

# THE EFFECTIVENESS OF WORK HEALTH AND SAFETY INTERVENTIONS BY REGULATORS: A LITERATURE REVIEW



April 2013

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## Summary

Despite a growing body of research very little is known about how and why interventions by regulators influence compliance and work health and safety outcomes. Much of the limited information that is available has been obtained from international studies, with almost no published information available on the effectiveness of work health and safety regulatory intervention in Australia. By understanding why interventions work in terms of how they influence the internal factors that motivate businesses compliance behaviour or mechanisms, regulators can design interventions that more precisely focus on influencing these mechanisms in order to increase compliance. By understanding for whom they work and in what circumstances, regulators can tailor their interventions to accommodate different subgroups of businesses e.g. different size businesses and different industry sectors. This review aims to identify possible mechanisms that may explain why interventions by regulators influence compliance and work health and safety outcomes, for whom and in what circumstances. The review outcomes should not be considered as definitive. Rather, they can inform thinking about the design and evaluation of future interventions.

### Interventions by work health and safety regulators

The following summarises the key points found in the literature review. The observed study outcomes suggest that the introduction of new regulations will lead to changes in safety practice and ultimately to changes in work health and safety outcomes for those businesses that:

- see themselves as being in an industry with significant hazards
- are larger businesses, and
- can interpret and apply the regulations to their specific circumstances.

Work health and safety interventions are thought to trigger mechanisms within businesses that affect work health and safety behaviours and compliance with regulation. This review identifies several key mechanisms including:

- awareness of requirements
- businesses' understanding of what they need to do to comply
- concern for reputation, and
- perception of their level of risk.

It appears that the effects of these mechanisms are modified by a number of context factors:

- large businesses are more likely to understand what they need to do in order to comply
- large businesses are more likely to be concerned about reputation, and
- businesses that perceive themselves as operating in a high risk sector are more likely to attend to new regulations as they are introduced.

The pattern of results observed suggests that inspections:

- are more likely to lead to improved work health and safety outcomes for small businesses and for those with no prior experience of inspections
- may reduce the severity of injuries rather than the overall injury rate, and
- that include penalties may be more effective for medium and large businesses.

The key mechanisms leading to inspections producing changes in work health and safety outcomes are:

- drawing managers' attention to the issue of safety overall
- enabling businesses to understand what they need to do in order to comply, and
- the potential for damage to businesses' reputation associated with being the subject of enforcement.

Large businesses are more likely to be concerned about damage to their reputation whereas the major challenge for small business may be to understand what they need to do in order to comply.

Prosecutions serve several functions including satisfying community expectations around investigation and punishment of wrongdoing as well as deterring others from offending. The treatment of work health and safety cases in the courts and the outcomes are likely to influence how prosecution of work health and safety offences serves both of these functions.

Only a very small number of studies on the impact of prosecutions were located. The results suggest that prosecutions have a small general deterrent effect. Large businesses are more likely to be able to understand and interpret court decisions and how they could apply to their business. Both low average penalties imposed by courts for work health and safety offences and the focus in the court cases on the specifics of the particular events leading up to the death or injury that led to the prosecution may act to limit the deterrent effect of work health and safety prosecutions.

Very little evidence is available in Australia or internationally regarding the effectiveness of guidance material. What evidence is available suggests that guidance may be more effective for those who already have a good understanding of what they need to do in order to comply. Large businesses are more likely to be aware of guidance material and to follow the safety practices in the guidance material.

The available evidence on whether campaigns lead to changes in safety practice and/or work health and safety outcomes for the targeted groups is very limited. There is some evidence that campaigns are more effective when they include a mix of education and enforcement. This suggests that industry campaigns by the regulator may change businesses safety practice through managers' understanding of what they need to do to comply and their concern for consequences.

Social marketing techniques that apply marketing principles to social good issues have been used in campaigns in other areas such as public health but there has been little application in work health and safety. Overall evidence of effectiveness is very limited.

There is some evidence that enforceable undertakings (EUs) are effective in changing the safety practices of businesses. No evidence is available on how they compare with court proceedings or in what types of businesses EUs are and are not effective. EUs may bring about change in the safety practice of businesses by:

- their perceived authority as binding legal agreements
- getting managers to take ownership of required improvements to safety practice, and
- making managers understand the consequences of harms that past practice has caused.

There is evidence that in some circumstances voluntary partnerships and incentives can be an effective way of changing businesses behaviour. Voluntary partnerships and incentive schemes are more likely to be effective in changing behaviour where:

- there is a high level of trust between business and the regulator, and
- business can see an advantage in taking part.

There is no evidence available regarding which businesses these schemes are effective for.

## Policy implications

Three broad areas for consideration can be identified from the review:

1. Small and large businesses could benefit from separate models for regulation:
  - for small businesses provide access to individual support and advice services. The aim for this group would be to be responsive in supporting them to move to compliance while retaining enforcement when compliance remains an issue.
  - for large businesses provide a high level of access to information and minimal interference by the regulator. The aim for this group would be to support existing compliance while responding harshly to non-compliance.
2. Compliance and enforcement policy can support the perceived duty to obey the law by emphasising procedural justice.
3. Specific changes that could enable improvement of the effectiveness of interventions by work health and safety regulators include:
  - making clear to business and particularly large business the consequences of non-compliance, especially loss of reputation. The objective is for businesses to clearly understand that punishment and other consequences of non-compliance are a result of their own choices and actions and not because the regulator is being heavy handed
  - considering restorative justice approaches for both small and large businesses in certain circumstances rather than proceeding to the court system
  - treating guidance material as a policy intervention and building evaluation into the development cycle, and
  - enforceable undertakings show potential as an alternative to court proceedings to change the behaviour of businesses.

## Research Gaps

Areas where current research is lacking include:

1. The effectiveness of work health and safety interventions in Australia. Almost no information is currently available.
2. The impact of circumstances on the effectiveness of regulatory interventions is poorly understood. Issues where further investigation is suggested include:
  - The impact of workforce demographic characteristics including education and training.
  - The impact of changes in business activity levels on the effectiveness of regulations. While it has been suggested that changes in business activity may influence the effectiveness of regulations there is little evidence available.
3. The outcomes of prosecution. Systematic collection and analysis of data on the outcomes of prosecutions could be used to inform compliance and enforcement policy.
4. The impact of external circumstances such as economic factors on compliance with regulation.
5. The outcomes of enforceable undertakings compared to cases that have proceeded to court.

## Introduction

We do not know whether many of the strategies used on a regular basis by work health and safety regulators, such as introducing regulations, conducting inspections, imposing penalties for non-compliance and running industry campaigns are effective in achieving the desired policy outcome of reducing work related deaths, injuries and disease. To enable them to develop and use evidence-based policy work health and safety regulators need to know what works. The strategies that work health and safety regulators use can be regarded as ways of intervening in the workplace to achieve policy outcomes. Specifically these strategies provide businesses, managers and workers with resources, incentives and punishments with the aim of changing their behaviour. The outcome of interventions such as this depends on the choices that businesses, managers and workers make in response to the resources, incentives and punishments provided. Because the choices that businesses, managers and workers make are dependent on a large, complex and variable set of factors in practice interventions by regulators will usually be effective for some members of the target industry in some situations but not others (Pawson 2006).

