupational injuries to the Irish economy and to develop an estimation model to achieve this. There are two broad approaches to undertaking this. The first is a top-down approach using a combination of aggregate data for Ireland and international evidence. The second approach involves a detailed assessment of accidents and assigns costs based on the impact on different groups.

The top-down approach uses the international estimates of the costs of occupational injuries and applies to Ireland. We will review this research to establish likely estimates for the Irish economy.

The second bottom-up approach uses Irish data and firstly assesses the number of injury and non-injury accidents work-related ill health. It is possible to estimate the first category using the available data for the Quarterly Labour Force Survey and other sources such as the Health and Safety Authority and the Department of Social, Community and Family Affairs. The next step is to estimate the costs of these injuries and ill-health. There are different costs for individuals, businesses and society. For individuals, the costs include:

- lost earnings;
- extra expenditure when absent ;
- cost of changing jobs; and
- human costs.

There is also extra cost of expenditure arising due to an illness. This could include additional medical bills, transport costs etc. The next category we examine is the cost to employers. This can arise due to:

- costs of absences and sick pay;
- compensation and insurance costs;
- company administration;
- recruitment, and
- damage from injuries (equipment, goods and materials).

Finally, there is the overall cost to Society (or benefits from reducing accidents) which is the measure of interest to this study. These costs include a summation of the costs specifically borne by individuals and companies in addition to some others and include:

- loss of output;
- insurance;
- administration;
- human costs; and
- medical treatment.

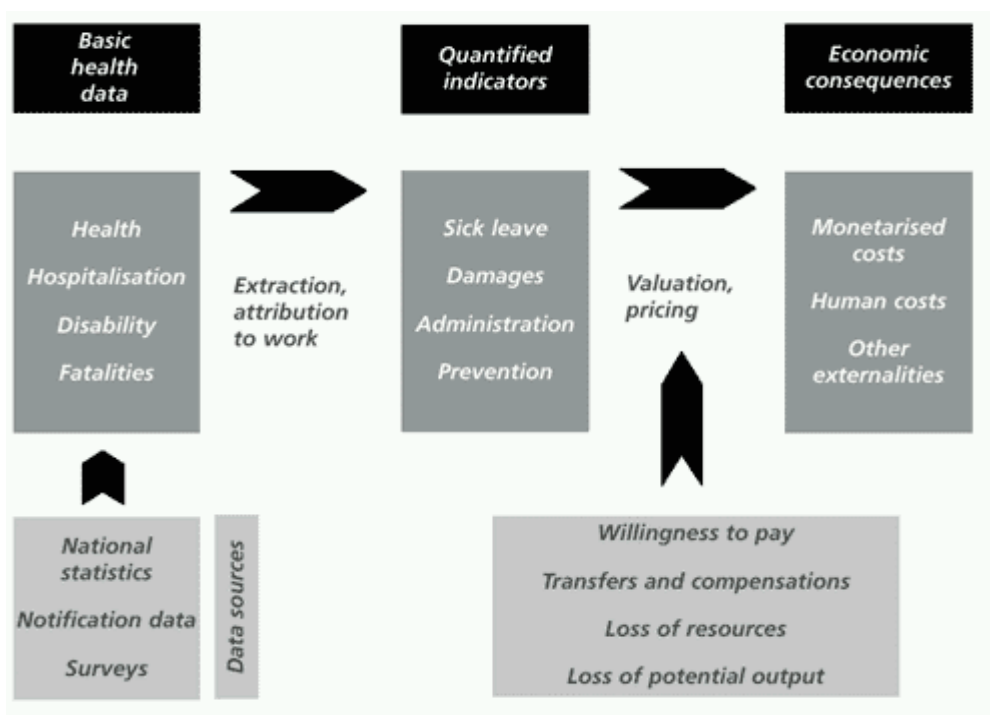
Preventing loss of output is the key economic benefit from reducing accidents. This loss of output is the overall estimate of the reduction in the economy's potential output because of a reduction in the available workforce. Along with health and insurance costs this is the key cost.

## **2.3 International Estimates of costs of accidents and ill-health**

### **2.3.1 General Approaches**

The approaches to estimating the costs of work-related injuries and illness are numerous. Cost estimates depend on the particular costing approach being used, the range of cost elements that are included, and the quality of available data and the values of key parameters. Figure 2.1 below outlines a general approach to undertaking these estimates.

**Figure 2.1: General approach to cost estimations of the effects of occupational disease and accidents**



Source: *The true costs of ill-health*, Mossink 1999

The way in which these steps are performed varies across the EU Member States (see Table 2.1). There are different approaches in terms of data used, and the approach to valuing parameters. Each of the steps influences both the accuracy and the scope of the assessment, and every step poses a number of fundamental and practical issues. Some of these are discussed below.

**Table 2.1: Overview of some National Economic Assessments, Data Strategies, Indicators and Pricing Principles Applied**

Country and Year	Data strategy applied	Main indicators	Pricing principles
Austria (1993)	Notification data	Accidents (occupational and commuting)	Lost production, output losses
Denmark (1991)	Percentage of sickness occurrence (related to total)	Total work-related illness	Financial transfers from public sector
Denmark (1996)	Epidemiological approach (exposure risk) surveys	Accidents, work-related diseases	Lost resources, financial costs
Germany (1993)	Notification data	Accidents (occupational and commuting)	Lost production
Finland (1994)	Notification data, estimations	Selected work-related illnesses	Lost production
Italy (1986, 1992)	Notification data	Accidents and occupational diseases	Financial costs, lost production
Netherlands (1997)	Survey, notification, percentage of sickness	Accidents, work-related illness	Financial costs, lost production, resource costs
United Kingdom (1994)	Survey, case study aggregation	Accidents, work-related illness	Financial costs, lost production, resource costs, willingness to pay
Australia (2000)	Accepted workers compensation claims	Work related injuries and illness	Financial costs, lost production, resource costs

Source: Mossink 1999

The availability of relevant and accurate data is the principal issue in the assessment of the cost of accidents and work related ill-health. In some countries insufficient data are collected and there are few sets collected which are common across all countries. Three main areas are used to collect the required data, all of which have associated problems:

- Social security data;
- Workforce surveys which rely on self-reporting; and

- Epidemiological studies, which try to establish causal associations between exposure and a specific health outcome but have stringent methodological requirements that cannot always be met.

Some of the key constraints in developing cost estimates are considered in the following sections as a prelude to discussing the available research.

There are relatively few data sets concerned with occupational diseases or work-related illnesses. Our knowledge of the extent to which different diseases can be attributed to occupational causes is limited since the concept of work-relatedness is not clearly defined and varies between countries. Most diseases are actually attributable to a multiplicity of causes, and workers' exposure is difficult to ascertain in a world in which the exposures associated with particular jobs are often not known, and in which workers frequently move from one job to another. Furthermore, the time lag between exposure and the onset of disease confounds straightforward attempts to measure the portion of disease attributable to working conditions.

Data may also be unreliable with regards to notified accidents. Many national systems provide disincentives to the reporting of accidents, leading to severe under-reporting. Micro research monitoring the cost of accidents in SMEs has been able to record the number of accidents and then construct costs more reliably. Jacobson and Mottiar's study of 14 firms in Ireland<sup>1</sup> shows firstly how costly accidents are, and secondly, how many smaller accidents which do not legally have to be reported are occurring in firms everyday. This under-reporting leads to substantial underestimations of the costs of accidents.

There is an issue about the cost components that are included. There is an emphasis in the research on the costs of accidents and formally recognised occupational diseases. This narrow focus ignores the often substantial costs to health of work-related stress and musculo-skeletal injuries (see Koningsveld and Mossink, 1997).

Beatson and Coleman (1998) conclude that most studies do not include all relevant cost components. A summary of the elements of costs that are included in a selection of studies is included in Table 2.2 and clearly illustrates this point.

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<sup>1</sup> Dr David Jacobson, Ms Zeine Mottiar *The Costs of Poor Safety in the Workplace*, DCUBS Research Papers 1996-7.

**Table 2.2: Cost Components included in National Studies of Costs of Occupational Accidents and Work-Related Illnesses**

Cost component	UK	Nordic countries	Australia	Denmark	Finland	Netherlands
Medical costs (hospitalisation, first aid, ambulances, non-hospital treatment)	partly	yes	yes	yes	yes	partly
Lost production (lost output, potential future loss, non-market production)	yes	yes	unknown	yes	yes	yes
Other costs (legal costs, lost time and production for others)	yes	no	partly	no	no	partly
Human costs (decreased healthy, life expectancy, grief and suffering)	yes	no	yes	no	no	no
Societal costs (police, fire brigade, inspection, administration)	yes	no	unknown	no	no	partly
Material damages (lost equipment & premises)	yes	no	unknown	no	no	yes
Expenditures for prevention	no	no	no	no	no	yes

*Source: Beatson and Coleman 1998*

Human costs, (e.g. reduced life expectancy) are difficult to estimate. British and Australian studies, in contrast to Nordic countries, attempt to place monetary values on the pain and suffering to victims and only the 1992 Danish and the British studies attempt to provide an illustrative estimate of the lost output to the economy of these effects.

The influences of national administrative and legal systems are also apparent, in terms of the recognition of work-related conditions, and the extent to which the costs to companies and individuals are covered by insurance, determining the extent to which costs are registered.

Measurement of economic effects, various pricing principles, or a mix of them, have been used by EU countries. There is no agreed way of calculating a monetary value for permanent health effects such as pain and suffering reduced quality of life, healthy life expectancy and fatalities. The 'willingness to pay' method is often used but results in a wide range of estimates and the ex-ante valuation is almost always much smaller than ex-post valuations.

Broadly speaking, all measurements are subject to two uncertainties; the insufficiently understood opportunity costs of occupational illness and injuries; and the insufficiently understood incidence of these conditions. Therefore the most in-depth analyses have taken strong assumptions. As order-of-magnitude estimates, these studies are helpful.

### 2.3.2 Empirical Results

Table 2.3 summarises some estimates for a selection of OECD countries. Most are in the range of 2-4% of national income, with the exception being the Norwegian and Swedish estimates at the high end and Great Britain on the low end. The main reason for the low British estimate is the much lower incidence rates of occupational injuries and disease in Britain, according to the study. The highest estimates, those of Sweden and Norway, are thought to be due to the inclusion of any illnesses suspected of being work-related and in our view overestimate the cost of accidents. This suggests that costs are in the range of between 2% and 4% of national income when the outliers are included but there is considerable uncertainty around such estimates.

**Table 2.3: Estimates of the Aggregate Economic Cost of Occupational Injury and Disease for Selected European Countries**

Country	Base Year	Cost as % of GDP/NI
Great Britain <sup>2</sup>	1995/6	1.2-1.4
Denmark	1990	2.5
Denmark	1992	2.7
Finland	1992	3.6
Norway	1990	5.6-6.2
Sweden	1990	5.1
Australia <sup>3</sup>	1992/93	3.9
Netherlands <sup>4</sup>	1995	2.6

*Source: Beatson and Coleman (1997)*

<sup>2</sup> Excluding NPV of future costs and costs arising from accidental events which did not cause injury, and including human costs.

<sup>3</sup> The figure here is based on an estimated cost of A\$15 billion. The report indicated, however, that costs could be as high as A\$37 billion.

<sup>4</sup> The figure here is a best estimate of FI 16.8 billion. The range of cost estimates is FI 12.9-22.8 billion. This study measures the effects of injury and ill health on lost output through their impact on social security payments. This is an imperfect measure, to the extent that disability benefits do not fully capture productive potential. A more common approach has been to measure lost output through earnings loss.

**Table 2.4: Estimates of costs of occupational injuries and non-injury accidents and work-related ill health in European countries**

Country	Base year	Cost as a percentage of GNP/I	Coverage <sup>5</sup>
Austria	1995	1.4	Accidents
Belgium	1995	2.3	Accidents and ill-health
Denmark	1992	2.7	Accident and ill-health
Finland	1994	3.8	Injury and ill-health
France	1995	0.6	Insurance costs of accidents and ill-health
Germany	1995	2.4	Insufficient information
Ireland	1996	0.4	Cost of claims for accidents and ill health
Italy	1996	3.2	Costs to public purse of accidents and ill-health
Luxembourg	1995	1.3-2.5	Accidents and ill-health
Netherlands	1995	2.6	Costs of health risks
Portugal	1995	0.4	Costs of accidents, and costs of social security compensation for ill health
Spain	1995	3.0	Accidents and ill health
Sweden	1995	4.0	Costs of reported injuries and of allergic diseases of the upper respiratory passages
Great Britain	1995/96	The figure for GB is estimated between 0.6% and 1.2% if costs for pain and suffering are left out <sup>6</sup>	Ill health, injury and non-injury accidents

Source: *The costs to Britain of workplace accidents and work-related ill health in 1995/96* HSE

<sup>5</sup> (1) It is likely that only work-place injuries are included, not non-injury accidents (2) work-related traffic accidents are included. Great Britain does not include these, which may help explain the low estimation.

<sup>6</sup> Percentages refer to costs incurred in 1995/96 only.

In 1998/99, the European Agency for Safety and Health at Work asked Member States for their best estimates of the costs of occupational health and safety to their economy. These may be more reliable and up-to-date than some of the early studies reported. These estimates are shown in Table 2.4, together with the HSE's estimates for Britain.

Information provided to the Agency did not always give sufficient insight into the way the calculations were carried out, what data were used and which cost factors were included or excluded. Nevertheless, it is a comprehensive list of countries.

Based on this set of studies, the most up-to-date EU member estimation in terms of techniques used, and the most complete in terms of cost components was the HSE British estimation<sup>7</sup>. This has a wide definition of relevant costs and takes into account future costs of injury and illness. It includes estimates of costs often ignored: those relating to non-injury accidental events, and to the loss of welfare to individual victims and their families. The total cost to employers is significant and suggests that employers could make considerable savings by improving their health and safety performance.

The British rate of workplace fatal injury is the second lowest and for non-fatal injuries is the third lowest among EU member states<sup>8</sup>, one of the reasons why the cost as a proportion of GDP is relatively low, between 0.6% and 1.2% of GDP.

The figures include:

- loss of output due to people being absent or leaving the labour market (around £2.2 billion),
- the property damage incurred by industry (£0.9 - £3.7 billion),
- the cost of medical treatment (between £181 million and £676 million),
- administration and recruitment costs incurred by firms, administration costs by insurance companies and the Department of Social Security (around £749 - £1735 million), and
- investigation costs to HYS and local authorities (about £11 million).

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<sup>7</sup> HSE *The Cost of Britain of Workplace Accidents and Work-related Ill Health in 1995-6*

<sup>8</sup> HSE *Statistics of workplace fatalities and injuries in Great Britain International Comparisons 2000*. Using standardised data from Eurostat. Work related road traffic accidents are excluded from rates of non-fatal injury for Great Britain but are included for the other member states.

If the loss of welfare resulting from pain, grief and suffering of individual victims and their families is included, the cost increases further. If the net present value of costs in future years is included, total costs to the economy could equal between 1.3% - 1.8% of GDP.

A further detailed attempt to calculate the economic cost of work-related accidents was undertaken by Leigh et al<sup>9</sup>. This used over 20 sources of primary data and 300 sources of secondary data, and estimates were cross-checked with those of their predecessors so that costs were constructed by cause of impairment or mortality, by source of cost, and by ultimate payer for the year 1992.

Prior studies underestimated costs by ignoring non-disabling injuries, deaths, and workplace violence, by taking inadequate account of diseases, and most importantly, by relying on only on a few sources of data (for example, Hoskin's study<sup>10</sup>). Strong assumptions were made in the areas of occupationally-caused disease, the indirect costs of morbidity and mortality, and the extent to which employers are able to pass on the costs of workers' compensation premiums.

The study by Leigh et. al included both direct and indirect costs.

- "Direct" cost, in this case, consists only of medical outlays, whether paid by workers' compensation, the employee, or the government.
- "Indirect cost" is the total amount of wages not earned by workers due to inability to work or premature death, calculated on the basis of the average severity of each category of nonfatal disease and average age of death for fatal diseases.

Taken together, the total economic costs were estimated to be just under 3% of US GDP for 1992. An interesting feature is the breakdown of costs between the different elements. This concludes that lost earnings account for over half of the costs with medical and insurance costs being the other significant elements.

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<sup>9</sup> Leigh, J. Paul, Steven Markowitz, Marianne Fahs, Chonggak Shin, and Philip Landrigan. *Costs of Occupational Injuries and Illnesses* University of Michigan Press, 2000

<sup>10</sup> Alan Hoskin 1996 "Work-related deaths decline", *Safety and Health*, May Vol.153, No.5, pp68-69. Estimated cost of 1.5% of GNI, but the costs of work-related ill-health were ignored.

Table 2.5: Cost of Different Elements - Percentage Terms

Cost Element	Proportion of Total Costs
Medical costs	16.9%
Insurance costs	10.1%
Lost earnings	55.6%
Others	17.4%
<b>Total costs</b>	<b>100.0%</b>

Source: Leigh et al. 1996

It is interesting to consider who actually bears the economic costs. The HSE 1995/96 study show a sharp contrast between injury and non-injury accidents, where employers bear 79% of the total 1995/6 costs, and illness where they bear 24% of the total 1995/96 costs. Individuals bear 56% of the injury costs in 1995/96, and 65% of the illness cost in 1995/96. The Leigh study estimated that employers overall paid 11%; consumers paid 9%; and workers paid 80% of the total cost of workplace accidents and illnesses.

In Australia (2000-01 study) it was found that the share of costs borne by the individual and community rises sharply with severity, while the employer bears most of the cost of short-term injuries and diseases, with the burden falling as severity increases. These costs still show that employers could make significant gains by reducing workplace injuries and non-injury accidents.

Another relevant issue is the cost distribution of various categories of work-related ill-health. The European Agency for Health and Safety<sup>11</sup> estimates that musculo-skeletal disorders are the most significant OSH problem, accounting for over 30% of total costs of occupational accidents and work-related ill-health. One fourth of total costs relate to psychological disorders and cardiovascular diseases while only 13% result from work accidents. In 2004/5, three quarters of all self reported work-related ill-health cases in the UK were musculo-skeletal disorders, stress, depression or anxiety<sup>12</sup>.

<sup>11</sup> William Hunter *Towards better OSH legislation* in the European Agency for Safety and Health at Work magazine 1999.

<sup>12</sup> HSE Health and Safety Statistics 2004/5

National and international studies show a rising incidence of stress-related conditions and musculo-skeletal disorders. This points to a substantial incidence of work-related ill-health that may not be reported by conventional statutory requirements. It is also widely acknowledged that evidence of much of the possible consequences of current work structure remains hidden.

