

Work-related road safety

A systematic review of the literature on the effectiveness of interventions – project report

Report submitted to the IOSH Research Committee

Shaun Helman BSc PhD and Graham B Grayson BSc PhD

Transport Research Laboratory
Crowthorne House
Nine Mile Ride
Wokingham
Berkshire
RG40 3GA
UK

Published in 2011



IOSH, the Chartered body for health and safety professionals, is committed to evidence-based practice in workplace health and safety. We maintain a Research for Public Benefit Fund to support research and inspire innovation as part of our work as a 'thought leader' in health and safety.

All recipients of funding from our Research for Public Benefit Fund are asked to compile a comprehensive research report of their findings, which is subject to peer review.

For more information on how to apply for grants from the Fund, visit [iosh.com/research](https://www.iosh.com/research)

Contents

Acknowledgments	4
Abstract	5
Executive summary	6
1 Project background	9
2 Literature review	10
3 Process of stakeholder engagement	11
4 Feedback from stakeholders	12
5 Conclusions and recommendations	15
References	18
Appendix A: Questions sent to stakeholders for comment at the beginning of the project	19
Appendix B: Summary of review sent to stakeholders for comment at the end of the project	20

Acknowledgments

The authors would like to acknowledge the time and effort taken by the practitioners and researchers who provided the feedback on this project. Their contribution is much appreciated.

Abstract

Road casualty statistics show that a large proportion of road casualties are accounted for by people who are in some way driving for work, so interventions to improve work-related road safety (WRRS) could have considerable potential as a means of reducing the total number of casualties. This project had two key aims. The primary aim was to carry out a systematic review of the published literature on the effectiveness of WRRS interventions. The second was to seek feedback and insights from various stakeholders in the WRRS field. Stakeholder feedback at the end of the project was in response to a summary of the literature review, and a number of themes emerged. By far the majority of respondents agreed with the conclusions of the review, and there was a general acceptance that methodological weaknesses are an issue in much of WRRS. A number of respondents agreed strongly that more controlled evaluations of WRRS interventions would be both useful and desirable. However, the difficulty of carrying out 'scientific' research in practical settings was noted by several stakeholders, given perceived commercial pressures for short-term results. Finally, the importance of leadership in WRRS was stressed by a number of stakeholders, who drew attention to the need for 'top-level buy-in' to WRRS interventions.

Based on the review findings and the stakeholder feedback, a number of recommendations are made for the improvement of practice and research in WRRS. It is recognised that there are commercial and practical issues that remain to be overcome when trying to persuade industry to engage in evaluation studies, but the main conclusion of the project is that there is a pressing need for more and better-controlled evaluation work if a better understanding of WRRS issues is to be achieved.

Executive summary

Background

Road casualty statistics show that a large proportion of road casualties are accounted for by people who are in some way driving for work. It has been estimated that between a quarter and a third of all road traffic incidents involve someone who was at work at the time. Further, it has been established that fleet car drivers have an elevated accident liability even when their higher mileage is taken into account. Thus interventions to improve work-related road safety (WRRS) could have considerable potential in terms of the absolute numbers of lives that could be saved and injuries prevented.

The project had two key aims. The primary aim was to carry out a systematic review of the published literature on the effectiveness of WRRS interventions. The second was to seek feedback and insights from various stakeholders in the WRRS field, including those in business responsible for the management of road safety risk, policy representatives, and academics and consultants who have an expertise in driver behaviour or WRRS.

Literature review

The objective of the review was to answer the following questions:

- Is there a sufficient literature of the highest quality evaluations (ie randomised controlled trials with sufficient sample sizes and using collisions or collision risk as an outcome variable) to make a definitive statement regarding the efficacy of WRRS interventions overall?
- If not, what are the suggested levels of effectiveness of WRRS interventions using weaker study designs?
- In either case, what can be said about the effectiveness of different subcategories of intervention (such as training, incentives, and enforcement through technology)?

The review is reported in full elsewhere. In summary, it concluded that the task turned out to be a difficult one, largely because of the scarcity of good data. If one adopts the criterion that an evaluation study should assess whether an intervention has brought about a statistically reliable change in crash rates, then the results were meagre in the extreme. Only four interventions met this criterion; three were in the same investigation, and all were conducted more than a decade ago. These conclusions, and possible reasons for them, were sent to stakeholders for comment.

Stakeholder feedback

A list of stakeholders and academics was agreed with IOSH. It was decided from the outset of the project that a number of different industry sectors and stakeholder types would be approached. The final list comprised 30 representatives, half of whom were directly involved with WRRS. To ensure that the project plans would meet user needs, a small subset of the stakeholders were approached at the beginning of the project on an opportunity basis, and were asked to reply to questions relating to the proposed definition of WRRS, their views on promising interventions, the level of evidence needed to demonstrate effectiveness, the gaps in WRRS knowledge, and the existence of any relevant 'grey' literature. All of the individual stakeholders were approached after the review had been completed, and asked to comment on a summary of the literature review.