Few previous studies have examined the potential mechanisms by which regulatory interventions may result in short and long term health and safety outcomes (Hillage et al. 2001; Kristensen 2005). One partial exception is a study by Wright et al. (2005) who investigated the motivations for businesses to comply with work health and safety regulations. Wright et al. concluded that key drivers of compliance include:

- enforcement of regulation and consequent fear of both business disruption and risk to reputation
- the financial incentive provided by insurance premiums, and
- the moral implications of non-compliance.

Wright et al. (2005) also examined differences in motivations between different groups of businesses. They noted that the moral implications in small to medium size enterprises (SME's) were expressed in terms of managers knowing the person who might be hurt whereas in larger business they were expressed in terms of societal values. A recent review by Bluff (2011) examined the impact of provision of information and capacity building, inspections and enforcement and prosecutions. Bluff noted that while there is evidence that inspections and enforcement lead to changes in outcomes few studies have examined how inspections and enforcement lead to these changes. Systematic reviews of the effectiveness of regulatory interventions have often produced inconsistent findings. Kralj (2000:213) concluded "the empirical evidence on the impact of occupational health and safety regulations is mixed, generally indicating that regulations have little or no impact on outcomes".

The aim of this review is to develop and refine explanatory models for why the set of activities undertaken by regulators leads to changes in safety outcomes. This is consistent with the proposal by Cox et al. (2008) that the policy making process requires particular rather than general information. That is rather than general rules concerning what works, policy makers need to know why different interventions work for specific groups in particular contexts. This is not a systematic review. The studies used to develop and refine the models were selected based on their relevance and a broad assessment of quality as described in Appendix 1. In practice due to the limitations of the existing body of research on intervention effectiveness in work health and safety this approach could only be followed in full for the sections on introducing new regulations and conducting inspections.

The refined models should not be regarded as definitive. They constitute potential explanations for the observed patterns of findings and should serve as a starting point to inform thinking. The review aims to complement previous reviews in work health and safety (see for example Bluff 2011; Kralj 2000; Tompa, Trevithick and McLeod, 2007) by focussing on explanations for why

interventions work - an issue most previous reviews in work health and safety have paid little attention to (Kristensen 2005). The focus has been primarily restricted to studies in work health and safety with limited material drawn from other regulatory domains.

For each of the following types of interventions the review develops explanations for why the interventions lead to changes in outcomes, for whom and in what circumstances:

1. introducing new regulations
2. conducting inspections
3. prosecutions
4. guidance materials
5. industry campaigns
6. enforceable undertakings
7. voluntary partnerships and incentive schemes.

The final section of the review brings together the models for each kind of intervention with the aim of providing information regarding potentially effective intervention strategies for different groups in different situations.

# Interventions by work health and safety regulators

## 1. Introduction of new regulations

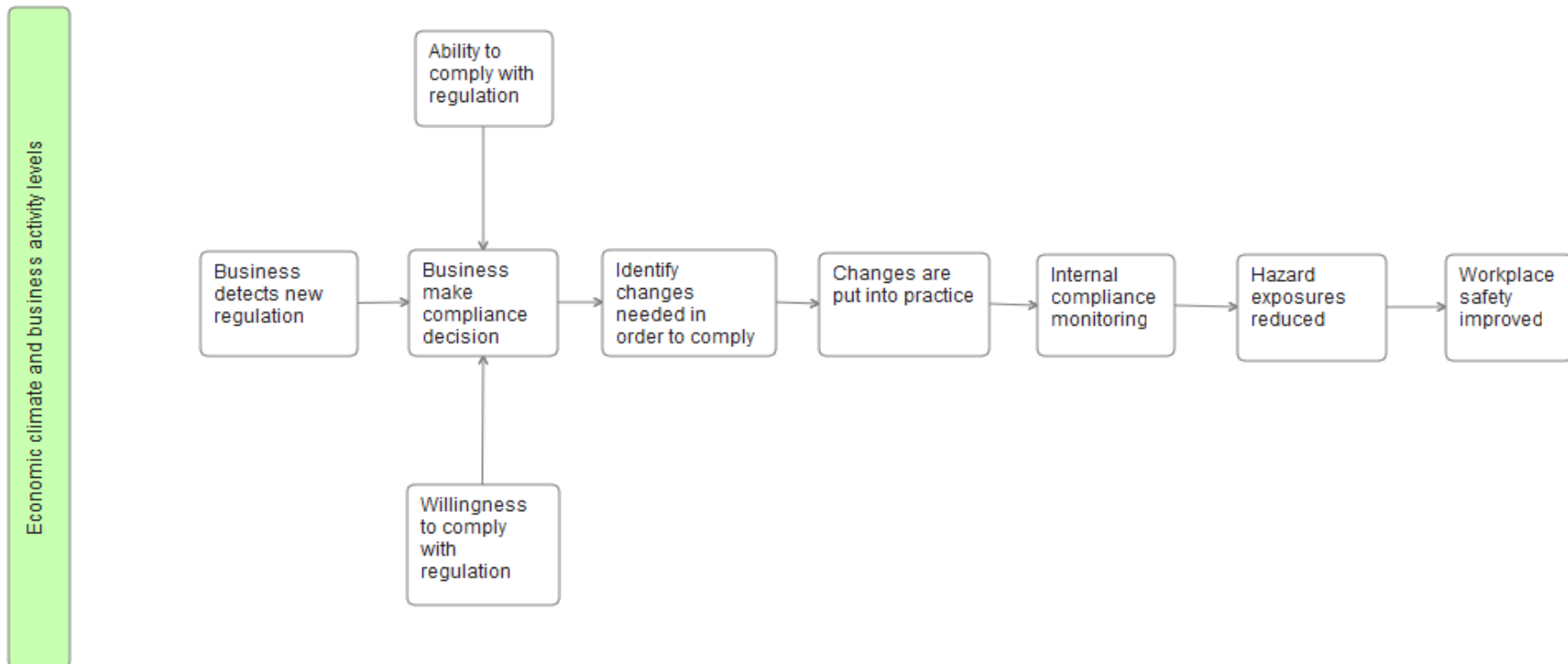
The introduction of new regulations is one of the primary strategies that governments use to influence the safety practice of businesses and individuals in the workplace. While laws ultimately have an effect as a result of the range of supporting strategies employed in their day to day implementation at the “street” level, the objective here is to focus on the effect of introducing a new law or regulation on work health and safety outcomes. That is introducing a regulation refers to the specific event of a new regulation coming into operation rather than the broad range of activities undertaken by regulators. The outcomes refer to changes in the target behaviour and in longer term goals such as reduction in injuries. Similar to other public health interventions, the introduction of new work health and safety regulations seeks to change safety practice by encouraging safe and healthy behaviours and discouraging unsafe and unhealthy behaviours through the use of positive and negative incentives “carrots and sticks” approach.

This section sets out a preliminary model of the steps between the introduction of a new regulation and changes to work health and safety outcomes in the workplace. This model aims to describe why introducing a regulation results in changes in safety outcomes in workplaces. The development of this initial model was informed by a preliminary scan of a number of sources including a review of the socio-legal literature by Amodu (2008) and a review by Wright, et al. (2005). Other key sources were the Netherlands T<sup>11</sup> model and the A2E model (for further details see Organisation for Economic Cooperation and development 2002), Ayers and Braithwaite (1994), Parker (2000), Gunningham, Thornton and Kagan (2005), Winter and May (2001) and Tyler(2006).