## **2.4 Conclusions**

Our review of the relevant literature on the costs of injury and illness leads us to make the following conclusions:

- The costs borne by society as a whole arising from accidents and ill-health at the workplace are difficult to measure;
- The overall share of occupational injury and illness costs in a typical developed country economy is large – approximately 2-4% of national income as measured by indicators such as GDP or GNP but there is considerable uncertainty and it would be prudent to adopt an estimate towards the lower bound;
- Interestingly, the cost in nominal income terms is related to the size of an economy. This is an important point to consider given the growth of the Irish economy during the period under review.

## **3 Estimated Cost of Accidents and Illness in Ireland**

### **3.1 Introduction**

In this section we present indicative estimates of the costs for Ireland. This is initially based on the applying the international evidence to Irish data. The second approach builds up estimates based on a micro approach. This utilises available data on the occurrence of injuries and illness in Ireland. This principally relates to data available from the CSO and the Health and Safety Authority and provides a basis for our estimation of the cost of injury and illness for the Irish economy.

### **3.2 Top-Down Cost Estimates**

It is possible to use a top down approach to estimating costs using international evidence, as described in Section Two. We assume average costs of approximately 2.5 % of national income based on a review of international studies. This is a conservative estimate reflecting our concern that a number of these studies may overestimate costs. In today's terms (GNP estimated at €134,190m for 2005) this is equivalent to circa €3.3 billion for Ireland.

### **3.3 Micro-Based Approach**

A micro approach is also available based on estimates of lost output, insurance and health costs. This would consider all direct costs borne by individuals and companies but also the wider costs to society. These include a wider cost in terms of lost output, higher economy-wide prices and reduced growth potential which is borne by society as a whole. We first consider the lost output due to temporary absence from the labour force.

### 3.3.1 Costs of Temporary Absences from Work

First, we examine the position based on the limited available information on the temporary absences from work due to work related accidents or ill-health.

Table 3.1 shows the number of incidents causing more than three days absence and reporting rates of accidents per economic sectors as estimated by the Health and Safety Authority for 2002. In absolute figures, it was estimated that there 20,900 incidents causing more than four days absence in 2002. This compares with only 7,870 accidents that were actually reported. Agriculture, forestry and fishing show the lowest reporting rate, with only 5.2% of injuries with more than four days absence being reported. The sectors of construction, retail, hospitality, finance, education, health and social work and other services were all below the average reporting rate of 37.7%.

**Table 3.1: Estimated Reporting Rates by Economic Sector, 2002, Health and Safety Authority**

<b>Economic sector</b>	<b>Estimated number of persons injured with 3+ days absence (QNHS)</b>	<b>Reported accidents (SAFE)</b>	<b>Estimated reporting rates (%)</b>
A-B Agriculture, Forestry & Fishing	2,000	104	5.2
C-E Other Production Industries	4,000	2,612	65.3
F Construction	4,200	1,169	27.8
G Wholesale & Retail Trade	2,300	790	34.3
H Hotels & Restaurants	1,400	155	11.1
I Transport, Storage & Communication	1,700	883	51.9
J-K Financial & Other Business Services	1,000	282	28.2
L Public Administration & Defence	1,000	856	85.6
M Education	300	86	28.7
N Health and Social work	2,200	640	29.1
O Other Services	1,000	153	15.3
<b>Total</b>	<b>20,900</b>	<b>7,870</b>	<b>37.7</b>

Source: QNHS (CSO), SAFE (Health and Safety Authority)

A more complete dataset for this purpose of addressing this issue is available from the CSO. This estimates the number of days lost due to temporary illness and injury based on the quarterly labour force survey.

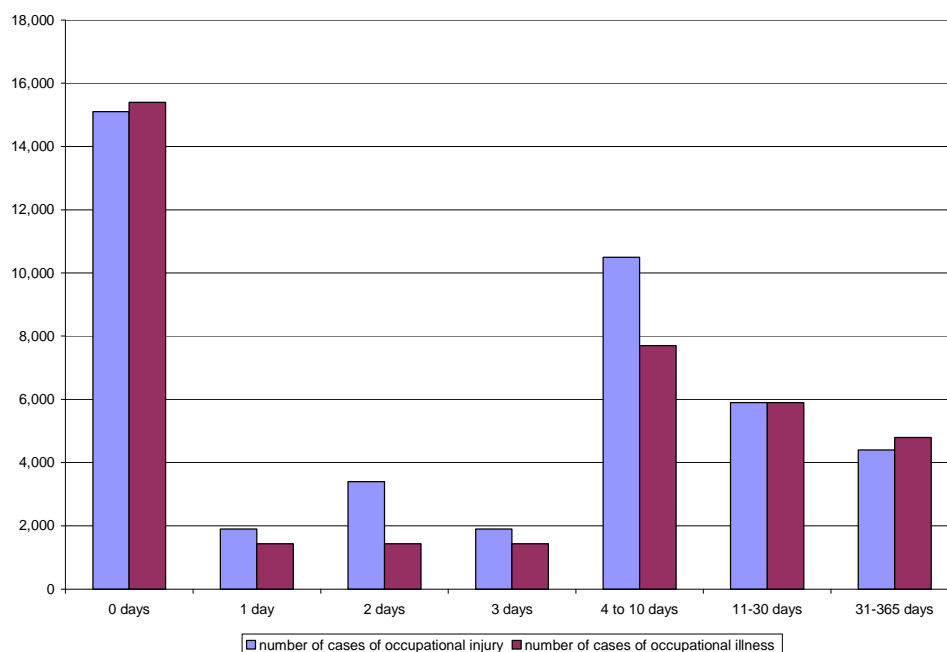
Table 3.2 shows the data for 2002. This indicates that there were 610,409 days lost due to injury and 675,720 due to illness. The loss due to illness and injury per person in the workforce was estimated to be 0.7 days in 2002.

**Table 3.2: Number of Days Lost Due to Occupational Injury and Illness and Rates per Person in Employment and Rates Per Incident, 2002**

	Number of days lost	Number of persons	Days lost per person	Number of incidents	Days lost per incident
Due to injury	610,409	-	0.3	43,100	14.2
Due to illness	675,720	-	0.4	38,100	17.7
Total	1,286,129	1,772,000	0.7	81,200	15.8

Source: QNHS (CSO)

**Figure 3.1: Occupational Injury and Illness among Persons in Employment by Number of Days Lost, 2002**



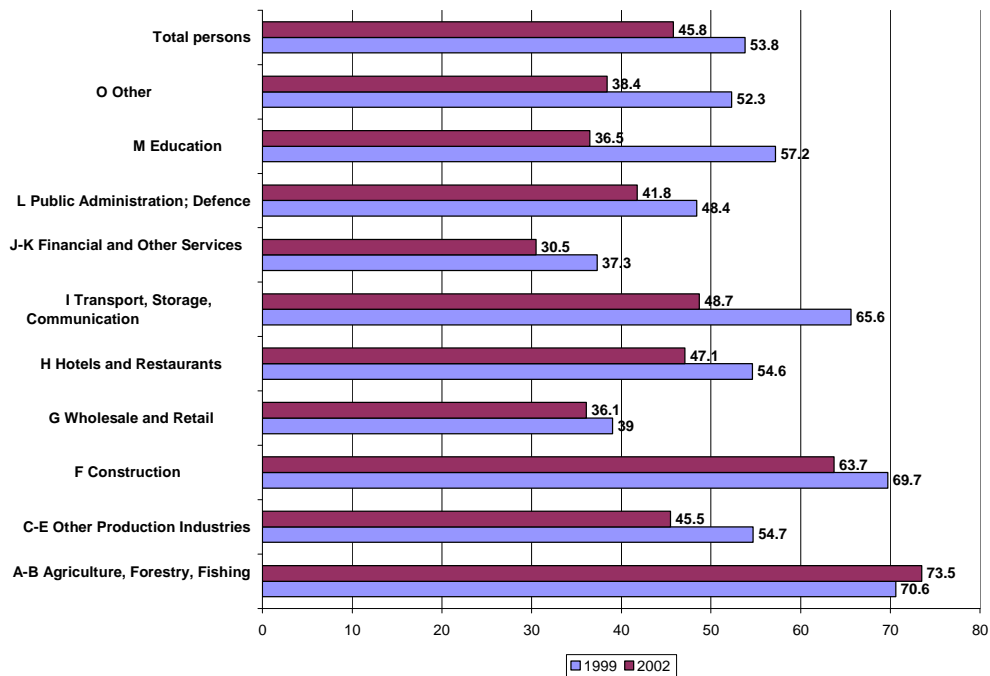
Source: Health and Safety Authority

Figure 3.1 shows the number of cases of occupational injury and illness among workers by number of days lost. This shows the duration of the absences from the workforce.

Both cases of illness and injury show a similar pattern of number of days likely to be taken off and the majority of cases involve a low number of days off.

Figure 3.2 shows the rate of illness and injury per 1,000 workers by sector between 1999 and 2002. Overall, the rate has declined substantially – from 53.8 workers per 1,000 to 45.8 workers. In all sectors except for Agriculture, Forestry and Fishing, the rate of injury and illness has declined.

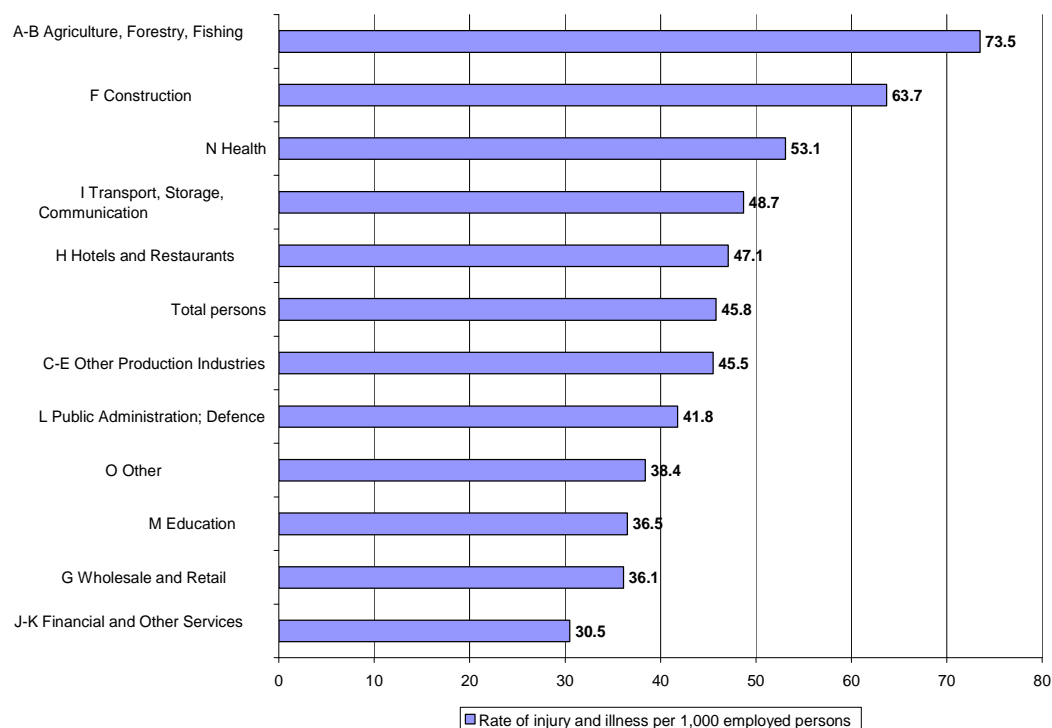
**Figure 3.2: Occupational Injury and Illness rates by sector between 1999 and 2002**



Source: Health and Safety Authority

Figure 3.3 shows that in 2002 the agricultural sector was the most dangerous, in terms of rates of injury and illness. This was followed by the construction sector.

**Figure 3.3: Rate of injury and illness per 1,000 Persons in Employment by Sector - 2002**



Source: CSO

The CSO estimates indicate that there were 43,100 persons who suffered injuries at work and a further 38,100 suffered an occupational illness, arising from work activities. These resulted in 1.3 million workdays lost among those in employment; half of which were due to injury. At an average pay of circa €30,000, this corresponds to circa €60 million per annum. This excludes work-related illness, the inclusion of which would lead to a higher figure. Data for 2003 suggested 54,400 suffering injury and 46,300 suffering illness. Using this dataset this would lead to an even higher cost estimate.

Cost of permanent absences due to work-related injury is more significant and this is reviewed next. We use the data based on the number of people not in the labour force due to work-related injuries and illness.

### 3.3.2 Costs of Long Outstanding Absences from the Workforce

Estimating the number of people not in the labour force due to injury and illness is difficult. Based on the available data it is estimated that there are 34,000 persons not in the labour force due to illness or occupational injury (a breakdown by age and type of illness is provided in table 3.4). This could be taken as a proxy for long-term absences from the workforce and, with some caveats, could be used as an input in estimating these costs to the economy. This data are set out in Table 3.4 and relate to those not in the labour force due to injury and illness. It excludes persons over 65 and relates only to absences due to injury or illness.

Table 3.3 shows the status of the persons suffering injuries or illness by sex and age. Illness has longer-term effects than injury, with 32,000 people out of work due to illness compared to only 2,100 due to injury. Those not in the labour force due to injury or illness are far more likely to be men than women.

**Table 3.3: Persons not in labour force aged 15 years and over with injury or illness by sex, age and principal economic status, 2002**

	Males			Females		
	15-64	65+	Total	15-64	65+	Total
<b>Persons with Injury</b>						
<i>Total</i>	1,400	-	1,400	700	-	700
<b>Persons with Illness</b>						
<i>Total</i>	14,500	8,900	23,300	6,400	2,200	8,700

Source: QNHS (CSO)

**Table 3.4: Estimated Total Occupational Injury and Illness and Rates per 1,000 Persons Aged 15 and Over By ILO Economic Status, 1999 and 2002, Health and Safety Authority**

				1999	2002
ILO Economic Status				Total	Total
Number of cases of occupational injury and illness	In labour force			89,100	83,700
	In employment :			85,600	81,200
	full-time			-	69,900
	part-time :			-	11,300
	Unemployed :			3,500	2,500
	Not in labour force			21,200	34,100
	Total aged 15 or over			110,200	117,800
Total persons	In labour force			1,688,100	1,857,000
	In employment :			1,591,100	1,772,000
	full-time			1,324,600	1,473,500
	part-time :			266,500	298,500
	Unemployed :			96,900	84,900
	Not in labour force			1,227,400	1,266,400
Total aged 15 or over			2,915,500	3,123,300	
Rate per 1,000	In labour force			52.8	45.1
	In employment :			53.8	45.8
	full-time			-	47.4
	part-time :			-	37.9
	Unemployed :			36.1	29.4
	Not in labour force			17.3	26.9
Total aged 15 or over			37.8	37.7	

Source: QNHS Q2 1999 and Q1 2003

Based on the standard labour force survey data circa 34,100 persons are not in employment due to work-related illness/injury. For prudent reasons we assume that this may overstate the number and we use a lower figure for the purposes of estimation. For illustrative purposes we assume that 75% of these absences are actually work-related and on this basis this could involve a cost to the economy of €0.825 billion per annum. These estimates are subject to uncertainty but economic costs are clearly significant based on a prudent set of assumptions.

CSO data for 2004 on disability and longstanding health issues indicate that circa 10 % of the population fall into this category. This equates to 274,200 people and 164,300 are not in employment. While only a percentage of this number may be work-related injury, this number and the estimated lost output could be significant. Assuming half is work-related involves circa 82,000 people – this could involve a cost to the economy of circa €2.3 billion, which is higher than previous estimates. In summary, cost of permanent absences due to work-related injury is significant. Two different measures of permanent absences from the labour force suggest a cost to the economy of between €0.825 billion and €2.3 billion per annum.

There is also the issue of insurance costs. Employer liability per annum in 1999 prices is at an estimated average of 1.8 % of payroll costs – this is equivalent to circa €1.2 billion in today's prices (given gross added value of €69,734 million for industry, distribution, transport and communication sectors).

**Table 3.5: Average and Median Employer and Public Liability Insurance Premium as a Percentage of Payroll- by Year**

Year	Employer Liability Claims		Public Liability Claims	
	Average %	Median %	Average %	Median %
1995	1.9	1.0	1.4	0.6
1996	1.8	1.0	1.3	0.6
1997	1.8	1.0	1.2	0.6
1998	1.8	1.0	1.1	0.5
1999	1.8	1.0	1.2	0.5

Source :IBEC survey

It is also possible to use estimates of medical costs, insurance costs and other costs based on international evidence as set out in Table 3.6. Given the lack of research in Ireland on the medical costs issue, and the uncertainty associated with such estimates, we use the international estimates where possible. As such, according to the estimates in Table 3.6 the non-labour output costs, including medical costs, amount to roughly the same cost again as the cost of lost output.

**Table 3.6: Cost of Different Elements- Percentage Terms**

Medical costs	16.9%
Insurance costs	10.1%
Lost output (including fringe benefits)	55.6%
Others	17.4%
Total costs	100.0%

*Source: Leigh et. al. 1996*

### 3.4 Conclusions

The main conclusions to be drawn from the above evidence are as follows:

- International evidence suggests average costs of approximately 2.5 % of national income - in today's terms this is equivalent to circa €3.3 billion;
- Lost output based on temporary and permanent absences from the workforce due to work-related ill-health and illness suggest a cost to the economy of between almost €1 billion and €2.4 billion - we assume €1.8 billion, taking a prudent approach;
- International evidence suggests that other costs could amount to the same again at €1.8 billion;
- Irish evidence indicates insurance costs of €1.2 billion which is broadly consistent with these international estimates;
- Accordingly, the bottom-up approach suggests costs of circa €3.6 billion, which is equivalent to just over 2.5% of national income.

## **4 Costs and Benefits of Health and Safety Legislation**

### **4.1 Introduction**

The previous section identified the costs of work-related accidents and ill-health for the Irish economy. In this section we look at the costs and benefits associated with the implementation of Health and Safety legislation. We examine the benefits for society in terms of the impact on accidents costs and the costs of Health and Safety legislation for Irish business.

### **4.2 Economics of Health and Safety Legislation**

Government intervention in the area of Health and Safety can be economically justified when there are imperfections in risk information. In theory, the goal of regulatory bodies is to isolate incidents where misinformation about health risks leads people to make non-optimal decisions in order to internalise the situations where health and safety risks are not already realised in the market decision. Policy needs to strike a balance between the costs of prevention, borne by employers, and the costs of injuries and ill health which fall upon the individual and society.

The benefits of health and safety measures are extremely difficult to measure, and usually underestimated in comparison to the associated costs. The complexities of industrial regulations and their enforcement make the causality between intervention and workplace safety very difficult to prove, benefits often have no clearly defined economic value when compared to costs, and as before, components of the cost of injuries and illness may be omitted. An important practical consideration is the fact that costs tend to be incurred immediately, while benefits are deferred to some future point.

Ashford (1999)<sup>13</sup> argues that the costs of health and safety are usually no more certain or reliable than the benefits, and may be overestimated. This is primarily because compliance costs based on current technology ignores the role played by technological innovation in reducing those costs. A retrospective analysis of eight regulations issued between 1974 and 1989 concluded that the agency's estimates of economic impacts systematically and significantly over-estimated compliance costs by ignoring the innovative response of industry to the enacted standards.