All respondents agreed with the definition of WRRS that was proposed, although two respondents suggested that it might be useful to extend the scope of the review to include interventions that focused on the reduction of injury severity in the event of a collision, and this was done. All respondents gave multiple examples of types of intervention that they felt held promise, and three specifically mentioned that they thought 'systems-based' or 'multifaceted' approaches would be most effective. The majority of the respondents mentioned a decrease in accidents or accident severity as one key outcome measure. Many participants also suggested that evidence of behavioural change would be useful. There was a feeling among respondents that gaps in WRRS knowledge were less of a problem than a general lack of good evidence overall.

Stakeholder feedback at the end of the project was in response to the summary of the literature review. The request for feedback to academics and consultants was very general; other stakeholder groups were asked in addition to comment on any issues they thought had been missed in the review, and how the messages in the review could be communicated to a wider audience. Feedback was received from 17 of the stakeholders who were approached. The following five themes emerged from the feedback:

- There was general agreement with conclusions, with half of the stakeholders explicitly mentioning in their feedback that they agreed with the conclusions of the review. Despite the overall tone of agreement, there were a few dissenting statements, which tended to point out the existence of good case studies.
- There was a general acceptance that methodological weaknesses are an issue in much of WRRS. Half of the stakeholders made specific reference to the fact that what evidence does exist in the WRRS field is methodologically weak, though again there were comments from some stakeholders suggesting that despite our focus on more robust evaluation designs, methodologically weaker designs were still valuable.
- A number of stakeholders agreed strongly with the suggestion that more controlled evaluations of WRRS interventions would be useful and desirable.
- The difficulty of carrying out ‘scientific’ research in practical settings was noted by a number of stakeholders, who offered their opinion that it would be difficult to convince businesses to take part in such studies because of the perception that it is better to be seen to be doing something in the short term.
- The importance of leadership in WRRS was stressed by several stakeholders, who drew attention to the need for leadership or ‘top-level buy-in’ to WRRS interventions.

The stakeholder feedback tells us that those who work in or around the WRRS field are perfectly aware that there is a lack of properly controlled evaluation studies; furthermore, they also know that much of the evidence that does exist comes from designs that are not sufficient to ascertain which are the ‘active ingredients’ in those interventions that are believed to demonstrate safety benefits. In addition, all stakeholders appear to accept the difficulties of carrying out properly controlled research, but even those stakeholders who are at the ‘practitioner’ end of delivering WRRS believe that more such research is needed, and should be attempted. The enthusiasm for WRRS among business leaders that has been built up over the past decade is in itself a good thing for the future of the field; however, due to the limitations in the evidence base identified in the review (and apparently accepted by stakeholders), it might be suggested that the WRRS field is not in a position to comment with certainty on how to harness this enthusiasm and leadership in the most effective ways, by providing the most effective interventions.

Recommendations

The following recommendations are made from the current project:

- **More robust and scientific evaluation studies should be encouraged in WRRS.** A strong recommendation of the current project is that there needs to be a much greater commitment to classical evaluation in WRRS. Although case studies suggest that it is sometimes possible to have some success in assisting companies with managing road risk, they are not contributing to an understanding of the true nature of the WRRS problem. A return to some classical evaluation work, and a data-led approach, is necessary to achieve this. This includes a commitment to proper experimental (or at least quasi-experimental) designs examining the impact of interventions on crash rates (or validated proxy measures – see below) with appropriate control groups. In addition, factors such as regression to the mean and exposure need to be taken into account.
- **A number of steps should be taken to encourage the involvement of organisations in better evaluation studies.** A second recommendation (that is perhaps needed to enable the others) is that greater engagement with organisations is needed to convince them of the need for, and value of, better evaluation studies.
- **WRRS can be improved through a reduction in road use.** One of the main intentions of the authors of this report (and of the accompanying review) was to provide an evidence base that could be used by businesses to help them manage their WRRS risks. For businesses seeking to manage their WRRS risk, one recommendation that can be made (based on the *prima facie* safety case) is that risk can be reduced through a reduction in the amount of road use by workers.
- **‘Best practice’ should be seen as the norm in WRRS.** The term ‘best practice’ is a misleading one, since it has not in any sense been assessed as being the ‘best’. It is also potentially a dangerous one, as it can suggest that nothing more needs to be done once such practices are in place. Many of the measures that currently form part of the holistic approach are simply good business practice, and should not be regarded as safety interventions in their own right. For example, ensuring that drivers have valid licences, have not been disqualified, and can actually see to drive is basic good practice, and should be treated as a baseline from which to measure future improvement through using properly focused and quantifiable interventions.
- **A greater use of in-vehicle data recorders (IVDRs) should be encouraged in management and evaluation of interventions.** IVDR data offers a ‘proxy measure’ that can be used to assess the

impact of interventions and changes over shorter timeframes than accident statistics, and with more objectivity than attitudinal measures. There should be an effort in WRRS to make more use of such technologies in evaluation work.

