Sources of data on occupational road safety: an international review

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Abstract

Vehicle crashes are the leading cause of occupational fatalities. This research provides a multi-nation review of: occupational crash data sources; integration of occupational road safety into government agency priorities; and public and private sector initiatives to reduce crashes.

Informants in 15 nations provided information on data systems for recording and reporting occupational crashes, which was supplemented by discussions with government and industry experts, and a review of literature and crash statistics.

The research concluded that definitions for work-related crashes varied across nations. Because roadway crashes do not always fall within the jurisdiction of occupational safety and health (OSH) agencies, OSH data can exclude on-road driving incidents in some countries. Further, data systems maintained by transport agencies may not identify crashes as work-related. Uniform standards to facilitate data sharing within and between countries are lacking. For data sources such as workers' compensation, coroner records, and hospital admissions, linkages with OSH or transport-based data are limited.

Several recommendations are made including the need for: better linkages via common case definitions, coding, and interagency collaboration; OSH agencies to increase data capture and make road safety a policy priority, with governments leading by example in effectively managing their own vehicles and drivers; and more rigorously evaluated, accessible, case studies to be conducted and disseminated.

Key words

Occupational road safety, fleet safety or work-related road safety data

1 Introduction

While a great deal of government time and investment around the world has been devoted to road safety in general, until recently little attention was focused on work-related injuries occurring on the road. In the last few years, several studies (see for example 1, 2) have highlighted the extent of the road safety problem involving people driving as part of their work. This has led to the emergence of occupational road safety (also referred to as work-related road safety or fleet safety) as an important issue in a number of countries including the USA, UK, Finland, Australia and New Zealand for a range of societal, business, legal and cost reasons.

Initially much of the attention on occupational road safety has tended to focus on heavier and larger vehicles, particularly trucks and buses, because road safety data is readily available for these vehicle types in most jurisdictions. The large number of smaller vehicles driven for work, such as cars, vans, sports utilities and pick-ups, appear to have been mostly overlooked (3). At the same time, occupational safety and health (OSH) specialists have traditionally focused on safety in the workplace, or on work sites. This is changing, however, with increasingly strong relationships developing between road safety and OSH, for example in the US (1), Finland (4) and UK (5). Despite this, in many jurisdictions, there is still only limited and fragmented data available on the true extent of the problem, and limited information available regarding effective countermeasures.

This situation led the US National Institute for Occupational Safety and Health (NIOSH) to commission a small-scale exploratory study to review Worldwide Occupational Road Safety (6), the findings from which are summarised in this paper.

The overall objective of the study was to contribute to NIOSH's coordinated research program on occupational road safety, which includes global activities to promote road safety at work.

To meet this objective the following aims were set.

1. Obtain and summarise information on sources of occupational crash data worldwide.
2. Describe the integration of occupational road safety into occupational safety and transportation infrastructures in different nations.
3. Make recommendations on key government and organisational initiatives to promote occupational road safety, and identify the most pressing needs for future research.

2 Methods

To meet these objectives a review of government legislation, policies, guidance and statistics was undertaken, supported by a literature review and discussion, email contact and more formal structured questionnaires/interviews with relevant government OSH, Transport and other agencies, industry leaders and experts around the world.

For the survey element of the project, personal contacts were obtained in as many countries as possible. The research was also mentioned in an industry newsletter, and several organisations (particularly Roadsafe and the Global Road Safety Partnership) helped to circulate details of the project and the questionnaire. During the period of the research, trips were made to both South Africa and New Zealand by the researchers, which meant that more detailed information could be captured for those countries.

Overall there were 31 questionnaires or other communications received, from 15 countries. Table 1 summarises the quality, depth and breadth of the data. Overall, the data were judged to be adequate. In some cases, more complete data were obtained or inconsistencies were resolved through further discussions with participants. Where multiple questionnaires were received from a country, data were combined and reconciled so as to produce a single response for each country.

Country	Survey fully completed	Quality/depth of data	Extra narrative provided
Australia	Yes	Good	No
Canada	No	Incomplete	Yes
Czech Republic	Yes	Good	Yes
Europe	No	Incomplete	Yes
Finland	Yes	Good	No
India	No	Incomplete	No
Ireland	Yes	Good	No
Nepal	No	Incomplete	Yes
New Zealand	Yes	Good	Yes
Netherlands	Yes	Good	No
Norway	Yes	Good	No
South Africa	No	Incomplete	Yes
Sweden	Yes	Good	Yes
UK	Yes	Good	No
USA	Yes	Good	Yes
Vietnam	No	Incomplete	Yes

Table 1: Characteristics of the data received from participants

An obvious and disappointing gap in the responses was from mainland European countries, few of which responded to the request to take part in the research. Correspondence with the European Transport Safety Council (7) suggested a lack of any pan-European research or practice covering occupational road safety.