In addition, studies would benefit by analysing the strands of government policy trends in particular industries. Studies are more valuable if they include not just enforcement variables, but also incentives, workers' rights to refuse and different types of injury in their models. The nature of health and safety implies that cost-benefit studies should not merely be a technical exercise but should also take account of the social and human values upon which policy is based.

### **4.3 Benefits of Health and Safety legislation**

In America<sup>14</sup>, numerous sophisticated statistical examinations of health and safety legislation effectiveness during the 1970s uncovered no evidence of any safety-enhancing impact. Although there has been a downward trend in the frequency of workplace injuries since the 1970s, this began well before then and the health and safety legislation variable has been found to be statistically insignificant<sup>15</sup>. This is thought to be down to the imbalance in costs of compliance (at an average of at least \$300 per worker) and the lack of enforcement and low fines (the expected cost of non-compliance was \$17 per worker during the period reviewed). Furthermore, the nature of workplace accidents was largely ignored. As many as 75% of workplace accidents result from momentary carelessness or physical hazards, such as wet floors, but the legislature standards concentrated on the organisation of production and more visible measures.

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<sup>13</sup> European Agency for Health and Safety at Work Magazine 1999, *Compliance costs: the neglected issue*

<sup>14</sup> *Regulation* The Cato Review of Business and Government *Improving Workplace Safety Standards or Insurance*, Kniesner and Leeth 1991

<sup>15</sup> Thomas J. Kniesner and John D. Leeth in CATO Handbook for Congress

In the 1980s, econometric studies attributed to inspections in the US a 2 to 3 reduction in lost workdays per 100 workers a year, due to more targeted inspections (on those industries with higher measured industrial injury rates and on those firms with worse safety records) and a more consultative approach to firms. The safety-enhancing effects of legislation however are still small overall due to the low inspection rate and relatively low fines per violation (\$60 per worker). The effect of legislation is swamped by the far heavier financial incentives from workers compensation and compensating wage differentials to workers in less than completely safe workplaces.

It is thought that the vast majority of injury risks that stem from the work process, especially employee error, are not affected by the technological standards imposed by legislation in the U.S. If every firm in America were to comply fully with legislation's standards, for example, at cost of about \$100 billion to \$500 billion in new investments, total injuries would be reduced by only 10 to 20 percent.

Some interesting studies have shown that the real effect of regulatory activity may have been to encourage industry self-regulation. Supporting Gunningham's findings in Australia, studies have suggested that publicity surrounding health and safety regulation creates an industrial expectation of regulatory presence and that firms respond to actual or anticipated regulatory presence with actions, possibly broad programmatic efforts to reduce hazards, intended to bring down occupational injury rates<sup>16</sup>. Pedersen (2000)<sup>17</sup> found that there is a significant relationship between command-and-control regulatory activities and industry self-regulation, and evidence suggesting that if levels of resources allocated to enforcement activity drop below the levels seen in the 1970s, regulation may not foster industry efforts at self-regulation.

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<sup>16</sup> Gray and Schloz, "Does regulatory enforcement work? A panel analysis of OSHA enforcement", 1993, *Law Society Review*

<sup>17</sup> Pedersen, "Industrial Responses to Constrained OSHA Regulation", 2000, *AIHA Journal*

Lanoie (1992)<sup>18</sup> studied the effects of government intervention, primarily on accident prevention, worker compensation and experience rating, in Quebec and found that, at best, certain measures led to a minor reduction in the frequency of accidents in the period 1983-87. However, in a study by Lewchuk, Robb and Walters 1996, the Internal Responsibility System (a system placing greater emphasis on having employers and employees regulate their own working conditions) is compared to the previous administrative model, especially the impact of Joint Health and Safety Committees which are a critical component of the North American trend in self-regulation. Their tests strongly suggested that the new model helped reduce the number of lost-time claims made by workers in Ontario in a number of key industrial sectors. However, workplaces that moved towards the Internal Responsibility System reluctantly showed no clear effect, suggesting that commitment to the co-management of health and safety at the workplace is important. This highlights the need for differential policies targeting particular firms and sectors.

In Britain there is a reasonable body of evidence indicating that there is a long term positive trend in safety performance. Davies and Elias (2000) reported that there is a long term (1986-1997) downward trend in injuries in Great Britain that can be attributed to improved safety performance, having controlled for changes in industrial structures, the economic cycle and patterns of employment.

In Australia, OHS and workers' compensation performance shows continual improvements. Data from the government's comparative performance monitoring project shows an improvement in the incidence of work-related injury and disease and a reduction of 40% in workplace fatalities since 1999-2000.

### 4.3.1 The causal link between regulation and improved health and safety

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<sup>18</sup> "The Impact of Occupational Safety and Health Regulation on the Risk of Workplace Accidents: Quebec, 1983-1987" Lanoie 1992, *Journal of Human Resources*

From the recent literature, Gunningham<sup>19</sup> identifies regulation “as the most important motivators of behavioural change and identified personal liability, reinforced by credible enforcement, as the single most important motivator of CEOs”<sup>20</sup> while Hillage et al. (2001) recognise legislation and associated guidance as an important form of leverage over employers.

A British Government Report concluded in 1997 that “actual, planned or threatened...legislation...was the most frequently cited driver of company action”. Pederson (2000) also finds that industry, regardless of employment size, is sensitive to regulatory emphasis.

However, it is not simply regulation that it is important, but *how it is perceived*, i.e., whether regulation is understandable and reasonable and whether firms face regulatory overload or not. Many firms comply with regulation because they believe it to be morally correct and so the case for particular regulatory activities must be made. In Britain, it is apparent that the HSE is an actor in the creation of societal concern and awareness on health and safety issues. It is imperative therefore that a regulatory body should clearly state policy expectations and show uniformity in applying them.

We can conclude that the presence of government in this field is crucial in motivating key actors, but the additional marginal benefit of particular regulations is in doubt. However, the potential for increased benefit through better policy design could be quite substantial.

The findings of KPMG Consulting in their February 2001 paper *Key management motivators in Occupational Health and Safety* and the DKM report indicated that organising prevention efforts along industry lines will lead to more effective prevention efforts. This is fairly intuitive, based on the following facts:

- Firms are industry focussed;
- Motivators vary between industries, in part because of differences in firm size between industries;
- The opportunities to influence firms varies between industries;
- Program effectiveness can be measured more easily on an industry basis; and
- Client focus will be enhanced.

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<sup>19</sup> Neil Gunningham, 1999, *CEO and Supervisor Drivers: Review of Current Literature and Current Practice*.

<sup>20</sup> See Wright (1994) and Gunningham (1984)

Recently, in recognition of these principles, the HSE has been working increasingly with trade associations and professional bodies, encouraging them to produce appropriate health and safety guidance for their sectors.

## 4.4 Costs of Health and Safety legislation

Table 4.1 presents the costs associated with Health and Safety legislation and the components of each of these costs.

**Table 4.1: Cost Factors Regarding the Cost of Preventive Activity at Society Level**

Cost	Cost Factors	Price Determinants
Investments	Costs of specific OSH equipment or additional costs of other investments related to top OSH	Market prices, quotations, invoices
Additional investments	Changes in non-OSH-related capital goods to facilitate functioning of OSH equipment (e.g. reconstruction of buildings)	Market prices, quotations, invoices
Engineering, consultancy and planning costs, related to investments	Expenditures for internal and external activities for design and implementation of new equipment or working procedures	Market prices, quotations, invoices
Additional costs of substitution products (recurring costs)	Price difference (e.g. for non-toxic chemicals, lighter product)	Market prices, quotations, invoices
Purchase of personal protective equipment (recurring costs)	Costs of protective equipment	Market prices, quotations, invoices
Additional costs for changed working procedures and maintenance (recurring costs)	Price difference between old way of working and new directly related to the preventive action; note that new ways may also result in cost savings (e.g. extra costs to work according to safety standards)	Market prices, quotations, invoices

**Table 4.1: Cost Factors Regarding the Cost of Preventive Activity at Society Level continued**

Extra work time of direct personnel (recurring costs)	Time spent on meetings, training, participatory developments	Total wages of time spent
Costs of internal or external OSH services (recurring costs)	Including occupational health services	Market prices, quotations, invoices
In-company activities	Human resource management, health promotion, OSH policy and management	Total wages of time spent
Other workplace costs	Anything that is not covered in the previous headings	Market prices, quotations, invoices, total wages of time spent
Costs of policy-making, research and enforcement at national or sector level	Including labour inspectorates	Total expenditures and wages of relevant authorities and sector organisations

*Source :Inventory of socio-economic costs of work accidents, Mossink and de Greef for the European Agency for Safety and Health at Work*

The major cost of health and safety regulation is felt in the form of higher investment. The process of regulation itself is also costly. Studies in this area typically review a few aggregate figures (costs, benefits, cost-per-lives saved) for a range of major regulations. These studies do not focus exclusively on the costs of Health and Safety regulation in the workplace, but do offer insights into the formation of policy and its efficiency.

The study by John Morrall (1986) claims that government regulations cost up to \$72 billion per life saved. Morrall synthesises the data on costs and benefits for a large number of regulatory impact analyses (RIA). Agencies generally do RIAs for each “major” rule whose annual impact on the economy is estimated to exceed \$100 million.

In *Risks, Costs, and Lives Saved*, Hahn reviewed a total of 92 rules and used the RIA studies to find that estimates of net benefits to government regulation are substantially overstated and that about half of the regulations would not pass a cost-benefit test.

Hird and Hahn (1991)<sup>21</sup> attempted to estimate the total sum of the costs and benefits from health and safety regulations but could not state with confidence whether the benefits exceeded the costs. They concluded that the annual costs of the regulations in the late 1980s may have exceeded the benefits by as much as \$65 billion, or that alternatively, benefits may have exceeded costs by as much as \$104 billion. They suggest that benefits are probably larger than the costs, but only by a small amount.

We are sceptical, however, about these studies due to some major flaws and incomplete data. All unquantified costs and benefits are excluded and the large uncertainties that are present are not acknowledged. Morrall acknowledges that he “revised” agency cost and benefit estimates (sometimes by orders of magnitude and almost always biased toward increasing costs and lowering benefits) but the studies justifying these revisions were not named. Hahn used agency figures, but out of the 136 major rules in his database, 41 were assigned “zero” benefits, including a rule to protect 3.9 million agricultural workers from acute pesticide poisoning.

A more interesting result, given the uncertainty inherent in these studies and the process of policy-making, is the study by Tengs and Graham in *Risks, Costs....* They evaluate the cost-effectiveness of 185 interventions that in aggregate avert around 56.7 thousand premature deaths annually at the cost of \$21.4 billion. They conclude that the choice of a more efficient group of regulations could result in more than twice as many lives being saved holding the current aggregate expenditure constant, and that holding the number of lives saved constant, expenditures could have been reduced to \$9.7 billion. When formulating policy in this area, it is clear that risks need to be assessed and ranked and that the distribution of resources needs to be rational. Other similar studies have also shown similar results.

*Public Health Law and Ethics*, ed. Lawrence O’Gostin (2002) shows that the estimated cost per statistical life saved has varied across regulations by a factor of over \$10 million, ranging from an estimated cost of \$200,000 per statistical life saved with the Environmental Protection Agency’s (EPA’s) 1979 trihalomethane drinking water standard to more than \$6.3 trillion with EPA’s 1990 hazardous waste listing for wood-preserving chemicals. The median cost per life year saved by Health and Safety Legislation was \$88,000.

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<sup>21</sup>The Costs and Benefits of Regulation Yale Journal on Regulation 8 (Winter): 233–78

There is little estimation of costs of regulations in Europe. In Britain however, three-quarters of employers say health and safety requirements benefit their companies as a whole and over 80% of employers regard HSE favourably<sup>22</sup>. The HSE has used a cost benefit analysis approach to policy development since the early 1980s. In 2004 the HSE reviewed its legislative programme, reshaping it in the light of new priorities, better regulation principles and the availability of resources. Sixteen proposals were stopped and a further nine were put on hold pending consideration of alternatives to legislation.

Cost-effectiveness analysis (CEA) is being increasingly used by authorities to develop policy. Instead of questioning the objective trade-off, cost-effectiveness ratios compare different regulatory interventions. In 2003, the US Office of Management and Budget (OMB) issued new guidance that requires agencies to supplement BCA with cost-effectiveness analysis for economically significant health and safety regulations. The first OMB Report on the Benefits and Costs of Regulation in 1997 highlights the problems with aggregate estimates and notes the need for more and better analysis of individual regulations. Their recommendations build on the consensus on best practice to improve the quality of regulatory analysis<sup>23</sup>:

- Estimating the economic impact of regulations after they are in place;
- Use consistent assumptions to compare the effectiveness of regulations and;
- Develop a better database.

These measures are hoped to rationalise regulatory activity.

## 4.5 Conclusions

As a first step in examining the costs and benefits of the 1980 Health and Safety Act in Ireland we reviewed the international research on the costs and benefits.

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<sup>22</sup> Figures are taken from the 2004 MORI survey *Attitudes towards health and safety: a quantitative survey of stakeholder opinion*

<sup>23</sup> See Arrow et al. (1996) and Crandall et al. (1997).

The research concludes that the benefits of regulation are difficult to measure and usually underestimated while costs are often clearer. Moreover, the benefits of health and safety legislation vary considerably with the approach taken and depend on the nature of the regulatory intervention. The research suggests that success is not just down to a particular regulation but the principles underpinning the whole regulatory framework and how this is perceived by employers. Regulation may have an 'invisible' effect by simply putting Health and Safety Legislation on the agenda of employers and cultivating self-regulation in the long-term.

There is evidence that movement to a system of self-regulation (although still relying on forms of traditional enforcement) has improved health and safety outcomes. Partnership and commitment with all involved agents appears, based on empirical evidence and intuitively, to be a more effective guarantor of raised standards. (see section 4.3.1)

## 5 Costs and Benefits at Company level

### 5.1 Introduction

The previous section examined in aggregate the costs and benefits to society of Health and Safety Legislation. In this section, we examine the cost and benefits of Health and Safety legislation for companies based more on company-specific research. We also examine the impact of specific regulatory interventions in more detail and the incentives faced by companies.

### 5.2 Costs of Health and Safety Legislation

The research suggests that a mixture of education, incentives, regulation and enforcement mutually reinforce health and safety standards, although it is difficult to gauge the relative effects of each component. As the European Agency for Safety and Health at Work finds in a review of EU Member States, all states have a mixed regime of enforcement regulation, incentives and advice, and each element plays an important role. This is also reflected in the policy approach in Ireland.

It is clear that work accidents cause a burden to employees, companies and society as a whole. However, there are large differences in the nature of the burdens and costs and the factors determining their distribution. This is important in considering costs and benefits.

The greatest areas of uncertainty in the distribution of costs are the largest in magnitude; medical costs and the cost of lost wages. How much of these costs are paid out of workers' compensation, and how much or the cost of the workers' compensation system is shifted from employers to other groups in society? The costs of occupational safety and health for companies are to a large extent influenced by the national system of social security. Relevant issues in social security and healthcare system are the following:

- Is there a national compensation system for disability due to occupational illnesses and injuries; if so, which illnesses are accepted as occupational?
- Can employees claim damages and financial consequences; are employers liable to damage claims of their (former) employees?
- Do funds or subsidies for improvement of working conditions exist?

- Are social security or insurance premiums dependent on safety and health risks or past performance of the company?

**Table 5.1: A classification of safety and health costs and benefits**

	Examples of prevention activities (preventative costs)	Examples of consequences or effects of an accident and diseases	Possibilities of analysis
Individual employees:	Using personal safety equipment Effort in adopting safety attitudes and health life and workstyles	Pain and suffering Consequences to relatives and friends Losses in second job or household	Evaluation of own safety and health activities
Enterprises :	Developing safety and health management Carrying out workplace safety and health inspection Developing a safety climate Planning production Measures to improve working conditions	Production losses Insured and uninsured costs of accidents Quality losses Legal sanctions	Evaluation of effects of preventive measures, efficiency measurement Insurance: compensations and premiums Evaluation of production process Costs and benefits in decision-making techniques Profit-loss analyses
Society as a whole:	Social attitudes and values Safety and health legislation and inspection Trade union and sector organisation activities Safety and health research education and information	Medical treatment and rehabilitation Accident investigation and administrative and legal actions Insurance activities Costs to the national economy Social costs	Of national safety attitudes and safety programmes Cost-benefit analysis of new regulation Evaluation of trade union and sector organisation activities

*Source: Inventory of socioeconomic costs of work accidents, Mossink and de Greef for the European Agency for Safety and Health at Work*

Table 5.2 implies that, although regulation is a factor in decision-making regarding Health and Safety for firms, there are several other compliance variables that government can change to internalise the costs of accidents.

Employers will always seek to externalise these costs and a powerful non-regulatory instrument is to internalise costs for companies, reducing the State's welfare costs and improving the incentives to boost the level of Health and Safety.

**Table 5.2: Principles for internalising costs of accidents to companies**

Method of cost internalisation	Principle or examples
Liabilities	Workers or insurance companies can claim damages due to occupational injuries or diseases
Legal sanctions, fines	Labour inspectorate can give financial penalties, demand improvements or temporarily stop production (Ontario)
Differentiation in premiums	Insurance companies or public funds adjust premiums for increased risk of accidents, occupational injuries and diseases. Premiums may also be adjusted according to past performance
Payment of sick leave	Obligation to (partly) pay wages during period of sick leave or disability
Market regulation	Attractiveness for new personnel, advantages in obtaining government orders Improvement of the 'accident rating' for subcontractor in case of call tenders Effects of company image

Source: *Inventory of socioeconomic costs of work accidents* European Agency for Safety and Health at Work

### 5.3 Impact of Regulation

The common perception that Health and Safety measures are a cost rather than an investment has shifted somewhat, particularly for larger firms and organisations in higher risk sectors. On the whole, employers believe that the benefits of regulations equal or outweigh the costs of compliance and the KPMG survey in Australia found that 70% of CEOs and 85% of supervisors agreed that improving health and safety reduces costs. The level of in-house health and safety expertise influences the perceived level of risk and awareness of regulations (MTS (1994)). It is clear that small firms tend to respond less to regulations due to their lower level of awareness.

There is conflicting evidence as to whether or to what extent investment in Health and Safety will actually produce net benefits or net costs to a firm and varies depending on:

- The nature of the enterprise;
- The sector in which it is operating and the nature of the hazards which it generates; and
- Whether there is a low or high risk.

However, to be effective, OHS requires a systematic approach and an approach that has been developed from the needs of the organisation.

There are some cases of strong externalities that demand government legislative intervention. As shown by the HSE British study, the cost of ill-health to employers is less than for injuries. Investment to reduce ill-health may be less economical for employers because of the delay between cause and effect, the short horizons of firms and free-riding opportunities as employees leave to work for other businesses. There is also a case for strong regulation and enforcement in the case of contractors, since any costs of poor health and safety are not directly borne by the client, reducing externalising costs of illness and injury.

