An investigation into the official data sources and collection methods used to capture selected work-related death statistics in the Republic of Ireland.

A report prepared for the Department of Enterprise, Trade and Employment and the Health and Safety Authority by the School of Public Health and Population Science, Centre for Safety and Health at Work, University College Dublin.

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An investigation into the official data sources and collection methods used to capture selected work-related death statistics in the Republic of Ireland: work-related road traffic fatalities and deaths from occupational cancer.

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EXECUTIVE SUMMARY

Every death that occurs in, or associated with, a workplace is an unacceptable tragedy. One would expect that it should be easy to quantify the number of persons who die as a result of workplace accidents or from a work-related disease, however this is not always the case. There are two particular types of work-related death where it is suspected that the number of deaths may be underestimated: work-related road traffic fatalities and deaths that result from occupational cancer. This report explores the issues that contribute to the lack of certainty in these two circumstances and examines the data collection systems that currently contribute to our statistics.

Chapter 1 outlines the gravity of the problem of fatalities on Irish and European roads and describes the direct or indirect role played by a variety of organisations in collecting data that helps to monitor the extent of the problem. The data sources for work-related road traffic deaths are identified and the data collection methodologies are examined. The chapter reviews research on the data collection processes used to determine the extent of this problem in the United Kingdom, the United States of America, Australia and New Zealand. A review of the literature on the experience in these countries shows that official statistics on work-related road traffic fatalities from individual official sources are often incomplete for a variety of reasons, including under-reporting, non-recognition due to the definitions used, case identification issues, and lack of detail due to the different agendas of data collection agencies. Estimates of the true number of work-related road traffic fatalities abroad are based on research that uses multiple sources, and - despite the findings in these countries that road traffic accidents comprise one of the largest categories within work-related fatalities and that a large percentage of persons involved in road traffic fatalities are at work at the time - it is considered that the full extent of the problem is probably still underestimated. This chapter includes the results of a small pilot study carried out to explore the differences between the work-related road traffic fatality data on record from three official sources, in Co. Kildare, in a three-year period. It finds that the number of work-related deaths from road traffic collisions (8) in the Coronial files was double that of fatal injuries at work reported to the Health and Safety Authority (4) in the period studied, and that more than one third of the work-related fatal road traffic collisions on the coronial files involved someone who was at work at the time. Consequent to examination of the data collection process, the literature review and the pilot study, recommendations are made that will facilitate future assessment of the true extent of this problem.

Chapter 2 describes the challenges to identifying cases of death from work-related cancer and explains why the number of cases of occupational cancer is estimated rather than quantified. The commonly accepted method used to estimate the proportion of cancer mortality that can be attributed to occupation is explained, and recent work, which argues that this methodology is inappropriate and out of date, suggests that the generally accepted fraction of cancer mortality attributed to occupation should be used with caution. The means by which Irish cancer incidence and mortality data are collected is described and the data-collection role of Irish organisations and agencies involved, to any degree, in the collection of data, directly or indirectly, related to occupational cancer is outlined. Due to the difficulties associated with identifying occupational cancer in the first instance, quantification of work-related cancer deaths is impossible, however recommendations are made that could improve our knowledge of the extent of the problem, and our ability to estimate the occupational fraction, in the future.

CONTENTS

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- National Cancer Registry of Ireland,
- National Roads Authority,
- Road Safety Authority,
- Superintendent Registrar's Office.

A list of individuals interviewed or consulted is provided in Appendix 3.

PREFACE

In the Republic of Ireland, work-related injury fatality statistics are compiled by the Health and Safety Authority (HSA), which gathers this information from self-reports from employers, self-employed persons, and from data forwarded from state authorities, such as An Garda Síochána, and from the Coroners' offices. Mortality rates from occupational disease are more difficult to capture and rely on a number of sources.

Studies in other countries have shown that the true extent of work-related deaths, particularly in the areas of deaths resulting from road traffic collisions and occupational cancer, is not reflected in official statistics because of limitations in data collection systems. The data collection systems in Ireland are not radically different to those in other countries, and it is known that all Irish work-related deaths are not currently captured by any single data collection system, and are therefore not easily quantified. It has been suggested that the 50 to 70 fatal accidents reported to the HSA each year represent only one aspect of those who die as a result of work activity, and that the true level of occupational fatalities may be a multiple of that revealed by the accident figures reported annually by the HSA (Mulligan, 2005a and 2005b).

The aims of this project are to:

a) Identify the sources used to collect data on work-related road traffic fatalities, and on deaths resulting from occupational cancer, in order to examine the systems in place for collection of data and generation of related statistics.

b) Identify gaps and make recommendations for improvement of the systems, if appropriate.

Arrangement of this report

Because the data collection systems for work-related road traffic fatalities and for occupational cancer deaths are quite different, this report explores the data collection systems in two separate chapters. In each chapter, a brief profile of the roles and relevant functions of a variety of national organisations is provided, the data sources and the data collection systems currently in place are described, and the background to the problem is outlined, using relevant national and international literature sources. Findings are discussed and suggestions for future action are made.

Note

Terminology used to describe road traffic collisions varies from country to country, with the following range of terms being used in varied combinations: motor-vehicle, road traffic, collision and crash. It should be noted that motor vehicle collisions or incidents do not necessarily take place on the road. To avoid confusion, in this report, the terms 'road traffic collision' and 'road traffic fatality' are used where possible throughout, however, the exact terminology used by authors of relevant reports is used when quoting, or when referring directly to, their findings.

CHAPTER 1 WORK-RELATED ROAD TRAFFIC FATALITIES

1.1 INTRODUCTION

Road transport is the leading cause of death for EU citizens aged 45 and under, and kills about 130 persons per day, with approximately 43,500 people killed on European roads in 2004 (European Transport Safety Council, 2006). Scallan et al (2004) found motor vehicle traffic accidents to be the leading cause of unintentional injury death in Ireland. In 2004, 374 persons were killed on Irish roads (National Roads Authority, 2005) and 399 were killed in 2005 (Garda National Traffic Bureau, 2006).

Each week the national media report the fatalities resulting from road traffic collisions on Irish roads, and attempt to give a sense of the physical and psychological trauma visited on families and communities by these tragic incidents. The deaths and morbidity resulting from such incidents are deemed unacceptable, and there are a variety of strategies, in place and under development, at national and international level, which aim to reduce the number of collisions on the roads (Department of Transport, 2004). These strategies include carrying out research that will improve our understanding of the factors that place persons at risk.

It is not currently known exactly how many Irish road traffic collisions involve persons at work. It is known that a wide range of employees drive for a living (drivers who collect and deliver goods, sales personnel, taxi-drivers, emergency and public service employees, transport workers, for example) and that other employees work close to public roads and are at risk as pedestrians (construction workers, service and maintenance workers) or as passengers in vehicles in the course of their work. It is also known that a number of collisions involve small and large goods vehicles. Road transport is the dominant mode of moving goods in Ireland (about 93%) and is thought likely to remain so in the future (Department of Transport, 2005).

This section of the report describes the extent of the problem of road traffic fatalities in the Republic of Ireland, outlines the role and functions of the main organisations and agencies involved, and describes how data on road traffic fatalities, and work-related road traffic fatalities in particular, are collected in the Republic of Ireland. It examines the issues that have been the focus of research on work-related road traffic fatality data collection in other countries and summarises the lessons that can be learned from their experience. Finally it explores whether all work-related road traffic fatalities are being identified by the current data-collection system.

1.2 ROAD TRAFFIC DEATHS: THE EXTENT OF THE PROBLEM

Road traffic injuries, and their prevention, are a growing global public health issue (World Health Organisation [WHO], 2004). Prevention strategies, such as the enforcement of legislation to control speed and alcohol consumption, the use of seatbelts and crash helmets, and the safer design of roads and vehicles have significantly reduced the incidence and impact of road traffic collisions in high-income countries. Prevention strategies are based on collaborative approaches from agencies involved in enforcement, planning, infrastructure, health and research. Despite international and national efforts, the scale of the problem remains large. In order to address the problem, it is necessary to understand it, and data on the incidence and types of crashes, and the circumstances surrounding incidents is necessary to guide prevention interventions. Nationally and internationally, data on road traffic collisions are collected in order to develop focused strategies to reduce the incidence of collisions and to evaluate

the effectiveness of interventions. International comparisons are limited by differences in definitions and collection methodologies, but fatality rates can be relatively easily compared.

The WHO estimates that 1.18 million people died from road traffic collisions in 2002: this is an average of 3,242 deaths per day, and that 127,000 persons lose their lives in the European region annually as a result (Racioppi et al, 2004). International and national statistics provide analyses of road traffic collisions from a variety of perspectives, but it is rare to see any reference to the 'work-relatedness' of collisions. It general, it is quite simply not known how many road traffic collisions are work-related. Even in countries where work-relatedness is factored into data collection, underestimation remains an issue. The reasons for this are explored in greater detail later in this chapter.

In Ireland, 374 people were killed in road traffic collisions in 2004, 399 in 2005 and 200 people were killed in the first six months of 2006 (Garda National Traffic Bureau, 2006). Tackling the unacceptable level of fatalities on Irish roads involves the collaboration of many organisations and groups. Brett (2006), CEO of the new Road Safety Authority, stresses that the continuing rise in the number of road deaths in Ireland since 2003 is a cause for concern and highlights the need for all of the agencies involved in road safety to increase the scale and extent of initiatives already planned under the National Road Safety Strategy. A High-level Group on Road Safety monitored the current, and previous, Government strategies. The group is chaired by the Department of Transport, and includes representation from major stakeholder groups: The Department of Transport and its agencies (the National Safety Council and the new Road Safety Authority, and the National Roads Authority), An Garda Síochána, the Irish Insurance Federation, the Department of Justice, Equality and Law Reform, and the Medical Bureau of Road Safety. The first Government Road Safety Strategy (1998), '*The Road to Safety 1998 – 2002'* facilitated a collaborative approach to road safety from all the relevant agencies. This strategy included targets on speeding, seat belt wearing, driving under the influence of alcohol, and engineering strategies. The second Government Strategy for Road Safety (2004) '*Road Safety Strategy 2004 – 2006'* again advocated a strategic approach, which has been summarised as "Education, Engineering or Enforcement", and which requires the ongoing collaboration of the relevant agencies. The Road Safety Authority (RSA), formally established on 1 September 2006, will prepare the next Road Safety Strategy

1.3 WORK-RELATED ROAD TRAFFIC FATALITIES: IRISH DATA COLLECTION AGENCIES

A brief profile of those organisations that have a direct or indirect role in the collection of road traffic collision data, including their role in respect of work-related road traffic collisions, follows. A brief profile of the role of the Coroners' Offices is also included.

1.3.1 Department of Transport

The overall objective of the Department of Transport is to provide, within the framework of a balanced and integrated transport policy, for the safe, efficient and cost effective movement of persons and goods by road. Implementing agencies include the National Safety Council (NSC) and the National Roads Authority (NRA). The new Road Safety Authority was established under the aegis of the Department of Transport in September 2006, and will take over all of the functions of the NSC and some of the functions of the NRA. (http://www.rsa.ie/).

1.3.1.1 National Safety Council

The National Safety Council was established in 1987 and one of the objectives was promoting Road Safety awareness in Ireland (http://www.nsc.ie/). Under the Government Strategy on Road Safety, the role of the NSC is one of education (Brett, 2006). Partnerships with emergency services, local authorities, commercial organisations and voluntary bodies are an active part of the work of the council. The Council implements education programmes, media campaigns and community activities, and runs conferences and seminars, with the aim of positively influencing public attitude and behaviour in relation to road and fire safety issues. Road safety officers, employed by the County Councils, work closely with the NSC. The road safety functions of the NSC are now being subsumed into the new Road Safety Authority (RSA). A wide range of road safety awareness publications are available on the NSC/RSA website, however none specifically target work-related driving issues.

1.3.1.2 National Roads Authority

The National Roads Authority (NRA) was established in 1994, with the primary function of securing the provision of a safe and efficient network of national roads, and with overall responsibility for the planning and supervision of construction and maintenance of national roads. Its functions can be carried out directly or, more often, through Local Road Authorities. The NRA is responsible for collating, analysing and reporting on the national records of road accidents as they are reported by An Garda Síochána, using data provided by an Garda Síochána through the CT68 form system. The Authority produces an annual report called 'Road Collision Facts'. Work-related incidents are identified only based only on the type of vehicle involved in collisions.

1.3.1.3 Road Safety Authority

In September 2006 the Department of Transport formally established a new Agency to take a lead role in the area of road safety: the Road Safety Authority (RSA). The RSA is the statutory body now responsible for accident and road safety research in addition to promoting road safety, driver testing and licensing, vehicle standards, road haulage enforcement functions, registration of driving instructors, driver vocational training and compulsory basic training for motorcyclists. The RSA now has responsibility for the four key areas of Education, Enforcement, Engineering and Evaluation and plans to build strategic partnership with key stakeholders, and to set up advisory panels on specific areas relevant to their programme of work, which will be developed based on the next Road Safety Strategy.

1.3.2 An Garda Síochána: the Garda National Traffic Bureau

The Garda National Traffic Bureau was established in 1997. The primary responsibility of the Bureau is the proactive formulation of policy to reduce deaths and road accidents. Its function is to formulate policy, by prioritised enforcement and traffic management, and to oversee traffic policing throughout the Republic of Ireland. Traffic management is a shared responsibility between an Garda Síochána and other agencies.

The Bureau is based at Garda Headquarters in Dublin and is led by an Assistant Commissioner. Under the Government Strategy on Road Safety, the main road safety role of an Garda Síochána is one of enforcement (Brett, 2006). Operational traffic units based in each Garda Division carry out enforcement, which is almost entirely a Garda function; their brief includes the enforcement of road traffic legislation and aiding the free flow of traffic.

Gardai collect data from road traffic collision sites and enter this data to the computer system to generate a CT68 form. All collisions involving fatalities are reported to the Superintendent of each Division. Data on the CT68 form is forwarded to the National Roads Authority for collation and analysis. Up-to-date provisional fatality statistics are provided on the Garda Síochána website http://www.garda.ie/angarda/trfinfo.html. A Memorandum of Understanding exists between an Garda Síochána and the Health and Safety Authority (HSA), which ensures that Gardai inform the HSA when a road traffic collision is work-related. The short 2002 document has recently (Worral, 2006) been reviewed and developed into a more detailed operational protocol for investigation of workplace accidents and incidents. While road traffic accidents are not specifically mentioned in this document, it clearly defines the responsibilities of each agency in the event of an incident involving both agencies.

1.3.3 Irish Insurance Federation

The Irish Insurance Federation (IIF) is the representative association for insurance companies in Ireland; membership includes Irish insurance companies and branches of foreign insurers established in Ireland. The IIF publication 'Factfile' is published annually and provides key facts and figures on the insurance business in Ireland, derived mostly from data provided by members, but also other official data and data from the Central Statistics Office. Individual insurance companies may be able to provide data on fleet incidents but these are not necessarily publicly available, however it should be noted that in recent years a number of insurance companies have developed safe fleet driving schemes including advanced driver training programmes.

1.3.4 Coroners' Offices

A Coroner in Ireland is an independent official with legal responsibility for the investigation of sudden and unexplained deaths. The role of the Coroner is to enquire into the circumstances of such deaths and to establish the facts; if a death is found to be due to unnatural causes, an inquest must be held by law. Certain deaths must be reported to the Coroner, including deaths that result from accidents. Deaths resulting from road traffic collisions are sudden deaths, which are not due to natural causes and a Coroner normally investigates them. A member of an Garda Síochána brings road traffic collision fatalities to the attention of the relevant Coroner, normally by telephone, and also by completion of Form C71. Following inquest, the final Coroner's Certificate documents the name and age of a victim, his/her occupation and the cause(s) of death. Coroners' offices also retain records of documentation gathered as part of their enquiries, such as depositions from witnesses, including Gardai, and these may contain narrative data about the work-relatedness of the activity of the fatality victim at the time of the collision. It should also be noted that if any such death results from an accident at work, an Inspector of the HSA normally attends the inquest.

Recent reviews of the Coroner's Act and of the Coroner Service identified a number of areas for improvement of the service. Recommendations included the formation of a new Coroner Agency, the functions of which would include the development of a National Information System for Coroners (Department of Justice, Equality and Law Reform, 2000). A Rules Committee, set up consequent to the Review, recommended that any death due to an accident at work, occupational disease or industrial poisoning should be reportable to the Coroner, that a jury must be used in any circumstances of death where an accident, (industrial or occupational) poisoning or disease was involved and which requires reporting to a relevant authority, and that Coroners could consider properly 'interested persons' under the provisions of the Safety, Health and Welfare at

Work Act, 1989 (Department of Justice, Equality and Law Reform, 2003). The Safety, Health and Welfare at Work Act, 2005 permits disclosure of information, by the Authority, to a Coroner holding an inquest.