Key concepts adopted from these models include:

- knowledge of regulations
- ability to comply with the regulations e.g. access to resources and skills
- cost benefit considerations – material and non-material advantages and disadvantages arising from compliance, and
- willingness to comply with regulations.

A preliminary view of the relationship between the introduction of new regulations and changes in safety outcomes incorporating these concepts is shown in Figure 1. This model can also be considered as describing the path from when businesses become aware of a new regulation to changes in outcomes. The model also suggests where the regulation may fail to achieve desired outcomes. For example, if businesses in the target group are not aware of the regulation or cannot understand what they need to do to comply or are not willing to comply, this would result in the regulation not producing the desired outcomes for some members of the target group.



doview.com model

**Figure 1: Introducing new regulations resulting in improved work health and safety outcomes – preliminary model**

## Studies that evaluate the impact of regulations

The eleven evaluations of regulations reviewed were selected on the basis that they can contribute to understanding:

- the mechanisms triggered by the introduction of regulations
- sub groups for whom different mechanisms may operate, and
- contexts in which regulations are more or less likely to trigger these mechanisms.

In many cases the evidence from any given study is partial and/or inferred from what is presented in the paper rather than being directly available. The review identifies for each study potential mechanisms that can explain the observed outcomes, subgroups where the outcomes suggest different explanations and particular contexts where the outcomes suggest different explanations. The potential mechanisms, subgroups and contexts identified are used to refine and elaborate the preliminary model. The key points for each of the studies reviewed are shown in the boxes. (Extended summaries of each study are shown in Appendix 2 – Table 3.)

### **Study 1: House of Lords - Merits of Statutory Instruments Committee (2009)**

This study contributes to understanding the effects of awareness of a regulation and its interpretation on compliance. The evaluation findings suggest that businesses were aware of the regulation because they took action however the actions were in some cases wrong and ineffective. This suggests that while businesses were aware of the regulation they did not understand what they needed to do in order to comply.

Study one suggests a refinement to the preliminary model which proposed that target group members need to become aware of a new regulation. The findings suggest that once businesses become aware of new regulations they need some way of understanding what they have to do in order to comply. Thus we now have two mechanisms:

- awareness of the regulation, and
- understanding how to apply the regulations to their business.

The inference drawn here is consistent with Swan et al. (2002).

### **Study 2: Martinez, et al.(2009)**

Martinez et al. (2009) provide some insights on the impacts of context factors on the effectiveness of regulations. The key outcome from this study concerned the influence of context factors on the effectiveness of the directive as it was adopted into legislation for construction safety in different countries. The authors suggest the educational level of the workforce as one potential explanation for differences in outcomes in different countries. Thus the educational level of the workforce can be seen as a contextual factor that influences businesses capacity to implement safe work practice.

Study two suggests a further modification to the preliminary model to include workforce demographic factors as a contextual influence on businesses' capacity to comply. The finding discussed here is an inference the authors drew based on their findings and statistical data from the member countries. The authors indicate that the impact of

workforce demographics should be considered as a hypothesis needing further investigation.

**Study 3: Foley et al. (2009)**

Foley et al. (2009) examined the impact on safety outcomes before during and after the period in which an ergonomic rule was introduced in Washington State and subsequently repealed as a result of an industry-led campaign. This study contributes to understanding the effect of willingness to comply on the impact of a new regulation. The study showed that the introduction of the rule resulted in a decline in musculo-skeletal disorders (MSDs) that was reversed when the regulation was repealed. A key finding was that incidence of MSDs had begun to increase prior to repeal of the regulation.

Foley et al. (2009) argue that the timing of the change in impact of the regulation was due to the perception that the law had lost any authority because it would be revoked. From the findings presented in the report, the change in compliance with the rule seems to be linked to the industry led campaign for its repeal. This suggests the preliminary model should include perceived authority as an influence on compliance.

**Study 4: Lipscomb, Li and Dement, (2003)**

This study evaluated the impact of a standard introduced in Washington State in the US for vertical fall arrest on the rates of work related falls among carpenters. The study found evidence of a sharp decline in work related falls in the group of carpenters studied very shortly after introduction of the standard. This study contributes to understanding the impact of awareness of a regulation on outcomes. The authors suggest that the early change observed was due to the effort by the regulator to communicate the standard to the industry prior to its introduction. The authors do not provide enough details about the communication strategies used by the regulator to make it clear whether these strategies focussed on awareness or understanding or both.

Study four suggests that businesses' awareness of a regulation may be a mechanism leading to improved outcomes. This supports the finding from Study one. The inference that awareness of a regulation leads to improved outcomes is based on the finding about the impact of communication on the timing of the change in outcomes. This is consistent with the proposal in the preliminary model.

**Study 5: Vickers et al. (2005).**

This study contributes to understanding how differences between subgroups can influence the effectiveness of regulation. Vickers et al. concluded that small businesses can be divided into several groups based on their responses to and attitude towards regulation. Vickers et al. grouped the businesses into three groups: avoiders/outsideers, reactors and proactive learners. The Vickers et al. results suggest that businesses' overall attitude towards regulation influenced their awareness of and responses to regulation. Vickers et al. also noted that retail businesses were less likely to be able to identify relevant health and safety legislation and micro businesses were less likely to be aware of legislation. This suggests that size and industry sector should also be included as group factors influencing awareness and capacity to comply. There were also differences in acceptance of regulation between businesses owned by different ethnic minority groups that Vickers et al. suggest can be interpreted as being due to cultural differences in acceptance of regulation.

Study five suggests that the following factors should be added to the preliminary model:

- cultural variation as a group factor influencing acceptance of regulation. Further investigation of this factor in work health and safety is required
- attitude towards regulation can be seen as a group difference influencing the operation of mechanisms triggered by new regulations. This is supported by the work of Valerie Braithwaite (see for example Braithwaite 1995; Braithwaite 2008; Braithwaite et al 2009) on motivational postures in a range of regulatory domains.
- business size, and
- industry sector.

The attribution of differences in acceptance of regulation to cultural differences is an inference drawn by the authors without further supporting evidence and further investigation is needed.

**Study 6: Swan et al. (2002)**

In their evaluation of the Control of Substances Hazardous to Health (COSHH Schedule 9 - for assessing biological risks). Swan et al. (2002) found that representatives from businesses, unlike those from laboratories, saw application of the legislation as difficult due to its technical language and approach. This was despite the fact that ten of the fourteen paragraphs are intended to be general in application, only four paragraphs refer to intentionally working with biological agents as distinct to incidental exposure.

The results suggest that laboratories, for which the issues covered by the legislation were part of everyday practice, had the background knowledge to understand and implement the requirements whereas other industries that dealt with these hazards occasionally found it more difficult.

Comparing Study six with Study one, the pattern of outcomes in the two studies can be explained by the same mechanism, namely businesses' understanding of how to apply the regulation to their specific circumstances.