It is important to compare the business benefits of health and safety to the cost of health and safety improvements. Unfortunately, cost benefit analysis tends to be difficult and inaccurate – indicators such as lost time, accidents and illnesses tend to have limited relevance and poor statistical reliability in smaller companies. Even in larger firms, there is no sign of widely applied CBA models.

Emphasised in the literature is the significance of indirect costs and the potential savings in these indirect costs that could result from intervention<sup>24</sup>. In Morrissey's study of Australian firms (mostly large firms) in 2002, it seems that firms often have some form of costing, but this is generally based on the direct wage cost. Studies also cite the short-term horizons of firms and the lack of financial optimisation of managers as imperfections.

For individual enterprises it is important to know if specific investment in health and safety measures will lower their costs. In most EU Member States, instruments exist, or are being developed, which give support to enterprises in evaluating the costs and benefits of particular measures rather than provide full cost benefit analyses.

In *Increasing Productivity and Profit through Health and Safety* by Oxenburgh et al., 2001, many case studies (over sixty) showed that ergonomics and occupational health and safety can improve the working conditions of employed people without reducing the profitability of the enterprise. Previous work by Spilling et al. (1986) and Heller-Ono (2001) also showed substantial returns to investment. Studies have shown that hazard specific regulations can lead to greater improvements of risk management compared to hazards only covered by general regulations (see Peretz et al.).

In summary, the following conclusions can be made about the impact of regulation:

- Market failures in regards to the costs of accidents and illness vary and as such, regulation should focus on particular market failures, such as the issue of contracting, rather than adopt a blanket approach;
- Case-studies and surveys show that regulations directed at specific hazards may have higher marginal benefits, especially for SMEs; and
- The use of CBA or cost-effectiveness analysis (CEA) and health and safety expertise within firms is sometimes infeasible but could remove information problems by raising the employer's perception of significant Health and Safety risks and increasing compliance to good regulation.

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<sup>24</sup> Oxenburgh et al. 2001.

## 5.4 Education and Training

Numerous evaluations have pointed towards the effectiveness of education and advice in raising awareness, and awareness is an important factor in improving health and safety precautions (Wright 2000). Improving awareness is a key element of the work of the Health and Safety Authority in Ireland. Businesses in the UK place equal weight on enforcement and information/advice as drivers for improved Health and Safety performance. Studies in the US, Canada and Australia have also shown that education and advice is a critical element of securing compliance and improvement in health and safety. All firms have been shown to respond to the perception and recognition of the general level of standards and whether they measure up to these, so sharing this information should help to continually raise standards.

SME studies have also suggested that “prescriptive” advice would be of great use, given the lack of in-house expertise to interpret goal based health and safety regulations (see HSE review 2004). Essentially, small firms would like one document to tell them “everything they need to know about their business”(Wright et al. 2003). Direct contact is the most effective method of education, especially for SMEs, but this is becoming less feasible and a strain on resources.

The HSE has therefore recognised the importance of reaching out to SMEs through a wide range of intermediaries such as trade associations, trade unions, worker safety advisors, professional bodies and educational and training bodies. There have been a series of pilot studies and British initiatives with the goal of improving the knowledge base of SMEs and providing access to advice through intermediaries. In each case, these have demonstrated the potential effectiveness of such schemes and are welcomed by SMEs.

## 5.5 Enforcement and Inspection

Most studies examine enforcement in the context of inspection, which has an advisory role, making it difficult to concentrate simply on formal enforcement. There is mixed evidence on the efficacy of enforcement through inspections and penalties. The February 2004 report by DKM Economic Consultants for the Health and Safety Authority in Ireland surveyed micro level studies on the impact of penalties and inspection, and found that the link between enforcement, compliance and improvement in work place safety is often tenuous<sup>25</sup>. An OECD study (2000) found only a modest reduction in injury rates (1%) following an increase in enforcement activity (by 10%), but that the individual plants targeted experienced a drop of 22% in injury rates over the following 3 years.

Enforcement action can work, but it cannot be seen in isolation from the regulatory mix. There is a general consensus that a mix of both punishment and persuasion is the best policy (see Hopkins 1995). For example, a fear of enforcement, whilst being a motivator for improvement, paradoxically deters people without prior contact with the HSE in Britain to seek their advice and assistance. Thus, different regimes can be made responsive to different situations.

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<sup>25</sup> See Bartel and Thomas

Enforcement is generally most required to deal with reluctant compliers, either an entire sector or in particular firms. The role of inspections is often highlighted as responsible for a continued OHS dynamic within firms, essentially because such action may serve to refocus employer attention on safety and health problems previously ignored or overlooked. Studies by the Institute of Employment Studies (Hillage et al., 2001) and by the University of East Anglia (Rakel et al., 1999) have found that direct contact methods, specifically inspections, are effective in regards to improving duty holders' knowledge and gaining improved precautions. It has often been found that guidance has the greatest impact on receptive organisations and less impact on organisations that lack high level direction or concern for health and safety. The VPP (Voluntary Protection Program) in America, adopted by Ireland, offers partnership, cooperation, and compliance assistance to employers who maintain a good safety record and an effective safety programme, while aiming to preserve and improve traditional adversarial enforcement mechanisms for recalcitrant employers. This method of encouraging self-regulation but avoiding minimal standards has proved popular.

The context under which an intervention occurs plays an important role in determining the success of that intervention. Research shows that the effects of regulatory presence varies by the employment size of business, suggesting that different enforcement and consultative strategies must be employed to cater for the various problems and motivations in different employment size strata<sup>26</sup>. It is commonly accepted that "traditional" methods of intervention – that is, issuing advisor documents, inspection based advice and enforcement work, and accident investigation – are effective in the context of traditional industries and large organisations.

Pedersen (2000) found that large plants responded positively only when confronted with serious violation citations and increasing penalties, whereas small plants responded positively to all forms of regulatory action tested. Schloz and Gray's 1990 American data shows that Health and Safety inspections have a great effective on focusing management attention on occupational Health and Safety, especially in SMEs, and Australian research by Stewart (1994) supports this, noting that employers valued visits by inspectors and found them "constructively informative".

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<sup>26</sup> See Ayres and Braithwaite *Responsive Regulation: Transcending the Deregulation Debate*, 1992.

However, reliance on conventional direct regulation of SMEs is unfeasible given their number. Given the significant response of small business to all of the tested forms of regulatory presence SME compliance may be heavily dependent on the maintenance of a credible traditional enforcement strategy while traditional regulatory resources such as inspections should be concentrated in larger firms. In all cases, the level of active regulation needed is related to the pervasiveness of a commitment to health and safety in workplaces.

Penalties are thought to have little effect. A British Health and Safety Executive study of factors influencing safety performance in the construction industry (Whittington et al. 1992) found that: “there is little evidence that UK firms are generally motivated to proactively comply with health and safety regulations for instrumental purposes, due to the perception that the likelihood of detection and/or prosecution is low”. Research into OHS in the USA and Australia points to a similar situation (i.e. that penalties have no significant deterrent effect on industry as a whole because of their low likelihood)<sup>27</sup>. However, as the fear of enforcement is a significant motivator for organisations, there may be value in exploring new types of penalties, charging regimes and enforcement strategies so as to maximise the deterrent effect of enforcement.

An approach similar to that used in environmental legislation could be used, which is that managers must use “all due diligence” in order to avoid personal liability, with penalties extending to prison. In these cases it matters more that the belief of retribution is present, rather than the reality, since deterrence is the primary goal. There is considerable data suggesting that both the severity and certainty of punishment exert a strong effect on the number of injuries in the workplace, with the latter exerting stronger influence<sup>28</sup>. From US and Canadian data, Brown surmises “there is good reason to believe that penalties enhance compliance in the short term by threatening would be offenders with punishment, and in the long term by changing attitudes about what is morally acceptable behaviour” (1992:703). This may contribute to a long-term culture change.

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<sup>27</sup> Wright 1998:16.

<sup>28</sup> See Gunningham 1999 and quoted sources.

Most health and safety systems do not provide large scale financial incentives – typically these account for less than 0.1% of payroll costs, which is only a fraction of the actual costs of illnesses and absenteeism<sup>29</sup>. EU Member States seem to have well-developed systems for the imposition of financial penalties and administrative fines on individual enterprises, but they are applied modestly.

A lesson from the evidence is that a carrot *and* stick system should be used. This is shown in the model developed by the European Foundation for the Improvement of Living and Working Conditions, in which disincentives proved successful and were judged as practical. Some member states have taken initiatives to increase financial sanctions and there is also an increasing interest in using administrative fines instead of, or in addition to, bringing offenders to court. However, there are problems with such incentives such as discriminatory hiring of workers based on health and union membership.

In Ontario, penalties were imposed on companies with poor records, but if the company took remedial actions specified by the authorities, the penalty would not be collected. Targeted firms are charged an extra 100% of their premium in their first penalty year and a further 25% in each succeeding year, until sufficient improvement is made or a ceiling of 200% is reached. Both the average number of accidents and the costs of accidents decrease substantially after a penalty was assessed<sup>30</sup>.

On the spot fines have also been proposed as an efficient and effective deterrent. The majority of industry recipients and government inspectors in Australia<sup>31</sup> supported the use of on-the-spot fines as an effective way of preventing injury and illness in the workplace. They were generally perceived as an effective way of getting the message across.

In summary of the above review, the following points should be noted about inspection and enforcement:

- Even if traditional CBAs have found that traditional regulatory practices have modest benefits, the presence of a regulatory body and credible enforcement mechanisms are critical to improved health and safety standards;

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<sup>29</sup> *The Costs and Benefits of Occupational Safety and Health* European Foundation for the Improvement of Living and Working Conditions.

<sup>30</sup> Leigh 1997

<sup>31</sup> National Occupational Health and Safety Commission

- Inspection activity needs to be responsive to the situation. Responsibilities must be assigned by the system and the people who need to be influenced within the organisation must be targeted;
- These findings suggest that a stricter system of penalties and increased visits could play a role in raising the profile of health and safety within firms through the 'ripple effect' while avoiding costly legislation;
- The deterrent component must be fully utilised by giving more publicity to fines and granting greater powers to inspectors.

## 5.6 Commercial Incentives

It is widely believed that financial incentives and reputational risk are emerging as powerful and recognised incentives. These methods are limited, however, by technical problems. Particularly problematic is the issue of attribution of illness to work and the reliability and acceptance of an economic appraisal of health effects to individual workers and their families.

A major barrier to linking health and safety practice to the liabilities of the company is the structure of national insurance systems, which usually do not differentiate between firms on this basis. The differences in attitude to worker safety between the US and Europe relates to workers compensation arrangements and to a much higher level of cost directly borne by USA organisations.

While research in the UK, Israel and Australia shows that organisations are primarily motivated by external factors (such as public relations and customer demands)<sup>32</sup>, US research indicates that the need to reduce accidents is a strong motivating factor. Rees (1988) found that the costs related to workers compensation became the single most important factor motivating large construction firms due partly to the high costs of compensation in the construction industry in the US. It has been estimated that without workers' compensation insurance, the number of fatal accidents and diseases would be 48% higher in the US<sup>33</sup>.

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<sup>32</sup> Wright 1998

<sup>33</sup> Viscusi and Moore 1990.

In Britain, there has been a substantial increase in the cost of employers' liability premiums and a hardening of terms amongst insurers. Several reports and surveys (see the Research Report 196 for the HSE (2004)) have shown that organisations have responded to the increase in cost by attempting to improve health and safety. It is important however, that organisations believe there is a link between their performance and their premiums, so experience ratings need to be developed. Where costs of insurance have risen beyond a certain level, as in Australia, New Zealand, Canada and America, we can see improved standards of rehabilitation and return to work standards. The reported injury and rate of workers' compensation claims have declined in all of these countries. An interesting finding is that where rehabilitation schemes have been imposed by regulation, such as in Australia and in certain states in the US, the results have been mixed. Ireland has developed a scheme whereby SMEs could reduce their premiums if they agreed to undertake the approved Occupational Health and Safety course.

Exerting supply chain pressure may prove to be an important and effective complementary strategy in SMEs, given the difficulties of direction intervention. The UK construction sector has demonstrated the potential of this policy; an increasing number of companies were taken off tender lists or threatened with removal due to checks by clients (Dow 1994) – also see case study. However, Brabazon et al. (2000) found that although health and safety preconditions have a significant impact on suppliers, many clients in the construction industry do not exert this pressure. On the whole, it is uncertain whether clients currently exert pressure outside of the more regulated sectors such as chemicals, a conclusion supported by the Evaluation of Good Health is Good Business, which reports that few firms cite supply chain pressure as a prompt for improving health and safety.

In summary, the following points should be noted:

- The evidence from overseas in from recent events in the UK suggest that insurance premiums do provide a new lever to influence employers;
- Reputational incentives using benchmarking and performance monitoring based on Occupational Health and Safety could aid self-regulation.

## 5.7 Individual accountability

The evidence indicates that direct personal liability imposed upon directors and officers is a powerful factor to promote improved safety, health and environmental performance<sup>34</sup>. There are various simple and non-costly measures to promote personal liability, for example;

- A CEO can be obligated to personally 'sign off' that the company is in compliance with regulatory requirements, and made individually responsible for inaccurate statements.
- Health and Safety can also be used as a performance indicator of the company and also of individual managers.

A series of studies have found that many large organisations have started managing health and safety due to the perceived reputational risk as well as the social and moral argument (see HSE Review 2004). In Britain, the Wright, Marsden and Holmes (2003) study noted that the HSC guidance on director's responsibility was a significant influence on board level responsibilities. This reinforces the importance of designating responsibility and targeting individuals rather than firms and industries in general. The existence and enforcement of effective regulations is a key aspect of creating reputational risk.

It was also shown in Britain that government regulation can go further than its traditionally narrow quantitative role. The UK has a national construction safety and health programme that is based on effective partnerships with all players in the industry and a combination of different kinds of interventions. The survey and consultation study by Brazabon et al. (2000) found that the CDM regulations helped to define the responsibilities of the different roles in the complex organisational situation in the Construction industry and also prompted improvement in procedural controls on worksites.

The Irish Construction Safety Partnership has also shown considerable success. There have been significant improvements in collaboration of safety, health and welfare in the industry with employers and workers representative organisations and government agencies working more closely together. The reduction in fatal accident rates has continued to decline from a peak of 16 per 100 000 workers in 1996, despite the influx of new and inexperienced workers into the industry<sup>35</sup>.

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<sup>34</sup> KPMG 1996, Hopkins 1995 and Purvis 1996.

<sup>35</sup> European Agency for Safety and Health at Work, Construction Case Studies.

## 5.8 Conclusions

We examined the company-based research evidence on the cost and benefits of Health and Safety legislation for companies. The research suggests that a mixture of education, incentives, regulation and enforcement mutually reinforce health and safety standards and can have positive effects, although it is difficult to gauge the relative effects of each component.

The market failures leading to below optimal Health and Safety measures taken by firms are varied and sometimes not significant, and regulation should reflect this, for example, with specific measures aimed at contractors, temporary working conditions and hazards with severe long-term effects. Case-studies and surveys show that regulations directed at specific hazards may have higher marginal benefits, especially for SMEs. Numerous evaluations have pointed towards the effectiveness of education and advice in raising awareness, and awareness is an important factor in improving health and safety precautions and is a key element of the work of the Health and Safety Authority in Ireland. Most studies examine enforcement in the context of inspection, which has an advisory role, making it difficult to concentrate simply on formal enforcement.

There is mixed evidence on the efficacy of enforcement through inspections and penalties. These findings suggest that a stricter system of penalties and increased visits could play a role in raising the profile of health and safety within firms through the 'ripple effect' while avoiding costly legislation.

It is widely believed that financial incentives and reputational risk are emerging as powerful and recognised incentives. The evidence from overseas and from recent UK studies suggests that insurance premiums do provide a new lever to influence employers. Also, the evidence indicates that direct personal liability imposed upon directors and officers is a powerful factor to promote improved safety, health and environmental performance<sup>36</sup>.

The international experience on the effectiveness of health and safety legislation is reflected in the 2005 Act. Inter alia, this Act places a greater emphasis on on-the-spot fines, joint safety agreements and increased penalties. In tandem with other measures, this should help the effectiveness of the legislation.

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<sup>36</sup> KPMG 1996, Hopkins 1995 and Purvis 1996.

The common perception that health and safety measures are a cost rather than an investment has shifted somewhat for companies. On the whole, employers believe that the benefits of regulations equal or outweigh the costs of compliance and the KPMG survey in Australia found that 70% of CEOs and 85% of supervisors agreed that improving health and safety reduces costs. Whether or to which extent investment in health and safety will actually produce net benefits or net costs to a firm and varies depending on the nature of the enterprise, the sector in which it is operating and the nature of the hazards which it generates and whether there is a low or high risk.

## 6 Impact of Health and Safety Legislation on Firms in Ireland

### 6.1 Introduction

The international evidence is increasingly showing that companies, for a variety of reasons, perceive health and safety as a benefit rather than a cost. Indecon carried out two surveys to ascertain firms' views in Ireland on the impact of Health and Safety legislation on their businesses: a survey of construction companies and a survey of industry in general. A key issue was to assess the cost and benefits of Health and Safety legislation. The results of these surveys are presented in this section.

### 6.2 Survey of Construction

Table 6.1 gives information of the size of firms responding to the survey of the construction sector. This was a postal survey and we received a response rate of over 15%. The majority of these firms have between 10 and 49 employees.

**Table 6.1: Number of Employees**

Number of employees	Percentage of respondents
1-9	18.9
10-49	58.1
50-249	18.9
250-499	2.7
500 or more	1.4

*Source: Indecon Survey of the Construction Sector*

First we asked firms whether health and safety legislation helped to reduce and/or contain costs. There are mixed views among these firms on whether Health and Safety legislation has helped to reduce insurance costs or not, as shown in Table 6.2. A sizeable minority (39.6%) believe that legislation has led to a reduction in insurance costs, while just 5% felt that they had led to an increase.

**Table 6.2: Views of respondents on the impact of Health and Safety Legislation on costs of insurance**

Impact	Percentage of respondents
Reduction of insurance costs compared to what they would have been	39.6
No impact on costs	43.6
Increase in insurance costs	4.7
Don't know	12.1

*Source: Indecon Survey of the Construction Sectors:*

A majority of respondents (53.8%) believe that the legislation has led to a reduction in the cost of accidents. 44.8% indicated that it had no effect.

**Table 6.3: Views of respondents on whether compliance with Health and Safety Legislation has reduced costs of accidents**

Impact	Percentage of respondents
Has reduced cost of accidents	53.8
Has had no impact on cost of accidents	44.8
Has increased costs of accidents	1.4

*Source: Indecon Survey of the Construction Sector*

Table 6.4 presents respondents' estimates of the gross annual costs of complying with Health and Safety legislation, as a percentage of total labour costs. There is quite an even distribution between the different categories, though the majority of firms put the cost at below 3%. We estimate the median cost for firms to be over 2% of annual labour costs.