The remainder of this paper presents the findings from the literature review, correspondence, surveys and interviews, followed by a summary of the most important findings, recommendations and areas for further work.

3 Literature

Several recent reviews have been published on occupational road safety in countries around the world, including Australia, Finland, New Zealand, the UK and USA. This research provides a rich source of information for the countries concerned. In summary, a great deal of work has been produced on highly regulated large or heavy occupational vehicles such as trucks and buses. Much less has been published on small or light occupational vehicles such as cars and vans. The following provides a brief overview of some of the regional literature, and allows readers to explore the detailed sources they are based on in more depth:

- Australia: for examples see Haworth et al (8), Murray et al (1), Mitchell et al (9), Haworth and Symmons (10), Newnam, Watson and Murray (11), Wishart and Davey (12), Davey and Banks (13), Stuckey et al (3) and other papers from the fleet safety sessions at the annual Australasian Road Safety Research, Policing and Education conference (14).
- New Zealand: for examples see LTNZ/ACC (15), IPRU (16), McNoe et al (17) and Murray and Sheppard (18).
- Finland: for examples see Salminen (4, 19, 20, 21, 22 and 23).
- Sweden: see the much-quoted Swedish Televerket study (24), and more recent research on the behaviour of bus drivers (25).
- UK: for examples see HSE (5), Murray (26), Ward and Lancaster (27), Baughan et al (28), DfT (29), Clarke et al (30) and Motorists Forum (31).
- USA, see for example Ludwig and Geller (32), Strotmeyer and Pratt (33), Pratt (2, 34) and CDC (35).

Overall, the literature indicates the emerging status of occupational road safety, with several key findings:

- Researchers, industry bodies and government agencies are beginning to realise the extent of the problem and some useful research and practice has emerged.
- The field of occupational road safety, work-related road safety, fleet safety or the management of occupational road risk is becoming more mature in certain countries, such as the UK for example where government, non-governmental organisations and industry all continue to focus attention on the issue (for example see 5, 36 and 37)
- The extent of the problem shows up in transport, OSH and insurance data. There are limitations, however, such as the lack of 'purpose of journey' information in transport statistics (that specifically records the reason a driver was travelling at the time of a crash), which makes it difficult to identify work-related collisions in many jurisdictions; and, limited common coding or integration between data sets.
- A number of government initiatives have been implemented, such as the UK's Guidance on Work-Related Road Safety (5), but limited specific legislation is in place other than for heavy vehicles.
- At the organisational level Group Decision Theory (24) is often cited by researchers, and remains the only model that has been effectively evaluated against medium term collision and cost outcomes. Other models, including the Haddon Matrix, Theory of Planned Behaviour, Organisational Psychology and Stages of Change have all been used in a fleet setting, particularly by researchers from the Centre for Accident Research and Road Safety – Queensland, to better understand the different types of factors impacting on the behaviour of work-related drivers.

Many of the authors cited can be seen as 'pioneers' in occupational road safety and were therefore engaged in more detail via a survey, personal discussions and interviews. A summary of the findings follow.

4 Results from survey, personal discussions and interviews

4.1 Overview of the Survey

The survey, personal discussions and interviews focused on the following nine questions.

1. What is the contribution of occupational crashes to the overall burden of roadway fatalities?
2. How does the definition of a work-related crash differ country by country, and is commuting included?
3. Are work-related crashes captured through reporting systems for occupational fatalities, through the general crash reporting systems, or both?
4. Do any nations keep data about the number of miles, hours or journey driven for work-related journeys, other than for obvious commercial vehicles such as trucks or buses?
5. What is the status of data on the comprehensive reporting systems non-fatal crashes?
6. Is occupational road safety a government priority, or left to businesses to manage?
7. Where governments do play a role in occupational road safety, is it typically a part of the occupational safety and health infrastructure, transportation safety infrastructure, or both?
8. To what extent are occupational drivers covered by safety regulations?
9. As well as safety regulations, what other countermeasures have been adopted/researched by governments, businesses, universities and non-governmental organisations (NGOs)?