1.4 SOURCES OF WORK-RELATED ROAD TRAFFIC FATALITY DATA IN IRELAND

Data relating to work-related road traffic deaths come from two main sources:
a) Road traffic collision fatality data, where a work-related link can be established, and
b) Work-related accident fatality data where a road traffic cause can be established.

The Memorandum of Understanding that exists between an Garda Síochána and the HSA ensures that Gardai inform the HSA when a road traffic collision is work-related. The purpose of the memorandum is to ensure that effective liaison and investigation takes place with good co-operation and sharing of information, however it also highlights an important point. An Garda Síochána has responsibility for enforcement and investigation of breaches of criminal law, while the HSA has responsibility for investigation of breaches of OSH law. The purpose of data collection in each instance is therefore subtly different, but this affects the type and manner in which data are collected.

1.4.1 Road Traffic Collision Fatality Data

In the Republic of Ireland, a fatal road traffic collision is defined as one "…where at least one person is killed as a result of the collision and where death occurs within 30 days" (National Roads Authority, 2005, p. vii). Road-users killed include car-users, pedestrians, cyclists and motorcyclists. A total of 374 persons were killed in 334 collisions on Irish roads in 2004 (National Roads Authority, 2005) and 399 persons were killed in 2005 (Garda National Traffic Bureau, 2006). In 2003 Ireland's road death rate, per 100,000, was 8.4, but this rose to 9.3 in 2004 and to approximately 10 in 2005. This compares with rates in 2004, of 5.6 per 100,000 in the UK and of 4.9 per 100,000 in the Netherlands (Brett, 2006).

Gardai gather data about all collisions, which are brought to their notice, at collision scenes. The data are subsequently entered into a computer system, whereby provided fields are completed either using free text or by choosing an option from a drop-down menu; when all of the data are entered a CT68 form is generated and printed. Data collected in this manner cover many aspects of the collision, including information on the environment, the vehicle, and the drivers(s), passenger(s), cyclist(s) or pedestrian(s).

Printed CT68 forms are forwarded to the National Roads Authority (NRA) for collation and analysis. The NRA produces an annual publication '*Road Collision Facts*', which is based on the road collision data provided by An Garda Síochána. This report provides detailed analysis and valuable information about collision rates and trends as well as collision types (single vehicle, head-on, pedestrian), the time and day of collision, the location (urban or rural roads), vehicle type, road conditions at the time of the collision, and the road user type (car user, pedestrian, cyclist, etc.) including their age and gender. The NRA report covers all road traffic collisions reported to An Garda Síochána, where details were recorded and forwarded to the NRA. Reports are not confined to fatalities, and include personal injury and material damage incidents that occur on roads in the Republic of Ireland.

Two questions are particularly relevant when identifying a work-related component:

a) Purpose of journey, for both drivers and pedestrians. The NRA fields include the following seven values:

1 To/from work
2 To/from school
3 To/from shopping
4 To/from match
5 To/from home
6 To/from pub/hotel
7 Other leisure
8 Not known

There is no option to capture 'at-work' incidents and selecting the 'to/from work' category for an 'at-work' incident suggests a commuting incident, which is not categorised in Irish or EU official health and safety statistics (ESAW) as an 'at-work' incident.

b) Type of vehicle. This category captures work-related vehicles such as taxi, public service vehicle or goods vehicle, and in such cases a reasonable assumption can be made that the majority of persons driving such vehicles are at work. The value labels used by the NRA for this field are:

1 Pedal cycle
2 2 wheeled motor vehicle
3 Private car
4 Van
5 Taxi
6 Hackney car
7 P.S.V. (minibus)
8 P.S.V. (bus)
9 Goods, not over 2 tons, unladen
10 Goods, over 2 tone, rigid
11 Goods, rigid + trailer
12 Goods, artic with semi trailer
13 Artic, tractor only
14 Other

While the data does identify fatal incidents in which the victims are driving, or are passengers in, private cars, it is not possible to identify cases where drivers use their personal vehicle for work purposes, or where the victim is driving a company car.

The NRA makes its data available to the HSA for statistical purposes.

1.4.2 Accidents at Work Fatality Data

In the Republic of Ireland, work-related fatalities are deaths in which an employee or self-employed person, or a member of the public, dies, as a result of an accident at work, within one year of the accident. Victims may be employees, self-employed, family workers, or non-workers. Data for such deaths are collected by the HSA under the Safety, Health and Welfare at Work (General Application) Regulations, 1993, Part X, Notification of Accidents and Dangerous Occurrences, following the methodology laid down by the European Union as part of its harmonisation strategy - European Statistics on Accidents at Work (ESAW), (European Commission, 2001). Employers and self-employed persons (and in the case of a self-employed person being killed due to an accident at work, the next-of-kin) are obliged to report the accident and the

death as soon as possible to the HSA. Notification of accidents takes place when the responsible person completes the prescribed (IR1) form, which can be completed and submitted on-line or completed in hard-copy format and mailed or faxed to the HSA. Notification of deaths should take place by the quickest means possible, ideally in the first instance by telephone, and HSA personnel can be accessed on a 24/7 basis for reporting fatalities if necessary. The Gardai often call the HSA to the scene of a fatality.

The HSA publishes illness, injury and fatality statistics annually. Until 2003 these statistics were included in the HSA Annual Report, however since 2003-4 a more detailed separate report is published: '*Summary of fatality, injury and illness statistics'*. The most recent edition was published in April 2006, covering the period 2004-2005. The annual statistical report includes analysis of all accidents that occur, which are reported to the HSA, where details were recorded and forwarded to the HSA by employers or others. Injury reports are not confined to fatalities, and include serious personal injuries, which occurred in work places in the Republic of Ireland. The system of reporting relies on self-reporting by employers, supported by data made available to the HSA by Gardai and by the Occupational Injuries Benefit Scheme. It is well–accepted that where the reporting of non-fatal injuries is concerned, under-reporting is a significant problem, particularly among certain sectors, small and medium enterprises, and the self-employed (HSA, 2006) and Eurostat estimated that the accident data collected in Ireland in 1998 could reflect only 38% of the accidents that actually occur (European Commission, 2001). While this difficulty may also apply to accidents resulting in a death, it is less likely, due to the small size of the country, where deaths at work continue to draw the attention of the Gardai and the national media, albeit not always the headlines.

A total of 73 persons were reported, to the HSA, as killed at work in 2005, of which 64 were workers (HSA, 2006). Nine persons were killed as a result of injury by vehicle or transport in the workplace, and two persons as a result of injury by vehicle or transport in a public place; the former nine fatalities represent 12% of fatalities and the latter two fatalities represent 3% of the total reported deaths for the period. The HSA fully recognise that there are road traffic fatalities, involving persons at work, which have not been reported to them and are therefore not included in their statistics (HSA, 2006). This is important because evidence from abroad suggests that road traffic collisions play a major role in work-related deaths and have been found to be responsible for up to a quarter of such deaths in other countries, as shown below.

1.5 INTERNATIONAL RESEARCH ON WORK-RELATED ROAD TRAFFIC FATALITY DATA

The challenges to collecting work-related road traffic fatality data are not unique to Ireland. This section looks at research-based evidence from other countries to identify the problems and solutions associated with capturing work-related road traffic fatality data.

1.5.1 United Kingdom

In the United Kingdom (UK), a risk management approach has been taken to work-related road safety. Acknowledging that many vehicles are driven for work purposes, and that reliable data on work-related road traffic collisions was not available, the aims of the 2000 UK Road Safety Strategy included the specific work-related road safety aims of:

- A reduction in the number of road traffic collisions that are connected to work,

- Establishment of accurate statistics for work-related incidents on and near roads, and
- Effective liaison between those who enforce road traffic law and those who enforce health and safety law (Department for Transport, 2000).

To this end an independent Work-Related Road Safety Task Group was set up by the Health and Safety Commission (HSC). The terms of reference and membership for this group, which included high-level representation from a wide group of stakeholders, are provided in appendix 1. This group initiated a consultation process (HSC, 2001), and subsequently generated much of the work, research, review and guidance that have emerged in the UK since 2001. The Task Group commissioned a number of research projects to identify sources of statistics on work-related road traffic accidents and to identify the factors that may be involved. The sources used for this research were:

a) A Police survey. Police in four Police districts asked additional questions at road collisions to establish whether anyone was at work; it was found that 30% of all incidents involved at least one person who was at work, and that 33% of the fatalities involved someone who was at work.
b) Confidential data from fleet insurance claims. This research estimated the number of fleet vehicles involved in serious collisions each year. The results were considered to be an under-estimate, as the data did not include incidents where the fleet vehicle was not at fault.
c) A study of accidents in Cambridgeshire. 24% of drivers involved in collisions were 'at work' at the time of the accident.
d) Data from the Coroner's database for the years 1994 and 1999 were examined. Coding and text descriptions indicated that an average of 4% of the total number of victims of traffic fatalities were at work at the time of the collision. Commercial vehicles and commercial passenger carrying vehicles were involved in 85% of fatalities, and 23% of all fatalities involved a commercial vehicle.
e) Fleet risk management data and research reports from academic institutions and from the British Transport Research Laboratory were also examined.

(Work-Related Road Safety Task Group, 2001a and b).

The overall findings of the Task Group were that just under 25% of road traffic fatalities involved a commercial vehicle, and while data on at-work non-commercial vehicles was not available, using data from the police survey and from insurance claims, the Task Group were able to estimate that between a quarter and one third of all road traffic accidents involved someone who was at work at the time (Work-Related Road Safety Task Group, 2001). The Task Group felt that much could be done within existing (road traffic and OSH) law to improve the 'at-work' road safety situation and recommended a more rigorous application of existing OSH law to on-the-road work activities, including occupational driving. They also recommended that employers extend their OSH management systems to include driving as a risk to be managed, and that the Health and Safety Executive (HSE) produce guidelines to facilitate and encourage this. In relation to data collection, the Task Group commented on the difficulties of getting robust data and recommended that the HSE and the Department for Transport should develop a joint research programme to learn more about work-related road safety issues, and that the requirement to report 'at-work' road traffic collisions be included in the requirements of the UK Reporting of Injuries, Diseases and Dangerous Occurrences Regulations, 1995 (RIDDOR).

Among other recommendations, a number of the fatality data-related recommendations of the Task Group have since been implemented:

1. The Police reviewed their report form and included a question about journey purpose from January 2005 (STATS 19). There is now a field for 'on the road

work activity', where a section of the form asks whether the journey was as part of work. Prior to this the purpose of journey was not established at all.

2. A review of RIDDOR, undertaken in 2005, has included consideration of the questions as to how at-work road traffic accidents involving fatalities should be reported to the enforcing authorities (HSC, 2005). The final outcome of the revision has not yet been published, however a 2006 progress report recommended rejecting the suggestion to report work-related road traffic incidents through RIDDOR and noted that the Department for Transport is actively engaging with the HSE in a programme of work designed a) to raise employer awareness of their responsibilities in relation to safe driving, and b) to reinforce the mechanism by which the police provide the HSE with information on road traffic accidents where a health and safety causal factor is suspected (HSC, 2006).
3. The HSE have clarified their policy on enforcement of OSH legislation in relation to work-related road traffic incidents, and has revised the operational memo (OM 2003/103), which now explains in very precise detail the circumstances and situations where HSE may have a role to play (HSE, 2003a).
4. A Protocol for Liaison between the Police, the Transport Police, the Crown Prosecution Service, the HSE and the Local Government Association (HSE, 2003b) was reviewed and updated in 2003 and the associated 'Work-related deaths investigators guide' (HSE, 2003c), which places an emphasis on joint investigation, was published.

The latter two items, while not specifically data-related, have been noted here because different reasons or agendas for investigating deaths among the relevant enforcing agencies can affect both the type of data collected and the level of detail provided on narrative data, so clarification of the roles and clear understanding of circumstances of when one agency should call in the other is essential. Evidence in other countries has also shown that coronial files, while extremely useful in collating statistics on work-related road traffic accidents, can suffer from lack of detail in the narrative data that makes a work-related classification difficult.

Subsequent to the activity generated by the Task Group, the HSE and/or the Department for Transport have funded a number of research projects, which study work-related road accidents (for example Lancaster and Ward, 2002a, 2002b and 2002c; Braughton et al, 2003; Clarke et al, 2003; Bomel, 2004; Murray, 2004). These research reports highlight trends and patterns and identify environmental and human behavioural risk factors which are not directly relevant to data collection systems, but which add to the knowledge-base for work-related road safety risk assessment and risk management purposes, and which help to build a risk profile. There has also been a marked increase in the amount of guidance available on managing occupational road risk for employers in the UK (HSE, 2003d and 2005).

1.5.2 European Union

In Europe, it is acknowledged that road traffic collisions make up an important share of all work-related accidents (European Commission, 2001) and that there are different arrangements in different states regarding the inclusion or exclusion of road traffic data, making it difficult to get a true picture. Under the 2001 EU European Statistics on Accidents at Work (ESAW) Methodology, an accident at work is defined as "*a discrete occurrence in the course of work which leads to physical or mental harm*". A fatal accident is defined as "*an accident, which leads to the death of a victim within one year (after the day) of the accident*". The methodology specifically excludes accidents on the way to and from work (commuting accidents) although it should be noted that there is a separate EU

project, using a similar methodology, underway in relation to commuting accidents (Eurostat, 2005). However, the phrase "*in the course of work*" is clarified to mean "*whilst engaged in an occupational activity or during the time spent at work*". This specifically includes cases of road traffic accidents in the course of work (European Commission, 2001, p.12.). Eurostat, the EU statistical organisation, adjusts for acknowledged under-reporting in a number of countries. In addition, because reliable data on fatal road traffic and transport accidents is not available in the UK and Ireland, Eurostat excude road traffic and transport fatalities from all other countries to calculate the fatal incidence rate at work for all member states (Eurostat, 2005). Irish legislation requires that road traffic fatalities that occur in the course of work be reported to the HSA, however, it is known that under-reporting is a problem and Eurostat reports that data on such accidents is unavailable from Ireland (European Commission, 2001).

1.5.3 United States of America

In the United States of America (USA) work-related road traffic collisions are the leading cause of death from traumatic injuries, not only in the general population but also in the workplace (Pratt, 2003). A national analysis of work-related death certificates, covering deaths in the period 1980-1995, found that the leading cause (23%) of work-related fatalities was motor vehicle crashes (Marsh and Layne, 2001). There were some acknowledged limitations to the analysis method used, as standardised guidelines for coding (including the field asking whether deaths were work-related) on death certificates in the USA were only introduced in 1992, however the findings are supported by other research.

Because of the large number of federal and state agencies involved in both workplace health and safety and in road safety, no single satisfactory source of data exists in the USA to analyse worker injuries or fatalities occurring as a result of road traffic collisions. The National Census of Fatal Occupational Injuries (CFOI) compiles a count of all fatal work injuries occurring in the USA in each calendar year. Diverse and multiple state and federal data sources (such as death certificates, workers' compensation records, and reports to federal and state agencies) are used to identify, verify, and profile fatal work injuries. This method assures counts are as complete and accurate as possible and overcomes some of the limitations of using death certificates alone. In 2004, the fatality rate for those working in the transport and materials handling group was 17.5 per 100,000 workers compared with a rate of 4.1 per 100,000 for all workers. For the 2004 data, over 20,000 unique source documents were reviewed as part of the data collection process. Fatal events are included as work-related road incidents if the travel was for work purposes or was a condition of employment. Commuting incidents are not included in the scope (USA Department of Labour, 2001). The National Census of Fatal Occupational Injuries (CFOI), carried out by the American Bureau for Labour Statistics, shows highway incidents as the highest cause of occupational fatalities on a year-on-year basis (USA Department of Labour, 2004).

The USA Centre for Disease Control analyzed data for 1992-2002 from the Fatality Analysis Reporting System (FARS) of the National Highway Traffic Safety Administration and from the Census of Fatal Occupational Injuries (CFOI) to characterize fatal occupational roadway crashes and to identify workers at highest risk for fatality (Pratt, 2004). CFOI provides information on the occupation and industry of the fatally injured worker; however, FARS provides more detailed information on crash circumstances and contributing factors. These statistics showed that the road traffic work-related fatality rate was much higher for men (1.7 per 100,000) than for women (0.3 per 100,000), and that the rates were higher for older workers.