- **Better outcome measures should be a priority.** It is recognised that outcome measures are a problem. Collision data can be sketchy, claims data incomplete, cost data slow to gather, and so on. It is perhaps understandable that many organisations have looked to other more easily collected, if less tangible, measures against which to assess their progress in improving WRRS. There has also been an increasing tendency to use attitude or behaviour measures as outcomes. Difficulties with collision and injury data should not be allowed to mask the fact that they remain the only valid measures of safety, and there is still no substitute for accident data. It is possible that in the future properly validated proxy measures will become available, but this will only come about as the result of well-designed and large-scale research studies. This would be to the benefit of WRRS as a whole, and should be encouraged.

Summary

Without a return to 'classical' evaluation, work to improve WRRS can only be on an *ad hoc* and less than efficient basis. There are of course commercial and practical issues that remain to be overcome when trying to persuade industry to engage in evaluation studies. Companies may not wish to invest time and money in evaluation studies if they perceive that holistic approaches (even if supported only by case study data) are sufficient for their needs. In addition, companies may be reluctant to have their accident data made public. Nonetheless, the fact remains that there is a pressing need to use controlled evaluation studies to assess which WRRS interventions work, by how much, and through which causal mechanisms.

1 Project background

1.1 The problem

Road traffic collisions continue to present a serious public health burden, and according to the World Health Organization are predicted to be the fifth-leading cause of death by 2030, compared with being the ninth-leading cause in 2004.¹

Within these overall road accident statistics, it is commonly accepted that there is a 'driving for work' effect, in at least two senses. Firstly, a substantial proportion of traffic collisions involve people driving for work. Figures available from the UK Department for Transport show that in Britain in 2009, 18 per cent of all drivers and riders aged over 15 and involved in a collision where someone was injured were 'driving for work' at the time. An earlier estimate by the Work-related Road Safety Task Group² was that between a quarter and a third of all road traffic incidents involved someone who was at work at the time. Secondly, it has been established that fleet car drivers have an elevated accident liability even when their higher mileage is taken into account.³

In other words, we know that those people who drive for work are sufficiently exposed to driving to account for a large number of injuries on the road, and we know that when they are exposed, they are more likely to be involved in accidents than non-work drivers are. Combined with the fact that employers present a 'gateway' through which drivers can be reached with targeted safety interventions, these observations mean that work-related road safety (WRRS) is a field with great potential to reduce the injury burden to society from road collisions.

1.2 This project

The project had two key aims. The primary aim was to carry out a systematic review of the published literature on the effectiveness of WRRS interventions. The second was to seek feedback and insights from various stakeholders in the WRRS field, including those in business who have sought to manage their WRRS risk through the various interventions under review, policy representatives, and academics and consultants who have an expertise in driver behaviour and/or WRRS.

1.3 This report

This report describes the process through which the project aims were met, and summarises the findings. In Section 2 we discuss the literature review itself and present a summary of its main findings. Section 3 describes the process by which feedback on the review was sought from stakeholders, and Section 4 summarises the feedback received. Finally in Section 5 we outline recommendations.

2 Literature review

Although there are a number of different forms that interventions focused on WRRS can take, and although there are many providers of such interventions, there is a lack of understanding as to which types of intervention are most effective, and to what degree. The objectives of the review were to answer the following questions:

- Is there a sufficient literature of the highest quality evaluations (ie randomised controlled trials with sufficient sample sizes and using collisions or collision risk as an outcome variable) to make a definitive statement regarding the efficacy of WRRS interventions overall?
- If not, what are the suggested levels of effectiveness of WRRS interventions using weaker study designs?
- In either case, what can be said about the effectiveness of different subcategories of intervention (such as training, incentives, and enforcement through technology)?

The review is reported in full elsewhere. In summary, it concluded that the task turned out to be a difficult one, largely because of the scarcity of good data. If one adopts the criterion that an evaluation study should assess whether an intervention has brought about a statistically reliable change in crash rates, then the results were meagre in the extreme. Only four interventions met this criterion; three were in the same investigation, and all were conducted more than a decade ago. These conclusions, and possible reasons for them, were sent to stakeholders for comment.

A summary of the literature review is provided in Appendix B.

3 Process of stakeholder engagement

A list of stakeholders and academics was agreed with IOSH. It was decided from the outset of the project that a number of different industry sectors and stakeholder types would be approached. The final list included representatives of the following types (with the number of people approached in each category in parentheses):

- academics (8)
- consultants working in WRRS (3)
- company fleet/WRRS representatives (4)
- insurance industry representatives (2)
- government and policy representatives (7)
- fleet organisation representatives (6).

To ensure that the project plans would meet user needs, a small subset of the stakeholders were approached at the beginning of the project on an opportunity basis, and were asked to reply to the questions shown in Appendix A. All of the individual stakeholders were approached after the review had been completed. They were asked to comment on a summary of the review, shown in Appendix B.