The full country by country responses are described by Murray and Pratt (6) and summarised in Table 2, which supports many of the findings from the literature and confirms that many opportunities exist to improve occupational road safety surveillance around the world. Further detail is provided in the following question by question summaries.

Country (ORS = occupational road safety)	**Commuting included in ORS**	**OSH data identifies ORS**	**Transport purpose of journey data available**	**Other data eg Health identifies ORS**	**Vehicle exposure data available**	**Journey exposure data available**	**Distance exposure data available**
Australia	Yes/No	Yes	No	Yes/no	Yes	No	No
Canada	No	Yes	No	?	?	?	?
Czech Republic	No	Yes	Yes	?	No	No	No
Finland	Yes	Yes	Yes	?	Yes	No	No
India	No	?	?	?	?	?	?
Ireland	No	Yes	No	?	No	No	No
Nepal	Yes	No	No	?	No	No	No
Netherlands	No	No	No	?	No	No	No
New Zealand	No	No	Yes/No	No	No	?	?
Norway	No	Yes	Yes/No	Yes	Yes	Yes/No	Yes
South Africa	No	No	No	Yes/No	Yes	No	Yes
Sweden	No	Yes	Yes	Yes/No	Yes	No	Yes
UK	No	No	Yes	?	Yes/No	Yes/No	Yes/No
USA	No	Yes	Yes	No	Yes/No	Yes/No	Yes/No

Table 2: Summary of responses to surveillance data questions

4.2 Definitions of occupational road crashes

Several findings emerged from the analysis of occupational road crash definitions.

- Many participant countries do not have an official definition of an occupational road crash, and in those that do there is limited consensus as to whether it's a transport or OSH management-led issue.
- Occupational road safety is an emerging OSH and a transport issue, but neither system provides complete data to quantify the full extent of the problem. To date, attention has mostly focused on heavy vehicles, and incidents on work sites. This reflects the fact that heavy vehicles are currently easily identifiable in road safety data, and are involved in a disproportionate number of fatal road collisions and on-site fatalities, in part due to their size, difficulty of driving and sharing the road with and high rates of exposure (high mileages, and on-site manoeuvres compared to other vehicle types).
- More work is required to define occupational road safety, and to manage it as both a transport and an occupational safety issue.
- A starting point to quantify the extent of the problem would be to ensure that national transport safety data is coded to include a 'purpose of journey' question and that OSH data includes on-road incidents where the person is driving as part of their work.

4.3 Occupational Safety and Health (OSH) data

Several findings emerged from the analysis of the availability of OSH data.

- OSH fatality and injury data in some jurisdictions can at least partly identify the extent of the occupational road safety problem, but this is by no means complete or comprehensive, as the data is typically collected and analysed for other purposes.
- Given the data that has emerged from Australia (9), New Zealand (17) and the USA (35), on-road crashes appear to represent a large proportion of occupational fatalities, which means that there could be some scope for the OSH agencies to focus more legislative, enforcement, research and improvement attention in this area.

4.4 Road transport crash data

Several findings emerged from the analysis of the availability of road transportation crash data.

- Crashes involving some vehicle types, such as trucks and buses, can be identified in the transport data in most participant countries, however, very few of the countries collect any 'purpose of journey' data – so the full extent of the occupational road safety problem is unknown, particularly where small vehicles such as cars and vans are used on work business. In Australia, Queensland is the exception, rather than the norm, in having a 'Purpose of journey' question in its Traffic Incident Recording System (TIRS) data collection system and knowing that at least a quarter of the fatal road collisions in the state involved someone driving for work (1).
- The fact that some participants found it difficult to answer within the framework of the questionnaire suggests that data and initiatives on occupational road safety cut across several agencies including transportation, OSH, workers' compensation and medical. These data sources are rarely integrated in a way that allows clear visibility on the full extent of the occupational road safety problem. Better data linkages, for example between road safety statistics and hospital admissions, or between OSH and insurance data, such as the research described by Davey and Banks (13), would result in a more complete picture.
- 'Purpose of journey' data in road safety statistics is scarce, and would be a useful first step in moving towards a better understanding of the full extent of the problem. Data coding and experience is already available from the UK and Australia (18).

4.5 Data from 'other' agencies

Several findings emerged from the analysis of the availability of relevant data from other agencies.

- Several other potential data sources are available in Australia and other jurisdictions around the world, including insurance, workers compensation and hospital records.