The USA National Institute for Occupational Safety and Health (NIOSH) acknowledge that road traffic collisions comprise the largest category of work-related fatalities and has collected data on work-related road traffic collisions for a number of years, using verified data sources and firm definitions. As a result, a large body of information, designed for both road safety and workplace safety interventions, has been developed, and NIOSH has identified three discrete groups of drivers who should be targeted for workplace prevention measures: those in the motor carrier industry, other vehicle fleets, and drivers who use personal vehicles for work purposes (Pratt, 2003).

1.5.4 Australia

In Australia, research findings from the early 1980s, using coronial records for the period 1982 – 1984 to identify cases, showed that 24% of all work-related fatalities occur on roads, not including commuting accidents, which accounted for another 15%. These figures were thought to be an under-estimate because the Coroner's records did not always contain sufficient information to definitively classify an incident as work-related (Harrison, Mandryk and Frommer, 1993).

A major study was carried out in Australia on all work-related fatalities that occurred between 1989 and 1992 (NOHSC, 1998). Work-related road traffic deaths were identified by looking at all non-suicide fatal incidents involving a motor vehicle, and three discrete groups were identified: workers, commuters and by-standers: 33% of work-related fatalities were found to have occurred on public roads, and nearly a quarter of workplace bystander deaths were the deaths of workers travelling as a passenger in the cab of a working vehicle.

Subsequent to this study, an analysis was carried out to determine the coverage of work-related fatalities by the official agencies involved. The on-going system for collecting work-related fatality data in Australia is a compensation-based system that does not include the military or self-employed (NOHSC, 2002a). It was found that the Occupational Health and Safety (OHS) Agencies had minimal coverage of work-related deaths that occurred on the road (Driscoll et al, 2003). Another component of the study looked at all traumatic deaths using coronial records with cooperation from the Australian Bureau of Statistics and the deaths registry (Mitchell et al, 2004) to identify road traffic deaths. Analysis of the data revealed that the majority of work-related road fatalities involving workers were of males (92%), most of whom were less than 45 years of age. Nearly half of the deaths involved workers who were employed in the transport and storage industry. Overall around 30% of all work-related deaths involved the worker being fatally injured in a motor vehicle crash on a public highway and an OSH authority investigated only 8% of these deaths. Coronial records were found to potentially provide excellent coverage of work-related fatalities; they contained considerable detail, including blood alcohol and stimulant levels, and permitted detailed analysis of the data, permitting the development of a risk profile and identifying a need to address road safety in the work-based context.

The Australian National Occupational Safety and Health Commission (NOHSC) has examined the difficulties of making international comparisons with Australia's occupational fatality statistics and has identified inclusion/exclusion of road traffic fatalities as one of the main comparison limitations (NOHSC, 2004). The Commission also carried out a review of the content and quality of the relatively new Australian National Coroner's Information System (NCIS) (NOHSC, 2002a), including an analysis of police textual descriptions (NOHSC, 2002b), to determine whether it could provide timely and accurate information on (all) work-related fatalities in Australia, and concluded that the NCIS could potentially be confidently used as a national surveillance system for work-related fatalities,

subject to a number of improvements to make the methodology simpler (mostly concerned with the way data are captured and with addressing missing data issues). The conclusion was that the only comprehensive, reliable and robust source of work-related fatality data in Australia was the Coroner's system, and it was suggested that the new Coroner's Information System would become the basis of future surveillance of traumatic work-related fatalities (Driscoll et al, 2003).

1.5.5 New Zealand

Descriptive epidemiology carried out by the New Zealand Environmental and Occupational Health Research Centre (1999) examined work-related fatal injuries in New Zealand in the period 1985 – 1994. Cases were identified from the national electronic mortality files and the circumstances of each fatal incident were reviewed using coronial files. In this study, deaths due to traffic crashes were excluded, not because they were considered to be outside the work-related definition, but for pragmatic reasons (lack of funding and case identification difficulties). Despite the exclusion of road traffic fatalities, the study concluded that these deaths, and by-stander deaths, should be studied, as it was estimated that they probably accounted for the single largest category of work-related injury deaths, possibly as much as 25%, and that exclusion of this category resulted in serious under-estimation of the number of work-related deaths.

Subsequent work (New Zealand Environmental and Occupational Health Research Centre, 2003) therefore focused on examining work-related road traffic fatalities, and reviewed all the coronial files involving traffic crashes on public roads, in the period 1985 – 1998, for work-relatedness. Personal variables such as age and gender, circumstantial variables, such as vehicle type, in addition to contributory and work factors were examined. It was found that such fatalities contributed to 29% of all work-related fatal injuries in New Zealand in the period, with a rate or working fatalities of 1.1 per 100,000 workers and a rate of 0.9 per 100,000 workers for commuting fatalities. When commuting fatalities were excluded to allow comparability with international data, road traffic fatalities accounted for 18% of all work-related fatalities. Availability of this data made it possible to study risk factors for the non-commuting (at work) incidents and revealed that males accounted for over 93%, and that 66% of victims were under the age of 45 years. It also found that such fatalities occur most commonly from Monday to Saturday, during the traditional workday during daylight hours; this is in contrast to most motor vehicle incidents which occur at weekends. Pedestrian fatalities were generally workers who worked on the road, such as road maintenance workers, and contributed 17% to the non-commuting incidents. The overall conclusion of the study was that traffic fatalities (excluding commuters) comprise the largest single category of work-related injury death in New Zealand.

1.5.6 International Comparisons

International comparison of occupational fatality statistics is treated with caution due to the limitations caused by differences in scope and in the methodologies used to collect data. One of the recognised factors that make international comparisons of work-related fatalities difficult is the inclusion/exclusion of road traffic fatalities (European Commission, 2001; NOHSC, 2004). For example, in Europe, Eurostat adjusts occupational fatality rates to eliminate the bias that would be introduced because fatalities due to road traffic collisions in the course of work are not recorded as accidents at work in a few member states, such as the UK. In the long-term Eurostat intends to produce incidence rates including these accidents, even though they realise it will mean changing the reporting procedures in some member states (European Commission, 2001).

A comparative study was carried out between fatalities from work-related motor vehicle incidents in the USA, Australia and New Zealand, using data from some of the studies mentioned above (Driscoll et al, 2005). A previously successful methodology was used (Feyer et al, 2001) and analysis relied on data derived from USA death certificates and Australian and New Zealand coronial data. Bystander and commuting deaths were excluded. The results showed that, for the period which all datasets had in common (1989-1992), work-related motor traffic deaths accounted for 31% of all Australian worker deaths, 16% of all New Zealand worker deaths and 22% of all USA worker deaths. The differences could not be accounted for by differences in industry distribution and the authors suggest that the differences arise because of limitations in the collection systems and differences in case identification, and that the figures for New Zealand and the USA are underestimated for these reasons. Despite the differences and limitations, the findings suggest that characteristics of work-related road traffic collisions in all countries are similar, as are the hazards for drivers. Common trends were identifiable, for example males accounted for 92-93% of deaths and had a rate 9-10 times that of females. High-risk industries included transport, storage and communications, with between one third and half of all deaths in this category.

1.5.7 Conclusions from Literature Review

It has been suggested that the annual fatal accident statistics in Ireland do not reflect the full picture, because they do not include the full extent of work-related road traffic fatalities. This is true, but it is not unique to Ireland, and the background to the problem has been described above. Experience abroad has shown that official statistics on work-related road traffic fatalities from individual official sources are often incomplete due to under-reporting, the definitions used, case identification issues, and due to a lack of detail provided in field and narrative data because the purpose of data collection differs for the data collection agencies involved. The systems designed to monitor road traffic statistics can fail to collect detail on occupational circumstances of victims and systems designed to monitor work-related fatalities can fail to gather data on the road safety circumstances and risk factors associated with the accident. Data from coronial records can be a valuable, if labour intensive, source of data on work-related fatalities. In Ireland, the HSA acknowledge that their work-related fatality statistics do not include many road traffic fatalities that are quite simply not reported to them. The individual data collection systems, in general, collect the data necessary for their own purposes; however, the gap lies in where the information is of value to an agency other than that which collected the data. In the absence of data record linkage, experience in other countries has shown that dedicated research projects have been necessary to facilitate quantifying or estimating the extent of the problem and subsequently developing risk profiles for occupational road risk, and it should be noted that much of this research can be carried out using existing multiple data sources.

1.6 PILOT STUDY

While it was beyond the scope of this study to carry out empirical research, a small pilot study was carried out to explore the differences between the work-related road traffic fatality data on record from the Health and Safety Authority, the National Roads Authority and the Coroner's Office. The aim of the study was to explore the extent of the differences in the number of work-related road traffic fatalities collected in one geographical area of Ireland, in order to ascertain whether research of this kind would be of benefit. Data for the years

2002, 2003 and 2004 in the geographical area of Co. Kildare were examined. This pilot study does not attempt to be representative of the national situation.

1.6.1 Methodology

Three data sources were identified for examination:

1. Narrative data from the coronial files from the office of the Coroner for Co. Kildare;
2. Published fatality information from the HSA annual and statistical reports;
3. NRA dataset.

Records for 2002, 2003 and 2004 were used, because some of the Coroner's files for 2005 were not closed.

1. Coronial Records

An examination of the files from the office of the Coroner for Co. Kildare was carried out for the calendar years 2002-2004 inclusive. Records of deaths as a result of a road traffic collision were identified for each year using the Kildare County Coroner's Register, and coronial files for all road traffic collisions in the years 2002, 2003 and 2004 were requested. The 45 deaths noted on the Register as being due to road traffic collisions were verified using the Coroner's Certificate in individual files. Coroner's files contain depositions from witnesses to the incident, from persons who can provide information about the circumstances leading up to and following the incident, and from Gardai. Depositions from each file were manually examined for 'work-relatedness' of the incident. Cases were classified as follows:

a) Worker deaths: if, according to witness (including Garda) depositions, the victim was engaged in a work-activity at the time of the collision (e.g. driving a truck or van, which was noted to be delivering or collecting goods), the case was classified as a 'worker' death.
b) By-stander deaths: if one of the parties directly involved in the collision was engaged in a work-activity at the time of the collision, the case was classified as a 'by-stander' death. An example could be a case of a pedestrian, who was knocked down by a van or truck noted in witness statements to be making deliveries at the time of the collision, thus the truck driver was considered to be at work. By-stander deaths, in the international literature, refer to deaths of persons, usually members of the general public, who are not at work, but who are killed as a result of exposure to a workplace hazard. In Ireland, the Safety, Health and Welfare at Work (General Application) Regulations require the notification of such deaths (Part X, 1, b) to the HSA.
c) Worker-involvement: a number of cases were noted in which the fatally injured party was neither at work, nor killed as a result of exposure to a work-place hazard, but where another person involved in the collision was at work; these cases were classified as 'worker-involvement'. An example in this category is a case where the car in which the victim was travelling veered inexplicably into a public service vehicle or a goods vehicle, the driver of which was at work, but who was neither injured in, nor an factor in the lead-up to, the incident).
d) Not work-related: if there was no evidence in the depositions that any party involved in the incident was at work at the time of the collision, the case was classified as not work-related.
e) Commuting fatalities were not included.

A second researcher independently verified the classifications.

HSA fatality statistics

The published HSA annual statistical reports for the calendar years 2002 (Annual Report), 2003 (Annual Report) and 2004 (Statistical Report) were examined. There are minor differences in how the report for each year presents work-related fatal incident data, but the following information is provided: the date of

the incident or the date of the fatality, the geographical location (by county) and the age and occupation of the victim, in addition to a brief description of the incident.

NRA data

The NRA makes anonymised raw road traffic collision data available in spreadsheet format for research purposes. The NRA dataset was requested and provided in electronic format. As the data was in raw data format, the coding used was also provided. Road traffic fatalities for the calendar years 2002, 2003 and 2004 were extracted from the full data set, and the data for Co. Kildare was identified and extracted for analysis.

The effect of differences in fatality definition used by the HSA (one year after the day of an accident) and the NRA (within 30 days of the incident) was not explored, as the majority of deaths occur at or shortly after road traffic collisions.

1.6.2 Coroner's Data Results

- Two 'worker' and six 'by-stander' deaths were identified in the Coronial files in the specified time period.
- Four of the six by-stander deaths involved the 'worker' driver being arrested under Road Traffic legislation following the collision; two of the incidents involved pedestrians being knocked down by a vehicle making deliveries.
- Another 8 fatalities within this period were categorised as 'worker-involvement' cases.

Thus 17.7% of the 45 road traffic fatalities in this area, within the specified time period, were fatalities where the victim was either at work or was killed as a result of another person's work activity. When 'worker-involvement' cases are included more than one third (35.5%) of the 45 fatal road traffic incidents directly or indirectly involved at least one person who was at work.

Witness lists for cases deemed to be work-related were examined for the presence of an Inspector from the HSA at the inquest. None of the inquests were attended by the HSA. There is no evidence in the documentation to suggest that the HSA was ever informed of any of these deaths.

Year	Total deaths reported to Coroner	Deaths categorised as Road Traffic Collisions	'Worker' deaths	'Bystander' deaths	'Worker-involvement cases	Not work-related
2002	158	15	2	2	1	10
2003	177	15	0	3	5	7
2004	198	15	0	1	2	12
Total	**533**	**45**	**2**	**6**	**8**	**29**

Table 1.1 Summary of work-related road traffic deaths from Kildare Co. Coroner's files, 2002-2004

1.6.3 HSA Data Results

The HSA annual statistical reports for the period 2002 to 2004 inclusive were examined. The findings were:

- In 2002 there was 1 work-related fatality reported to the HSA in Co. Kildare; this incident was not a road traffic collision. The HSA annual report 2002

notes, "…*an unknown number of people also died in work-related road traffic injuries, which are often not reported to the Authority*" (HSA, 2003, p. 57).

- In 2003 there were 2 fatalities reported to the HSA in Co. Kildare, neither of which were road traffic collisions. The 2003 annual report notes that "…*two goods vehicle user deaths were reported to the Authority in 2003 but that the actual number of such deaths may be in the region of twenty, based on NRA data for 2002*" (HSA, 2004, p. 57) and "*In addition to the …reported fatalities are road traffic fatalities that have not been reported to the Authority*" HSA, 2004, p.68). The two goods vehicle user deaths referred to were noted as having taken place in Counties Laois and Meath. Neither of these fatalities matched deaths recorded in the Co. Kildare Coroner's files. One of the fatalities recorded by the HSA for Co. Kildare was classified as a construction accident as it took place on a construction site, so even though it involved a vehicle the incident did not take place on the roads; and the date of the incident did not match any cases classified in the Coroner's files as a road traffic fatality.
- In 2004 there was 1 fatality reported to the HSA in Co. Kildare, which was not a road traffic collision, although again it involved a motor vehicle on a construction site. The statistical report again notes: *"…in addition to the workplace fatalities presented are road traffic fatalities that have not been reported to the HSA*" (HSA, 2005, p. 35).

The fatalities referred to above which involved motor vehicles on construction sites would not normally be recorded on the NRA road traffic data, which collects data only from incidents which take place on the road, however the relatively high number of work-related motor vehicle incidents should be noted.

The HSA data for the time period specified did not match any of the work-related fatality cases identified in the Coroner's files. The HSA accident notification scheme is reliant on the ability of third parties (Gardai and employers) to recognise a road traffic fatality as a work-related death and on their being aware of, and compliant with, relevant legislation and local agreements.

1.6.4 NRA Data Results

The NRA makes anonymised raw road traffic collision data available in spreadsheet format for research purposes. Road traffic fatalities for Co. Kildare for the calendar years 2002, 2003 and 2004 were extracted from the full data set. There were 55 fatalities in 52 collisions recorded in Co. Kildare in the period studied. Cases were cross-referenced with the Coroner's files using date of incident and/or date of death, location of incident and the age and gender of victims.

It should be noted that while the Kildare County Coroner's data contained files for 45 road traffic fatalities, the NRA data for Co. Kildare for the same period contained 55 fatalities. There are a number of reasons why NRA cases may not always present on the Coroner's files for the same district, for example where an incident occurs near a county border and the victim is brought to the nearest hospital, which may be across a county border, for treatment, before the death occurs; in such a case the Coroner for the county of death will investigate the death. This can particularly occur in counties bordering Dublin, such as Kildare.