4. Feedback from stakeholders

4.1 Feedback at the beginning of the project

This section discusses replies to the individual questions shown in Appendix A, from the following subset of stakeholders:

- academics (2)
- consultants (1)
- company fleet/WRRS representatives (4).

4.1.1 Definition

All respondents from all groups stated that they agreed with the definition, although two respondents (one consultant and one company/fleet WRRS representative) suggested that it might be useful to extend the scope of the review to include interventions that focused on the reduction of injury severity in the event of a collision. This was done.

4.1.2 Which intervention types hold most promise?

All respondents gave multiple examples of types of intervention that they felt held promise, and three specifically mentioned that they thought 'systems-based' or 'multifaceted' approaches would be most effective. Other specifics mentioned included the use of education and training, corporate and management procedures, the use of technology to monitor ongoing behaviour, driver selection (including personality), and reducing exposure through use of teleconferencing.

4.1.3 What kind of evidence is needed?

All but two of the respondents mentioned a decrease in accidents or accident severity as one key outcome measure. Many participants also suggested that evidence of behavioural change would be useful. Other suggestions included measures of stress in drivers regarding things such as time pressure (perceived by this respondent as being a major cause of WRRS issues), and metrics related to companies' internal processes such as the amount of communications between drivers and managers (presumably safety-related communication). One company fleet/WRRS representative mentioned the need for control groups, and one of the two academic respondents made it clear that randomised control trials should be seen as the strongest type of evidence.

4.1.4 What are the knowledge gaps?

One company fleet/WRRS representative discussed the need for a greater understanding of whether or not there was a specific 'driving for work' effect in the first place, which suggests that this basic understanding³ may not have been communicated as clearly as it could have been. Another mentioned the need for a better understanding of the effectiveness of interventions in actual changing behaviours 'day-in, day-out' in the workforce. The academics and consultant all mentioned that they expected there to be a general lack of good evidence overall, especially for those interventions that might be expected to have a *prima facie* case for effectiveness (eg reducing travel through teleconferencing). One academic suggested that the problem would not so much be identifying the gaps in knowledge, but would be instead be in finding the knowledge in the first place.

4.1.5 Grey literature

No stakeholders were aware of any 'grey' literature of note.

4.2 Feedback at end of project

Stakeholder feedback at the end of the project was in response to the summary of the literature review shown in Appendix B. The request for feedback to academics and consultants was very general (ie 'tell us what you think'); other stakeholder groups were asked in addition to comment on any issues they thought had been missed in the review, and how the messages in the review could be communicated to a wider audience. Feedback was received from all of the stakeholder groups approached (numbers of respondents below in parentheses):

- academics (3)
- consultants working in WRRS (2)
- company fleet/WRRS representatives (3)
- insurance industry representatives (2)
- government and policy representatives (5)
- fleet organisation representatives (2).

The authors examined the feedback and organised it into themes on the basis of an informal thematic analysis. The purpose of this exercise was to establish where there were obvious points of agreement and disagreement, and to seek specific feedback on how the review could best contribute to the WRRS field. The following sections describe and discuss the themes that emerged from the feedback.

4.2.1 General agreement with conclusions

The vast majority of stakeholders either agreed with the general conclusions of the review or did not question them. Around half of the stakeholders mentioned agreement explicitly in their feedback. Some example responses include:

I agree with your general conclusions. (Academic)

I think what you have written is broadly correct. (Government and policy representative)

I agree with your general conclusions and the recommendations that fundamental empirical research is required to cast light on what works (and what doesn't) in the work-related road safety area. (Academic)

Essentially, this is absolutely correct. (Company/fleet WRRS representative)

...the findings are very consistent with my own subjective impressions of the field. (Company/fleet WRRS representative)

Despite the overall tone of agreement, there were a few dissenting statements. These tended to point out the existence of some good case studies and in one case led us to some very recent work which we were able to include in the final version of the review. Some examples were:

...there is actually quite a lot of good practice out there. (Consultant)

I applaud your commitment to return to the rigours of 'classical evaluation' but other approaches should not be ruled out. (Consultant)

The observations [that WRRS in the UK has largely been about dissemination of best practice but without evaluation] do not concur with the feedback that I have been getting and seems to be an academic approach to a practical subject. (Fleet organisation representative)

4.2.2 Methodological weaknesses are an issue in much of WRRS

Around half of the stakeholders made specific reference to the fact that what evidence does exist in the WRRS field is methodologically weak. Examples of such responses are:

[Regarding] the... 'impressive gains' reported by some organisations... many of these case studies failed to use a control group so we cannot be certain whether gains observed were due to some other factor. (Academic)

[I] recognise the limitations of the available research to offer proof of efficacy of schemes. (Government and policy representative)

There were also comments from a few stakeholders suggesting that, despite our focus on more robust evaluation designs, methodologically weaker designs were still valuable. For example:

...there has been a good deal of practical application of good practice initiated by the evidence from many businesses that investment in good management systems reduces risk. (Government and policy representative)