**Table 6.4: Perception of gross annual costs, if any, of compliance with Health and Safety Legislation as percentage of annual labour costs**

Percentage	Percentage of respondents
0	0.7
0-0.1	7.1
>0.1-0.2	15.0
>0.2-0.5	7.9
>0.5-1.0	12.9
1-2	15.7
2-3	12.9
3-5	16.4
5-10	10.7
Other	0.7
<b>Median</b>	<b>2.0%</b>

Source: Indecon Survey of the Construction Sector

As shown in Table 6.5, the majority of construction firms believe that there has been a net benefit for their business arising from Health and Safety legislation and this view is evenly spread across all companies irrespective of size.

**Table 6.5: Views of respondents on whether there is a net benefit or net cost for their business arising from Health and Safety Legislation**

Impact	Percentage of respondents
Net benefit	51.7
Net cost	35.2
Don't know	13.1

Source: Indecon Survey of the Construction Sector

As shown in Table 6.6, the majority of respondent firms believe the overall impact of complying with Health and Safety legislation to be either positive or very positive for their business. This is contrary to the view on some quarters that health and safety is purely a cost of business. However it is consistent with the research on the international experience which suggests that employers benefit by improving their health and safety performance (see section 2.3.2).

**Table 6.6: Views of respondents on the overall impact of complying with Health and Safety Legislation on their business**

Impact	Percentage of respondents
Very positive	19.5
Positive	53.0
Neither positive nor negative	18.1
Negative	9.4
Very negative	0

*Source: Indecon Survey of the Construction Sector*

Table 6.7 presents respondents' views on the impact of Health and Safety legislation on various aspects of their business. Respondents are generally positive about the impact of this legislation on and see the appointment of a safety officer, staff training and investment in accident prevention as being particularly positive. There are more mixed responses for the other two elements (preparation of safety statement and preparation of records) with larger proportions believing the impact of these to be neither positive nor negative. In all cases, however, only a very small minority of respondents believe that the different aspects have a negative impact on their business.

**Table 6.7: Summary of views of survey respondents on the impact of Health and Safety legislation on various aspects of their business**

Impact	Aspect of business				
	Preparation of safety statement	Appointment of safety officer	Staff training	Preparation of records	Investment in accident prevention
Very positive	17.4%	24.6%	19.9%	10.9%	19.6%
Somewhat positive	45.8%	50.7%	62.4%	48.2%	53.1%
Neither positive nor negative	35.4%	19.6%	14.9%	33.6%	23.1%
Somewhat negative	1.4%	4.3%	2.8%	6.6%	3.5%
Very negative	-	0.7%	-	0.7%	0.7%
<i>Total</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>

*Source: Indecon Survey of the Construction Sector*

### 6.3 Survey of Industry

As well as the survey of the construction sector, Indecon also undertook a general survey of industry to find out companies' views on Health and Safety legislation. This was an interview survey of 100 firms. Indecon questioned respondent firms on the impact of this legislation on various aspects of their business.

Table 6.8 shows respondents' views on the impact of this legislation on insurance costs. A clear majority of those respondents that didn't choose the 'don't know' category feel that the legislation has had no impact on the cost of company insurance, though a significant minority believe that it has led to a decrease in costs.

**Table 6.8: Views of respondents on impact of compliance with Health and Safety legislation on company insurance costs**

Impact	Percentage of respondents
Insurance costs have increased	5
Insurance costs have stayed the same	30
Insurance costs have decreased	23
Not applicable/don't know	42
<i>Total</i>	<i>100</i>

*Source: Indecon Survey of Industry*

As shown in Table 6.9, a large proportion of respondents believe that Health and Safety legislation has assisted in the recruitment of skilled staff, though a similar proportion believe that it has had no effect. Only a small minority believe it to have hindered recruitment.

**Table 6.9: View of respondents on impact of compliance with Health and Safety legislation on recruiting skilled staff**

Impact	Percentage of respondents
Has assisted recruitment of skilled staff	39
Recruitment of skilled staff has stayed the same	38
Has hindered recruitment of skilled staff	4
Not applicable/don't know	19
<i>Total</i>	<i>100</i>

*Source: Indecon Survey of Industry*

As with the survey of the construction sector, the majority of respondents believe that Health and Safety legislation has reduced accident related costs. No respondents to Indecon's survey believed that costs had risen as a result of this legislation.

**Table 6.10: Views of respondents on impact of compliance with Health and Safety legislation on accident-related costs**

<b>Impact</b>	<b>Percentage of respondents</b>
Accident-related costs have reduced	66
Accident-related costs have stayed the same	24
Accident-related costs have risen	-
Not applicable/don't know	10
<i>Total</i>	<i>100</i>

*Source: Indecon Survey of Industry*

Table 6.11 shows respondents' views on the cost of compliance with Health and Safety legislation, as a percentage of the total annual wage bill. The largest proportion of respondent firms falls into the 1%-5% range. We estimate the median for this sample to be below the construction sector, at 1% with smaller firms indicating a higher cost as a percentage of their wage bill.

**Table 6.11: Views of respondents on approximate cost of compliance with Health and Safety legislation as a percentage of company's total wages bill**

<b>Approximate cost</b>	<b>Percentage of respondents</b>
Less than 1%	22
1-5%	38
6-10%	10
More than 10%	2
Don't know	28
<i>Total</i>	<i>100</i>
<b>Median</b>	<b>1%</b>

*Source: Indecon Survey of Industry*

The vast majority of respondents believe that the benefits of Health and Safety legislation outweigh its costs, as shown in Table 6.12.

**Table 6.12: Views of respondents on whether benefits of compliance with Health and Safety legislation outweigh costs for company**

View	Percentage of respondents
Benefits outweigh costs	96
Costs outweigh benefits	1
Not applicable/don't know	3
<i>Total</i>	<i>100</i>

*Source: Indecon Survey of Industry*

There is also an overwhelmingly positive response to the overall impact of compliance with Health and Safety legislation on respondents' businesses, as shown in Table 6.13. A total of 92% of respondents believe this impact to be either somewhat or very positive.

**Table 6.13: Views of respondents on the overall impact of complying with Health and Safety legislation on their business**

Impact	Percentage of respondents
Very positive	48
Somewhat positive	44
Neither positive nor negative	5
Somewhat negative impact	3
Very negative impact	-
<i>Total</i>	<i>100</i>

*Source: Indecon Survey of Industry*

Finally, Table 6.14 examines respondents' views on the impact of Health and Safety legislation on various aspects of their business. The results are very similar to those from the survey of construction firms with respondents being very positive on the impact of the appointment of a safety officer, staff training and investment in accident prevention. They are slightly less positive about the impact of preparing a safety statement and preparing health and safety records. However, the overall response is positive with very few respondents feeling that the legislation impacts negatively on the different aspects of their business.

**Table 6.14: Summary of views of survey respondents on the impact of Health and Safety legislation on various aspects of their business**

Impact	Aspect of business				
	Preparation of a safety statement	Appointment of a safety officer	Staff training	Preparation of health and safety records	Investment in accident prevention
Very positive	39%	54%	61%	48%	58%
Somewhat positive	46%	34%	31%	36%	29%
Neither positive nor negative	12%	9%	5%	10%	9%
Somewhat negative	2%	1%	2%	4%	2%
Very negative	-	-	-	1%	-
Don't know	1%	2%	1%	1%	2%
<i>Total</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>

Source: *Indecon Survey of Industry*

## 6.4 Conclusions

The key findings of the construction industry survey are as follows:

- A sizeable minority (39.6%) believe that Health and Safety legislation has led to a reduction in insurance costs, while just 5% felt that they had led to an increase. These results were spread evenly across all firm sizes.
- In contrast, a majority of respondents (53.8%) believe that the legislation has led to a reduction in the cost of accidents;
- Regarding the gross annual costs of complying with Health and Safety legislation, a majority of firms put the cost at below 3%. We estimate the median cost for firms to be over 2% of annual labour costs in the construction sector;
- The majority of construction firms believe that there has been a net benefit for their business arising from Health and Safety legislation.

From the survey of industry

- A clear majority of those respondents feel that the legislation has had no impact on the cost of company insurance, though a significant minority believe that it has led to a decrease in costs;
- A majority of respondents believe that Health and Safety legislation has reduced accident related costs;
- Regarding the cost of compliance with Health and Safety legislation as a percentage of the total annual wage bill, the largest proportion of respondent firms falls into the 1%-5% range. We estimate the median for this sample to be below the construction sector at about 1%;
- The vast majority of respondents believe that the benefits of Health and Safety legislation outweigh its costs.

## **7 Trends in Health and Safety Enforcement and Activity in Ireland**

### **7.1 Introduction**

In this section we examine some of the features of Health and Safety legislation arising from the 1989 Act and trends in enforcement in Ireland since then. Next we consider the evidence of the impact of health and safety legislation on the number of people affected by accidents. We seek to assess the extent to which improvement in Occupational Health and Safety is due to a greater Health and Safety culture and enforcement of regulations and legislation.

It should be noted that this chapter refers to the provisions of the 1989 Act given the Terms of Reference of this study. The 2005 Act contains significant additional provisions and significantly strengthens the Health and Safety legislation. However, these are not reviewed in this chapter.

### **7.2 Health and Safety Authority legislation and enforcement**

The 1989 Act was a significant piece of legislation which changed the nature of Health and Safety in Ireland. It introduced new practices and placed new obligations on employers which have impacted upon behaviour.

### **7.3 Employers' Obligations**

The Act imposed new obligations on employers. Some of these are set out in sections 12 and 13. Under the Act, the employer is required:

- To manage and conduct work activities in such a way as to ensure the safety, health and welfare at work of all employees;
- To provide systems of work that are planned, organised, performed, maintained and revised as appropriate so as to be safe and risk free;
- To provide adequate safety and health training, including in particular, information and instructions relating to their specific task or workplace;
- To provide protective clothing and equipment where risks cannot be eliminated or adequately controlled;

- To ensure that appropriate health surveillance is made available to every employee;
- To report accidents and dangerous occurrences to the relevant authority (Section 33);
- To prepare and revise emergency plans and procedures;
- To ensure that the physical environment of the place of work, regarding stability, ventilation, fresh air, temperature and lighting, is adequate;
- To identify hazards and risks by means of a safety statement. This becomes the basis on which every employer must manage the safety and health of employees (Section 12);
- To consult their employees on safety and health matters at the place of work and to consider any representations on safety and health matters made by their employees. Employees have the right to appoint safety representatives to make appeals to the employer on their behalf (Section 13).

These are considered significant new obligations compared with the position prior to the Act.

## **7.4 Enforcement**

### **7.4.1 The Authority**

A key element of the 1989 Act was the establishment of the Health and Safety Authority. Sections 14 to 26 of the Act outline the role, structure and functions of the National Authority for Occupational Safety and Health, the body with overall responsibility for the administration and enforcement of the Act and subsequent health and safety legislation. Some of the functions of the Health and Safety Authority are to:

- Provide an institutional setting for involving both sides of industry and other interests in framing and implementing national policy through wide consultation;
- Monitor compliance;
- Provide national information and advice to employers, employees and self-employed on all aspects of workplace health and safety;
- Promote education, training and research in the field;

- Work with various specialist committees and task forces to focus on specific occupations and hazards;
- Develop new laws and standards on health and safety at work.

The Health and Safety Authority is empowered to;

- Demand access to any relevant information by serving a “Notice Requiring Information” (Section 42);
- Carry out special reports and inquiries into any accident, disease, occurrence, situation or other matter related to the protection of safety, health or welfare of persons at work arising out of work activities (Section 46).

The Health and Safety Authority is first and foremost perceived as an organisation ensuring enforcement, although it is also widely perceived as an organisation that promotes health and safety standards, in line with the importance of raising awareness highlighted in Section 5. The Health and Safety Authority is believed to be effective in implementing each of its tasks, but least so when it comes to prosecuting companies<sup>37</sup>, a concern widespread internationally (see Section 5).

#### 7.4.2 Inspections

Powers of inspection are a key feature of the Act. Under Section 34 of the 1989 Act, inspectors are given a broad range of powers, among which are:

- To enter, inspect and examine and search any place of work;
- Where he believes that an offence has or is being committed, to use reasonable force where necessary to enter a place of work, under a warrant of a Justice of the District Court;
- To take any necessary action or require such action from any person as to enable him to carry out any necessary examination and inquiry;

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<sup>37</sup> Survey on Inspections, January 2003, a report prepared by Millward Brown IMS for the Health and Safety Authority.

- If the inspector is concerned about any work activity, he may request an improvement plan where remedial action is specified, to be written by the person in control. Failure may result in an Improvement Notice being served on that person. A Prohibition Notice may be served if the Inspector is of the opinion that an employer has broken an Act or regulation in relation to an activity that has been or is likely to be risk of serious personal injury to people at work;
- Where a prohibition notice has been served and activities are carried on in contravention of it, the High Court may by order prohibit the continuance of such activities on application by the Inspector.

Granting inspectors more power is in line with international best practice described in Section 5. Overall satisfaction with inspections is high (nine out of ten respondents were either 'very satisfied' or 'satisfied'), and reaction to inspections is largely positive<sup>38</sup> (89% of customers agreed with the outcome of the inspection). However, out of all Health and Safety Authority activities, clients believed that increased inspections would best contribute to improved workplace standards.

### 7.4.3 Penalties

A person guilty of a contravening any of the requirements of the 1989 Act, broadly outlined above, is subject to a fine not exceeding £1000 or not more than 2 years in prison, according to the Act. Penalties are also imposed under various other acts specific to particular industries or substances. The onus of proof is on the accused person in all cases.

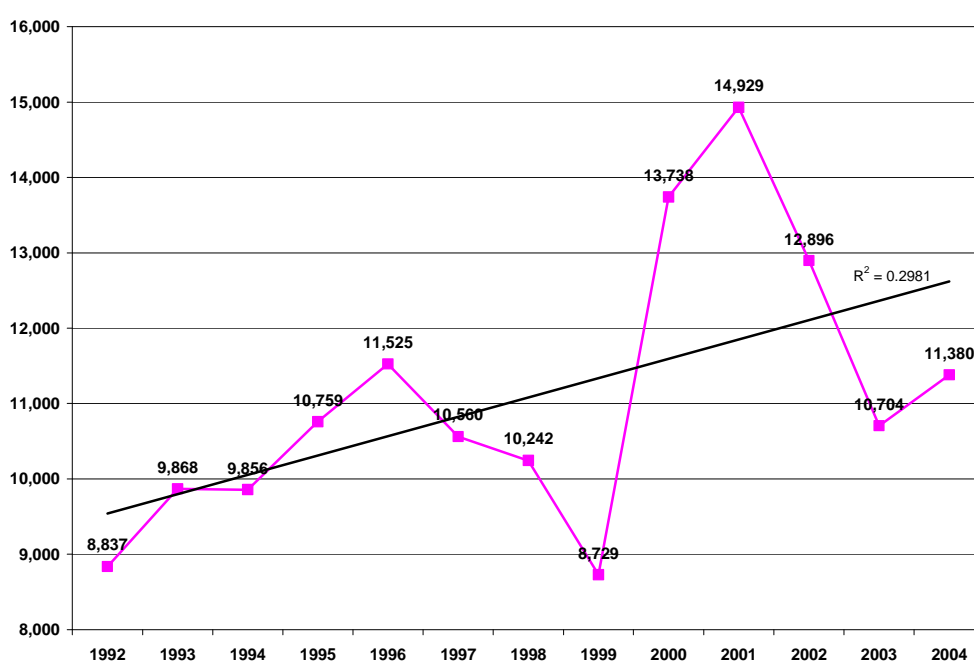
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<sup>38</sup> Ibid.

## 7.5 Trends in Enforcement Activity

A key issue is to examine trends in enforcement activity based on the implementation of the 1989 legislation and then to establish whether there is a link between this activity and improvements in the rate of accidents. Figure 7.1 shows the number of inspections between 1992 and 2004. The number of workplace inspections has increased, albeit unevenly, since 1992.

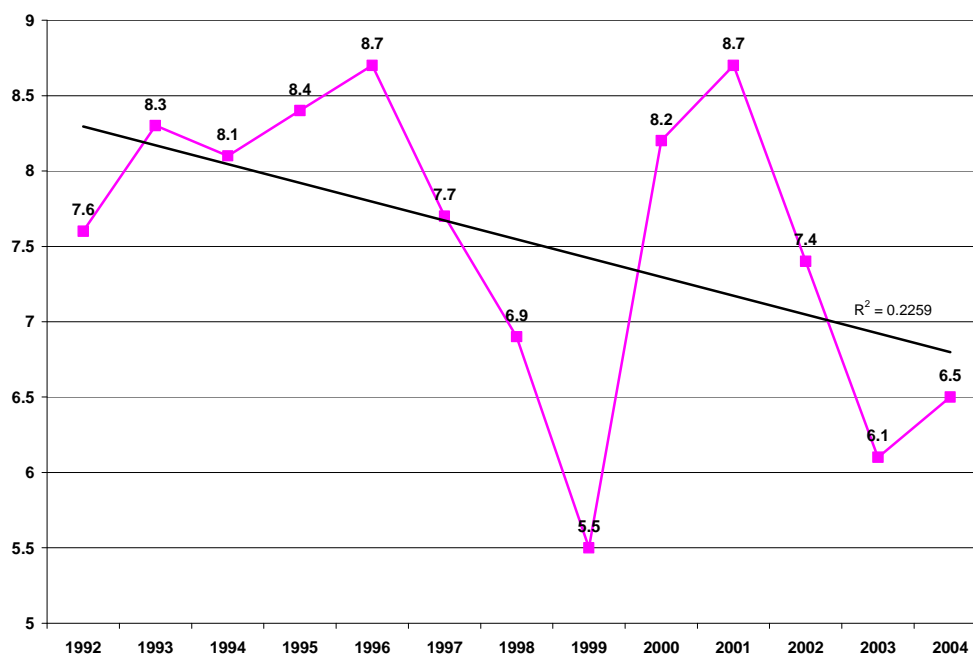
Figure 7.1: Number of Inspections 1992-2004



Source: Health and Safety Authority and Indecon Analysis

Figure 7.2 shows the trends in rate per worker employed. In contrast to the previous figure, this series shows a weak downward trend, reflecting the fact that the number of workers is rising faster than the number of inspections. However, it could be argued that the key issue is the distribution of the inspections between the sectors of the economy (see Section 4.3).