- This information has some potential but there are limitations the data is collected for insurance or hospital administration purposes rather than safety improvement; statistics are often held at the local, regional or company rather than national level; there is limited causation or 'purpose of journey' information; and few linkages appear to exist between data sets.
- Such data is probably most useful for individual organisations and agencies to manage their own risks; although in Australia Compulsory third party insurance data has to potential to be used in much more detail at the State and National Level to help develop occupational road safety programs for high risk groups including taxi, bus, truck and other identifiable commercial vehicle drivers (1).

4.6 Measurement of occupational driving exposure by number of vehicle, journeys or miles

Several findings emerged regarding the availability of data relating to the measurement of occupational driving exposure.

- Only limited exposure data appears to be available, which makes it difficult to calculate and compare crash rates between different types of vehicle use within and between participant countries.
- Much more work is required to analyse the available data, identify gaps and determine what assumptions need to be made in order to accurately ascertain the extent of occupational driving.

4.7 Government priorities and regulations

Participants were asked to agree or disagree with a series of statements on regulatory and policy aspects of occupational road safety, and to provide further information. Figure 1 shows the percentage of the participant countries agreeing with each statement, and that across all 15 participants there are some gaps, and areas of opportunity, on all of the statements shown.

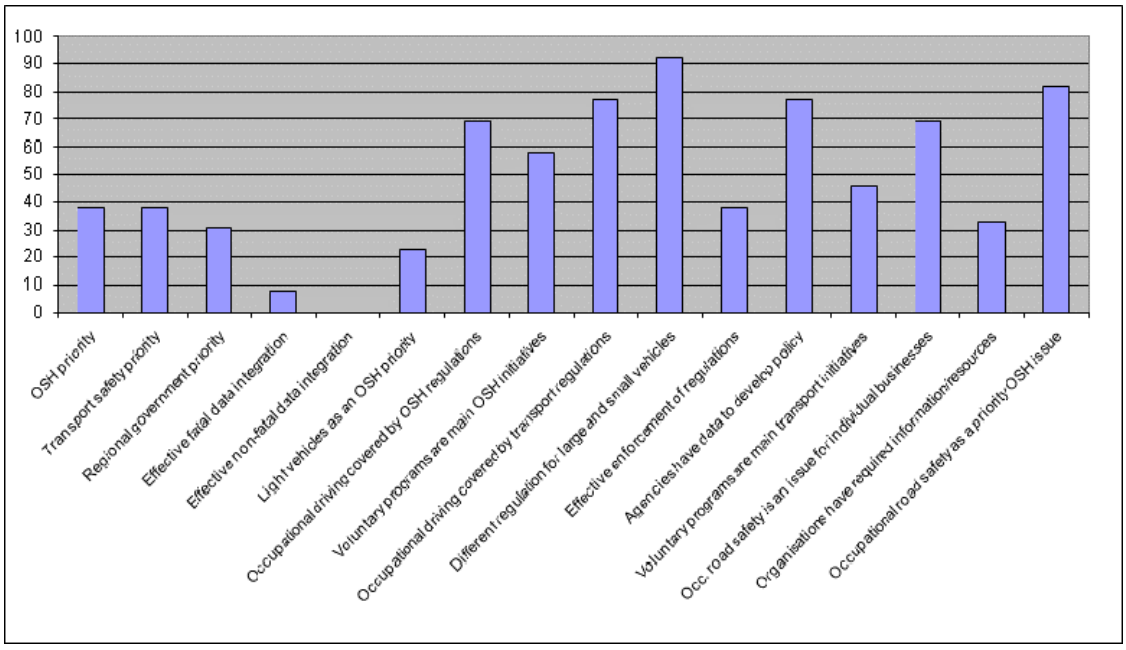

Figure 1: Percentage of participants who agreed with statements on government priorities

As well as the data shown in Figure 1, which suggests there are many areas such as data and enforcement, where occupational road safety could be improved and prioritised, several other findings emerged from the analysis of participant responses regarding government priorities and regulations.

- While occupational driving appears to be covered by OHS regulations in many jurisdictions, occupational road safety is not necessarily seen as a priority issue for OSH, transport or regional

government agencies in Figure 1. Despite this, its importance has increased substantially in recent years as the full extent of the potential for fatality and injury reduction becomes better understood. Available data from other studies (for example see 18), and anecdotal evidence, suggests that between a quarter and third of all fatal road collisions involve someone driving for work, a figure which increases substantially when commuting is also included.