...given that generally the approach... has been to apply the principles of *Successful health and safety management* (HSE published guidance HSG65), why would that not work equally as effectively as it has for non road related issues, ie other workplace based H&S topics? (Government and policy representative)

4.2.3 More controlled evaluations are desirable

A number of stakeholders agreed strongly with the suggestion that more controlled evaluations of WRRS interventions would be useful and desirable. Responses included:

Overall I agree that it would be great to replicate the Televerket study or something like it... (Consultant)

I can see great universal benefit in doing more scientifically controlled evaluations – no organisation wants to throw good money at ineffective initiatives. (Company/fleet WRRS representative)

One company/fleet respondent even suggested that such work could be utilised to establish the validity of the various proxy measures that have been suggested in the field:

Given how hard it is to do studies using accident rates as an outcome measure, and the temptations to use easier-to-measure proxy variables, it occurs to me that there would be value in someone, somehow, putting together a coalition of interested fleet operators and government, to fund a very large-scale study, big enough and long enough to measure accident rates well, and compare them with a range of simultaneously gathered proxy or proposed mediating variables – ie a super-scale validation study. This would perhaps put some proxy variables out of action for good (showing their lack of validity) and if we were lucky, find one or two that actually had enough validity to become the outcome measures of choice in subsequent, smaller studies. That would transform the whole field... (Company/fleet WRRS representative)

4.2.4 Difficulty of carrying out 'scientific' research in practical settings

A number of stakeholders offered the opinion that despite the appeal of more controlled scientific studies, it would be difficult to convince businesses to take part in such studies because of the perception that it is better to be seen to be doing something, rather than withholding interventions from control groups, for example. Quotes included:

I might add that it is always difficult to get commercial (or commercially-minded) organisations to do this sort of research unless they can see it heading in short order to a tool they can use... (Government and policy representative)

I [have] experienced this myself [when assisting] a large multinational company with... a growing crash problem that had most insurers reluctant to cover them. The company (and the insurers) did not want to take the time, trouble or expense of trying to assess the underlying problems then implementing an appropriate intervention and evaluating the result. A quick fix was all they wanted... (Academic)

But it may be difficult to convince organisations to take part in such studies due to the fear of litigation... What if someone from your control group is involved in a fatal accident? (Company/fleet WRRS representative)

4.2.5 Importance of leadership in WRRS

A number of stakeholders drew attention to the importance of leadership or 'top-level buy-in' to WRRS interventions. For example:

One thing I can say for certain is that leadership is important. In every case I have been involved in... there has been someone or a committee that has 'made the programme happen'. (Consultant)

Management buy in, and management led cultural change, is key; without it any driver level initiatives eventually fail. (Insurance representative)

Key first steps... include board level leadership. (Consultant)

It is the top-level direction which really makes the difference. (Government/policy representative)

5 Conclusions and recommendations

5.1 What can we conclude from stakeholder feedback?

The stakeholder feedback tells us that those who work in or around the WRRS field are perfectly aware that there is a lack of properly controlled evaluation studies; furthermore, they also know that much of the evidence that does exist comes from designs that are not sufficient to ascertain which are the ‘active ingredients’ in those interventions that are believed to demonstrate safety benefits. In addition, all stakeholders appear to accept the difficulties of carrying out properly controlled research, but even those stakeholders who are at the ‘practitioner’ end of delivering WRRS believe that more such research is needed, and should be attempted. In slight contrast to the review, a small number of stakeholders suggest that some case-study and holistic work done in WRRS is valuable in demonstrating effectiveness.

In other words, the main conclusions from the review appear to be in line with what stakeholders observe, although in some cases stakeholders do not view deficiencies in the literature as being as much of a problem as do the review authors.

We would like to propose that although there are reasons to explain the lack of good quality evidence, these reasons do not justify the acceptance of the status quo. As one academic put it in when responding to the conclusions:

I note you mention the emphasis on ‘best practice’. In the absence of evidence this might be described as ‘best guess’ – I don’t mind being quoted on that.

WRRS users need to be made aware that without evidence of effectiveness, many of the off-the-shelf options open to them (with the possible exception of those intervention types with *prima facie* validity, such as reducing exposure to road risk through using the roads less) are themselves activities with unknown benefits. The outlook for holistic approaches is not much better. At best, holistic approaches which include many different interventions of unknown individual effectiveness are an inefficient way to approach the problem; at worst they are unethical, if (as has been shown in some other road safety domains) some of their component parts might in some circumstances be harmful, at least for some groups of road users.⁴

It is interesting that the one thing mentioned in stakeholder feedback as relating to the success of WRRS interventions – the importance of leadership or ‘top-level buy-in’ – is of a different logical type (ie it is a context in which things get done) to the activities that often make up intervention content (such as training, monitoring of behaviour, incentives and group discussions). It is entirely plausible that without appropriate levels of leadership any WRRS intervention may be doomed to fail, since in effect a lack of leadership will almost always lead to the intervention not being implemented as intended. In evaluation, this would be seen as a failure of process; if the treatment is not delivered as intended, then its potential level of effectiveness in terms of outcomes (eg reduced crash rates) is simply not related to the final effectiveness achieved.