**Study 7: Suruda et al. (2002)**

Suruda et al. (2002) found that a revision of the Occupational Safety and Health Administration (OSHA) trench and excavation standard which removed some ambiguity, together with a targeted inspection program led to a reduction in fatalities resulting from trench collapses. Two other key observations were the overall lower rates of fatalities at larger firms and unionised firms compared to smaller non-unionised firms.

There are two possible mechanisms that could explain the outcome pattern observed in Study seven. The difference between larger and smaller firms suggests that making the standard easier to comply with may have made it easier for smaller firms with less knowledge and resources to apply the standard. Union presence especially in the US system provides a greater capacity for workers to pressure businesses for better safety standards without the direct involvement of the regulator. The targeted program of inspections may also have made smaller and non-unionised firms more concerned about consequences of non-compliance. It is notable that a decrease in fatality rates was observed in firms with fewer than 11 employees which were exempt from routine, unannounced inspections.

**Study 8: Smitha et al (2001)**

Smitha et al (2001) found that regulations that targeted employers with high accident or claims rates were relatively ineffective while regulations that required businesses to take actions to improve safety or to communicate better with their workforce were the most effective. The authors argue that it may be that the targeting initiatives were not effective because they focussed on a small subset of the population of businesses whose behaviour may be relatively difficult to change.

It is possible that employers with high accident rates were not motivated to change by the threat of enforcement and/or that the circumstances of this group make it difficult for them to change. Comments in the paper suggest that employers that were targeted were likely to engage in lengthy legal fights with the regulator. By comparison regulations requiring actions to improve safety and increase consultation potentially target a larger group and may be more likely to increase businesses' ability to comply. The information available in the paper makes it difficult to establish potential mechanisms however possibilities include the attitude of employers with high accident rates towards compliance and/or the way that employers perceived the different regulatory approaches i.e. procedural justice.

The other key outcome from this study concerned the significant effects of subgroup differences including: industry type, industry size within type, and context factors including employed population age distribution, union presence and unemployment rates. Companies with older workforces, a unionised workforce and in states with lower unemployment rates were likely to have lower injury rates.

**Study 9: Addison, and Burgess (2002)**

The study can contribute to understanding how sub group differences within small business can influence awareness of regulations. Addison and Burgess found that awareness of and understanding the area of application of manual handling regulations in a group of small businesses in the UK varied greatly by industry type with metals and engineering being the highest and food and drink being the lowest. They also found that while smaller businesses were less likely to be aware of the regulations this did not necessarily mean their work practices were unsafe. However it often meant they were not aware of less visible hazards such as chemical exposures.

The findings from Study nine suggest that in different industry sectors managers' awareness of regulations may be influenced by the perceived relevance of health and safety to their business. Managers of small metals and engineering businesses are likely to know that their workers do tasks that are potentially hazardous such as working with machines. By contrast managers of small retail businesses may not see any obvious hazards in the tasks that their staff do.

**Study 10: Wells and Greenall, (2005)**

Wells and Greenall (2005) found that reductions in hazard exposures in the foundry industry in the UK were a result of complex interactions between legislative change, investment in new machinery and changes in work practice. The results showed that while reductions in exposures were associated with legislative change the change was also associated with investment in new machinery. The investment in new machinery was driven by a number of factors and actually happened prior to the legislation coming into force. Once the legislation came into effect it drove additional monitoring and subsequent changes to work practice to achieve compliance.

Wells and Greenall's (2004) findings suggest that compliance with new regulatory requirements is only one of the factors influencing the actions that businesses take that lead to improved safety outcomes. This suggests that the model of the impact of introducing new regulations should include the effect of existing work practices.

**Study 11: Henson and Heasman (1998)**

Henson and Heasman (1998) investigated the process that food businesses follow in complying with food safety regulations. They investigated the compliance process through a survey and in-depth interviews with a sample of UK food manufacturers and retailers. Henson and Heasman found that the decision to comply was not based on a calculation of the relative costs and benefits of compliance and non-compliance but rather reflected a concern not to be seen as operating outside the rules. Another factor suggested in this paper is that of compliance culture. Business reported that they made decisions that followed their compliance culture i.e. whether they usually complied or not, rather than basing the decision on a full economic analysis.

These results suggest that willingness to comply with regulations may be influenced by concern for others' perceptions. Given the direct link between compliance with food safety rules and potential impacts on the business it is possible that being seen as following the rules could be more important in relation to food safety than other areas. Further investigation is required.

**Why regulations lead to changes in work health and safety outcomes**

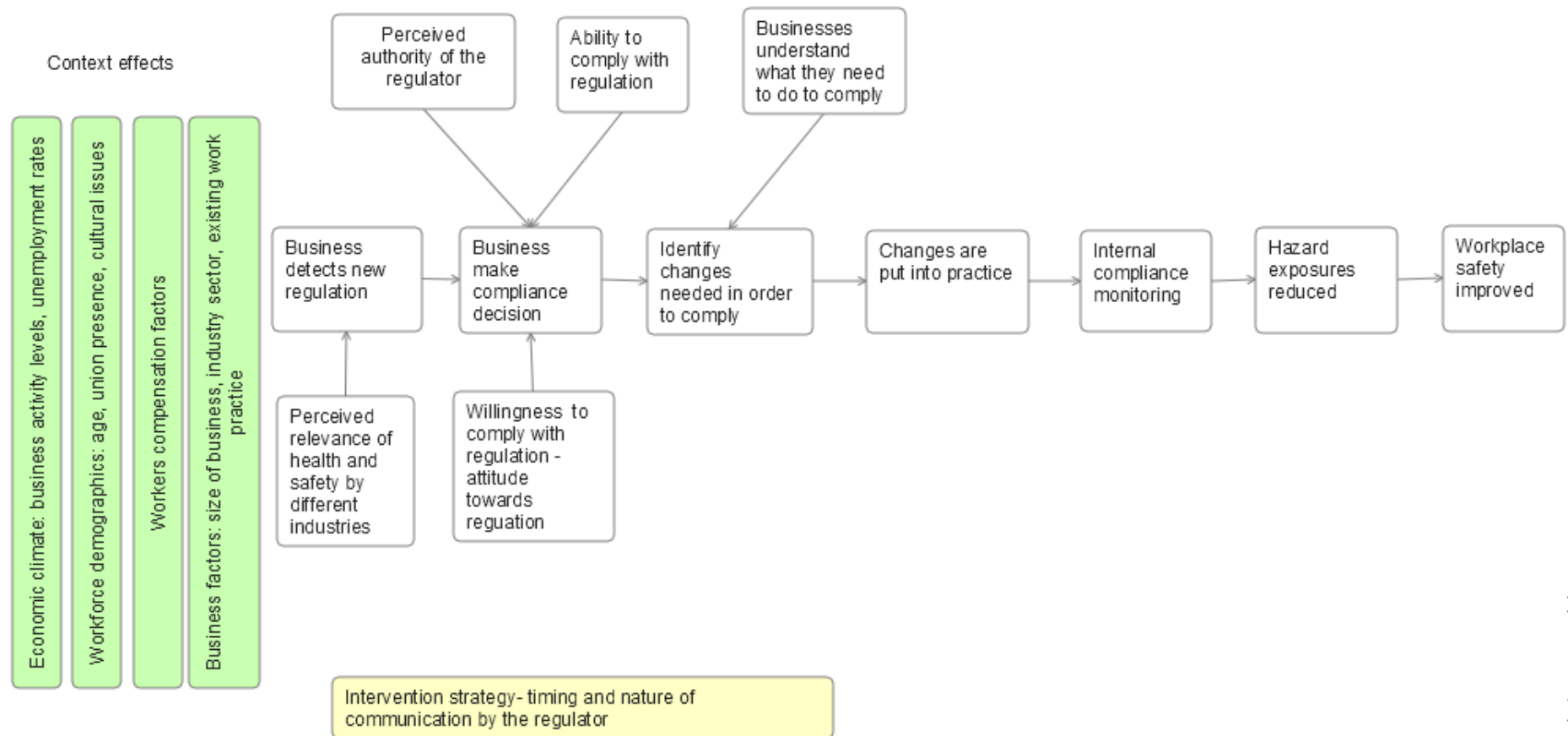
The pattern of outcomes observed for the 11 studies reviewed above suggests that for larger businesses and those businesses that pay attention to regulations and have a positive perception of the regulator the introduction of new regulations is more likely to result in improved work health and safety outcomes. A revised model of the ways that the introduction of new regulations leads to improved safety outcomes is shown in Figure 2 below. The results suggest that mechanisms influencing businesses response to the introduction of new regulations include:

- awareness: businesses need to be aware of a regulation for it to influence their behaviour
- understanding: to change their behaviour in response to the introduction of a regulation businesses need to understand what they need to do to comply
- concern for reputation: businesses are concerned not to be seen as "lawbreakers", and
- perceived relevance of the regulation.

The results suggest that these mechanisms may result in different outcomes depending on a range of context factors including:

1. economic climate
  - business activity level
  - unemployment rate
2. workforce demographic variables
  - age of the workforce
  - union presence (for firms in the United States)
  - levels of education in the workforce
  - cultural attitudes towards regulation in some groups
3. business variables
  - size of business
  - industry sector
  - acceptance of regulation.

These contextual factors are expected to have different effects at different stages in the process of change. The model suggests that different groups, including large and small businesses and high and low hazard industries, will differ on the level of attention they give to new regulations. When they become aware of a regulation, the model suggests that subgroups with different attitudes to regulation and the regulator are likely to differ in their decisions about whether to comply. Further on in the process of adapting their practice to meet new regulatory requirements the model suggests that large and small businesses may differ in understanding what they need to do in order to comply.



**Figure 2: Introducing a new regulation resulting in improved work health and safety outcomes - refined model**

## Conclusion

The preliminary model of how businesses respond to a new regulation suggested that it could be seen as a simple “black box model” where businesses become aware of regulations, interpret them and make whatever changes are needed in order to comply. The revised model as supported by findings in the literature suggests that the process that businesses go through to comply with a new regulation is far more complicated and that businesses are not a homogeneous group in the way that they move through the process.

A key overall implication from Figure 2 is that large and small businesses, industries with different levels of hazards and businesses with more and less positive attitudes towards the regulator are likely to differ in their responses to new regulations. This suggests that rather than a one size fits all approach, regulators may want to consider providing different kinds of advice and support for large and small businesses.

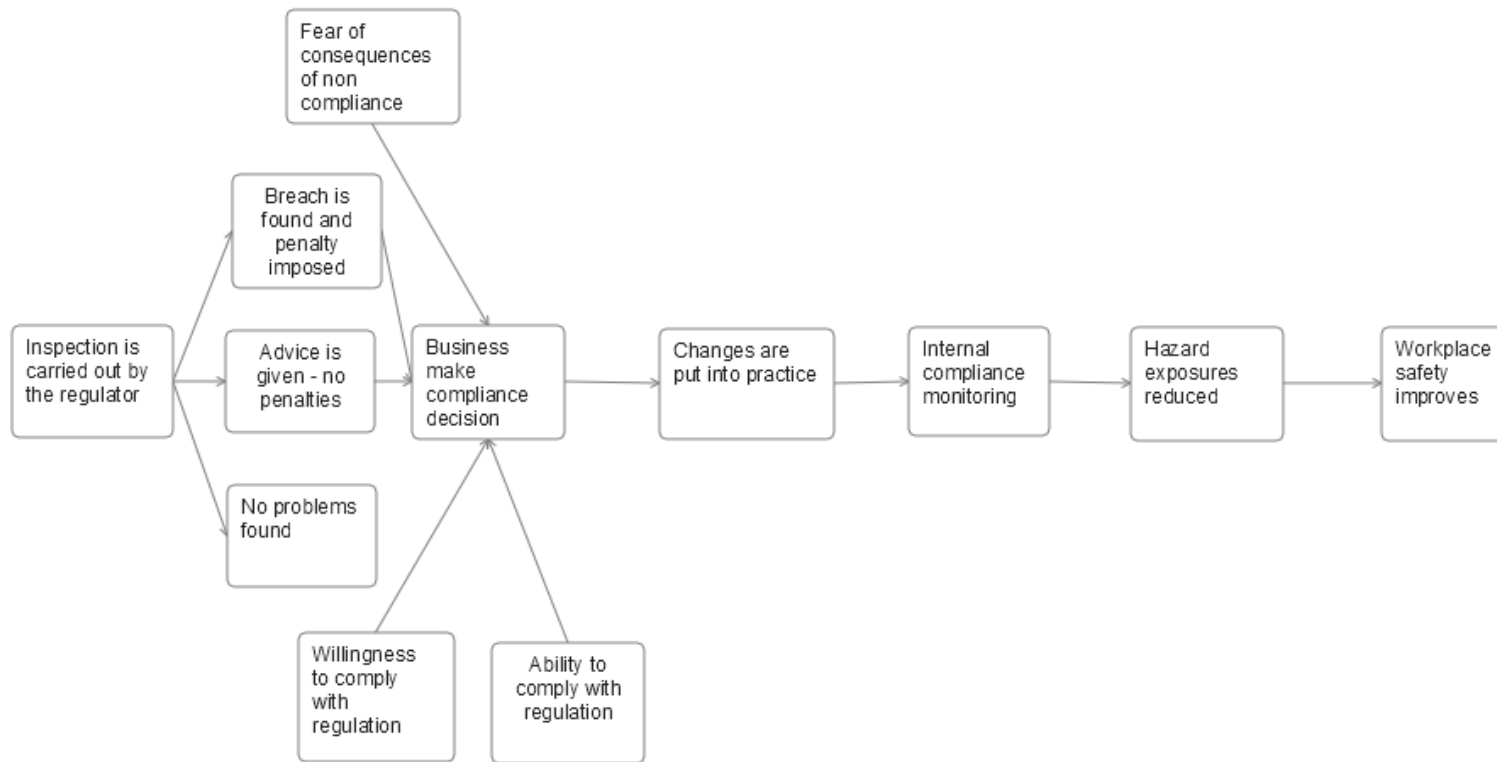
## 2. Conducting inspections with and without penalties

Work health and safety inspections aim to persuade or compel employers to comply with regulations. They may include both educational and enforcement elements. There are two major bodies of literature on the impact of inspections on employer behaviour and safety outcomes. There is an extensive body of theory from the socio-legal literature on regulation in general that is potentially relevant in explaining the way in which inspections and penalties in the work health and safety domain result in businesses changing their behaviour. There is also an extensive body of quantitative research from the United States (US) on the impact of inspections on compliance and outcomes. A US study investigated the impact of random government inspections on injury rates and workers compensation costs (Levine et al. 2012). The study found a nine per cent reduction in injury rates and a 25 per cent reduction in workers compensation costs. This study did not examine why inspections result in reductions in injury rates. The authors note that more investigation is needed on this issue. A review of the effectiveness of intervention strategies used by the Health and Safety Executive (HSE) by Wright, Marsden and Antonelli (2004) found that inspections influence the behaviour of businesses through a combination of advice and enforcement.