The NRA data was examined for cases where the purpose of journey for one or more victims was classified as 'to/from work', and for cases where one or more vehicle was classified as either a goods vehicle or a public service vehicle. These cases were cross-referenced with the Coroner's data by date of incident, location and gender and age of victims to establish whether witness depositions suggested that a driver was 'at work' as opposed to on the way 'to/from work'.

NRA data for Co. Kildare 2002: 19 fatalities

- Eight NRA cases had either a driver or a pedestrian's 'purpose of journey' classified as 'to/from work'. When cross-referenced with the Coroner's data, two of these cases matched cases categorised (for this pilot study) as 'worker' deaths and one matched a case categorised as a 'by-stander' death.
- One case was categorised by the NRA as involving a work (either Public Service or Goods) vehicle. The same case matched a case categorised on the Coroner's files (for this pilot study) as a case of 'worker' death.

NRA data for Co. Kildare 2003: 17 fatalities

- Seven NRA cases had a driver or pedestrian's 'purpose of journey' classified as 'to/from work'. When cross-referenced with the Coroner's data, one NRA case matched a Coroner's case categorised (for this pilot study) as a 'worker' death, and two cases matched cases from the Coroner's data categorised as 'by-stander' deaths.
- Three cases were categorised by the NRA as involving a work vehicle. All three cases had been categorised (for this pilot study) on the Coroner's files as 'by-stander' deaths. One case was not on the Coroner's files.

NRA data for Co. Kildare 2004: 19 fatalities

- Five NRA cases had a driver or pedestrian's 'purpose of journey' categorised as 'to/from work'. When cross-referenced with the Coroner's data, none of these incidents were categorised (for this pilot study) as 'worker' or 'by-stander' deaths.
- Three cases were categorised by the NRA as involving a work vehicle. Two of these three cases matched cases categorised (for this pilot study) on the Coroner's files as worker-involvement, but were not 'worker' or 'by-stander' deaths.

The NRA data are analysed each year to produce a document that provides valuable information about road traffic collisions in Ireland; the information is used to develop prevention strategy and policy. Because of the way data are collected, valuable information relating to worker deaths is being missed. From the cases studied, it appears that in the absence of any other option, Gardai are classifying 'at work' cases as 'to/from work', however, the question on 'type of vehicle' appears to identify the majority of work-related cases. While the 'work-vehicle' category appears to be efficient at capturing work-related deaths associated with goods vehicles and taxis, there is no means of capturing cases where persons drive their own, or a company, vehicle in the course of work.

1.6.5 Discussion of Pilot Study Results

Under Irish legislation a place of work can be a vehicle, and road traffic fatalities that take place in, or are associated with, a vehicle in the course of work should be reported to the HSA. Each year, when reporting the fatality statistics, the HSA notes that their data does not include road traffic fatalities that were not reported to them. The extent of this under-reporting is not known. This pilot study illustrates that in a three-year period, there were 4 work-related fatalities reported to the HSA from Co. Kildare. However, if the work-related road traffic fatalities from the Coroner's data are included, the work-related fatality figure for Co. Kildare for the period rises to 12. In this small geographical area, the number of work-related deaths from road traffic collisions is double that from other causes, and more than one third of the fatal road traffic collisions involved someone who was at work at the time. Neither result should be extrapolated to national figures because the study cannot be taken to be representative, however the findings are in keeping with the findings of research in other countries and suggests that further research of this nature should be

undertaken, involving larger areas and using multiple data sources: Coroner files, HSA data and NRA datasets. Such research is feasible: the NRA data is made available in raw data format for research purposes, and the two Coroners interviewed in preparing this report (Coroners for Co. Kildare and for Dublin City) both support the use of existing data for research purposes.

It is worth noting that an additional 8 'worker-involvement' road traffic fatalities were identified using the Coroner's data. Recall that incidents categorised as 'worker-involvement' were those incidents where a witness, who was involved in the collision, was at work. In most of these cases the witness was driving a truck making deliveries or collections. In many of these cases, the witness appeared to play no part in the factors causing the incident, but was nonetheless affected by it (for example an intoxicated pedestrian walking out in front of a van driving to collect or deliver goods, a car veering inexplicably into the worker witness's side of the road, or the witness's vehicle colliding with debris from the collision). There is no way of knowing whether such witnesses had received education on occupational road risk or driver training, and such investigation was beyond the scope of this study, but should be considered for future work.

Despite the fact that the Coroner's data revealed a number of 'at-work' and 'by-stander' fatalities, the Garda-collected NRA data for the same cases imply that these cases are commuting incidents, simply because of the limited available responses for the 'purpose of journey' question on the CT68 form. The Garda/NRA data cannot identify work-related private-vehicle fatalities.

1.7 DISCUSSION AND CONCLUSIONS: WORK-RELATED ROAD TRAFFIC FATALITY DATA

International research indicates that many countries have difficulty in using a single source for occupational fatality surveillance and rely on a combination of systems. It is generally accepted in the countries included in the research that data collection systems designed for work-related fatalities do not capture all of the relevant road traffic data (European Commission, 2001; Pratt, 2003; New Zealand Environmental and Occupational Health Research Centre, 2003). International studies have shown that many countries acknowledge that it is not a simple matter to capture the full number of people that die as a result of work-related road traffic collisions, and even using multiple sources it is thought that under-estimation is still a problem. Despite all of these limitations, the countries that have carried out research into the area have concluded that road traffic fatalities contribute significantly to, and in many cases comprise the largest single category of, work-related injury deaths (USA, Australia, New Zealand, UK). In Ireland, this problem has been shown to exist in the small geographical area of Co. Kildare, where, in a three-year period, the number of work-related road traffic fatalities was more than double that of the work fatalities reported to the HSA under the workplace accident notification scheme. The extent of the problem at national level in Ireland is not known but should be investigated. Simple modification to the Garda data collection system should be considered, as part of a larger drive to clearly establish the circumstances in which the HSA would like to be notified of road traffic fatalities. The recent development of the original Memorandum of Understanding between the Gardai and the HSA is likely to be followed in each organisation by guidance for staff training purposes, as occurred in the UK, where the work-related deaths protocol for liaison was followed by the investigators guide. It should never be the intention that the HSA investigate every work-related road traffic fatality, particularly when the breach of legislation relates to road safety law, however, they should be in a position to quantify them, so that employers may be made aware that

occupational road risk is part of their overall health and safety management strategy and so that national progress in this regard can be monitored.

Under Safety, Health and Welfare at Work legislation, the employer's responsibility is to promote health and safety management, and to prevent harm (injury or illness) to employees and others affected by work activities. Responsibilities include identification of hazards, assessment of risks and implementation of appropriate control measures, which may include training, information, and supervision. Knowing, or making reasonable estimates, of work-related injury fatalities has been essential for prioritising areas for national OSH injury prevention interventions and strategies, and this is particularly evident in high risk sectors such as agriculture and construction. In recent years a number of larger organisations, often facilitated by their insurance company, have developed Occupational Road Risk and fleet safety policies (Kenyon, 2006). There is little evidence to show that occupational road risk is being prioritised at national level in Ireland, as it is in other countries - there is a dearth of awareness-raising literature and neither the HSA nor the NSC/RSA highlight it as an issue; this is despite the literature evidence that in other countries road traffic fatalities account for a significant number of work-related deaths and that a significant number of the victims of road traffic incidents are at work at the time. If the situation in Ireland was thought to be similar to that of the other countries studied, it would appear to be common sense that joint interventions should be designed and implemented both from an occupational safety and health perspective (where occupational road risk can be assessed and controlled as for any other hazard in the workplace), and from the Road Safety point of view (where at-work education and training and awareness-raising will be of benefit to employees and their families in all of their driving activities).

An essential first step in developing policy and strategy on any workplace hazard and its management is to collect information about the current situation. In the Irish context, we have an idea of the extent of the problem, but we do not have the full picture, and more research is required, using multi-stakeholder and multiple data-source approaches. Gaining a realistic picture of what proportion of work-related injury fatalities can be attributed to road traffic collisions, and a realistic picture of what proportion of road traffic collisions are work-related, is essential in order to develop a risk profile. The approaches taken to preventing work-related and road traffic fatalities have much in common and both rely on strategies of education, enforcement, and engineering solutions. The establishment of the new Road Safety Authority provides an opportunity to set up high-level collaboration between the agencies, both in terms of a joint approach to managing the problem, and also in terms of joint research. Such an approach will be mutually beneficial.

1.8 RECOMMENDATIONS

1. **Garda form CT68 should be reviewed with a view to including 'at-work' or 'engaged in a work activity' options.** Gardai collect road traffic fatality data at the scene of collisions. The response options available to Gardai for the 'purpose of journey' variable includes one that refers to work: 'to/from work'. This value label may be used inappropriately to describe 'at work' incidents, even though the wording suggests a commuting accident. There is no 'at work' option and this should be reviewed.
2. **Garda role in notifying the HSA of fatal road traffic collisions, in circumstances where the victim died while engaged in a work activity or as a result of a work activity, should be clarified.** Gardai routinely contact the HSA if they are called to a work-related death, following the agreement in the Memorandum of Understanding. It appears, however, that

some road traffic fatalities are not seen as work-related by Gardai, possibly because of how the data are collected, or because they consider that no breach of health and safety legislation took place. However, many relevant fatalities are not being reported to the HSA, despite clear evidence that there is a work-related factor. Recent changes to the Memorandum of Understanding between an Garda Síochána and the HSA could be followed-up by a protocol document, such as in the UK, which clearly outlines the roles of the two agencies in the event of a work-related death, including road traffic fatalities.

3. **Employers should be made aware of their duty to report fatal road traffic collisions to the HSA, in circumstances where the victim died while engaged in a work activity or as a result of a work activity.** It appears that some road traffic fatalities are not seen as work-related by employers, most likely because of lack of awareness of, or fear of the repercussions of complying with, notification legislation. As a result many such fatalities are not being reported to the HSA. In contrast to other countries, in Ireland there is a dearth of information and guidance on occupational road risk and this is likely to be a factor. The promotion and provision of education and guidance on occupational road risk for employers, as an occupational safety and health issue for which they have responsibility, should also increase awareness of notification requirements. A campaign to raise awareness of road risk, as an issue for occupational safety and health management, should be prioritised.
4. **The HSA should have an input to the upgrade of the Coroners' Information System.** Valuable data relating to road traffic fatalities is available in coronial files. This data includes the name, address, occupation and the date and cause of death of the victim; files also include narrative data in witness depositions, which may establish a work-related component. While this has been shown to be a good source of data internationally, many Irish Coroners' files are currently held in paper format, which makes collation of data for research very labour intensive. One of the recommendations of the Coroner's review was to upgrade the Coroners' Information System, and this should be very beneficial to the surveillance and analysis of work-related road traffic fatalities when this is achieved. The HSA made a submission to the Review of the Coroner's Service and should ensure that the Authority has an input when such an information system is being designed.
5. **Ensure that data collection is not addressed in isolation, but is one of the items on a work-related road traffic fatality reduction agenda.** The first step in addressing an occupational safety and health risk is to have knowledge of the current situation, so that the risk can be assessed. Recommendations 1, 2 and 3 directly address limitations of the current data-collection systems. It is beyond the scope of this study to make specific recommendations to address occupational road risk outside of the context of data-collection; however, it is strongly recommended that data collection issues should not be addressed in isolation, but within the context of a multi-stakeholder holistic approach, overseen and guided by an advisory or task group. This should involve collaboration between the HSA, RSA, and an Garda Síochána as a minimum, but should also include other relevant agencies such as insurance companies, driver training agencies, organisations with driving fleets, and the Coroner Service. The group should be funded to develop a strategy to extend existing measures to address the issue of occupational road risk, including but not limited to data-collection issues.
6. **The Road Safety Authority and the Health and Safety Authority should work together at a high-level to maximise existing strategies.** Research in the USA, Australia, New Zealand, UK and other countries has shown that road-traffic collisions comprise the largest single category of

work-related fatalities, and that between a quarter and a third of fatal road-traffic and highway incidents involve at least one person at work. The strategic approaches taken by road safety agencies echo risk management approaches taken by the HSA to reduce the risk of injury from workplace hazards. The establishment of the Road Safety Authority provides an opportunity to initiate a high-level collaborative approach between the agencies with the aim of preventing work-related road-traffic fatalities, using a joint approach.

7. **Further research into the work-related road-traffic data collection systems should be planned and funded to establish the full extent of the problem.** International research has shown that despite good intentions, no single data collection system captures all work-related road-traffic fatalities; and that in order to establish the full extent of the problem and to develop a risk profile to inform strategy, research using multiple data sources is needed. It is not always necessary to collect new data, rather to make use of a variety of existing data sources. Such research would facilitate development of an understanding of the links between known causes of road-traffic collisions (e.g. fatigue, speed) and the occupational road risk factor, and would further highlight the strengths and weaknesses of the data collection systems, and should be funded and undertaken in Ireland.

CHAPTER 2 WORK-RELATED CANCER DEATHS

2.1 INTRODUCTION

Cancer is responsible for approximately 12% of all deaths worldwide (Irish Cancer Society, 2005). In Ireland, there are more than 20,000 new cases of cancer registered each year and more than 7,500 cancer deaths, which is about a quarter of all deaths (National Cancer Registry, 2005). Most cancers occur in the population aged over 65, and incidence is predicted to increase, mostly due to population ageing (National Cancer Registry, 2006). This chapter explores the challenges to establishing the number of persons who die from occupational cancer in Ireland.

Methods for collating data on occupational disease vary widely. Leigh et al (1999) found that even developed countries have fragmented reporting systems and less well developed countries have none at all. Globally, no single approach has been found that can provide an accurate account of occupational diseases, and methods for estimating rates are particularly deficient because of deficiencies in the reporting systems, coupled with the fact that many diseases have multiple potential causes, including lifestyle factors, and long latency periods. The issue is compounded by liability and employer responsibility issues (Leigh et al, 1999).

Work-related, or occupational, cancer is cancer caused by exposure to carcinogens in the workplace. This chapter describes the challenges to identifying cases of work-related cancer and explains how the extent of the problem of occupational cancer is estimated rather than quantified. The methods used to estimate the proportion of cancers that can be attributed to occupation are explained, including recent caution against using the proportion that has been widely used for many years. The means by which cancer incidence and mortality data are collected in Ireland is described and finally the data-collection role of the Irish organisations and agencies involved, to any degree, in the collection of data, directly or indirectly, related to occupational cancer is outlined.

2.2 OCCUPATIONAL CANCER: HOW THE EXTENT OF THE PROBLEM IS ASSESSED

Cancers evolve through a complex process from multiple causes, and can occur in, and are usually categorised by, different areas of the body, e.g. bladder cancer or lung cancer. Prevention of cancer is a global public health issue and most developed countries, including Ireland, have Registries, which collect cancer data and which quantify the extent of the problem, monitor trends and make predictions for future incidence (http://www.ncri.ie). Parkin et al (2001, p. 4) clarified the ways in which the 'burden' of cancer, or the disease frequency, can be expressed:

- *Incidence*: the number of new cases occurring; this can be expressed as an absolute number of cases per year or as a rate per 100,000 persons per year. Rates are used to compare the risk between populations. A reduction in incidence is used to assess the impact of primary prevention strategies.
- *Mortality* is the number of deaths occurring; this can be expressed as an absolute number of cases per year or as a rate per 100,000 persons per year. It provides a measure of the impact or outcome of cancer.
- *Prevalence* is essentially the number of persons alive at a given time, who have had a cancer diagnosed at some time in the past.

For this project, the measure of interest is mortality. A widely-used method of estimating mortality from occupational cancer is to estimate the percentage of deaths that can be attributed to occupation; this is referred to as the *attributable*

fraction (Steenland et al, 2003) and requires data derived from epidemiological studies.

2.2.1 Occupational Cancer

Occupational cancer is the term used for cancers associated with, or caused by, exposure to carcinogens in the workplace. Occupational cancer can present at different sites in the body, and is clinically identical to a similar cancer where an occupational cause is not suspected. This makes establishing an occupational cause in individual cases difficult; however, over time, as a result of clinical observation, epidemiological studies and analysis of statistical patterns and trends, a number of occupational carcinogens have been identified, and certain cancers are known to be associated with specific occupational exposures. Specific exposures are associated with a person's occupation and with the industrial sector in which they work. In cases of suspected occupational cancer, detailed medical history taking can establish a high probability of an occupational cause.