Another way of thinking about this is as follows. The enthusiasm for WRRS among business leaders that has been built up over the past decade (with the help of such schemes as Driving for Better Business – see www.drivingforbetterbusiness.com) is in itself a good thing for the future of the field; however, owing to the limitations in the evidence base identified in the review (and apparently accepted by stakeholders), it might be suggested that the WRRS field is not in a position to comment with certainty on how to harness this enthusiasm and leadership in the most effective ways, by providing the most effective interventions.

5.2 Recommendations

The following recommendations are made from the current project.

5.2.1 More robust and scientific evaluation studies should be encouraged in WRRS

A strong recommendation of the current project is that there needs to be a much greater commitment to classical evaluation in WRRS. Although case studies suggest that it is sometimes possible to have some success in assisting companies with managing road risk, they are not contributing to an understanding of the true nature of the WRRS problem. A return to some classical evaluation work, and a data-led approach, is necessary to achieve this. This includes a commitment to proper experimental (or at least quasi-experimental) designs examining the impact of interventions on crash

rates (or validated proxy measures – see below) with appropriate control groups. In addition, factors such as regression to the mean and exposure need to be taken into account.

A starting point is provided by Gregersen's work⁵ from the late 1990s. Group discussions, training and incentives were all found to decrease crash risk compared to a control group, and this work should be revisited and expanded to facilitate a greater understanding of the precise methods that provide the greatest benefits. Care should be taken to define the precise causal mechanisms by which such interventions are expected to have their effects, and to check that this is plausible against existing knowledge. It is not sufficient to rely on intuition as this is sometimes wrong; for example, training to increase car-handling skills has traditionally been accepted by the public (and policy makers) as being of safety benefit, but has now been largely discredited as a safety intervention in the wider road safety field.

Interventions should be based on a clear understanding of what the data tell us about contributory factors to crashes. The risk factors identified as being the most important for work-related crashes in the literature (fatigue and sleep-related factors, time pressure, in-car distractions) should be the initial focus of intervention content, along with the general behavioural antecedents of crashes and crash outcomes, such as speed choice and seat belt wearing.

Finally, although the current WRRS field is united on the importance of leadership and management buy-in, little has been done to define or measure it formally. Given that this nebulous variable is undoubtedly required to ensure that any interventions are delivered as intended (and indeed at all), its presence/absence and characteristics should also be included in any evaluation work.

5.2.2 A number of steps should be taken to encourage the involvement of organisations in better evaluation studies

A second recommendation (that is perhaps needed to enable the others) is that greater engagement with organisations is needed to convince them of the need for, and value of, better evaluation studies. There are several key messages that need to be communicated:

- Up until now there has been very little firm evidence regarding what works, and what does not, in decreasing crash risk in WRRS.
- The evaluation of individual interventions, or small combinations of treatments delivered as coherent packages, to address specific crash problems (that have been identified through a data-led approach) can satisfy the needs of businesses. At the same time they can contribute to the evidence base in a way that is not possible when adopting the 'holistic' or 'change everything' approach.
- In addition, such an approach can offer financial savings to businesses in the longer term, since, as the more effective treatments are identified, it will be possible to maximise resource allocation to those treatments, and away from treatments with more uncertain outcomes.
- Dissemination work should also include advice to organisations on how study designs with control groups are not unethical in the absence of strong evidence that a given treatment (ie the one being withheld from the control group) is effective.

5.2.3 WRRS can be improved through a reduction in road use

One of the main intentions of the authors of this report (and the accompanying review) was to provide an evidence base that could be used by businesses to help them manage their WRRS risks. Due to the paucity of the research literature identified, we are not in a position to be able to rank different types of intervention, as had been hoped. For businesses seeking to manage their WRRS risk, one recommendation that can be made (based on the *prima facie* safety case) is that it can be reduced through a reduction in the amount of road use by workers. In the authors' judgment, until good evidence is available to say otherwise, steps taken to reduce travel by the riskier road modes such as driving and cycling (for example by using teleconferences, and taking public transport – bus and rail – where travel is necessary) have the best chance of proving effective at reducing road injuries.

5.2.4 'Best practice' should be seen as the norm in WRRS

The term 'best practice' is a misleading one, since it has not been in any sense assessed as being the 'best'. It is also potentially a dangerous one, as it can suggest that nothing more needs to be done once such practices are in place. Many of the measures that currently form part of the holistic approach are simply good business practice, and should not be regarded as safety interventions in their own right. For example, ensuring that drivers have valid licences, have not been disqualified,

and can actually see to drive is basic good practice, and should be treated as a baseline from which to measure future improvement through using properly focused and quantifiable interventions.