From a preliminary scan of the socio-legal literature the following concepts were identified:

- specific deterrence – imposition of sanctions deters individual businesses from repeating the offence
- general deterrence – imposing sanctions deters further breaches by the business and by other businesses
- bounded rationality – suggests that sanctions have the effect of drawing managers’ attention to the issue of safety, and
- co-operation - assumes that businesses want to comply with regulation.

Figure 3 sets out a preliminary model of why inspections and enforcement activity lead to changes in safety outcomes. The model draws on key concepts from the socio-legal literature as well as a review of the impact of interventions conducted by the HSE (Hillage et al. 2001). This model aims to explain how inspections may work as interventions leading to changes in safety practice and changes in outcomes. The model suggests that inspections can potentially influence employer behaviour through the desire to avoid penalties and through the businesses’ understanding of how to comply. That is, visits may provide an incentive to change behaviour by imposing penalties but they may also provide resources that enable businesses to improve their understanding of how to comply.



doview.com model

**Figure 3: Why inspections lead to increased compliance and improved work health and safety outcomes - preliminary model**

## Studies that evaluate the impact of inspections

The fourteen evaluations of inspections reviewed were selected on the basis that they can contribute to understanding:

- the mechanisms triggered by inspections with and without penalties
- sub groups for whom different mechanisms may operate, and
- contexts in which inspections are more or less likely to trigger these mechanisms.

Detailed summaries of the studies are presented in Appendix 2, Table 4.

### **Study 1: Gray and Jones (1991)**

In their evaluation of the effect of health inspections on subsequent hazard exposures Gray and Jones found a significant decrease in hazard exposures on subsequent inspections. The effect of inspections on subsequent exposures was greatest for the first inspection. They also found that a reduction in citations for violations of regulations during a period when the US administration was opposed to business regulation was associated with an increase in hazard exposures.

Gray and Jones do not discuss mechanisms for the impact of inspections in this study. In related work, Gray and Scholz (1991) suggested that the large impact of the first inspection can be accounted for by assuming a “shock effect” where the inspection draws management’s overall attention to safety combined with the deterrent effect of being fined for violations. The results also suggest that the political environment of the regulatory agency may have had an impact on the conduct of inspections.

### **Study 2: Burby and Paterson (1993)**

Burby and Paterson found cooperative inspections that focused on relationship building were more effective than deterrent inspections that focussed on penalising violations for securing compliance with performance-based standards. However, both approaches were equally effective for securing compliance with specification-based standards. This study can contribute to understanding the mechanisms leading to changes in outcomes as a result of inspections.

The specification standards discussed in this study involved monitoring to ensure that particular emission standards had been met while the performance standards were intended to support the development of plans to ensure that adverse impacts did not occur. The discussion suggests that gaining compliance with performance-based standards was most likely to occur when there was a positive ongoing engagement between the business and the regulator.

This study suggests that by taking different approaches the inspectors may be triggering different mechanisms. With inspections that focus on penalties the intervention may be working through a deterrence mechanism where businesses make changes in order to avoid the threat of penalties. By comparison inspections that focus on relationship building may trigger a positive engagement response from the business.

**Study 3: Nielsen (2007)**

This study contributes to understanding how the approach taken by inspectors to inspections can influence outcomes. The outcome of this study indicates that more communication between companies and inspectors improved the effectiveness of inspections in terms of ensuring that safety issues are addressed. More communication between the business and the inspector was also associated with businesses receiving more lenient outcomes.

The authors suggest that there is a risk that subgroups of businesses with lower capacity to communicate with the inspector could perceive the situation as inequitable and be less motivated to comply as a result. The authors also suggest that the effect of communication between the business and the inspector may have been due to inspectors providing more advice on how businesses could improve their safety practice rather than just focussing on compliance. Why there is less communication with some businesses than others is not explored in the paper.

The findings of Study three suggest that the nature of the interaction between the inspector and the business during the inspection can influence the likelihood of the business improving their safety practice. This finding may be related to the finding by Gray and Scholz (1991) that longer inspections resulted in better outcomes. It may also be the case that the communication addresses procedural justice issues. The business is able to put their position before the inspector decides on a solution resulting in perceptions of fairness (Tyler 2006).

**Study 4: Weil (1996)**

Weil (1996) found that inspections with enforcement led to increased levels of compliance measured by a reduction in violations in subsequent years. The results also showed that increased compliance reduces injury severity rather than reducing overall rates of injury. This study contributes to understanding the relationship between compliance with regulation and changes in safety outcomes.

The findings from Study four suggest that a full description of the relationship between inspections and enforcement and improved safety outcomes needs to consider both the ways that inspections and enforcement drive changes in behaviour and how changes in compliance result in improved outcomes. A possible interpretation of this finding is that inspections may reduce specific hazard exposures by increasing compliance with standards and regulations. The impact of reducing hazard exposures may be to reduce the injuries caused by accidents rather than the likelihood of accidents occurring. The results are consistent with an earlier study by Cooke and Gautschi (1981).

**Study 5: Weil (1999)**

This study found that for construction businesses that had a long history of interactions with the regulator, the impact of inspections and penalties on subsequent behaviour was relatively small compared to businesses that had received less prior regulatory attention. This study contributes to understanding the influence of different levels of experience with the regulator on the effect of inspections on business behaviour. Weil noted that at the time this study was conducted many of the large businesses could potentially have had twenty or more years' experience with the regulatory regime.

Study five suggests that prior experience may influence the mechanisms triggered by inspections that lead to changes in behaviour. Thus for businesses with little or no prior experience inspections may have a shock effect that is not triggered for more experienced businesses. It is also possible that businesses that have high levels of previous experience of being inspected may have already remedied the issues that inspections detect. The effect of experience proposed here may be similar to the decrease in the impact of repeated inspections reported in Ko, Mendeloff and Gray (2010).

**Study 6: Scholz and Gray (1990)**

Scholz and Gray (1990) found that receiving any penalty in an inspection resulted in a reduction in workplace injuries in subsequent years. This study focused on large, frequently inspected firms with higher than average accident rates. The results also showed that the size of penalties was less important than receiving any penalty. They also found that the effect of inspections and/or enforcement may take more than a year to show up in accident rates; longer than other studies had suggested.

The results of Study six support a behavioural model where receiving any penalty directed managers' attention to the issue of safety. The key difference between this study and Weil (1999) is that this study focussed on firms with higher than usual accident rates. The study by Weil focussed on construction companies that had a long history of interaction with the regulator but did not necessarily have high accident rates.