The International Agency for Cancer Research (IARC, 2006) classifies carcinogenic agents and occupational exposures as known, probable or possible carcinogens, and this source is generally used as an international standard on which legislation is based. There is ambiguity, and no simple rule, on how to come up with a definitive list of occupational carcinogens. Individual substances categorised as carcinogenic by IARC may be found in and / or out of the workplace. Various organisations publish lists of occupational carcinogens but there are no standard criteria for inclusion. Siemiatycki et al (2004) reviewed the monographs published by IARC, augmented with data from other sources and attempted to devise a summary list of occupational carcinogens of which 28 agents were categorised as definite occupational carcinogens, 27 as probable, and 113 agents as possible.

Even where exposure is known, it is difficult to quantify, as account must be taken of levels and duration as well as numbers exposed, and it is often necessary to estimate exposure due to lack of data. An attempt to estimate European national exposures (Kauppinnen et al, 2000) concluded that about 23% of all European workers, and 22% of workers in Ireland, were exposed in the course of their work to the carcinogenic agents in the study database (CAREX), however, it should be noted that, because of lack of national data, default estimates were used for Ireland.

In Ireland, the Department of Social and Family Affairs includes certain cancers in the list of prescribed diseases, for which those diagnosed, having worked in a particular occupation, will receive compensation through the social welfare system. The list includes the following cancers:

- Carcinoma of the nasal cavity or associated air sinuses,
- Diffuse mesothelioma,
- Angiosarcoma of the liver,
- Cancer of the mucous membrane of the nose or associated nasal sinuses,
- Cancer of a bronchus or of a lung,
- Squamous-celled carcinoma of the skin and
- Primary neoplasm of the epithelial lining of the urinary tract.

(Department of Social and Family Affairs, 2004b).

Because the effects of past exposure to a workplace carcinogen may take many years to manifest, work-related cancer tends to occur late in working life (Takala, 2005). Like most occupational diseases, occupational cancer is preventable. It is known that employees in some occupations are exposed to carcinogens in their workplace, and general Irish OSH legislation, in addition to

the Safety, Health and Welfare at Work (Carcinogens) Regulations, 2006, set out the arrangements that employers must put in place to ensure that the health of exposed individuals is protected and monitored. However, it is also known that those who are exposed to carcinogens at work are also exposed to carcinogens in their social and environmental context, and if they develop cancer, it cannot always be assumed that the cause is occupational. Thus quantifying the incidence of, and the mortality from, occupational cancer is problematic. This problem is global (Leigh et al, 1999), and, even within Europe, international comparisons of occupational cancers are difficult because of the variations in recognition systems used in different countries - there were only two occupational cancers recognised by all countries in one European study - and because of under-reporting (Kranig, 2006). Because of this lack of definitive data, scientists attempt to estimate the proportion of cancer cases and deaths due to occupational exposure. It is generally accepted that there can only be cautious estimates of the number of occupational cancers and their proportion to all instances of cancer (Australasian Faculty of Occupational Medicine 2003).

2.2.2 Estimates of Occupational Cancer Mortality

Many estimates of cancer mortality are based on the findings of Doll and Peto (1981) from a study carried out in the USA in 1978, in which the authors summarised the scientific literature to estimate the possible contribution of various factors, including occupation, to cancer mortality for each cancer site. While acknowledging that some cancer sites (e.g. lung cancer) would be responsible for a larger fraction of deaths than other sites (e.g. skin cancer), these estimates suggested that between 2 and 8% of all cancers in the USA were attributable to occupation, most likely about 4%. Despite the authors' acknowledgement that they had not taken account of interaction of exposures and many other limitations, these estimates are still commonly used, nearly three decades later (Clapp et al, 2005; Evans et al, 2005; HSE, 2006).

in Ireland, it is known that there are, on average, over 20,000 new cases each year and that more than 7,500 people die of cancer each year (National Cancer Registry, 2005), therefore based on Doll and Peto's estimates, as has been already been highlighted in the Irish OSH media, as many as 300 cancer deaths in Ireland each year may have an occupational cause (Mulligan, 2004a), with an uncertainty range of 150 – 600. The British Health and Safety Executive (HSE) acknowledge that UK estimates, based on the Doll and Peto methodology, are out of date (HSE, 2006), and has recently commissioned work to re-estimate the burden of occupational cancer in the UK (Evans et al, 2005) with a view to devising a methodology appropriate to updating them. In the USA, Clapp et al (2005) argue that Doll and Peto's estimates are not only out of date but are an under-estimate of the true figures. O'Neill (2005), writing in Hazards magazine, denounces Doll and Peto's estimates and argues that it suited industry to accept these figures because they underestimate the true picture. He is critical of the HSE for accepting these figures for so long. He quotes from an interview with Dr. Clapp:

> "Using the 1981 Doll/Peto estimates for occupational cancer probably underestimates the occupational exposure contribution by a factor of two to four in both the US and the UK."

He also cites interviews with internationally renowned academics, Prof. Andrew Watterson and Dr. Samuel Epstein, who both agree that Clapp's estimates are probably correct. The HSE accepts that the estimates are out of date, and further publications are anticipated when current work is complete.

Boffetta et al (1999, p.230) described a number of ways of estimating the burden of occupational cancer; these include examination of the results of pooled analyses of case control studies, linkage analysis of census and cancer

registry data, examination of data on the incidence of neoplasms caused primarily by occupational exposure (such as mesothelioma), and the figures proposed by Doll and Peto. Other approaches (Evans et al, 2005, p.4) include applying national cancer rates for specific occupations for countries closest in geographical or economic development to nations with no occupation specific cancer data; comparison of age/gender/occupation incidence rates for specific diseases from one country to another; and identification of the number of people exposed to specific carcinogens and estimation of the proportion of cases due to these exposures.

2.2.3 Research from the United Kingdom

Evans et al (2005) summarised the findings of the workshop of experts in the UK, who gathered to assess the methodological approaches and data that might be used to update the estimate of the current burden of occupational cancer due to past exposures. The experts agreed that it was appropriate and feasible to update Doll and Peto's mortality estimates and pointed out that the potential impact of unrecognised carcinogens (possibly not yet on the IARC list) should be included in any assessment, and that some exposures, which no longer take place because of advances in knowledge and prevention strategies, including elimination, could be relevant to the current burden, although not necessarily to the future. The workshop identified various approaches that could be used to assess occupational attribution, but noted that the optimal method would differ by cancer and carcinogen. It was suggested that the HSE would face challenges in relation to the adequacy of the data held, on exposure as well as on those exposed. Possible methods suggested for estimating the excess of a cancer that is attributable to occupation were:

- "Direct estimation from representative population-based case-control studies;
- Application of exposure-response relationships derived from one source to data on the population distribution of exposures derived from a different source;
- Extrapolation from estimates of attributable numbers for another disease caused by the same hazardous agent, with assumptions about the exposure-response relationships for the two diseases;
- Application of attributable fractions estimated from studies in other countries to data on cancer incidence in Great Britain." (Evans et al, 2005, p.39.)

It was stressed that as well as updating estimates for the overall burden, a breakdown by cancer and carcinogen should be carried out so that workplace interventions could be designed. There was no consensus about the current burden of occupational cancer in the UK, but it was agreed that to provide an updated estimate of the current burden estimates of incidence as well as mortality would be needed, because not all cancers are fatal. The workshop was to be followed by commissioning a team of epidemiologists and statisticians, using occupational hygiene and toxicological advice as required, to determine the current and future attributable fraction of occupational cancer in Great Britain.

2.2.4 Research from the United States of America

In the USA, Clapp et al (2005) carried out an extensive review of the scientific evidence on environmental and occupational exposures considered to cause, or suspected of causing, nearly 30 types of cancer; their recommendations included more research, urgent action on the part of the USA Government to reduce occupational and environmental exposure, and that the USA should follow Europe's example by introducing a REACH (Registration, Evaluation and Authorisation of Chemicals) approach. The authors criticise the Doll and Peto methodology for attempting to assign causation to exposure in a manner that totals 100%, when all of the evidence makes it clear that cancer evolves as a

result of a complex interaction of multiple causes; they also criticise the field of cancer research for missing this point, even though Doll pointed it out in subsequent publications. The authors identify a number of other limitations: Doll and Peto's work was based on epidemiological studies in large industries only, even though exposure to asbestos, for example, was commonly found in smaller workplaces; their analyses for deaths were limited to those aged less than 65 years, and it is well accepted that because of the latency period, cancer does not present for years and even decades after exposure. Coupled with the knowledge that Doll and Peto's estimates were based on a list of 16 carcinogens, which is low compared to currently accepted lists, Clapp et al (2005) concluded that Doll and Peto's estimate of the fraction attributable to occupation is too low, and concurred with Landrigan (1995) who suggested a central estimate of 10%, although Steenland et al (2003) estimated a range of occupational cancer deaths between 2.4 and 4.8% of all cancer deaths and 5 – 10% of the cancer deaths for which estimates could be generated.

2.2.5 Other International Research

The Australasian Faculty of Occupational Medicine (2003) cautions its members that estimates of the proportion of cancer attributable to cancer are hampered by uncertainties, but that reliance has to be placed on these population estimates, based on epidemiological studies, rather than on registers of particular cases, for all of the reasons outlined in the last section.

In Europe, some attempts have been made to quantify the extent of occupational cancer, in the context of collecting data on other occupational diseases. Eurostat's European Statistics on Accidents at Work (ESAW) system only addresses cases of occupational illness that are caused by a single specific event causing immediate absence from work. Unfortunately occupational illness is typically due to prolonged exposure and only becomes apparent after many years. Eurostat launched a pilot project (European Occupational Disease Statistics – EODS) for collecting occupational disease data in 1995, and subsequently collected the first statistical data on recognised occupational diseases for the reference year 2001. Recognition practices and social security arrangements for occupational diseases differ between the Member States, therefore the core data included only those 68 occupational disease items that were covered by all national systems (Karjalainen and Niederlaender, 2004). Almost 1,500 cases of work-related cancer were reported from 12 Member States in 2001: mesothelioma (1,168), lung cancer (208), bladder cancer (56), nasal and sinus cancer (44), leukaemia (11), cancer of the larynx (7), and skin cancer (5). The EODS specification also defined data, and asked for it to be provided, for deaths due to occupational disease during the reference year, regardless of when the occupational disease had been recognised for the first time. Only 6 Member States were able to provide such data. Fifty-five of these deaths were due to cancer (mesothelioma and lung cancer). The project, and the report, highlighted the data collection weaknesses, which pose the challenges to collecting this type of data:

- the economic activity of the employer was unknown in 24% of cases;
- incidence rates for occupational cancer were not calculated a) because it is necessary to have information on the number of workers exposed in order to calculate an incidence rate and this data was not available, and b) occupational cancer develops over a long period of time and cases occurring in this decade may result from exposures 10 – 40 years ago;
- reporting of occupational diseases is dependent on the way in which the concept of an occupational disease has been integrated into the national social security system; and, finally, this integration influences reporting, which is dependent on financial and legal motivations for employees, employers and physicians to notify cases.

The challenges to case identification for occupational disease in general, and occupational cancer in particular, and consequently data collation and classification, are well documented (Leigh et al, 1999, AFOM, 2003; Clapp et al, 2005, Evans et al, 2005) and are summarised here:

- Exposure: The mere presence of a carcinogen in the workplace does not mean that workers were necessarily exposed. There is no risk unless the worker is actually exposed to the agent.
- Latency period: exposure to agents that can cause environmental and occupational cancers is likely to occur years or decades before the cancer is diagnosed. Exposure may not have been recognised, acknowledged or recorded.
- Record keeping: while modern legislation requires keeping detailed records of carcinogenic agents, exposed personnel, health surveillance and monitoring, this is a relatively recent development in the context of the typically long delay between exposure and manifestation of cancer. Even where records exist, they can be incomplete and/or inaccurate.
- Multi-causation: It is well accepted that a single factor or agent does not necessarily cause cancer. A person exposed to carcinogens in the workplace is likely to also be exposed to other environmental carcinogens.
- Medical history: medical history taking does not always include a detailed occupational history. Unless the physician has knowledge of both the agents that can cause occupational cancer and of the nature of work that can expose employees to the risk, vital information or links can be missed. The histology and clinical presentation of a work-related cancer are no different to a similar cancer due to another cause.
- Data collection issues: different systems collect data for different purposes and with all occupational diseases there are difficulties with primary reporting, collating and classifying.
- Attribution: cancer in a patient with a known previous exposure to a workplace carcinogen cannot necessarily be attributed to the agent.

Since Doll and Peto, many other estimates of occupational fraction have been attempted. The World Health Organisation (WHO) describe a number of methods that can be used which involve knowing the occupational carcinogens, identifying the proportion of the population that is exposed and determining the relative risk using scientific literature (Driscoll et al, 2004). Deschamps et al (2006) attributed 3.18% of cancer to work-related causes in a recent study in France, and they cited findings from studies carried out in other countries: 6 – 10% in the United States, 6% in the UK, 4% in Spain, 1.5% in Australia. Imbernon (2002), who estimated the attributable fraction for certain cancers in France, emphasised that the attributable fraction from one country should be applied with caution to another: the fraction depends on the relative risk of the disease associated with a factor and on the proportion of subjects exposed within the population, and this requires epidemiological studies. She recommended that comparisons should only be made with countries with comparable levels of industrialisation and credible attributable fractions published in the international literature.

A lot of research has been carried out on Cancer Registry data in the Nordic countries; this is possible because of the availability there of well-organised historical data on occupation and exposures, and a unique central personal number that can be used for linkage of data between different data sources. Epidemiological studies on occupational cancer have been carried out in Nordic countries using data linkage between census, population registries, and cancer registries (Kjaerheim, 1999). Despite the value of linking data in this context, the ‘occupation’ variable still poses a limitation because this information is

limited to one or two points in time. The confidentiality issues that normally arise in data linkage, are not relevant in the Nordic countries because informed consent is not required. Andersen et al (2004) argue that linking data in this way solves the problem of bias that results from the low response rates that hamper surveys in studies in this area, however they concur that the main limitation is the uncertainty over occupational exposure data.

Wong (2001) suggests that the increasing use of personal identification numbers to record everyday transactions and health-events, coupled with advances in computerisation and archiving, opens endless possibilities for record linkage in epidemiological research, particularly occupational and environmental research, however he also points to the limitation that, for the most part, these databases are maintained for administrative purposes, not scientific. He concurred with the views of Kjaerheim (1999) and Andersen (2004) in noting that the main limitations are deficiencies in occupational information and lack of exposure data. He described a small number of occupational cancer epidemiology studies, carried out in the Nordic countries and in the USA, using both death certificate to census linkage and death certificate to cancer registry linkage, however, he cautioned against the temptation of using and accepting such administrative data for epidemiological purposes indiscriminately.

2.2.6 Conclusions from Literature Review

The international literature is generally agreed that current estimates of the fraction of cancer deaths attributable to occupation, based on the Doll and Peto estimates, are based on data and methodologies that are out-of-date and inappropriate to current work practices and working populations. Epidemiological work is in progress internationally which will help to address this situation.

It should be noted, however, that while many publications and studies continue to use attributable fraction and to cite proportions of cancer that can be attributed to occupation, most acknowledge that there are many uncertainties associated with this approach. Steenland et al (2003), advocate the use of attributable fraction, but noted that such estimates do not take into account duration or level of exposure among the exposed. Application of these percentages to estimate national figures should be carried out with caution, as the type of industry, the exposure levels, working conditions and many other variables cannot be assumed to be the same in the country making the estimates, as in the countries where the epidemiological work, on which the estimates are based, was carried out (Imbernon, 2002; Steenland, 2003).

The aim of this chapter was to assess whether Irish data collection systems capture all deaths that occur as a result of occupational cancer; the data system certainly captures cancer mortality, however, for occupational cancer the answer is obviously no, but this is neither surprising nor unique to Ireland. Because of the challenges to case identification, the number of cases of occupational cancer is not known, it is not possible to say how many occupational cancer deaths occur, and it is generally accepted that reliance on scientifically reliable estimates is necessary.

Given that the overall incidence of all cancer in Ireland is predicted to increase (National Cancer Registry, 2006) it can be reasonably assumed that the incidence of occupational cancer in Ireland will increase in the short to medium-term because of population ageing and the long delay between exposure and diagnosis. It is hoped that in the long-term, advances in knowledge and current prevention strategies will reduce both incidence and mortality. However, given the data-collection limitations highlighted in other countries and outlined above,

it is timely to audit the data that is currently being collected by Irish agencies, and the next section summarises the data sources and the official data currently being collected that is relevant to occupational cancer in Ireland.