5.2.5 A greater use of IVDRs should be encouraged in management and evaluation of interventions

IVDR data offer a proxy measure that can be used to assess the impact of interventions and changes over shorter timeframes than accident statistics, and with more objectivity than attitudinal measures. There should be an effort in WRRS to make more use of such technologies in evaluation work. IVDRs should be used when the behaviours being targeted for change by a given WRRS intervention can be defined; these behaviours can then be measured and linked to the interventions. In a suitable large-scale study they could also be linked to collision outcomes over the longer term (as part of a large-scale validation study).

5.2.6 Better outcome measures should be a priority

It is recognised that outcome measures are a problem. Collision data can be sketchy, claims data incomplete, cost data slow to gather, and so on. It is perhaps understandable that many organisations have looked to other more easily collected, if less tangible, measures against which to assess their progress in improving WRRS. There has also been an increasing tendency to use attitude or behaviour measures as outcomes. Difficulties with collision and injury data should not be allowed to mask the fact that they remain the only valid measures of safety, and there is still no substitute for accident data. It is possible that in the future properly validated proxy measures will become available, but this will only come about as the result of well-designed and large-scale research studies. This would be to the benefit of WRRS as a whole, and should be encouraged. Without a return to 'classical' evaluation, work to improve WRRS can only be on an *ad hoc* and less than efficient basis.

There are of course commercial and practical issues that remain to be overcome when trying to persuade industry to engage in evaluation studies. Companies may not wish to invest time and money in evaluation studies if they perceive that holistic approaches (even if only supported by case study data) are sufficient for their needs. In addition, companies may be reluctant to have their accident data made public. Nonetheless, the fact remains that there is a pressing need to use controlled evaluation studies to assess which WRRS interventions work, by how much, and through which causal mechanisms.

References

- 1 World Health Organization. *Global status report on road safety. Time for action*. WHO, 2009. http://whqlibdoc.who.int/publications/2009/9789241563840_eng.pdf (accessed 11 September 2009).
- 2 Work-related Road Safety Task Group. *Reducing at-work road traffic incidents*. HSE Books, 2001.
- 3 Downs C G, Keigan M, Maycock G and Grayson G B. *The safety of fleet car drivers: a review*. TRL Report 390. Transport Research Laboratory, 1999.
- 4 Katila A, Keskinen E, Hatakka M and Laapotti S. *Skid training for novice drivers – benefit for adults, pitfall for youngsters*. Paper presented at the International Conference of Traffic and Transport Psychology, Valencia, Spain, 1996.
- 5 Gregersen N P, Brehmer B and Morén B. Road safety improvement in large companies. An experimental comparison of different measures. *Accident Analysis & Prevention* 1996; 28: 297–306.

Appendix A: Questions sent to stakeholders for comment at the beginning of the project

- 1 Our task is to review the effectiveness of work-related road safety interventions. We define these as 'any intervention designed to lower the risk of being in a road accident while driving for work'. Do you agree with this definition?
- 2 What sort of interventions do you feel hold the most promise of improving work-related road safety?
- 3 What kind of evidence do you think is needed to show that something is effective?
- 4 What do you think are the gaps in knowledge about work-related road safety?
- 5 Do you have access to any 'grey literature' (unpublished reports etc) that could be relevant to our review?

Appendix B: Summary of the review sent to stakeholders for comment at the end of the project

Work-related road safety: a systematic review

There are a number of different forms that interventions focused on work-related road safety (WRRS) can take. Although there are many providers of WRRS interventions, there is a lack of understanding as to which types of interventions are most effective, and to what degree. Accordingly, a systematic review of the literature has been carried out. The objectives of this review were to answer the following questions:

- Is there a sufficient literature of the highest quality evaluations (ie randomised controlled trials with sufficient sample sizes and using collisions or collision risk as an outcome variable) to make a definitive statement regarding the efficacy of WRRS interventions overall?
- If not, what are the suggested levels of effectiveness of WRRS interventions using weaker study designs?
- In either case, what can be said about the effectiveness of different subcategories of intervention (such as training, incentives, and enforcement through technology)?

The review revealed a number of methodological problems that have impinged on WRRS in the past, and continue to do so in the present. The first, and most obvious, is that it takes place in the real world, and therefore experimentation to establish the effectiveness of remedial measures is extremely difficult. Twenty years ago, this was seen as a challenge, and good evaluation work was carried out, and possibilities for further research were identified. These have never been followed up. Largely as a result of pressure from policy makers and legislators, there has been a major change in emphasis where a concern with policies and procedures has become the main priority for fleet operators. While Murray *et al.*¹ stress the need for 'proactive key performance indicators', they also accept that much of the activity in the UK in the last decade has been concerned with identifying and disseminating best practice, rather than with evaluation.