**Figure 7.2: Rate per Worker of Inspections 1992-2004**



Source: Health and Safety Authority

Table 7.1 shows the number of inspections within three of the most risky sectors in the economy. Notably, inspections in the construction industry have increased dramatically, more than tripling between 1994 and 2001, from 2084 to 6508, although dropping slightly subsequently. Inspections in the mining and quarrying industry have also increased considerably. The number of inspections in the agricultural sector has varied considerably and overall experienced a decrease between 1994 and 2004. The percentage of inspections in the riskier sectors has increased from 35% of all inspections in 1994 to 58% of all inspections in 2004. As we discussed in Section 5, this should distribute resources to instances of greatest market failure which should improve the overall effectiveness of Health and Safety interventions.

**Table 7.1: Total Inspections and Percentage of Inspected Workplaces that have Safety Statement Prepared, by Economic Sector, 1994-2002, Health and Safety Authority**

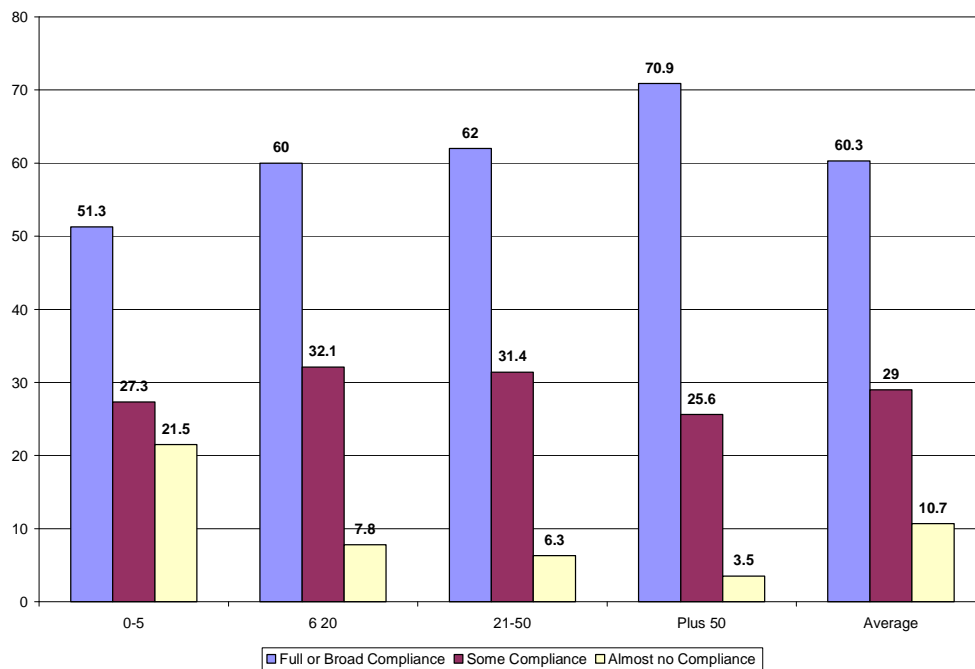
Economic Sector	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
<b>Number of workplaces that were inspected</b>											
Agriculture/Hunting/ Forestry	1012	1270	981	964	761	742	1,026	285	1,255	856	995
Mining/Quarrying	323	246	343	321	341	268	362	351	443	439	521
Construction	2,084	3,084	4,532	4,332	4,707	4,052	5,066	6,508	6,118	4,615	5,048
Total	9,856	10,759	11,525	10,560	10,242	8,729	13,738	14,929	12,896	10,704	11,380
<b>Percentage of inspected workplaces that have Safety Statements</b>											
Agriculture/Hunting/ Forestry	14.2%	11.6%	7.8%	7.5%	12.3%	13.5%	17.9%	36.9%	21.0%	18.5%	28.9%
Mining/Quarrying	48.1%	55.9%	48.9%	55.8%	61.0%	68.4%	65.8%	80.8%	74.8%	76.3%	78.3%
Construction	43.6%	49.5%	50.3%	49.5%	49.9%	51.7%	57.2%	71.6%	72.7%	62.5%	71.2%
Total	38.3%	43.5%	44.5%	45.1%	47.5%	48.9%	50.7%	63.0%	64.5%	60%	66.6%

Source: Health and Safety Authority

The proportion of workplaces with safety statements prepared has shown considerable improvement since 1994, from 38.3% of workplaces in 1994 to two thirds of workplaces in 2004. The agriculture sector however still lags behind in this respect, with below 30% of workplaces with a safety report prepared compared to fewer than three-quarters of workplaces in the other high-risk sectors. Nevertheless, the number of workplaces with safety statements in the agricultural sector more than doubled between 1994 and 2004, so progress is being made. Once again, this is a positive indication of the impact of the legislation.

Figure 7.3 below presents data on the quality of safety statements. Overall, only around three-fifths of safety statements show broad or full compliance with legal requirements. While 28% show some compliance and just over a tenth exhibit almost no compliance. Firms are more likely to display better compliance the larger they are, although more than half of small firms (of between 0 and 5 employees) showed broad or full compliance.

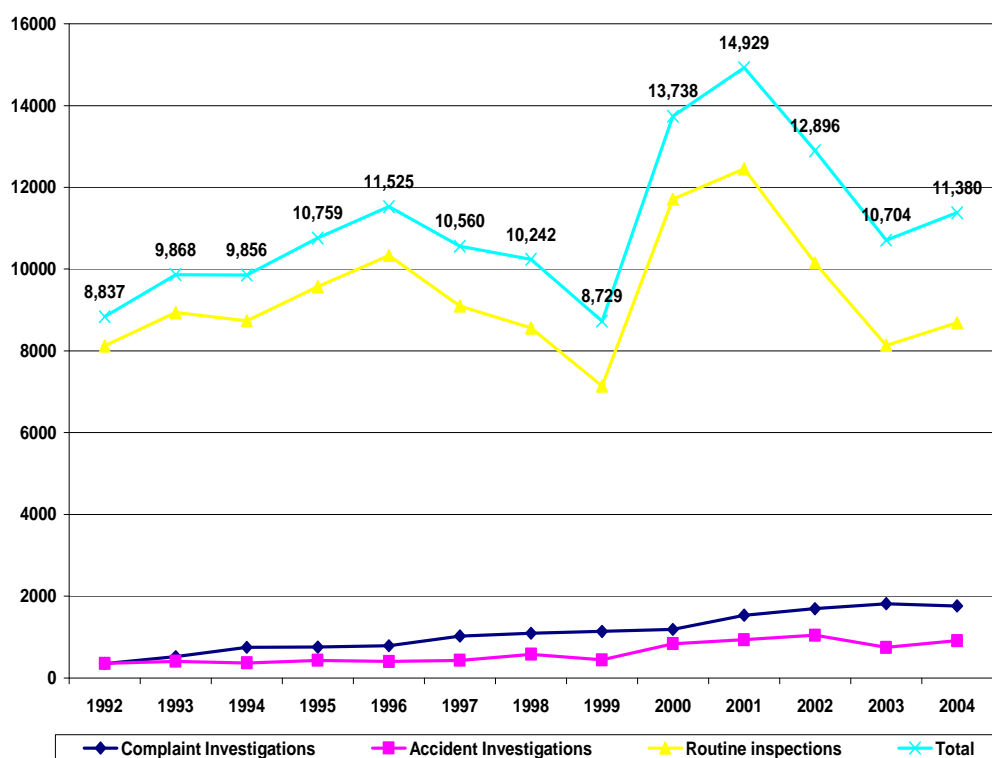
**Figure 7.3: Level of Safety Statement Compliance by Size of Firm in 2003**



Source: Health and Safety Authority

Figure 7.4 shows that the proportions of different inspection types stayed roughly constant between 1992 and 2004. The majority of inspections are routine inspections, although the number arising from complaints is increasing.

Figure 7.4: Number of inspections and types 1992-2004



Source: Health and Safety Authority

Table 7.2 gives details of prosecutions and indictments between 1992 and 2002. There has been a large increase in the number of hearings and prosecutions over this period, with total prosecutions rising from 22 in 1992 to 91 in 2002 although falling subsequently. This is an indication of the new Act and a greater enforcement culture, although from a low base. As discussed in Section 5, this can potentially improve Health and Safety performance but penalties and the chance of incurring them need to reach a certain level before the deterrent effect is apparent to any significant degree. Improvement in enforcement and in order to act as a warning has led to the appearance and steady increase in numbers of indictment hearings and convictions.

**Table 7.2: Number of Prosecutions Heard and Conviction Rates by Type of Prosecution, 1992-2004**

Year	Summary prosecution heard	Summary conviction	Summary conviction rate	Indictment prosecution heard	Indictment conviction	Indictment conviction rate	Total prosecution heard
1992	22			0	-	-	22
1993	30	26	87%	0	-	-	30
1994	37	29	78%	0	-	-	37
1995	24	23	96%	0	-	-	24
1996	35	27	77%	0	-	-	35
1997	39	30	77%	0	-	-	39
1998	55	49	89%	0	-	-	55
1999	63	56	89%	0	-	-	63
2000	64	47	73%	2	2	100%	66
2001	85	73	86%	7	7	100%	92
2002	86	70	81%	5	5	100%	91
2003	61	54	89%	15	15	100%	76
2004	25	19	76%	16	16	100%	41

Source: Health and Safety Authority

## 7.6 Conclusions

The 1989 Act was a significant piece of legislation which changed the nature of Health and Safety in Ireland. It introduced new practices and placed new obligations on employers which have impacted upon behaviour. A key issue is to examine trends in enforcement activity based on the implementation of the 1989 legislation and then to establish whether there is a link between this activity and improvements in the rate of accidents.

The data show that the number of inspections increased between 1992 and 2004 as an indicator of greater enforcement. More importantly, the percentage of inspections in the riskier sectors of Construction, Quarrying and Mining, and Agriculture, has increased from 35% of all inspections in 1994 to 58% of all inspections in 2004, which should improve the overall effectiveness of Health and Safety legislation. Other indicators such as number of prosecutions and number of companies with safety statements provide evidence of greater activity. For example, the proportion of workplaces with safety statements prepared has shown considerable improvement since 1994, from 38.3% of workplaces in 1994 to 60% in 2003. Once again, this is a positive indication of the impact of the legislation.

This period of improved working conditions has coincided with an increase in health and safety activity in Ireland, as measured by the number of inspections carried out by the Health and Safety Authority annually. One must be careful however not to assume that it has been the increased activity that has led to the fall in worker injury and fatality rates, a simple correlation of the variables does not allow us to conclude such a result. In order to understand the underlying relationship between the variables we have undertaken a detailed econometric analysis as part of this study. This is reported in the next section where we seek to assess the extent to which improvement in health and safety is due to a greater health and safety culture and enforcement of regulations and legislation.

## 8 Econometric Analysis of the Benefits of Health and Safety in Ireland

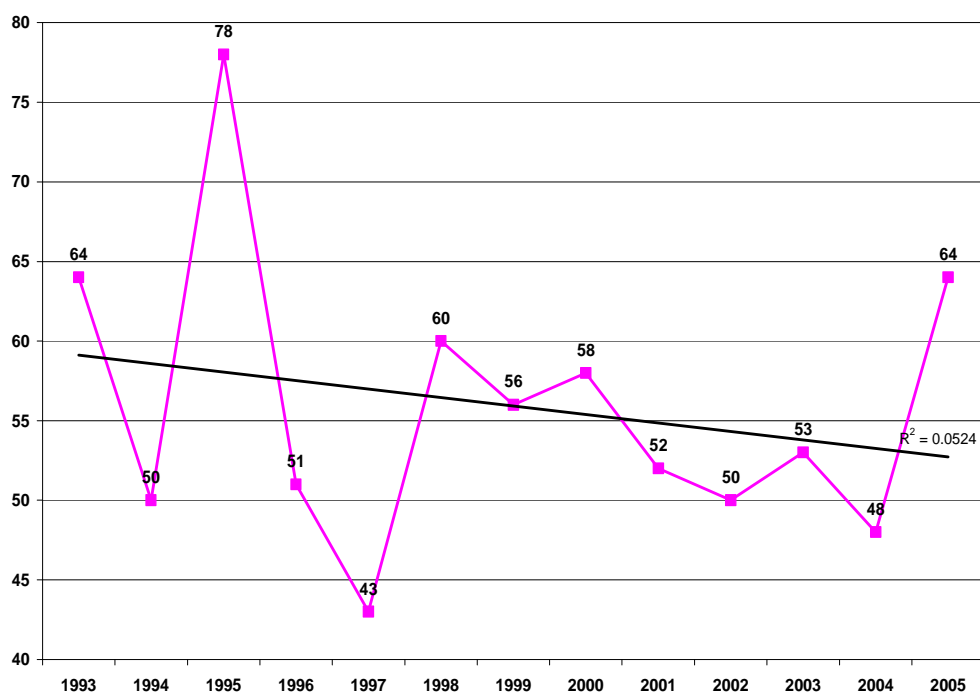
### 8.1 Introduction

In this section we review the trends in accidents and examine the approaches to establishing a link between these trends and greater health and safety activity.

### 8.2 Trends in Safety Record

We can see from Figure 8.1 a modest decreasing trend in the number of fatalities between 1996 and 2005. The correlation is weak, given the relatively short time period in which fatalities were measured.

Figure 8.1: Worker fatalities 1993-2005



Source: Health and Safety Authority

Figure 8.2 shows that, because of the substantial increase in employment in Ireland, the rate of fatalities has shown a clear downward trend.

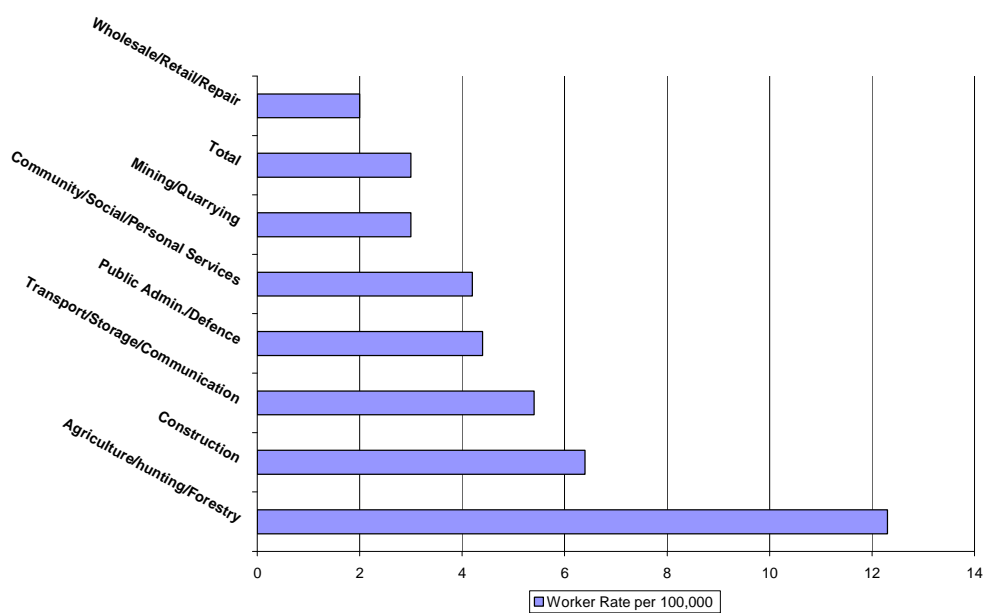
**Figure 8.2: Worker Fatality Rate 1996-2005**



Source: Health and Safety Authority and Forfas

Figure 8.3 shows the fatality rate by economic sector in 2003. The Agriculture sector had by far the highest rate of fatalities. Twelve out of the fourteen fatalities were of self-employed workers in this sector.

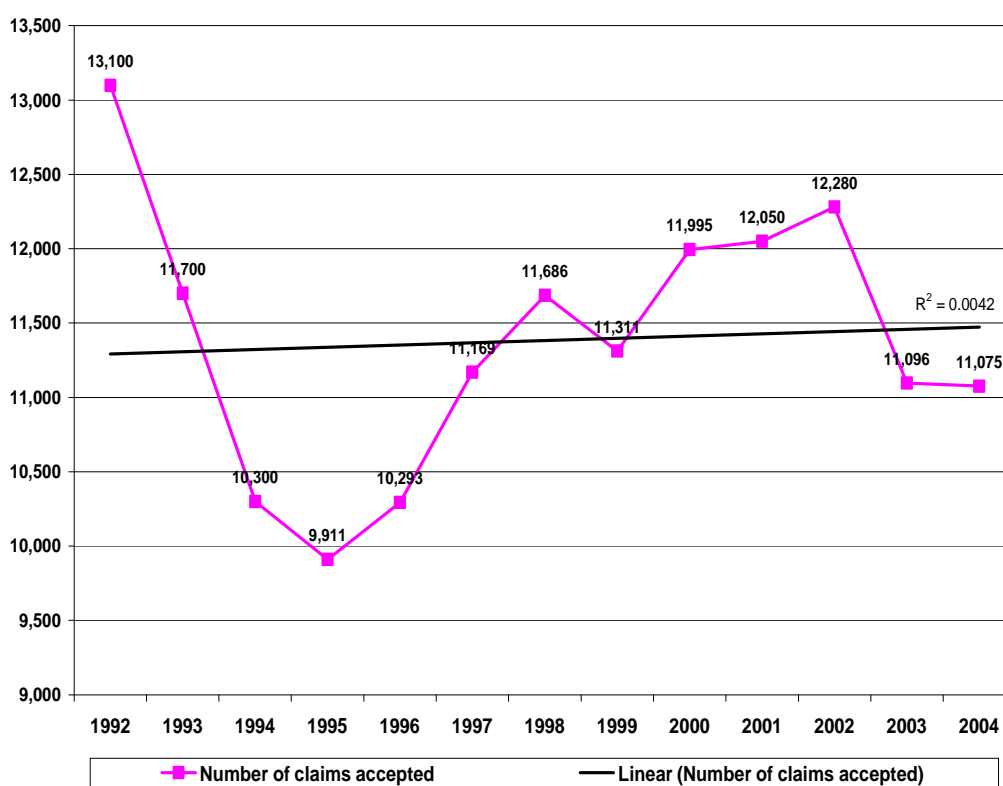
**Figure 8.3: Fatality Rate per Worker by Sector in 2003**



Source: Health and Safety Authority 2003 Annual Report

Figure 8.4 and Figure 8.5 show the absolute number and rate of cases of occupational injury benefits accepted per number of people employed. It is generally accepted that data on occupational injury benefit is the best available measure of trends in work-related accident. The figure below shows significant fluctuations in the number of claims over the period, with the number of claims falling in the period to 1995 and increasing up to 2002. But the level in 2004 is below 1992 levels.