2.3 OCCUPATIONAL CANCER DATA COLLECTED IN IRELAND

In order to monitor cancer incidence and mortality, most developed countries have a number of regional registries, or one national cancer registry. The website of the National Cancer Registry of Ireland describes the role and function of such Registries in detail (http://www.ncri.ie). Cancer registries collect information on all new cases of cancer and on cancer deaths occurring in a defined population. They permanently and securely store this information and produce regular reports based on analysis of the data. Registries tend to use internationally agreed standards, so figures on rates of occurrence or survival for different countries can be compared. Registries pick up cases actively, by employing researchers to go through hospital and other health care records and record details of new cases of cancer, and passively, by being notified of new cases of cancer by health care staff (National Cancer Registry, 2006). With the exception of mesothelioma registers, there are no registers of occupational cancer internationally (AFOM, 2003).

While the primary purpose of this project is to identify data sources for deaths caused by occupational cancer, this section identifies the agencies that collect any data, which could potentially be of benefit in establishing, or estimating, the incidence of occupational cancer and /or the number of related deaths. A brief profile of the Irish organisations that have a direct, indirect or potential role in incidence and mortality data-collection follows.

2.3.1 National Cancer Registry of Ireland

The National Cancer Registry of Ireland is a publicly appointed body for monitoring the incidence and prevalence of cancer and related tumours in the Republic of Ireland. It was set up by statute in 1991, is funded by the Department of Health and Children, and has been registering cancers nationwide since 1994. The information collected is used in research into the causes of cancer, in education and information programmes, and in the planning of a national cancer strategy (http://www.ncri.ie). The most recently available information shows that between 1994 and 2001, there was an average of 20,523 new cases of cancer registered each year, and that during the same period, there was an average of 7,584 deaths from cancer each year (National Cancer Registry, 2005).

Cancer cases are identified through a variety of sources, such as pathology reports, scans, x-rays etc., and from a number of health care providers. Researchers physically search medical records for data, and findings have shown that ‘occupation’ is listed for about 50% of cases. This could be useful information, however, Dr. Harry Comber, Director of the National Cancer Registry of Ireland, noted that there are limitations on the usefulness of this data for a variety of reasons:

- The occupation listed may date from the first, or any, admission of the patient to hospital and may have no relevance to their cancer diagnosis;
- The occupation listed may be vague or non-specific (e.g. civil servant; fitter; engineer) and no assumptions can be made on the potential past-exposures of the patient, the nature of work that they carried out or the sector of industry in which they worked.
- Many cancer patients are aged over 65 years and the occupation in many cases is simply listed as ‘retired’.

- Many occupations never retire and therefore may appear to be over-represented because of the age profile of cancer patients (e.g. farmer).

Moreover, knowing the occupation of a cancer sufferer is not enough to establish an occupational link.

One of the data variables that the National Cancer Registry collects from medical records, where available, is the Personal Public Service (PPS) number. There is potential for linking this data with information to be found on death certificates. The National Cancer Registry avails of the Death Event Publication Service and works with death registration data from the Central Statistics Office, including validated PPS numbers, for research purposes (Department of Social and Family Affairs, 2004), however, it does not make use of the PPS number at present.(http://www.welfare.ie/topics/ppsn/rou.html accessed 23 August 2006).

The Registry collects its cancer mortality data from information on death certificates, provided electronically, in cooperation with the Central Statistics Office.

2.3.2 Health and Safety Authority

The Safety, Health and Welfare at Work (Carcinogens) Regulations, 2001, impose duties on employers, in the event of the use of a carcinogen at work, to assess the risks and to take steps to eliminate or minimise exposure. The legal definition of a 'carcinogen' includes agents where the manufacturer, or his representative, has information indicating that the substance is carcinogenic to humans or probably/possibly carcinogenic to humans (see appendix 2). Employers are required to keep an up-to-date list of affected employees and to maintain records on the results of assessments, and measurements of exposure and health surveillance; such records must be made available to the HSA if requested. Such data, assuming all ethical and confidentiality issues were addressed, could be a valuable source for epidemiological studies in the future. The Regulations also require any employer who becomes aware of, or any registered medical practitioner who diagnoses, a case of occupational cancer to notify the HSA. The Authority is rarely notified of such cases by this route. The EU has recently commissioned a report on the extent to which the Carcinogen and Biological Agents Regulations were being implemented in member states; Ireland was included in this research, and the Irish survey was carried out by the Labour Research Department from the UK, in 2005. The report of this research has not been published to date (Labour Research Department, 2006, personal contact).

The Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations, 2006, require the Authority to establish a Register (Asbestosis and Mesothelioma Register); this is not a new requirement and was a duty under existing Regulations dating from 1989. Registered Medical Practitioners who become aware of a case of either condition will now be required to report it to the Authority, as opposed to reporting the case to Minister, as was previously required. The new and old Regulations also specify personal and clinical information to be included in individual medical records of exposed employees, and this data too may be of epidemiological value in the future. While the legislation does, and did, specify keeping a record of the name and address of relevant employees, it does not require keeping a record of the PPS number; this data can be of use in tracking deaths, as addresses change over time.

While both the Carcinogens and the Asbestos Regulations require relevant organisations to record a lot of data, there are minimal requirements for reporting, and non-compliance is an issue. While the recorded data may be of benefit for epidemiological purposes, the quality of data management and record

keeping is not controllable, and the records are personal medical records; these factors may be a limitation for future use of the data.

The HSA may be contacted by a Coroner in the event of an inquest into a death as a result of exposure to Asbestos, where the Coroner considers that the death is as a result of an occupational exposure, and requests the presence of an Inspector of the HSA at inquest. The HSA states that they become aware of approximately 25 to 30 deaths a year in this manner, and this reflects an increase in the number being reported to the Authority in recent years (from 4 – 5 per year in the 1990s). Such cases reflect exposures from many decades ago. It should be noted, however, that a Coroner is dependent on referral of suspected occupational deaths by medical personnel in hospitals and other healthcare settings, and it is likely that many deaths are not reported to Coroners because of lack of knowledge of the notification requirement on the part of the person certifying the death. The real number of such deaths is likely to be much higher (Personal contact, Dublin City Coroner, 2006).

There is currently no other statutory obligation on either employers or employees to notify exposure to the risk of, or cases of, occupational cancer to the HSA, and while employee representative organisations were reported to be putting pressure on the government to make occupational illnesses reportable under the new General Application Regulations (Mulligan, 2005), the draft General Application Regulations, circulated for consultation in 2005/2006, did not include any such requirement. In the UK, employers are currently required to report occupational illness under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations, 1995 (RIDDOR), however a preliminary report of an ongoing review of these Regulations by the HSC has raised questions about the efficiency of this system for collecting occupational disease information; it has been labelled ineffective, compliance is thought to be less than 5%, and it is mooted that dropping the disease-reporting requirement would have little or no impact on the statistical picture of ill health. The report suggests that other existing (e.g. THOR) and planned systems (e.g. Workplace Health and Safety Survey) may be more reliable (HSC, 2006).

The HSA does not directly collect occupational illness data. It relies on data and information provided by other data sources. These sources of occupational ill-health data are well documented in the HSA's annual statistical report (HSA, 2006) and are referred to below only in the context of the extent that they may capture cases of occupational cancer or work-related cancer deaths. Information on occupational ill health is currently gained mainly from the Central Statistics Office (CSO) through the Quarterly National Household Survey (QNHS), and from the Department of Social and Family Affairs through the Occupational Injuries Benefit (OIB) (illness) and Disability Benefit schemes.

The other sources of data on occupational ill-health that the HSA has used in recent years include reports of occupational disease gathered with the co-operation of pathologists and dermatologists, notification by physicians to existing schemes such as the British Reporting of Dermatological Diseases (EPI-DERM) and the Survey of Work and Occupation Related Disease (SWORD), discussed below, and voluntary reporting by hospital consultants.

2.3.3 The Central Statistics Office

The Central Statistics Office (CSO) is the national specialist statistics agency that is responsible for the collection, compilation and dissemination, for statistical purposes, of information relating to economic, social and general activities of the state. Surveys that yield data relating to cancer deaths is collected from the

Deaths Registration Survey and the Quarterly National Household Survey (QNHS).

2.3.3.1 Deaths Registration Survey

The Central Statistics Office collects data on deaths from their deaths registration survey. Approximately 30,000 deaths occur annually (http://www.cso.ie/). The data collected is taken from death registrations from the General Register Office and includes: date of death, address of residence of deceased, place of death, cause of death, occupation of deceased, age of deceased, sex of deceased, and marital status of deceased. Deaths are coded according to the 9th Revision of the International Statistical Classification of Diseases, Injuries and Causes of Death (ICD-9), (CSO, 2006), a uniform system of nomenclature and coding. The CSO publish statistics on the causes of deaths, including malignant neoplasms, to provide information on mortality in Ireland. Since 2004, the CSO receives death registration data via the Death Event Publication Service (described below). The CSO and the National Cancer Registry cooperate with one another in the collation of cancer death data, however, while this system produces valuable data on overall cancer mortality, it cannot normally distinguish occupational cancer deaths from cancer deaths from other causes. There are some cancers, which are highly likely to be of occupational origin (such as pleural tumours or mesothelioma) and these may be quantified using the ICD code. In this way, Brennan and O'Connor (2003) identified a trebling of annual mesothelioma deaths in the last 20 years by examining mortality data from the CSO and the National Cancer Registry, and Kabir and Clancy (2003) studied the rise in pleural cancer deaths in recent decades and predict 70 deaths from this cause in Ireland in 2007-2008.

2.3.3.2 Quarterly National Household Survey

The QNHS survey (formerly known as the Labour Force Survey) is a large-scale nationwide survey carried out by the CSO, on 3,000 households weekly. It produces quarterly data on the overall number of workers, and special modules, included in the first quarter of each year, include information on the number of workers with occupational injuries or ill health. This permits analysis of illness and injury rates in relation to the number of workers at a given time, and it gives a sector breakdown for the data.

In carrying out their survey, the CSO uses a methodology agreed by all the member states, and this facilitates comparison of data. The EU ESAW system has links with the European Community Labour Force Survey (LFS). The advantages of using the European Labour Force Survey are the comparability of this source and the possibility for establishing more detailed information on the national labour forces. There are also well-documented disadvantages: the methodology relies on self-reporting (and therefore self-assessment) by householders/workers and a physician does not validate the diagnoses. Changes in the methodology (e.g. the use, and wording, of questions), from time to time, makes comparison difficult (Eurostat, 2001).

The CSO consider that the QNHS is unlikely to pick up cases of occupational cancer, as there is minimal reference made, in the questions asked, to cancer (it is included in an 'other' category alongside other diseases). There is no possibility of this system identifying occupational cancer deaths (CSO, Personal contact, 2006).

2.3.4 Occupational Injury Benefit Claims

Occupational Injury Benefit (OIB) is a weekly payment, paid for up to 26 weeks, by the Department of Social and Family Affairs (DSFA) to PAYE employees injured at work or suffering from a prescribed occupational disease. The scheme

does not cover the self-employed or the army. The prescribed diseases covered by the scheme, and the types of employment in respect of which they are prescribed, are described in detail in the Department's publication SW33 (Department of Social and Family Affairs, 2004b) and include the following cancers:

- Carcinoma of the nasal cavity or associated air sinuses,
- Diffuse mesothelioma,
- Angiosarcoma of the liver,
- Cancer of the mucous membrane of the nose or associated nasal sinuses,
- Cancer of a bronchus or of a lung,
- Squamous-celled carcinoma of the skin and
- Primary neoplasm of the epithelial lining of the urinary tract.

The advantages of this system are that the information collected in this way has remained consistent over time in terms of the criteria applied, it is subjected to a series of checks to ensure that it is correct, and as it is economically linked and verified by both employer and by a medical practitioner, it is likely to be valid. This system is very good at collecting data on occupational injuries among PAYE workers. The DSFA collect data such as name, date of birth, PPS number, and employer, in order to process the claims. If a claim continues longer than 26 weeks, the claimant moves to the Disability Benefit scheme. Due to the serious nature of the illness it is likely that most sufferers of the above conditions will claim the full entitlement of OIB and transfer directly to Disability Benefit, after the 6 months. Payment, on either scheme, is discontinued when a claimant stops sending in Medical Certificates, however this may or may not be because they have died. In order to ensure that payment of a benefit or pension is discontinued upon the death of a recipient, the DSFA receives death certification information via the Death Event Publication Service. Theoretically, the Department can quantify the number of deaths of OIB/Disability recipients, who are receiving the benefit for an occupational cancer diagnosis, but they will not know whether the person actually died from their cancer diagnosis, as the cause of death is not shared (the recipient could have died in a road traffic collision). With disability benefit, it is possible for the Department to quantify the number of claimants for the above diseases (all recorded on the system as cancer), who came to them through the OIB scheme, and deaths are identifiable in the same manner.

However, currently, and in the past two years, no claims under OIB have been for occupational cancer, and none of the 624 clients currently in receipt of disability benefit for any cancer (note that they may not be occupational cancers) were previously OIB claimants. Since 2002, 3 deaths for occupational cancer claimants have been recorded (Department of Social and Family Affairs, 2006, personal contact).

2.3.5 Voluntary Reporting by Occupational Physicians

Voluntary reporting of occupational disease diagnosed by medical specialists was initiated in the UK in the 1980s, was developed during the 1990s, and continued to 2001 (Cherry et al, 2002). In 2002 the Health and Safety Executive (HSE) commenced funding the schemes; they were relaunched as 'The Health and Occupation Reporting Network' (THOR), and are charged with estimating the incidence of work-related disease in the UK using sampled reporting from medical specialists. The THOR schemes rely on the willing participation of panels of specialist doctors including occupational physicians, psychiatrists, rheumatologists, respiratory physicians, dermatologists and audiologists who report cases of work-related ill health anonymously; electronic reporting facilitates participation (Rogers et al, 2004). THOR includes a reporting scheme for general practitioners who have training in occupational medicine (THOR-GP).

The schemes have generated much published information for Health and Safety Executive statistics, and in peer reviewed journals. THOR includes a variety of surveillance schemes and those listed below have the potential to pick up occupational cancers:

- Surveillance of Work-Related and Occupational Respiratory Disease (SWORD). 450 respiratory physicians in the UK participate in reporting occupational respiratory disease. Types of diseases reported include mesothelioma and lung cancer. In the UK, asbestos-related lung diseases, including malignant disease (mesothelioma), have been shown by SWORD to continue to have a high incidence, especially in some occupational groups (Meyer at al, 2001).
- EPI-DERM. The types of skin diseases reported include neoplasia (cancers).
- Occupational Surveillance of Otorhinolaryngological Disease (THOR-ENT). This is a new scheme which commenced in July 2005. The scheme aims to collect data from Otorhinolaryngologogists.
- Occupational Physicians Reporting Activity (OPRA). Information reported to OPRA gives a very broad picture of occupational disease and work-related conditions in the UK since OPRA incorporates all of the categories covered by the other THOR component schemes, i.e. respiratory (SWORD), skin (EPI-DERM), musculoskeletal (MOSS), hearing (OSSA), mental ill-health (SOSMI) and infectious disease (SIDAW), as well as any conditions not included elsewhere.

In all schemes, physicians, who are provided with guidelines for deciding whether a case is work-related, are asked to report new cases of disease seen in the last month which, in their opinion, are work-related. Some participants report monthly (core reporters), others report only one month a year, with the reporting month being chosen randomly each year (sample reporters) (McNamee et al, 2006).

Following approaches from the HSA, pilots of EPI-DERM and of SWORD in the Republic of Ireland have been launched electronically using monthly reporting through online webforms. The THOR website states that 14 dermatologists and 12 respiratory physicians have agreed to participate in the pilot study in Ireland, and that over the first year (commencing January 2005) 77 cases of occupationally related skin disease (mainly contact dermatitis) have been reported, as well as 28 cases of occupationally related respiratory disease (including 13 occupational asthma, 7 pneumoconiosis, and 3 mesotheliomas). http://www.medicine.manchester.ac.uk/coeh/thor/schemes/ireland. While reporting via THOR is relatively new in Ireland, it has been very successful in the UK, and has provided valuable statisitcs, incidence estimates and disease trends (Rogers et al, 2004, McNamee et al, 2006). The possibility of dispensing with the RIDDOR occupational disease reporting requirement and relying more on the THOR scheme has been raised and is currently being considered in the UK (HSC, 2006).