**Study 7: Ko, Mendeloff and Gray (2010)**

Ko, Mendeloff and Gray (2010) investigated the effect of repeated inspections and the length of time between inspections on businesses compliance with Occupational Safety and Health Administration standards. Their key finding was a drop of between 30 to 50 per cent in the number of violations cited from the first to the second inspection. The reduction in the number of violations cited for subsequent inspections is very much smaller. The authors suggest that this may reflect a learning effect such that when employers experience their first ever inspection they undergo a bigger learning experience than at any subsequent inspections.

The findings of Study seven suggest a revision to the preliminary model to include an effect of employer experience with inspections. The expectation is that inspections will be less effective for employers with more prior experience with inspections. From the perspective of the current review there is also an interesting secondary finding that when an employee accompanies the inspector the number of violations cited increases by about 30 per cent in union workplaces. This finding appears initially to contradict the finding reported by Mendeloff and Gray (2005a) that inspections have a greater impact on outcomes at non-union workplaces. However, the effect reported by this study related to a change over years of subsequent inspections. It is possible that inspections have a stronger impact initially at union workplaces because at these workplaces workers can exert pressure on the employers to improve safety.

**Study 8: Gray and Shadbegian (2005)**

This paper investigated the effect of inspections on compliance with air pollution regulations in the paper manufacturing industry in the US and the relationship between compliance with one area of regulation (air pollution) and other areas including water pollution and OSHA regulations. The findings of interest for the current review were that:

- plants owned by larger firms were less responsive to inspections compared to plants owned by small firms
- plants owned by large firms were more responsive to the prospect of enforcement action than plants owned by small firms, and
- owner compliance behaviour in one regulatory area appeared to carry over into others e.g. knowing a plant's compliance with water pollution regulations provided an indication of whether it was likely to be in compliance with OSHA regulations.

Study eight suggests that the relative importance of different mechanisms for large and small firms varies. The authors suggest that large firms were more concerned about the social sanction associated with being the subject of enforcement action whereas they could easily manage inspections. By comparison smaller firms were less concerned about the effect on reputation associated with being the subject of enforcement action but were less used to dealing with inspections. The greater impact of inspections on smaller firms is consistent with the finding by Mendeloff and Gray (2005).

**Study 9: Fairman and Yapp (2005)**

Fairman and Yapp found that key reasons for the impact of inspections in small businesses in the UK were:

- many of the managers were aware of ongoing health issues for employees including back pain and dermatitis but without external advice they did not connect these issues with hazard exposures in the workplace
- when they were told by an inspector they had to make changes they normally did so without delay or argument because they were directly concerned about the legal consequences of not doing so, and
- their motivations for compliance were fear of penalties and or customers taking legal action.

The authors concluded that the businesses were not capable on their own of identifying either the need for changes and/or the changes required to resolve health and safety issues. They suggest that the business needed an inspector to identify the changes they should make. Their acknowledgement of the legal power of the inspector meant that they would make the changes the inspector told them to. They understood compliance with the law to be doing what the inspector told them to do.

Study nine suggests that two possible mechanisms that lead to changes in behaviour in small businesses following inspections are managers' understanding of what they need to do to comply and fear of consequences. Both of the proposed mechanisms are directly supported by qualitative analyses presented in the report. Mendeloff and Gray (2005b) report similar findings regarding the impact of inspections on small businesses.

**Study 10: Mendeloff and Gray (2005)**

Three alternative models were tested for the effect of inspections on injury rates. The results showed that inspections with penalties led to a reduction in all injuries including those not covered by standards. The research also found that inspections had a bigger effect on smaller rather than larger workplaces and on non-union rather than union workplaces.

Mendeloff and Gray (2005a) concluded that rather than deterring violations of the standards, inspections and penalties work by making managers pay attention to safety as an issue. The greater impact on non-union workplaces may reflect the fact that unions are able to exert pressure on employers for higher safety standards. Other research (see for example Weil 1999) suggests that inspections are likely to have a greater impact on smaller workplaces possibly because larger workplaces are more able to manage the effect of inspections.

**Study 11: Baggs, Silverstein and Foley (2003)**

This study contributes to understanding how inspections may trigger different mechanisms resulting in changes in outcomes. Baggs et al. found a significant decrease in claims associated with visits that included the potential for penalties but not for consultation-only visits where penalties were not enforced. They conclude that the simple presence of the regulator in the workplace was not associated with a reduction in claim rates. The study also found that the decrease in claims associated with enforcement activity was not specific to the particular issues cited but was an across the board decrease.

Baggs et al. (2003) conclude that inspections influence outcomes by bringing managers' attention to the overall issue of safety. These findings are consistent with the study by Mendeloff and Gray (2005b) who also concluded that enforcement activity has an effect on outcomes by making managers pay attention to the issue of safety overall.

**Study 12: Gray and Scholz (1991)**

Gray and Scholtz (1991) investigated the equity and efficiency of OSHA enforcement. In their analyses of OSHA's inspection practice they found that:

- enforcement actions against mid-size firms were more effective in reducing injuries than those against smaller or larger firms
- more intensive inspections regardless of the focus tended to have more impact on outcomes than less intensive inspections
- larger penalties did not reduce the likelihood of future citations for either the same breach or any breach, and
- small penalties reduced the likelihood of injuries as much as larger ones and required less inspection time.

The finding by Gray and Scholz (1991) that the size of the penalty did not influence outcomes suggests that managers may be influenced by being penalised rather than the size of the penalty. That is, the mechanism leading to changes in behaviour may be the impact on reputation of attention from the regulator rather than the financial cost of the penalty. The finding that more intensive and longer inspections were more effective than shorter inspections regardless of focus suggests that more interaction between the business and the inspector may lead to improved outcomes.

**Study 13: Cooke and Gautschi (1981)**

Cooke & Gautschi found that inspections significantly reduced days lost due to injuries for firms with more than 300 employees. This study used OSHA inspection data and injuries data from the US State of Maine for the period from 1971-76. This study also found that as business activity level declined the injury rate also declined. Inspections did not reduce overall incidence rates of injuries. The authors suggest that because standards are aimed at more serious hazards they may have the effect of reducing the severity of injuries rather than eliminating them.

Study 13 suggests that the effect of standards may be to reduce injury severity rather than overall rates of injury. This result is consistent with a more recent finding by Weil (1996).

**Study 14: Gray and Mendeloff (2005)**

This study investigated the effect of OSHA inspections on injuries in manufacturing plants. It built on several previous studies conducted in this area and used a similar modelling strategy and parts of the same data set. Their key finding is that the effect of inspections on injuries from 1979-1985 declines in subsequent years and becomes non-significant in the period 1992-1998. The authors note however that inspections continued to have a substantial effect in reducing injury rates at smaller and non-union workplaces.

The authors do not suggest a separate explanation for the impact of workplace size possibly because the majority of smaller workplaces in their sample were not unionised. The findings suggest that workers at unionised workplaces may have a greater capacity than those at non-unionised workplaces to insist on hazard reduction without the pressure of an inspection by the regulator.

**Why inspections lead to changes in work health and safety outcomes**

The pattern of outcomes in the studies reviewed suggests that inspections can improve health and safety outcomes especially for small businesses and for businesses with little or no previous experience of inspections. There is some evidence that inspections may reduce the severity of injuries rather than the overall injury rate. The initial effect of an inspection may be to draw managers' attention to safety overall. The results suggest that for medium and/or large businesses inspections that include penalties may be more likely to lead to changes in subsequent behaviour.