- Several countries, including the UK (5), New Zealand (18), and Australia (38) have clarified that the vehicle is classed as part of the workplace in recent years, although regulation and enforcement remains at a relatively low level.
- There is some limited evidence of such government agencies beginning to lead by example through their own safe travel initiatives.
- Integration of different data sets on occupational road safety is seen as important, but as yet rarely seems to be in evidence. There is also limited 'purpose of journey' data, which means that government agencies cannot easily generate data-led policies and regulations.
- Most of the focus to date has been on heavy commercial vehicles rather than smaller cars and vans, partly because road safety data is available to identify the risks involving such vehicles.
- Some government agencies, for example in the UK, New Zealand and Australia, have focused on voluntary education-based initiatives, which have engaged some organisations, but effective regulation and enforcement was felt to be required by several participants to get the majority of organisations to take action.

4.8 Non-regulatory government initiatives

There have been a number of government-led initiatives on occupational road safety, led by OSH, transport and other agencies in several countries including Australia, Ireland, the New Zealand, the UK and USA. These were summarised in detail by Murray and Pratt (6).

Given the importance of government, and the number of government workers who drive, such initiatives are important – particularly where government agencies apply good practice and lead by example themselves to give more credibility to the programs they encourage other organisations to adopt.

4.9 Other initiatives

The research focused on three other types of initiative, those developed by businesses and trade associations, 'not for profit' industry bodies and academic researchers. Murray and Pratt (6) described a wide range of such programs, and concluded that:

- Initiatives in occupational road safety can also have a positive effect on the local community, by reducing the risks for bystanders and family members.
- Many non-government led programs have been implemented for a range of societal, business, legal and financial reasons.
- To date, such programs appear to have operated in isolation, often led by dedicated individuals, organisations or groups who identified the extent of the problem and looked for ways to do something about it.
- Occupational road safety research, regulation and practice cuts across many traditional organisational and government level 'boundaries', such as transport, road safety, OSH, driver training and insurance risk management.
- Despite the emergence of much good practice, there is not yet definitive information on the most effective way to improve occupational road safety and how initiatives should be funded, implemented, sustained and evaluated.

5 Conclusions

The following findings, gaps and recommended areas for further study emerged from the research.

5.1 Summary of main findings and recommendations

All three of the research aims set out in Section 1 above were met at least in part for 15 participant countries. In particular, the paper has summarised information on sources of occupational crash data worldwide; described the integration of occupational road safety into occupational safety and transportation infrastructures in different countries; and, provided many recommendations to improve occupational road safety research and practice. These can be summarised as follows.

1. Occupational road safety is becoming more advanced in certain countries, as researchers, industry bodies and government agencies realise the extent of the problem and good practice emerges. 'Purpose of journey' data already available suggests that between a quarter and a third of road fatalities involve someone driving for work in the UK and in Queensland, Australia; and that at least a similar proportion of at-work injuries and fatalities involve vehicles in Australia and the United States of America.

2. Despite the scale of the problem, occupational road safety only appears to be partially on the 'road safety radar' in many jurisdictions and the full extent of the risk remains relatively unknown. 'Purpose of journey' data is rarely available in road transport safety statistics. OSH data systems do not always include on-road incidents. More widespread collection and availability of these two datasets is an important first step in moving towards a better understanding of the full extent of the problem. There is also only limited vehicle, journey or mileage exposure data available, which makes it very difficult to calculate and compare crash rates between different types of vehicle use within and between participant countries.

3. The extent of the problem sometimes shows up at least partly in several different data sets - including transport, OSH, workers' compensation, health and insurance. All of this information has some potential, but there are limitations; the data are typically collected for specific purposes rather than safety improvement; statistics are often held at the local or regional rather than national level; and there are limited or poor-quality causation data, preventing complete ascertainment of the full extent of the problem. There appear to be minimal data linkages, for example between road safety statistics and hospital admissions, or with OSH or insurance data, which would provide a more complete picture. This means that in many participant countries, transport data is only available for certain vehicle types that are obviously being used for occupational purposes, such as trucks and buses, but not for other vehicle types, particularly cars. Most government initiatives and legislation, therefore, focuses on larger occupational vehicle types and incidents on work sites.