2.3.6 Death Certificates

Approximately 30,000 deaths occur in Ireland each year (CSO, 2006). The Civil Registration Act, 2004 requires defined particulars to be entered in the Register of Deaths, including:

- Date and place of death.
- Sex of deceased.
- Forename(s), surname, birth surname and address of deceased.
- Personal public service (PPS) number of deceased.
- Date of birth or age last birthday of deceased.
- Profession or occupation of deceased.
- Certificated cause of death, duration of illness and date of certificate*.

- If an inquest in relation to the death or a post-mortem examination of the body of deceased was held, the forename, surname and place of business of the Coroner concerned.

While death registration data can be valuable for assessing cancer mortality, some limitations exist in relation to evaluating occupational cancer mortality: two variables, the occupation and the PPS number, are not always available, as the data collected is dependent on the knowledge of the person registering the death (Superintendent Registrar's Office, 2006, personal contact). Even where occupation is available, the limitations to its usefulness have already been highlighted. The PPS number could be of use in linking death to sector of industry.

The Death Event Publication Service (DEPS) became available from the Department of Social and Family Affairs in 2004 as part of the Inter-Agency Messaging Service. DEPS was developed so that notification of all registered deaths could be made available automatically, electronically, to all relevant public sector agencies, allowing subscribing agencies to identify those persons on their registers who are deceased. Limited death information (including data such as name, PPS no. and date of birth) is made available to the National Cancer Registry of Ireland for research purposes (Department of Social and Family Affairs, 2004).

2.4 DISCUSSION AND CONCLUSIONS: WORK-RELATED CANCER DEATH DATA

The National Cancer Registry provides a clear statistical picture of the incidence of, and mortality from, cancer in Ireland. Individual case identification for occupational cancer is fraught with problems and is difficult to prove, and as a consequence while it is known that occupational cancer is a fraction of the full national burden of cancer, the exact proportion is not known. This is an international issue and as a result it is accepted that it is necessary to estimate the burden of occupational cancer and associated mortality. The Doll and Peto (1981) methodology commonly used to estimate the occupational fraction for mortality is based on what was known over two decades ago and is generally acknowledged to be out of date and inappropriate in the context of major advances in knowledge in the area of carcinogen recognition and workplace exposure. Studies carried out in other countries have shown the overall attributable fraction to be both above and below Doll and Peto's estimate of 4%. Occupational illnesses have been described as occupational accidents in slow motion, and it must be remembered that the cases of cancer presenting today are as a result of exposure(s) which took place in different working conditions many years, even decades, ago. A long-term view needs to be taken to finding solutions to data collection deficiencies, and to making every effort to ensure that complete and accurate data is collected.

A variety of Irish agencies collect data that may contribute to our knowledge of the extent of the problem of occupational cancer in Ireland. For a variety of reasons (under-reporting, case identification, missing data such as PPS number or occupation) many of these records are incomplete and this makes it difficult to develop a true picture of the extent of the problem.

Because the term 'occupational' cancer is used, the value of knowing the occupation of an individual may be over-estimated; 'occupation', as recorded in a medical or occupational record, may be ambiguous, may reflect only a single moment in time and does not necessarily indicate exposure. For epidemiological purposes, knowledge of the sector of industry may be more valuable and this is often not available.

Data linkage has been used successfully in other countries, particularly in the Nordic countries, where citizens have a unique personal identification number, which can be used, without informed consent, for research purposes; this allows data from population registries, census and death records to be linked and is valuable in developing reference material in the general description of cancer incidence and distribution in the population. Recording of the Irish PPS number, when available, may facilitate data linkage in the future, however, under Irish legislation, the PPS may not be used as a means of identification and data protection issues may need to be explored. The Data Protection Act, 1998 sets out the circumstances in which sharing of data is permitted; personal data is defined as data relating to a living individual, so it is possible to carry out data-linked investigations using death certificates. Dr. Harry Comber of the National Cancer Registry suggests that current cancer registry records could be linked with social welfare records to determine the previous employer(s) and therefore sector of industry; in this way it may be possible to determine what sectors of industry have higher incidences of cancer and an occupational or sectoral link may be established. It may also be possible to use Death Certificate information to see whether links can be made between deaths from particular cancers and occupation as stated on the Death Certificate (Comber, 2006, personal contact).

In conclusion, data relevant to occupational cancer is collected in Ireland by a number of data collecting agencies, for different purposes. There are a variety of ways in which the data may be used for epidemiological studies, but few ways in which it can be used to quantify deaths from work-related cancer, due to the fundamental problems with identifying occupational cancer in the first instance. It is, and will be, necessary to rely on estimated proportions in order to assess the extent of the problem.

2.5 RECOMMENDATIONS

1. **Apply updated estimable fractions from studies in other countries to Irish cancer mortality data.** In so doing, the uncertainties of estimated fractions should be made clear and it should be remembered that the overall proportion should not be applied to individual cancers. Comparisons should be made with countries that are geographically, economically and industrially similar to Ireland, and that have credible fractions published in international peer-reviewed literature.
2. **Undertake epidemiological studies that will help to estimate the extent of the problem.** In order to plan for prevention, it is necessary to develop an epidemiological profile for occupational cancer using population-based studies (such as representative case-control studies). The WHO has published guidance on undertaking such research in both national and international contexts and a lot of research of this nature is being carried out in other countries. Such epidemiological studies should be commissioned and undertaken in Ireland.
3. **Explore the possibility of undertaking data linkage studies using death certification data.** Consideration should be given to undertaking studies to assess the risk associated with work-related cancer and specific occupations and industrial sector, linking data that is already available from the Cancer Registry with death certification data and employment data where available.
4. **Encourage reporting of occupational illnesses by (non-occupational) health professionals.** Many cases of occupational cancer and related deaths present in the general healthcare setting to physicians and other medical specialists who may not have occupational health training. THOR

relies on the knowledge and cooperation of medical specialists in disciplines other than occupational health to capture occupational disease – in the long term this scheme should also help to capture incidence of occupational cancer. The THOR Ireland scheme should be encouraged and monitored, and physicians should be made aware of the importance of reporting suspected occupation-related deaths to the Coroner.

SUMMARY

Work-related road traffic deaths and deaths resulting from work-related cancer appear to have little, apart from the occupational factor, in common. However, both types of death are difficult to quantify because of issues with case identification, and under-reporting. Work-related injuries and fatalities are easier to identify than chronic illness or deaths thought to be associated with occupational exposure.

In the event of sudden deaths, resulting from incidents such as road traffic accidents, one of the purposes of collecting information as part of the accident investigation process is to ascertain facts necessary for enforcement of legislation (road traffic or health and safety legislation) and possibly for prosecution. At a later stage, accurate data and information can be used for producing statistics, which facilitates evaluation of the extent of a problem, and allows progress to be monitored on a temporal basis. Risk profiles and risk alerts can be developed, which will facilitate development of strategies, targets, and objectives, and the implementation of policies to reduce the risk and ultimately reduce the number of deaths. The current data collection system for quantifying work-related road traffic fatalities has weaknesses and strengths. The primary weakness is that the number of road-traffic deaths that are work-related is not currently known for a variety of reasons; however, minor changes, such as review of the questions asked during data collection within the road-traffic collection system would increase the number of cases captured. Moreover, a commitment from both Health and Safety and Road Safety Authorities to a joint approach to addressing the problem of occupational road risk, through education of those who notify the HSA of such cases (employers and Gardai) will help to address the under-reporting problem. The strengths of the system are that data is currently collected by more than one source and further research, using (multiple) existing data sources is feasible, would be encouraged by the relevant data-collection agencies, and can facilitate a detailed evaluation of the true extent of the problem.

Quantification of deaths from occupational diseases, such as cancer, is not possible, because of genuine difficulties with case identification, and it is necessary to rely on estimates, which, in the case of cancer, generally attribute a fraction of cancer or cancer deaths to particular factors, such as occupation. Recent literature highlights the need to update the commonly accepted fraction for such estimates, and while epidemiological work is in progress, arguments have been put forward to suggest that the 4% fraction of all cancer deaths attributed to occupation, could be an under-estimate of the true figure, however caution should be applied, because there are so many uncertainties about the method and it is necessary to ensure that the fraction being applied is estimated on a population with similar exposure to the population under study. A variety of Irish agencies collect data that, in combination, have a potential to be useful in estimating the incidence and prevalence of occupational cancer, and that would encourage use of existing data for research purposes, but it is not possible to quantify occupational cancer mortality. In order to put in place strategies to manage the risk, it will be necessary to assess the risk by carrying out epidemiological studies in Ireland and by keeping abreast of scientific evidence from abroad to apply estimates derived from up-to-date studies on similar cancers in countries with a similar geographic, economic and industrial profile.

REFERENCES

1. Andersen, A., Kjaerheim, K and Sigstad Lie, J.A. (2004). Record Linkage in Occupational Cancer Studies. *Norsk Epidemiologist*. 14 (1) pp. 91 – 96.

2. Australasian Faculty of Occupational Medicine. (2003). *Occupational Cancer: A Guide to Prevention, Assessment and Investigation*. AFOM Working Party on Occupational Cancer.

3. Boffetta, P. and Kogevinas, M. (1999). Introduction: Epidemiologic Research and Prevention of Occupational Cancer in Europe. *Environmental Health Perspectives.* 107. Supplement 2. pp. 229 – 231.

4. Bomel Ltd. (2004). *Safety Culture and Work-Related Road Accidents*. Road Safety Research Report 51. Department for Transport: London.

5. Boufous, S. and Williamson, A. (2006). Work-Related Traffic Crashes: A Record Linkage Study. *Accident Analysis and Prevention*. 38 (1) pp. 14 – 21.

6. Braughton, J., Baughan, C., Pearce, L., Smith, L. and Buckle, G. (2003). *Work-Related Road Accidents.* Report prepared for Road Safety Division, Department for Transport. TRL Report TRL582.

7. Brennan, N.J. and O'Connor, T.M. (2003). *Ireland Needs Healthier Airways and Lungs: The Evidence. A compilation of statistical data*. Supplement to the Irish Medical Journal.

8. Brett, N. (2006). *Presentation to the Joint Oireachtas Committee on Transport*. 20 October 2005.

9. Central Statistics Office. (2006). Vital Statistics; 4th Quarter and Yearly Summary 2005. Stationery Office:Dublin.

10. Cherry, N.M., McDonald, J.C. (2002). The Incidence of Work-Related Disease Reported by Occupational Physicians, 1996-2001. *Occupational Medicine*. 52 (7): pp. 407-11.

11. Clapp, R., Howe, G., and Jacobs Lefevre, M. (2005). *Environmental and Occupational Causes of Cancer: A Review of Recent Scientific Literature.* Lowell Centre for Sustainable Production: Massachusetts.

12. Clarke, D., Ward, P., Bartle, C. and Truman, W. (2005). *An In-Depth Study of Work Related Road Traffic Accidents. Road Safety Research Report No. 58*. Department for Transport: London.

13. Coroners Act, 1962.

14. Data Protection Act, 1998.

15. Department for Transport. (2000). *Tomorrow's Roads: Safer for Everyone*. Department for Transport: London.

16. Department of Justice, Equality and Law Reform. (2000). *Review of the Coroner Service. Report of the Working Group.* Department of Justice, Equality and Law Reform: Dublin.

17. Department of Justice, Equality and Law Reform. (2003). *Report of the Coroner's Rules Committee.* Department of Justice, Equality and Law Reform: Dublin.

18. Department of Social and Family Affairs. (2004a). *Annual Report*.

19. Department of Social and Family Affairs. (2004b). *SW33. Prescribed occupational diseases under the Occupational Injuries Benefit Scheme*.

20. Department of Transport. (1998). *The Road to Safety 1998 – 2002*. Department of Transport: Dublin.

21. Department of Transport. (2004). *Road Safety Strategy 2004-2006*. Department of Transport; DUblin.

22. Department of Transport. (2005). *Statement of Strategy 2005-2007*. Department of Transport: Dublin.

23. Deschamps, F., Barouh, M., Deslee, G., Prevost, A. and Munck, J.N. (2006). Estimates of Work-Related Cancers in Workers Exposed to Carcinogens. *Occupational Medicine*. 56 (3) pp. 204-209.

24. Doll, R. and Peto. R. (1981). The Causes of Cancer: *Quantifiable estimates of avoidable risks of cancer in the United States Today*. Oxford University Press: Oxford.

25. Driscoll, T., Marsh, S., McNoe, B., Langley, J., Stous, N., Feyer, A-M. and Williamson, A. (2005). Comparison of Fatalities from Work-Related Motor Vehicle Traffic Accidents in Australia, New Zealand, and the United States. *Injury Prevention*. 11 (5) pp. 294-299.

26. Driscoll, T., Mitchell, R., Mandryk, J., Healey, S., Hendrie, L. and Hull, B. (2003). Coverage of Work-Related Fatalities in Australia by Compensation and Occupational Health and Safety Agencies. *Occupational and Environmental Medicine.* 60 pp. 195 – 200.

27. Driscoll, T., Steenland, K., Pruss-Ustun, A., Nelson, D.I and Leigh, J. (2004). *Occupational Carcinogens: Assessing the Environmental Burden of Disease at National and Local Levels*. World Health Organisation: Geneva.

28. European Commission. (2001). *European Statistics on Accidents at Work (ESAW) Methodology*. Doc. ESTAT/E3/HSW/2001/1130.

29. European Commission. (2003). Commission Recommendation of 19 September 2003 concerning the European Schedule of occupational diseases. (2003/670/EC).

30. European Commission. (2006). Commission Regulation of 24 February 2006. 341/2006 Adopting the Specifications of the 2007 ad hoc Module on Accidents at Work and Work-Related Health Problems Provided for by Council Regulation (EC) No 577/98 and Amending Regulation (EC) No 384/2005.

31. European Communities (Protection of Workers) (Exposure to Asbestos) Regulations, 1989. S.I. No. 34 of 1989.

32. European Transport Safety Council. (2006*). ETSC Briefing: Third Road Safety Action Programme, Mid-term Review.* ETSC: Brussels.

http://www.etsc.be/home.php

33. Eurostat. (2005). *European Statistics on Accidents at Work (ESAW) and commuting accidents*. Eurostat Metadata in SDDS format: Summary Methodology. http://europa.eu.int/estatref/info/sdds/en/hsw/hsw_acc_work_sm.htm

34. Evans, G. and McElvenney, D. (2005). *Burden of Occupational Cancer in Great Britain: Summary Report of a Workshop.* HSL/2005/54. Health and Safety Laboratory: Buxton.

35. Feyer, A-M., Williamson, A.M., Stout, N., Driscoll, T., Usher H. and Langley, J.D. Comparison of work related fatal injuries in the United States, Australia, and New Zealand: method and overall findings. *Injury Prevention*. 7 (1) pp. 22-28.

36. Garda National Traffic Bureau. (2006). *Road Collision Statistics*. http://www.garda.ie/angarda/statistics98/rtastats_longterm.html

37. Harrison, J.E., Mandryk, J.A. and Frommer, M.S. (1993). Work-Related Road Fatalities in Australia, 1982 – 1984. *Accident Analysis and Prevention*. 25 (4). pp. 443 – 51.

38. Health and Safety Authority. (2003). *Annual Report 2002.* Health and Safety Authority: Dublin.

39. Health and Safety Authority. (2004). *Annual Report 2003.* Health and Safety Authority: Dublin.

40. Health and Safety Authority. (2005). *Summary of Fatality, Injury and Illness Statistics, 2003-4.* Health and Safety Authority: Dublin.

41. Health and Safety Authority. (2006). *Summary of Fatality, Injury and Illness Statistics, 2004-5.* Health and Safety Authority: Dublin.

42. Health and Safety Commission. (2001). *Discussion Document: Work-related Road Safety Task Group. Preventing at-work road traffic incidents*. HSE Books: Sudbury.

43. Health and Safety Commission. (2005). *Review of the Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations 1995 Discussion document. http://www.hse.gov.uk/consult/disdocs/dde22.pdf*

44. Health and Safety Commission. (2006). *Review of the Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations 1995, Progress and Strategic Steer*. Including Annexes A, B and C. http://www.hse.gov.uk/aboutus/hsc/meetings/2006/250706/c40.pdf#search=%22%20HSC%2F06%2F40%22

45. Health and Safety Executive. (2003a). OM 2003/103: *Work-related road traffic accidents: An explanation of the circumstances where the HSE may have a role.* http://www.major-hazards.gov.uk/foi/internalops/fod/om/2003/103.pdf

46. Health and Safety Executive. (2003b). *Work-Related Deaths: A Protocol for Liaison.* HSE Books: Sudbury. http://www.hse-databases.co.uk/pubns/misc491.pdf

47. Health and Safety Executive. (2003c). *Work-Related Deaths: Investigators Guide.* HSE Books: Sudbury.

48. Health and Safety Executive. (2003d*). Driving at Work. Managing Work-Related Road safety*. HSE: Sudbury. INDG382.

49. Health and Safety Executive. (2005). *Workplace Transport Safety. An Overview*. HSE Books: Sudbury.

50. Health and Safety Executive. (2006). *Statistics: Cancer.* Accessed 09 September 2006. http://www.hse.gov.uk/statistics/causdis/cancer.htm

51. Imbernon, E. (2002). *Estimate of the Number of Certain Types of Cancers that are Attributable to Occupation in France*. Institut de veille sanitaire: Saint Maurice.