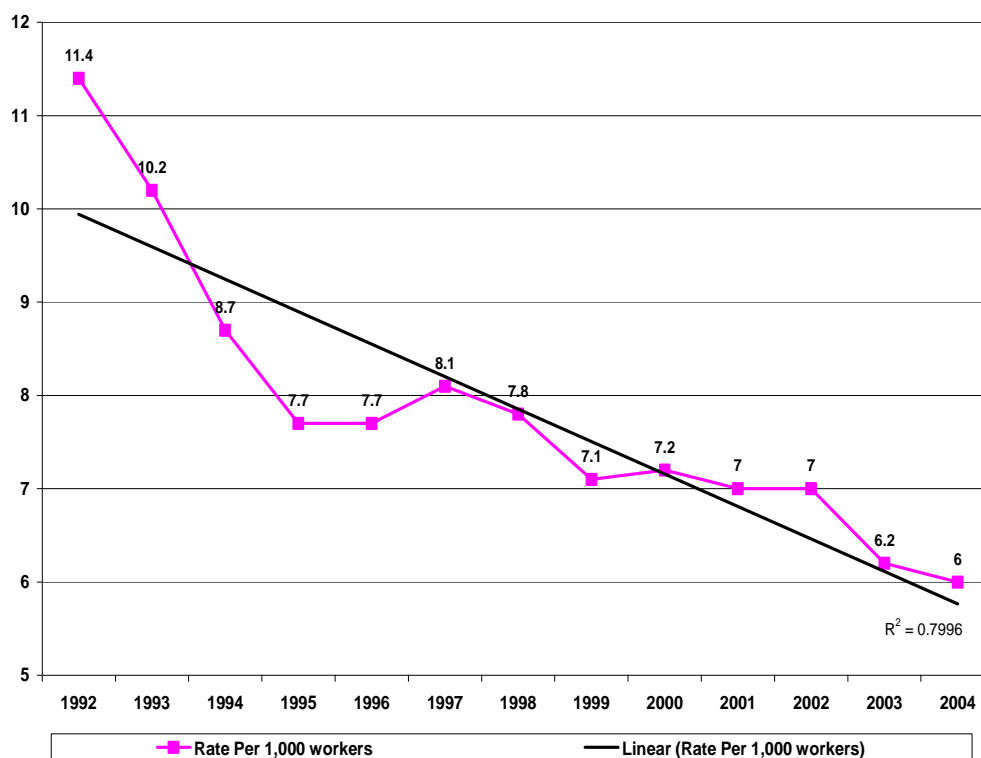
**Figure 8.4: Number of cases of occupational injury benefit, 1992-2004**



Source: Department of Family and Social Affairs

Regarding changes in the number of people employed, the occupational injury rate per person employed is half of the rate of 1992. The rate is estimated at 6 per 100,000 employees compared with 11.4 in 1992. The data are included in Figure 8.5.

**Figure 8.5: Rates per 100,000 of eligible workers for occupational injury benefit, 1992-2004**



Source :Department of Family and Social Affairs

### 8.3 Econometric Analysis of the Benefits of Health and Safety Activity

From the information presented in the previous section one can see that both the worker fatality and injury rates have fallen over the period 1995 – 2005. This period of improved working conditions has coincided with an increase in Health and Safety activity in Ireland, as measured by the number of inspections carried out by the Health and Safety Authority annually.

One must be careful however not to assume that it has been the increased activity that has led to the fall in worker injury and fatality rates, a simple correlation of the variables does not allow us to conclude such a result. In order to understand the underlying relationship between the variables we have undertaken a detailed econometric analysis as part of this study. Within the remainder of this section we first present the findings of previous research of this nature in the United States and Canada before moving on to describe our econometric model, the data used and finally the results.

### 8.3.1 Review of Econometric Literature

A considerable amount of research has been undertaken by researchers in the United States and Canada whereby they have attempted to econometrically estimate the benefits of Health and Safety regulation. The majority of these studies have concentrated on the effect of increased occupational health and safety activity on workplace safety, measured by occupational injury and fatality rates. However, one may also consider the benefits of occupational Health and Safety activity to be wider than this interpretation and research by Defour, Lanoie and Patry (1995) has shown that Occupational Health and Safety regulation, in the Canadian manufacturing industry, may have had a positive effect on productivity growth. Although this research indicates that the benefits of occupational Health and Safety activity can be multi-faceted, the purpose of this section is to review studies that have attempted to assess econometrically the benefits of Occupational Health and Safety activity on the safety of workers.

Interestingly, econometric analyses of the effects of occupational health and safety activity to date have not produced a unanimous result in relation to this with some failing to find statistically significant relationships between the key variables and others. One of the earliest attempts to estimate the impact of the Occupational Safety and Health Administration's (OSHA) activities on worker welfare in the US was undertaken by Viscusi (1978). Using data aggregated to industry level on health and safety investment and injury rates over the period 1972-1975, Viscusi found that the Administration's activity did not have a statistically significant impact on workers' injuries.

However, the research did show that firms responded to the incentive to invest in improved workplace quality and that they were increasingly likely to do so as long as this was expected to reduce the expected penalties associated with non-compliance. Although firms had an incentive to improve the workplace for their workers, Viscusi uncovered evidence of moral hazard among workers, with those in safer workplaces more likely to take risks, thus increasing the number of workplace accidents and fatalities.

Subsequent research carried out by Viscusi (1986) reversed one of the conclusions reached in his previous work, namely a statistically significant negative relationship was estimated to exist between the number of inspections and workplace injury rates. McCaffrey (1983) and Ruser and Smith (1991) found marginal evidence of safety benefits resulting from the increased activity of the Administration.

Bartel and Thomas (1985) similarly found this result and although the estimated impact of increased inspections on worker injuries was small their research also provided support for one of the earlier findings in Viscusi (1978), that a greater incidence of inspections had a positive impact on firm compliance. Therefore, according to Bartel and Thomas (1985) the estimated effect of an increase in the incidence of inspections was to improve the compliance of firms in a specific industry with regulations and to make the workers in that industry relatively safer.

This conclusion represents an obvious drawback associated with this approach. The use of aggregated industry level data does not allow for any adjustment to be made to address specific within industry dynamics that may be driving these results. The overall impact of an increase in the number of inspections on a particular industry over time may be magnified, or alternatively masked, by within industry changes that occur over the period being analysed wherein a reduction in worker injuries is also observed. To counter this potential problem, researchers began making use of newly available plant level datasets that would allow them to both observe and control for within industry effects.

Using a dataset that included information on worker injuries and inspections for 6842 manufacturing plants in the US between 1979 and 1985, Scholz and Gray (1990) found evidence to support four general hypotheses;

- The specific deterrence effect of an inspection;
- The importance of lagged effects of general deterrence;
- The asymmetrical effect of probability and the amount of penalty on injuries;

- The tendency of injury rates to self-correct over time.

Further to this the analysis undertaken indicated a significant difference between the impact brought about by a general inspection and inspections that led to the imposition of a penalty on firms. Scholz and Gray (1990) estimated that a 10% increase in enforcement activity would reduce injuries by approximately 1% for large frequently inspected firms, for whom the effect was largest. However, the Administration's inspections that imposed penalties were estimated to reduce worker injuries by 15% - 22% over the subsequent three year period.

An analogous effect was estimated by the model used by Gray and Scholz (1993) [see 8.3.2 for more details] which they subjected to extensive econometric testing resulting in their use of first differences in the dependent and independent variables to address an issue of endogeneity in the dependent variable. This problem seems obvious if one considers the relationship between injuries and inspections, not only can one expect changes in inspections to have an impact on injuries but a change in injuries may also bring about a change in inspections.

Having extended the Scholz and Gray (1990) dataset to include two new time periods, 1987 - 1991 and 1992 - 1998, Gray and Mendeloff (2005) use the basic model developed in the previous paper to estimate the impact of OSHA inspections on injury rates. Once again they find evidence that penalty inspections have a considerably greater impact on injury rates than do general inspections but that the impact of both inspections diminishes over time. They estimate penalty inspections brought about a total reduction of 15% in the injury rate in the early 1980s but that this fell to 8% in the late 1980s and further to approximately 1% in the 1990s. However, the figure for the period 1992 - 1998 was found not to be statistically significant. This result lends support to research published by Gray and Jones (1991) into the impact of health inspections that found the first inspection to have the strongest impact. As a result of their findings Gray and Mendeloff (2005) concluded that inspections type, number of employees, type of industry as well as differences in firm size cannot explain the overall reduction in injury rates.

In Canada, Lanoie (1992) used a panel dataset of industry level data to assess the impact of the Quebecois health and safety board's activity, over the period 1982 - 1987, on worker injury rates. Having estimated the model the rate of inspection was found to be the only statistically significant variable that had the effect of reducing the frequency with which workers sustained an injury that put them out of work. However, this effect was marginal.

In general, research in this area has only provided weak evidence of the positive impacts of inspections on injury rates (DKM, 2004). There is also evidence that inspections have a disproportionate impact on the frequency with which specific injuries occur. Cousineau, Girand and Lanoie (1995) found, using a panel dataset of 23 industries in Canada, that regulation had a greater impact on the rates of particular types of injuries than on the overall injury rate. This result suggests that regulation may not be the most appropriate method of dealing with certain risks to workers' safety. Similarly in the case of research conducted in the US, Weil (1996) argued that total-industry intervention measures are problematic as they may pick up shifting focuses of Occupational Safety and Health Administration's enforcement rather than the underlying degree of compliance among firms. Therefore, one could argue that the weak evidence given by many of these papers of the positive impacts of inspections on injury rates is effectively even weaker than first thought.

Finally, a paper by Klick and Stratmann (2003) can be seen to ignore the focus of the vast majority of research in this area and rather than estimate the impact of inspections on workplace injury rates in the US, they take occupational fatality rates to be their dependent variable. The authors also criticise the use of panel data techniques, the method used by Scholz and Gray (1990), Gray and Scholz (1993) and Gray and Mendeloff (2005), as this approach will not solve the simultaneity problem if the unobserved variables change over time. In order to correctly account for this the authors estimate the effect of OSHA inspections on occupational fatality rates using instrumental variable (IV) estimation. The model estimated provides a counter-intuitive result, similar to that found by Viscusi (1978) that was previously described as a moral hazard problem.

Klick and Stratmann (2003) found that increased safety regulation actually increased the occupational death rate over the period 1992 - 2001 for which they have estimated the model. This result highlights the need for researchers and policy makers to develop a better understanding of the relationship between occupational health and safety activities and injury rates. Research to date has largely shown there to be a likely reduction in injury rates as a result of increased inspection rates and that penalties act as a strong incentive for firms to maintain a safe work environment. However, over time this relationship has been shown to have broken down and an increasing number of researchers have begun to question the usefulness of Health and Safety activity in the US, and of the relevant authorities in Canada, as a general response to addressing workplace issues of Health and Safety.

Unfortunately it is not possible to assess or compare the effects of Occupational Health and Safety activity in Ireland, or indeed in Europe, as there does not exist a time series of reliable data that has previously allowed such an analysis to be undertaken. As a direct consequence of this there is a dearth of empirical research on this topic in Europe (DKM, 2004). The failure to collect the relevant data to enable such research at European level has been highlighted by both the European Agency for Safety and Health at Work (2003) and previously by Mossink (1999).

### 8.3.2 Econometric Analysis

#### *Data*

As has already been noted the availability of data is a major impediment to research in this area both in Ireland and at European level. Datasets which are publicly available for this purpose in Ireland have been found to be both inconsistent and incomplete, thus providing a further difficulty for research in this area and ultimately limiting both the quantity and quality of studies in this area.

Using the best available data from the Health and Safety Authority on workplace inspections and occupational fatalities, published in their annual reports, and information on employee injuries and employment numbers taken from the CSO's Quarterly National Household Survey (QNHS), we have constructed a parsimonious industry level dataset. The dataset, although not complete for all variables, contains annual industry aggregated data on seven broad industry groups over the period 1995 - 2004. The industry groups, classified by NACE category, included in the analysis are the following;

- A-B - Agriculture, Forestry and Fishing;
- C-E - Other Production Industries;
- F - Construction;
- G - Wholesale and Retail;
- H - Hotels and Restaurants;
- I - Transport, Storage and Communications; and;
- L - Public Administration, Defence and Social Security.

In the analysis we use median rather than the mean where appropriate. The median value corresponds to cumulative percentage of 50% (i.e., 50% of the values are below the median and 50% of the values are above the median). The median value of a variable may be used in place of the mean where the outliers in the data may positively or negatively skew the mean value. If there are unrepresentatively high or low observations in a data set, the median value will not be altered by these outliers, because it is only dependent on the value of the middle observation. The mean will include all outliers, and as a result may not be as representative a measure of the standard value as the median.

## Model

The basic approach we adopt to estimate the impacts of health and safety activity in Ireland is largely based on the model estimated by Scholz and Gray (1990). This approach has been widely used in the literature and was found by Gray and Scholz (1993) to resolve the problem of endogeneity in the independent variables. It has been necessary to adjust a number of features of this model to apply it to our data, due to the data being industry level aggregate data rather than plant level data, as was the case in the previous studies. The effect of this is to greatly reduce the number of observations in the dataset thus limiting the number of explanatory (independent) variables we can include in the model. The model that forms the basis for our analysis is contained in Figure 8.6.

**Figure 8.6: Basic Econometric Model**

$$\Delta \ln \text{Injury3Rate}_{it} = \beta_0 + \beta_1 \Delta \ln \text{InspRate}_{it} + \beta_2 \Delta \ln \text{InspRate}_{it-1} + \beta_3 \Delta \ln \text{InspRate}_{it-2} + \beta_4 \Delta \ln \text{Emp}_{it} + \beta_5 \text{Industry}_i + \beta_6 \text{Year}_t + e_t$$

Source: Scholz and Gray (1990), *Indecon*.

The dependent variable in this regression equation is the first difference (given by  $\Delta$ ) of the log of the rate per 100,000 workers of serious injury (injury that cause absence from work of more than 3 days), *Injury3Rate*. The reason we use the first difference has previously been discussed and we have chosen to convert all relevant variables to logs as this provides for a unit free analysis of the variables that will provide estimates of the effects in percentage terms. This approach facilitates easy interpretation of the effects but the estimation of the model in level form also yields results consistent with those found under this specification.

The rate of workplace inspections carried out by the Health and Safety Authority, per 1,000 workers, is included as an independent variable in the regression equation (*InspRate*). Unlike the Scholz and Gray (1990) approach, where inspections entered in as a dummy variable in the regression equal to one if a plant had an inspection in a specific period and zero otherwise. It is not possible to follow this approach with industry level data and therefore we have included the rate of inspections in a specific industry (*i*) in any one year (*t*) and have transformed this variable into the first difference of the log of the variable for reasons already outlined. Two period lags of this variable are also included in the regression equation to allow for changes in health and safety activity in previous years to have an impact on the rate of serious occupational injuries in subsequent years. As a prior to the estimation of the regression equation, one would expect these variables to be negative, thus to reflect a fall in the rate of serious injury as a result of an increased level of health and safety activity.

The use of injury and inspection rates as the dependent and independent variables in the regression equation is regarded as the most appropriate measure of these variables as changes in the level of occupational accidents may be wrongly interpreted if changes in the number of people employed in that sector are not similarly factored into the analysis. Similarly the impact of a 20% increase in the number of inspections in an industry can only be correctly interpreted if one accounts for the growth of the industry itself, it is possible that the increase in the number of inspections will not affect the rate of inspections per 1,000 workers if the industry is growing at a similar rate.

Also included in the regression equation is a variable to measure changes in industry workforce experience ( $\Delta \ln Emp$ ). This variable measures the change in the employment numbers within an industry (*i*) at time (*t*). One might expect increases in this variable to increase the injury rate, as it represents the introduction of new inexperienced workers that could be regarded as more likely to suffer and accident in the workplace. We also include a time and industry specific dummy variable to capture systematic industry and year effect otherwise not captured by the remaining independent variables. The final term *e* is a “white noise” error term, common to all regression equations of this type.

Further to the regression equation contained in Figure 8.6, we have also conducted analysis using the occupational fatality rate (of fatalities reported to the Health and Safety Authority) as the dependent variable (*RepFatalRate*). This variable has been subject to the same transformation as the injury rate and as such presents a comparison between the expected impact of health and safety activity on serious injury and occupational fatality rates. In accordance with the approach adopted in Gray and Mendeloff (2005), we have also estimated an analogous set of equations wherein we replaced the inspection rate and its lags with a ratio of penalty inspections (*Penalty*) to the total number of inspections in industry (*i*) at time (*t*). The results of the estimation of these regression equations are contained in the following section.

## **Results**

In general, the results generated from the estimation of the four key regression equations described in the previous section are consistent with those found most recently by Gray and Mendeloff (2005) in the US. A greater incidence of penalty inspections can be expected to have a greater impact on the rate of both worker injuries and worker fatalities than can similar increases in overall inspection activity. However, the impact of both penalty and total inspections are not found to be statistically significant in this case, a result also found by Gray and Mendeloff (2005) as well as in earlier work using industry level data by Viscusi (1978).

The first set of regression equations estimated considered the impact of the rate of total inspections (*InspRate*) on the rate of serious injury (*Injury3Rate*). From the results presented in Table 8.1 one can see the coefficient on the inspection rate, and its lags, provide limited support for the counter-intuitive impact that an increase in the rate of inspections can be expected to bring about an increase in the rate of serious injuries. Over a three year period an annual increase in the inspection rate of 10% is estimated to increase the rate of serious injuries by 2%.

However, if one considers the impact of an increase in the relative number of inspections leading to the imposition of a penalty, the cumulative impact of a similar increase in the ratio of penalty inspections can be expected to reduce the rate of serious injuries by 1.7%. As has already been noted, these figures are not statistically significant and therefore one must be careful when interpreting them and should only regard the result as a likely indication of the possible impacts.

An analogous set of regression equations were estimated using the rate of occupational fatalities as the dependent variable. The results of these regressions are included on the right hand side of Table 8.1. The results of these regressions provide information on the likely impact of increased inspection rates on the occupational fatality rates in Ireland. The results suggest that the impact on worker fatalities shall be greater than those estimated in relation to serious worker injury rates. The results of these regression equations are also more closely aligned with our prior view on the expected impact of increased health and safety activity.

If one considers the expected cumulative impact of an increase in the rate of general inspection of 10% over the current and previous year, the model estimates that this can be expected to bring about a 1.4% decrease in the rate of worker fatalities in the current year. This impact increases to an estimated reduction in worker fatalities of 3.4% if considers a similar increase in the rate of penalty inspections. We have chosen to only consider two periods of a cumulative impact in relation to these regression equations given the considerable size of the estimated coefficients on the third year in these regressions. It is not considered plausible that the effect of actions two years previous will have such an effect on worker and firm behaviour and as such is disregarded. Once again however the impact of Health and Safety activity is not found to be statistically significant.