4. Many participant countries do not appear to have an official definition of an occupational road crash. In those that do, there is limited consensus as to whether it is a transport or OSH health and safety issue. This means that more work is required to: define the scope of occupational road safety; include it as both a transport and an occupational safety issue; ensure that transport safety data is coded to include a 'purpose of journey' question; and ensure that OSH data includes on-road incidents if the person was driving as part of their work. The way in which 'work-relatedness' is measured in the transport or OSH statistics (for example by 'purpose of journey', work activity, vehicle ownership, vehicle type or job title of employee involved) also needs to be considered and agreed upon. The accessibility, coding and usefulness of Health/hospital and Coronial data should also be explored in more depth to assess the extent to which work-related motor vehicle injuries and fatalities can be identified.

5. Several countries have clarified that the vehicle is classed as part of the workplace in recent years, although regulation and enforcement remains at a relatively low level. This is an important step, because even when occupational road safety is not necessarily a priority issue for OSH, transport or regional government agencies, its importance has increased substantially in recent years as the full extent of the potential for fatality and injury reduction is better understood. Given the data that has emerged from Australia, New Zealand and the USA, on-road crashes appear to represent a large proportion of occupational fatalities. This supports the need for the OSH agencies to focus more data collection, research, legislative, enforcement and improvement attention in this area.

6. Some government agencies have focused on voluntary education-based initiatives, which have engaged the more proactive industry organisations, but several participants in this study viewed effective regulation and enforcement of existing road safety and OSH rules was a requirement to get the majority of organisations to take action.

7. There have been a number of government-led initiatives on occupational road safety in countries including Australia, Ireland, the New Zealand, the UK and USA. Despite this, there is only limited evidence of such government agencies beginning to lead by example through their own safe travel initiatives. Given the importance of government, the large scale of the government fleet identified by Murray et al (1) and the number of government workers who drive, such leadership is important. Government agencies should apply good practice and lead by example themselves to give more credibility to the programs they encourage other organisations to adopt. There are many societal, business, legal and financial reasons why government agencies requiring their own people, contractors and sub-contractors to drive as part of their work should be at the forefront in developing effective occupational road safety programs, policies, procedures and processes.

8. Despite the emergence of much good practice in industry, there is not yet definitive information on the most effective way to improve occupational road safety and how initiatives should be funded, implemented, sustained and evaluated. To date, many such programs appear to have operated in isolation, often led by dedicated individuals, organisations or groups who identified the extent of the problem and looked for ways to do something about it.

5.2 Limitations of the research and areas for further work

All research has limitations. In this case there are several, the most obvious of which are set out below, along with some suggestions for further work.

- Fragmented data, and in many cases an apparent lack of interagency collaboration, was identified as a major barrier to the future development of occupational road safety initiatives. Much more work is required to focus on data linkages and common coding between transport, safety, health, insurance and other agencies so that the full extent of the problem can be identified and any 'double-counting' can be identified and avoided.

- The lack of response from many countries, particularly those in mainland Europe, was highly disappointing despite several efforts to engage them. This in part stems from a lack of focus on occupational road safety as an issue in those countries, but with the benefit of hindsight perhaps even more could have been done to identify participants from those countries. This would be a useful next step, and could help researchers, agencies and relevant industry sectors to focus more attention on occupational road safety. Any readers based in countries not included in Tables 1 and 2, or who have identified gaps in the discussion, are encouraged to contact the authors.

- The findings in this research are no more than a beginning, to help identify the extent to which occupational road safety is an issue in the participant and other countries. There is clearly a need now for a much larger collaborative project to be undertaken, led by a well resourced research group or consortium to begin to explore and benchmark the available data and initiatives in each jurisdiction. There is also a strong argument for organising an international conference on occupational road safety to bring together researchers, policy makers, key government agencies, industry practitioners and other stakeholders to agree definitions, identify excellent case studies, share good practice and guide future actions. Such an event, co-sponsored by NIOSH and the World Health Organisation, is scheduled to take place in Washington, DC during February 2009.

- This research has mainly focused on the more developed and motorised nations of the world. Future studies and initiatives should focus on and engage the less motorised nations. It is important therefore to work closely with road safety, OSH and insurance agencies around the world in the development of occupational road safety, to ensure more complete data and a common approach so that effective countermeasures can be identified and implemented.

Overall, the research on which this paper is based can be seen to have further developed the level of knowledge and understanding about occupational road safety around the world, but it is clear that a great deal of work is still needed. This will require further research, funding, policy, enforcement and support from a number of government agencies and industry bodies. The extent of the occupational road safety problem identified by many of the participants in this research would suggest that taking action would be an effective use of road safety, OSH, business improvement, research, and project management resources.

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