52. International Agency for Research on Cancer. (2006). *IARC Monograph on the Evaluation of Carcinogenic Risks to Humans.* WHO: Lyons.

53. Irish Cancer Society. (2005). *Cancer Research Ireland Yearbook 2004/2005*. Irish Cancer Society: Dublin.

54. Kabir, Z. And Clancy, L. (2003). Mesothelioma trends in the Republic of Ireland: an epidemiologic study in the context of the causal pathway. *Irish Medical Journal*. 96 (10) pp. 299-302.

55. Karjalainen, A. and Niederlaender, E. (2004). *Statistics in Focus: Population and Social Conditions.* 15/2004. Eurostat.

56. Kauppinnen, T., Toikkanen, J., Pedersen, D., Yound, R., Ahrens, W., Boffetta, P., Hansen, J., Kromhout, H., Blasco, J.M., Mirabelli, D., Orden Riveria, O., Pannett, B., Plato, N., Savela, A., Vincent, R. and Kogevinas, M. (2000). Occupational Exposure to Carcinogens in the European Union. *Occupational and Environmental Medicine*. 57 (1) pp. 10-18.

57. Kenyon, M. (2006). Driving – Treated as Occupational Risk. *Health and Safety Review*. 11. (4). pp. 16 - 19.

58. Kjaerheim, K. (1999). Occupational Cancer Research in the Nordic Countries. *Environmental Health Perspectives*. Supplements No. 2. 107. pp. 233-238.

59. Kranig, A. (2006). Europe Studies Occupational Diseases. *Occupational Health Review*. 122. pp. 12 – 13.

60. Lancaster, R. and Ward, R. (2002a). *Management of Work-Related Road Safety. Development Department Research Programme Research Findings No 144.* Scottish Executive Central Research Unit.

61. Lancaster, R. and Ward, R. (2002b). *Management of Work-Related Road Safety.* Health and Safety Executive Research Report 018. HSE books: Sudbury.

62. Lancaster, R. and Ward, R. (2002c). *The Contribution of Individual Factors to Driving Behaviour: Implications for Managing Work-Related Road Safety*. Health and Safety Executive Research Report 020. HSE Books: Sudbury.

63. Landrigan, P.J. (1995). The Prevention of Occupational Cancer. (Guest

Editorial). *A Cancer Journal for Clinicians*. 46 (2) pp. 67-69.

64. Leigh, J., Macaskill, P., Kousma, E. and Mandryk, J. (1999). Global Burden of Disease and Injury due to Occupational Factors. *Epidemiology*. 10 (5). pp. 628 – 631.

65. Marsh, S. and Layne, A. (2001). *Fatal Injuries to Civilian Workers in the United States, 1980 – 1995; National Profile*. NIOSH: Cincinnati.

66. McNamee, R., Carder, M., Chen, Y. and Agius R. (2006). *Time Trends in the Incidence of Work-Related Disease in the UK, 1996-2004: Estimation from ODIN/THOR Surveillance Data*. http://www.hse.gov.uk/statistics/pdf/trendsinthor.pdf

67. Meyer, J.D., Cherry, N.M., Holt, D.L., Chen, Y. and McDonald, J.C. (2001). SWORD '99: Surveillance of work-related and occupational respiratory disease in the UK**.** *Occupational Medicine.* 51 pp. 204-208

68. Mitchell, R., Driscoll, T. and Healey, S. (2004). Work-Related Road Fatalities in Australia. *Accident Analysis and Prevention*. 36 (5) pp. 851-860.

69. Mulligan, H. (Ed). (2004a). Cronin: 300 Work-Related Cancer Deaths. *Health and Safety Review*. 9. (5). pp. 1 - 2.

70. Mulligan, H. (Ed). (2004b). Evidence Suggests over 500 Work-Related Deaths per Year. *Health and Safety Review*. 9. (10). pp. 1 - 2.

71. Mulligan, H. (Ed). (2005a). Alarming rise in fatalities. *Health and Safety Review*. 10. (7). pp. 1 - 2.

72. Mulligan, H. (Ed). (2005b). Cronin: SIPTU seeks review of true number of work fatalities. *Health and Safety Review*. 10. (2). pp. 1 - 2.

73. Murray, W. (2004). *Company Vehicle Incident Reporting and Recording*. Department for Transport: London.

74. National Cancer Registry. (2005). *Cancer in Ireland 1994 – 2001, Incidence, Mortality and Treatment.* National Cancer Registry: Cork.

75. National Cancer Registry. (2006). *Trends in Irish Cancer Incidence 1994 – 2002, with projections to 2020*. National Cancer Registry: Cork. http://www.ncri.ie/pubs/pubfiles/proj_2020.pdf

76. National Occupational Health and Safety Commission. (1998*). Work-Related Traumatic Fatalities 1989 – 1992.* NOHSC: Canberra*.*

77. National Occupational Health and Safety Commission. (2002a*). NCIS - Data Quality and its Ability to Provide Timely and Accurate Information on Work-Related Traumatic Fatalities in Australia.* NOHSC: Canberra.

78. National Occupational Health and Safety Commission. (2002b). *Work-Related Traumatic Fatalities in Australia estimated by using the NCIS Police Text Description of the Circumstance Surrounding Death June 2000-July 2001*. NOHSC: Canberra.

79. National Occupational Health and Safety Commission. (2004). *Fatal Occupational Injuries. How does Australia Compare Internationally?* NOHSC:

Canberra.

80. National Roads Authority (2005). *Road Collision Facts 2004.* National Roads Authority: Dublin.

81. New Zealand Environmental and Occupational Health Research Centre, Injury Prevention Research Unit. (1999). *Work-Related Fatal Injuries in New Zealand 1985 – 1994. Descriptive Epidemiology.*

82. New Zealand Environmental and Occupational Health Research Centre, Injury Prevention Research Unit. (2003). *Work-related Fatal Traffic Injuries in New Zealand 1985 – 1998: Descriptive Epidemiology.*

83. O'Neill, R. (2005). Burying the Evidence. Hazards 92. http://www.hazards.org/cancer/report.htm Accessed August 2006.

84. Parkin, D.M., Bray, F.I. and Devesa, S.S. (2001). Cancer Burden in the Year 2000: The Global Picture. *European Journal of Cancer*. 37. Supplement 8. pp 4 – 66.

85. Pratt, S. (2003). *Work-Related Roadway Crashes, Challenges and Opportunities for Prevention. NIOSH Hazard Review.* Centre for Disease Control, National Institute of Occupational Safety and Health: Cincinnati.

86. Pratt, S. (2004). Work-Related Roadway Crashes. United States 1992-2002. *Morbidity and Mortality Weekly Report*. April 2, 2004 / 53(12) pp. 260-264. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5312a3.htm

87. Racioppi, F., Eriksson, L., Tingvall, C. and Villaveces, A. (2004). *Preventing Road Traffic Injury: A Public Health Perspective for Europe.* World Health Organisation: Geneva.

88. Road Safety Authority Act, 2006.

89. Rogers, J.E., Agius, R.M., Garwood, C., Rector, A.L., Chen, Y/, Hussey, L. and Turner, S. (2004). Attitudes and Access to Electronic Exchange of Information on Occupational Disease. *Occupational Medicine*. 54 (5) pp 316 – 321.

90. Safety, Health and Welfare at Work (Carcinogens) Regulations, 2001. S.I. No. 078 of 2001.

91. Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations, 2006. S.I. No. 386 of 2006.

92. Safety, Health and Welfare at Work (General Application) Regulations, 1993. S.I. No. 44 of 1993.

93. Safety, Health and Welfare at Work Act, 2005.

94. Scallan, E., Staines, A., Fitzpatrick, P., Laffoy, M. and Kelly, A. (2004). Unintentional Injury in Ireland: a Comparison of Mortality and Morbidity Data. *Journal of Public Health*. 26 (1) pp. 6-7.

95. Siemiatycki, J., Richardson, L., Straif, K., Latreille, B., Lakhani, R., Campbell, S., Rousseau, M.C. and Bofetta, P. (2004). Listing Occupational Carcinogens. *Environmental Health Perspectives*. 112 (15) pp. 1447 – 1459.

96. Steenland, K., Burnett, C., Lalich, N., Ward, E. and Hurrell, J. (2003). Dying for Work: The Magnitude of US Mortality from Selected Causes of Death Associated with Occupation. *American Journal of Industrial Medicine*. 43 (5) pp. 461-482.

97. Takala, J. (2005). *Introductory Report: Decent Work - Safe Work*. XVIIth World Congress on Safety and Health at Work (Orlando, 18-22 Sep. 2005). International Labour Office: Geneva.

98. US Department of Labour. (2001). *Census of Fatal Occupational Injuries: Definitions.* http://www.bls.gov/iif/oshcfdef.htm

99. US Department of Labour. (2004). *Bureau of Labour Statistics. Census of Occupational Fatalities, 2004*. http://www.bls.gov/news.release/pdf/cfoi.pdf

100. Wong, O. (2001). Use of Administrative Databases in Occupational and Environmental Epidemiologic Research. *Annals of Epidemiology*. Editorial. 11. pp 281 – 285.

101. Work-Related Road Safety Task Group. (2001b). Discussion Document *Preventing At-Work Road Traffic Accidents.* HSE Books: Sudbury.

102. Work-Related Road Safety Task Group. (2001b). *Reducing At-Work Road Traffic Accidents. Report to the Government and the Health and Safety Commission*. HMSO: Norwich.

103. World Health Organisation. (2004). *World Report on Road Traffic Injury Prevention, Summary*. World Health Organisation: Geneva.

104. Worral, J.J. (2006). May the Force be with You. *Health and Safety Times*. Issue 16 pp. 69-73.

APPENDIX 1. UK WORK-RELATED ROAD SAFETY TASK GROUP: TERMS OF REFERENCE

The Terms of Reference for the Work-related Road Safety Task Group are to:

- establish (or signal what further work is required to establish) accurate casualty and incident statistics for work-related activities on or near roads;
- establish (or signal what further work is required to establish) the main causes and methods of preventing work-related road traffic incidents;
- promote a public debate on best practice in relation to preventing at-work road traffic incidents;
- propose minimum health and safety management standards for employers, the self-employed and others for work-related journeys and other work activities on the highway;
- propose if possible non-legislative mechanisms for dovetailing road traffic law with health and safety at work law;
- propose mechanisms for effective liaison between those who enforce road traffic law and those who enforce health and safety at work law
- prepare a Regulatory Impact Assessment if appropriate.

Membership of the Task Group comprised:

Chairman in addition to high-level representation from

- Police,
- Local authorities as highway authorities
- Local authorities as health and safety enforcing authorities
- Driving Standards Agency
- Traffic Commissioners
- Confederation of Passenger Transport UK
- Employer interests
- Road Haulage Association
- Transport & General Workers Union representing workers' interests
- TUC, representing workers' interests
- Occupational Safety Advisers
- The Despatch Association, representing motorcycle couriers
- The freight transport sector
- The Motorists' Forum
- Road Safety, Scottish Executive
- The National Assembly for Wales
- Vehicle Inspectorate
- Brake
- The insurance industry
- The Association of Car Fleet Operators
- Head of Transport Safety Division, HSE
- Head of Safety Unit, Field Operations Directorate, HSE
- Head of Road Safety Division, DETR
- Head of Road Haulage Division DETR
- Safety Policy Directorate, HSE (Secretary)

Work-related road safety task group. (2001, p. 17).

APPENDIX 2. IARC GROUPS

IARC groups

Group 1	The agent is carcinogenic to humans
Group 2A	The agent is probably carcinogenic to humans
Group 2B	The agent is possibly carcinogenic to humans
Group 3	The agent is not classifiable as to its carcinogenicity to humans
Group 4	The agent is probably not carcinogenic to humans

(IARC, 2006, p.23.)

APPENDIX 3. PERSONNEL INTERVIEWED AND / OR CONSULTED

The following personnel were either interviewed, consulted, provided clarification and/or documentation, data, information and assistance.

Central Statistics Office	Mr. Joseph Keating
Central Statistics Office	Ms. Stephanie Collins
Consultant Occupational Physician	Dr. Peter Noone
Department of Social and Family Affairs (OIB)	Mr. Padraig O'Cealleachain
Department of Social and Family Affairs (Disability)	Mr. Gerry Maher
Department of Social and Family Affairs	Mr. Donncha de Búrca
Dublin City Coroner's Office	Dr. Brian Farrell
Health and Safety Authority	Mr. Michael Henry
Health and Safety Authority	Ms. Marie Dalton
Health and Safety Authority	Mr. Kieran Sludds
Health and Safety Authority	Mr. Robert Roe
Health and Safety Authority	Ms. Roisin McEneaney
Irish Cancer Society	Ms. Jane Curtin
Kildare County Coroner's Office	Prof. Denis Cusack
Labour Research Department (UK)	Ms. Andrea Oates
Medical Bureau of Road Safety	Prof. Denis Cusack
National Cancer Registry of Ireland	Dr. Harry Comber
National Garda Traffic Bureau	Inspector Michael Brosnan
National Roads Authority	Mr. Desmond O'Connor
REACH Death Events Publication Service	Ms. Niamh Ashe
Road Safety Authority	Mr. Declan Naughton
Superintendent Registrar's Office	Ms. Aoife O'Sullivan
University of Manchester (THOR Ireland)	Ms. Ruth Parker

APPENDIX 4. GLOSSARY OF ACRONYMS

CFOI	National Census of Fatal Occupational Injuries (USA)
CSO	Central Statistics Office (IRL)
DEPS	Death Events Publication Service (IRL)
DETE	Department of Enterprise, Trade and Employment (IRL)
DSFA	Department of Social and Family Affairs (IRL)
EODS	European Occupational Disease Statistics (EU)
EPI-DERM	Occupational Skin Surveillance Scheme (UK)
ESAW	European Statistics on Accidents at Work (EU)
FARS	Fatality Analysis Reporting System (USA)
HSA	Health and Safety Authority (IRL)
HSC	Health and Safety Commission (UK)
HSE*	Health and Safety Executive (UK)
IARC	International Agency for Cancer Research
IIF	Irish Insurance Federation (IRL)
LFS	Labour Force Survey (EU)
MOSS	Musculoskeletal Occupational Surveillance Scheme (UK)
NCIS	National Coroner's Information System (AUS)
NIOSH	National Institute for Occupational Safety and Health (USA)
NOHSC	National Occupational Health and Safety Commission (AUS)
NRA	National Roads Authority (IRL)
NSC	National Safety Council (IRL)
OIB	Occupational Injuries Benefit (IRL)
OPRA	Occupational Physicians Reporting Activity (UK)
OSSA	Occupational Surveillance Scheme for Audiological Physicians (UK)
PAYE	Pay As You Earn (IRL)
PPS	Personal Public Service (Number) (IRL)
QNHS	Quarterly National Household Survey (IRL)
REACH	Registration, Evaluation and Authorisation of Chemicals (EU)
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (UK)
RSA	Road Safety Authority (IRL)
SIDAW	Surveillance Of Infectious Diseases At Work (UK)
SOSMI	Surveillance of Occupational Stress and Mental Illness (UK)
SWORD	Surveillance of Work-Related and Occupational Respiratory Disease (UK)
THOR	The Health and Occupation Reporting Network (UK)
THOR-ENT	Occupational Surveillance of Otorhinolaryngological Disease (UK)
THOR-GP	The Health and Occupation Reporting Network for GPs with Occupational Medicine training (UK)
UK	United Kingdom
USA	United States of America
WHO	World Health Organisation

*It is noted that the acromym HSE, which in this document refers to the British Health and Safety Executive, is also used by the Irish Health Services Executive. The Irish Health Services Executive is not referred to at all in this report and wherever the acronym HSE is used, it refers to the Health and Safety Executive in the UK.