The second barrier is the near universal use of multifactor interventions. While case study evidence is highly supportive of such an approach, what is lacking is an understanding of the relative effectiveness of the component parts of any intervention package. Concern with procedure in the UK has often led to multifactor interventions being adopted on a largely pragmatic basis. This contrasts with the situation in Australia, where the multifactor approach is employed with enthusiasm and buttressed by a range of theoretical and conceptual frameworks.

Another barrier to evaluation has been the lure of intervening variables. To most road safety researchers, accident statistics are the ultimate criterion by which any safety countermeasure should be assessed. In the WRRS field, however, there has been increasing pressure to move to other more 'explanatory' measures, such as behaviour and attitudes, partly because of the ease with which such data can be collected. There are a number of inherent problems with this approach, and it has achieved only limited success to date.

The final barrier to evaluation is that it is no longer seen as being important – at least not in the rigorous scientific sense. In the multifactor approach, changes to crash rates are now seen as only one of many possible key performance indicators. As an example, in the Wolseley case study by Murray *et al.*¹ there were 11 other measures cited as outcomes in addition to a reduction in collision rate. One result of these barriers to evaluation is the fact that not a single properly controlled evaluation study of WRRS interventions has been carried out in the last decade.

Since 1999, there have been six reviews of the literature. All six experienced difficulty in finding well-controlled evaluation studies. If one adopts the not unreasonable criterion that an evaluation study should assess whether an intervention has brought about a statistically reliable change in crash rates, then the results are meagre in the extreme. Only four studies meet this criterion; three were in the same investigation, and all were conducted more than a decade ago.

In 1996, Gregersen *et al.*² described the results of a major investigation in which four interventions were compared, together with a control. Three of the interventions were shown to have a significant effect in reducing accident rates. In 2000, Wouters & Bos³ were able to show that the installation of 'black box' recorders could reduce accident involvement among fleet drivers. These four interventions are the only ones in the literature that show scientific credibility. In the last decade, no serious

evaluation studies have been undertaken, and the claims of improvement in WRRS have been largely anecdotal in nature.

It is important to bear in mind that the absence of strong evidence of effectiveness does not mean that effectiveness has not been achieved. There have been a number of case studies in recent times that have claimed impressive gains in WRRS through the implementation of large-scale programmes. Two notes of caution must be sounded, however. The first is that it is in the nature of things that only success stories get reported. There is some counter-evidence (anecdotal, inevitably) that large programmes have been carried out in some organisations without making any impact on existing problems. The second is that the current practice is to use a broad package of measures, which means that the effectiveness of each individual component is therefore impossible to assess. Without a return to 'classical' evaluation, work to improve WRRS can only be on an *ad hoc* and less than efficient basis. Therefore a strong recommendation of the current review is that effort should be expended in the WRRS field on engaging with organisations that are willing to take part in more scientifically controlled evaluations of the effectiveness of different WRRS interventions. There is a pressing need to use controlled evaluation studies to assess which WRRS interventions work, by how much, and through which causal mechanisms.

References

- 1 Murray W, Ison S, Gallemore P and Nijjar H S. *Effective occupational road safety programs: a case study of Wolseley*. Transportation Research Board 88th Annual Meeting, Washington DC, 2009.
- 2 Gregersen N P, Brehmer B and Morén B. Road safety improvement in large companies. An experimental comparison of different measures. *Accident Analysis & Prevention* 1996; 28: 297–306.
- 3 Wouters P and Bos J M. Traffic accident reduction by monitoring driver behaviour with in-car data recorders. *Accident Analysis & Prevention* 2000; 32: 643–650.

All rights reserved. Permission to reproduce any part of this work will not be withheld unreasonably, on condition that full attribution is given to the publication and to IOSH.

While this paper reports on research that was funded by IOSH, the contents of the document reflect the views of the authors, who are solely responsible for the facts and accuracy of the data presented. IOSH has not edited the text in any way, except for essential formatting requirements. The contents do not necessarily reflect the views or policies of IOSH.

All web addresses are current at the time of going to press. The publisher takes no responsibility for subsequent changes.

© IOSH 2011
Published by IOSH
The Grange
Highfield Drive
Wigston
Leicestershire
LE18 1NN
UK

+44 (0)116 350 0700
www.iosh.com

IOSH is the Chartered body for health and safety professionals. With over 50,000 members in more than 130 countries, we're the world's largest professional health and safety organisation.

We set standards and support, develop and connect our members with resources, guidance, events and training. We're the voice of the profession and campaign on issues that affect millions of working people.

IOSH was founded in 1945 and is a registered charity with international NGO status.

IOSH
The Grange
Highfield Drive
Wigston
Leicestershire
LE18 1NN
UK

 twitter.com/IOSH_tweets
 facebook.com/IOSHofficial
 tinyurl.com/IOSH-linkedin
 youtube.com/IOSHchannel
 instagram.com/ioshofficial

+44 (0)116 350 0700
www.iosh.com

Institution of Occupational Safety and Health
Founded 1945
Incorporated by Royal Charter 2003
Registered charity in England and Wales No. 1096790
Registered charity in Scotland No. SC043254