**Table 8.1: Estimated Impact of Health and Safety Activity on Workplace Injuries and Fatalities, 1995-2004**

	Dependent Variable			
	<i>Injury3Rate</i>	<i>Injury3Rate</i>	<i>RepFatalRate</i>	<i>RepFatalRate</i>
<i>Constant</i>	-0.202 (-1.55)	0.650 (4.34)	-0.412 (-1.22)	0.224 (0.52)
<i>InspRate<sub>t</sub></i>	0.087 (1.33)	- -	-0.169 (-0.57)	- -
<i>InspRate<sub>t-1</sub></i>	0.129 (1.42)	- -	0.034 (0.10)	- -
<i>InspRate<sub>t-2</sub></i>	-0.010 (-0.09)	- -	0.256 (1.00)	- -
<i>Penalty<sub>t</sub></i>	- -	-0.108 (-0.72)	- -	-0.401 (-1.34)
<i>Penalty<sub>t-1</sub></i>	- -	-0.089 (-0.65)	- -	0.058 (0.21)
<i>Penalty<sub>t-2</sub></i>	- -	0.025 (0.27)	- -	-0.207 (0.52)
<i>Emp</i>	1.029 (0.91)	0.794 (0.65)	-0.997 (-0.28)	-0.308 (-0.10)
<i>Industry</i>	No	No	No	No
<i>Year</i>	No	No	No	No
<i>R<sup>2</sup></i>	0.8917	0.8739	0.2589	0.2925
<i>Obs</i>	28	28	40	40

Note: *t*-statistics are in parentheses.

Source: Indecon analysis

It is important to note that this does not imply that the analysis has failed to produce a result, the estimation of coefficients that are not statistically significant is a result and in the case of this study the result mirrors that of Gray and Mendeloff (2005) which conducted a similar analysis with better data in the US over a similar period. A significant limitation on the analysis carried out above is the availability of data: improvements in the amount and detail of data available is likely to improve the statistical significance of the results presented above, which provide for the estimated impact of Health and Safety activity in Ireland on worker injury and fatality rates, given the available data on a number of important sectors in the economy.

Instead of adopting a sectoral approach to the estimation it is possible to conduct an economy wide econometric estimation of the likely impact of an increase in overall health and safety activity on worker injury and fatality rates. This more general approach places more onerous constraints on our model than before due to the small sample size but a number of regression equations have been found to present statistically significant results.

In line with this more general approach we have estimated the overall expected impact of an increase in the rate of injury investigations carried out by the Health and Safety Authority on the rate of serious occupational injuries suffered by workers. Our analysis estimates that an annual increase in the rate of injury inspections of 10% is expected to have an overall cumulative impact of reducing the rate of serious injuries in workers by 6.1%, at a 5% level of statistical significance.

Similarly, we have estimated that a similar increase in the rate of investigations leading to penalties being imposed is expected to bring about a 9.6% reduction in the rate of serious worker injuries. The results of these regression equations indicate that there are substantial health and safety benefits accruing from enhanced rates of enforcement. However, one should exercise caution in relation interpreting these variables as although they are statistically significant they are based on a small sample size and would benefit from the availability of more and better data. It is also possible that there is some degree of endogeneity remaining in these regression equations as the omission of time varying dependent variables correlated with the independent variables is not corrected by first differencing. As discussed in Klick and Stratmann (2003) this issue can only correctly be remedied through the use of an instrumental variables (IV) approach, however due to the data constraints in relation to available in Ireland, this is currently not a viable approach.

## 8.4 Recommendations on Data Availability

Given the limitations on this analysis posed by the current level of data available, and collected, in relation to this topic it is recommended that a thorough review of data availability is undertaken and subsequently improved upon in order to facilitate the use of more detailed econometric analysis of the impacts of Health and Safety legislation on workers in Ireland, as part of future studies. In accordance with international best practice such as that already undertaken in Canada and the US, where it first emerged in the 1970s, it is recommended consideration be given to the establishment of a longitudinal plant-level data set.

The data set should be compiled for each industry, where the classification of industry follows that already employed by the CSO, or for a selection of industries deemed to be of key importance by the Authority. The plants included in the data set should be a sample of the industry total and be made up of firms willing to remain involved in the process for the remainder of its duration, this is recommended to be at least five years. A recent study by Gray and Mendeloff (2005) used a data set that contained the survey responses of 8,161 plants in 29 States, over three years, across all large industry categories. Such a regional dimension would not be required in the Irish case unless the Authority regards there to be such differences.

The method of sampling the firms should reflect the objective of the Authority, it may be deemed more important to assess the impacts of Health and Safety legislation on large firms in which case stratified sampling may be employed. Alternatively, it may be decided to focus on small plants or to implement a random sample of all plants. Plants should be surveyed annually and should be asked to provide information on the following;

- The size of the plant/firm, including the number of employees, the number of hours worked and wage rates, as well as the firms/plants turnover.
- The primary activity of the plant/firm and the level of Health and Safety activity in the plant/firm during the preceding year, including the cost of any capital investment or current expenditure on Health and Safety measures.

It could also be considered that the Authority would have a number of further obligations in relation to the collation of this longitudinal plant-level data set. The Authority could be required to collate information in relation to its activities vis-à-vis the plants contained in the sample. This would include maintaining an annual data set that could be matched to the survey responses of the firms on a number of issues, including;

- The number and type of inspections carried out on each of the plants/firms contained in the data set, as well as any such fines or penalties that resulted from the inspection.
- The number of workplace injuries, including their duration, as well as the number of fatalities reported to the Authority by the constituent plants/firms of the data set. Also the number of reported workplace accidents and the resulting action taken by the Authority.

The collation of this longitudinal plant-level data set could allow for Ireland to undertake an econometric analysis the impact of Health and Safety legislation akin to those that have been undertaken previously in the US and Canada, in accordance with international best practice and thus place Ireland at the forefront of this issue in Europe. However, the collation of this plant-level panel data set should be part of a wider data collection exercise designed to facilitate the use of further analysis of policy developments in the area of Occupational Health and Safety.

A complete industry level data set should be collated and compiled by the Authority as much of the information required is either already available or can be gathered through the existing Authority processes. Once again to facilitate more in depth analysis the Authority should ensure that the data collected can be reconciled with industry-level data sets already compiled by the CSO. This data set should include all of the information the Authority has been recommended to collect in relation to plants in the longitudinal plant-level data set, already discussed, such as the number and type of inspections, those that result in penalties/fines and the size of the penalties/fines. It should also include the number of workplace accidents, injuries and fatalities specific to each industry.

The completion of a pooled time-series and cross-sectional industry-level data set, containing annual data, such as that outlined above for each industry in the economy, over a five year period would allow for a more detailed analysis of a number of issues relating to Health and Safety in Ireland, the results of which would contribute to a the pool of research literature on the topic both in Ireland and the EU. The completion of a longitudinal plant-level data set could advance the potential for econometric analysis to contribute a significantly greater amount of guidance to future policy as well as being comparable to the latest research adhering to this standard of international best practice.

We are aware of the cost implications of collecting such datasets but we believe that it could assist policy-makers in assessing the effectiveness of policies and lead over time to improvements in policy development.

## **8.5 Conclusions**

From the information presented one can see that both the worker fatality and injury rates have fallen over the period under this review. This period of improved working conditions has coincided with an increase in health and safety activity in Ireland, as measured, for example, by the number of inspections carried out by the Health and Safety Authority annually.

There are some econometric results suggesting a link between these improved accident rates and Health and Safety activity. However, one should exercise caution in relation interpreting these variables.

Finally, given the limitations on this analysis posed by the current level of data available, and collected, in relation to this topic it is recommended that a thorough review of data availability is undertaken and subsequently improved upon in order to facilitate the use of more detailed econometric analysis of the impacts of Health and Safety legislation on workers in Ireland, as part of future studies. In accordance with international best practice such as that already undertaken in Canada and the US, where it first emerged in the 1970s, it is recommended consideration be given to the establishment of a longitudinal plant-level data set.

## 9 Conclusions

We have undertaken a detailed examination of each of the issues in the terms of reference using a variety of different research techniques. Having regard to the caveats discussed above, we offer the following conclusions:

### **Issue One: Costs of Work-Related Accidents and Ill-Health**

We have undertaken two broad approaches to estimating the costs of work related accidents and ill-health for Ireland. The first is a top-down approach using a combination of aggregate data for Ireland and international evidence. The second approach involves a detailed assessment of accidents and assigns costs to different elements.

The overall share of occupational injury and illness costs in a typical developed country economy is large – approximately 2-4% of national income but there is considerable uncertainty and it would be prudent to adopt an estimate towards the lower bound. We assume average costs of approximately 2.5 % of national income based on a review of the international studies. This is a conservative estimate reflecting our concern that a number of these studies may overestimate costs. In today's terms (GNP estimated at €134,190m) this is equivalent to circa €3.3 billion for Ireland.

The second approach is a micro approach which estimates the costs of specific elements using Irish data where possible. The main cost of accidents and ill-health to society is the lost output due to both the temporary and more permanent absences from the workforce. Accidents and ill-health reduces the size of the labour force with a resultant reduction in the economy's potential output. Other significant costs include insurance and health costs.

The cost of more permanent absences from the labour force is the most significant element of the cost. Estimating the number of people not in the labour force due to injury and illness is difficult. We use the data based on the number of people not in the labour force due to work-related injuries and illness. Based on the available data it is estimated that there are 34,100 persons not in the labour force due to illness or occupational injury. This could be taken as a proxy for long-term absences from the workforce and, with some caveats, could be used as an input to estimating those costs to the economy. Hence, based on the standard labour force survey data circa 34,000 persons are not in employment due to work-related illness/injury – if one assumes that 75% of this is actually work-related this could involve a cost to the economy of €0.825 billion per annum. These estimates are subject to uncertainty but economic costs are clearly significant.

CSO data for 2004 on disability and longstanding health issues indicate that circa 10% of the population fall into this category. This equates to 274,200 people and 164,300 are not in employment. While only a percentage of this number may be work-related injury, this number and the estimated lost output could be significant. Assuming half is work-related involves circa 82,000 people – this could involve a cost to the economy of circa €2.3 billion, which is higher than other estimates.

Hence, two different measures of permanent absences from the labour force suggest a cost to the economy of between €0.825 billion and €2.3 billion per annum. We assume a cost of lost output of €1.8 billion. International evidence suggests that other costs such as insurance and health could amount to the same again at €1.8 billion and Irish evidence indicates insurance costs of €1.2 billion which is broadly consistent with this. Accordingly, the bottom-up approach suggests costs of circa €3.6 billion, which is equivalent to just over 2.5% of national income. There are uncertainties around this estimate but it is clear from the available evidence that the costs of work-related accidents and ill-health are significant.

### **Issue Two: Benefits of Health and Safety Legislation**

The 1989 Act was a significant piece of legislation which changed the nature of Health and Safety in Ireland. There has been a reduction in work-related accidents and injuries as set out in this report and this period of improved working conditions has coincided with an increase in health and safety activity in Ireland. This is shown by measures such as the number of inspections carried out by the Health and Safety Authority annually.

One must be careful however not to assume that this increased activity that has led to the fall in worker injury and fatality rates, as a simple correlation of the variables does not allow us to conclude such a result. However, there are some econometric results suggesting a link between improved accident rates and health and safety activity. This suggests that the legislation has been effective at increasing health and safety awareness and reducing accident rates. One should exercise caution in interpreting these variables. Nevertheless, this result is consistent with the views of practitioners, survey evidence and the international research on health and safety.

The international review also suggests that Health and Safety policies in Ireland increasingly matches best international practice.

### **Issue Three: Impact on Business Costs and Competitiveness**

The common perception that health and safety measures are a cost to business rather than an investment has shifted somewhat. On the whole employers believe that the benefits of regulations equal or outweigh the costs of compliance and the impact on competitiveness may not be significant.

The key findings of the construction industry survey for this study suggested that a majority of firms put the cost at below 3% of annual labour costs and we estimate the median cost for firms to be over 2% of annual labour costs in the construction sector. We estimate the median cost for this for industry as a whole at about 1%.

Overall the majority of firms believe that there has been a net benefit for their business arising from Health and Safety legislation. The legislation certainly imposes a cost but it also brings substantial benefits in terms of a reduction in the cost of accidents and insurance costs.

## Annex 1 Additional Data

### Number of Days Lost to Occupational Injury and Illness and Rates Per Worker and Rates Per Incident by Economic Sector, 2002, CSO

	A-B	C-E	F	G	H	I	J-K	L	M	N	O	Total
<b>Number of days lost (thousands)</b>												
Due to injury	48.0	131.3	99.4	69.6	33.4	57.5	23.4	52.5	13.5	62.4	19.5	610.4
Due to illness	81.2	88.6	97.0	84.3	33.4	54.1	43.5	44.0	28.6	93.4	27.8	675.7
<b>Total</b>	<b>129.1</b>	<b>219.9</b>	<b>196.4</b>	<b>153.9</b>	<b>66.8</b>	<b>111.6</b>	<b>66.8</b>	<b>96.5</b>	<b>42.0</b>	<b>155.8</b>	<b>47.2</b>	<b>1286.1</b>
<b>Number of worker (thousands)</b>												
	114.3	303.2	188.5	252.3	110.5	110.9	226.6	88.6	115.0	165.7	96.3	1772.0
<b>Days lost per worker</b>												
Due to injury	0.4	0.4	0.5	0.3	0.3	0.5	0.1	0.6	0.1	0.4	0.2	0.3
Due to illness	0.7	0.3	0.5	0.3	0.3	0.5	0.2	0.5	0.2	0.6	0.3	0.4
<b>Total</b>	<b>1.1</b>	<b>0.7</b>	<b>1.0</b>	<b>0.6</b>	<b>0.6</b>	<b>1.0</b>	<b>0.3</b>	<b>1.1</b>	<b>0.4</b>	<b>0.9</b>	<b>0.5</b>	<b>0.7</b>
<b>Number of incident (thousands)</b>												
Injury	3.6	8.2	7.5	5.0	3.3	2.7	3.0	1.8	1.5	4.4	2.0	43.1
Illness	4.8	5.6	4.5	4.1	1.9	2.7	3.9	1.9	2.7	4.4	1.7	38.1
<b>Total</b>	<b>8.4</b>	<b>13.8</b>	<b>12.0</b>	<b>9.1</b>	<b>5.2</b>	<b>5.4</b>	<b>6.9</b>	<b>3.7</b>	<b>4.2</b>	<b>8.8</b>	<b>3.7</b>	<b>81.2</b>
<b>Days lost per incident</b>												
Injury	13.3	16.0	13.2	13.9	10.1	21.3	7.8	29.2	9.0	14.2	9.7	14.2
Illness	16.9	15.8	21.6	20.6	17.6	20.0	11.1	23.1	10.6	21.2	16.3	17.7
<b>Total</b>	<b>15.4</b>	<b>15.9</b>	<b>16.4</b>	<b>16.9</b>	<b>12.8</b>	<b>20.7</b>	<b>9.7</b>	<b>26.1</b>	<b>10.0</b>	<b>17.7</b>	<b>12.8</b>	<b>15.8</b>

Source: Health and Safety Authority

**Reported Fatalities and Fatality Rates per 100,000 Workers Excluding Road Traffic Accidents by Employment Status, 1999-2002, Health and Safety Authority**

	<b>Employment status</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
<b>Fatalities</b>	Employee	37	27	29	35	37
	Self-employed	19	31	19	15	16
	Family worker 15+	0	0	4	0	-
	<b>Total</b>	<b>56</b>	<b>58</b>	<b>52</b>	<b>50</b>	<b>53</b>
<b>Number of workers</b>	Employee	1,287,600	1,355,600	1,406,400	1,440,000	-
	Self-employed	283,100	293,500	291,900	293,900	-
	Family worker 15+	20,400	21,600	18,200	16,000	-
	<b>Total</b>	<b>1,591,100</b>	<b>1,670,700</b>	<b>1,716,500</b>	<b>1,749,900</b>	<b>-</b>
<b>Rate per 100,000</b>	Employee	2.9	2.0	2.1	2.4	2.6
	Self-employed	6.7	10.6	6.5	5.1	5.4
	Family worker 15+	0.0	0.0	22.0	0.0	-
	<b>Total</b>	<b>3.5</b>	<b>3.5</b>	<b>3.0</b>	<b>2.9</b>	<b>3.0</b>

*Source: Health and Safety Authority*

**Standardised Fatality Rates per 100,000 Workers Excluding Road Traffic  
Accidents for 9 Sectors of EU Member States, 2000, Eurostat**

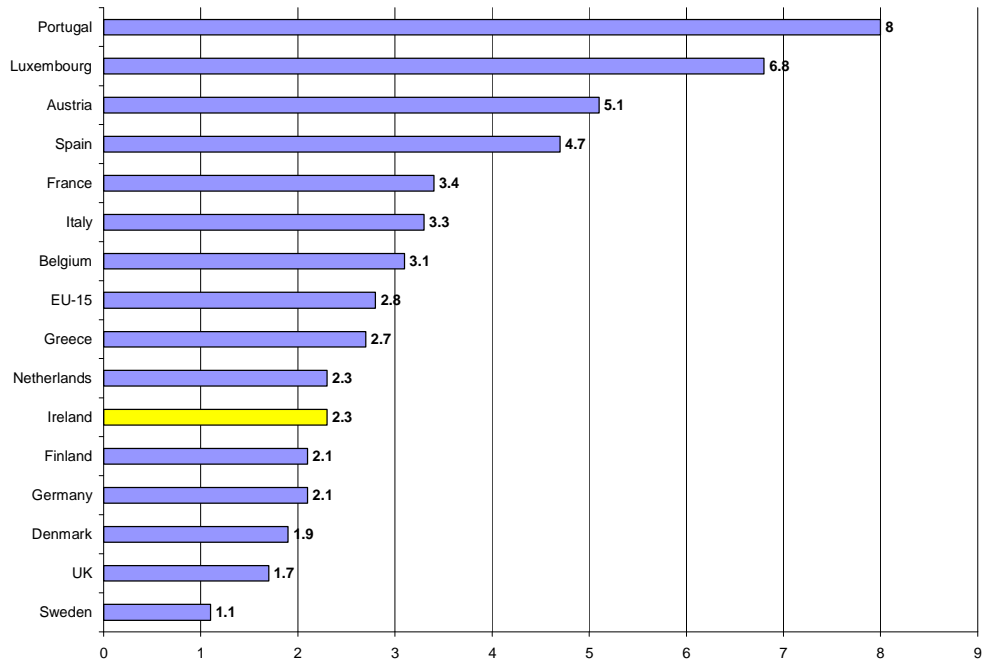
	Employment ('000)	Fatal Accidents	Standardised Rate
Austria	2,713	146	5.1
Belgium	2,021	56	3.1
Denmark	1,738	31	1.9
Germany	24,356	455	2.1
Greece	1,352	36	2.7
Finland	1,604	31	2.1
France	13,119	375	3.4
Ireland	978	21	2.3
Italy	14,952	469	3.3
Luxembourg	207	11	6.8
Netherlands	4,334	76	2.3
Portugal	3,200	256	8
Spain	9,662	415	4.7
Sweden	2,587	25	1.1
UK	18,728	228	1.7
EU-15	101,551	2,631	2.8

*Source: European Social Statistics 1994-2000*

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### International rates of worker fatalities 2002

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Source: Health and Safety Authority