Figure 4 shows a revised model of the impact of inspections on safety outcomes integrating the outcomes of the review. The model suggests that inspections trigger a number of different mechanisms resulting in changes in businesses compliance behaviour and improvements in safety outcomes.

Mechanisms leading to changes differ depending on the size of the business. For small businesses the primary mechanism resulting in change is, knowing what to do to comply with regulations. Contact with the inspector may be critical for small business. The inspector may be the key person providing them with specific information about how to manage hazards and apply controls for their business.

For large business the model suggests that the primary mechanism involved is the concern to avoid potential reputational damage associated with being the subject of enforcement action. Other subgroups for which the impact of inspections differs include those with different levels of experience with inspections. First time ever inspections have more impact than subsequent inspections.

Figure 4 indicates that characteristics of the inspection process including the approach taken and the communication between the business and the inspector can influence the likelihood of increased compliance with safety requirements. If the increased levels of compliance are sustained this may then result in a reduction in hazard exposures and a decrease in injury rates.

## **Conclusion**

The major suggestion from the refined model is that inspections play different roles for large and small business. For small business visits from the inspector may represent the only contact with the regulatory system. From the studies reviewed in this and the previous section, the emerging picture is that small businesses lack the knowledge and resources to understand how regulations apply to their business. They need support and assistance to enable them to understand what they need to do in order to comply.

Large businesses by comparison have a much stronger understanding of regulations and how they apply to their business. Compared to small business they are likely to be more concerned about the impact that being the subject of enforcement action may have on their reputation. For large businesses that are generally compliant, the threat of enforcement is likely to have a substantial impact on behaviour.

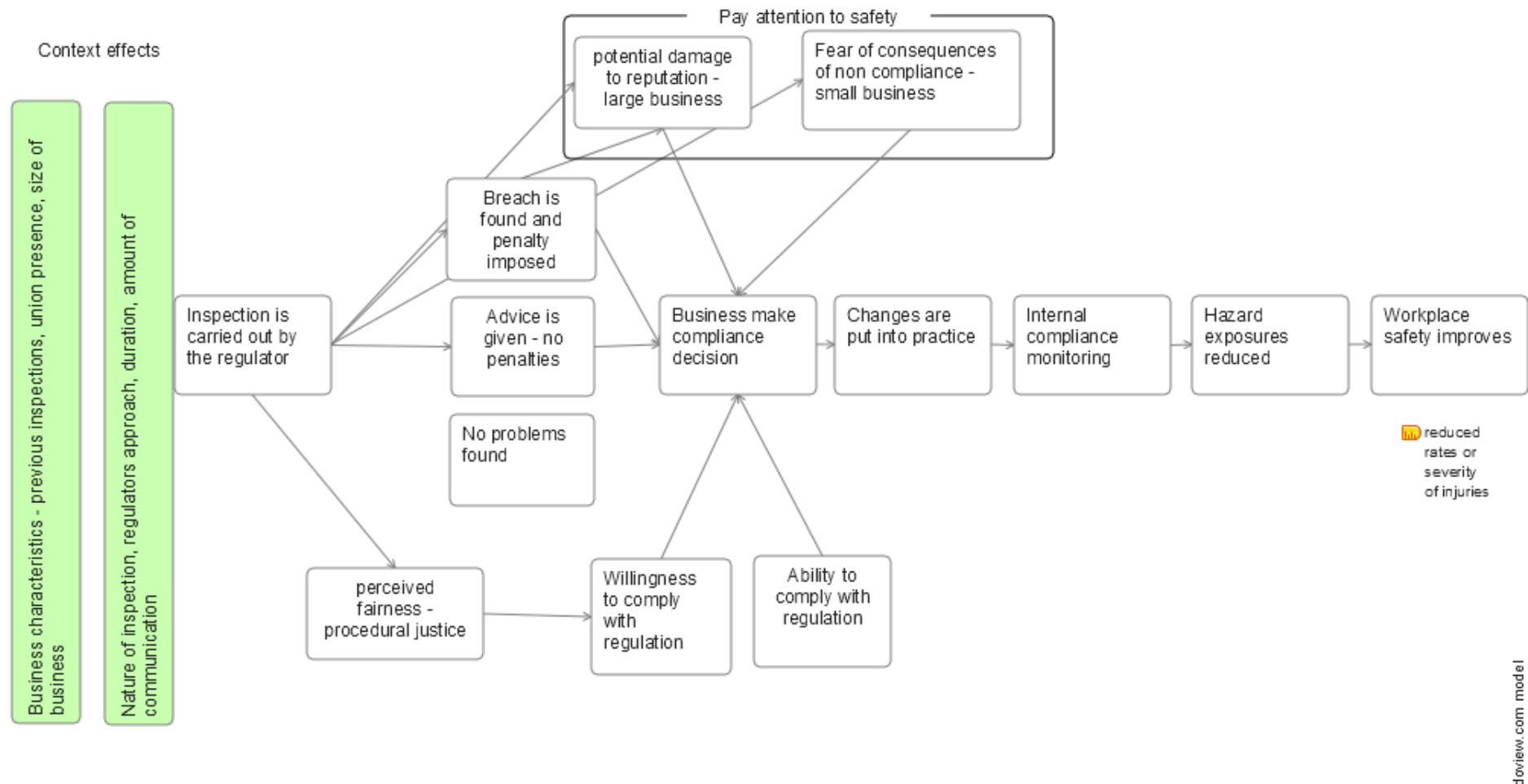


Figure 4: Why inspections result in increased compliance and improved safety outcomes - refined model

### 3. Prosecutions

One of the most severe sanctions that businesses can incur as a result of breaching work health and safety laws is for the regulator to recommend that they be prosecuted. In criminal law the primary purposes of prosecution are to punish wrongdoing, prevent the offender from re-offending and to act as a deterrent to others (Hopkins 2005). While work health and safety offences are criminal offences in the Australian legal system, it has been argued that in practice offences are often treated as regulatory violations rather than criminal offences (Johnstone 2003).

The legal model of the way that prosecution influences behaviour states that prosecution demonstrates to the community that wrongful acts will be punished and deters others. Punishment is also intended to serve a specific deterrent effect by sending a signal to the offender about the seriousness of their behaviour (Hopkins 2005). Thus it is important to note that prosecution serves multiple aims and can potentially be evaluated on multiple criteria. First the impact of prosecutions is likely to depend on the rate of convictions and the resulting sentences. Second, the impact of prosecutions and convictions on the behaviour of business is likely to depend on the extent to which businesses are aware of and understand the implications of prosecution cases resulting in convictions. Studies of the deterrent effect of prosecution in work health and safety are rare (Jamieson, et al. 2010).

This review sought evidence about whether or not and why prosecutions and the subsequent penalties imposed on convicted work health and safety offenders would be expected to lead to changes in the behaviour of prosecuted and non-prosecuted businesses.

#### Studies that evaluate the impact of prosecutions

Only four studies were located on the impact of prosecutions on business. The four studies included in the review focus on the impact of prosecutions on non-prosecuted businesses. Three of the four studies discussed below are in the work health and safety domain and fourth is the environmental protection domain. Summaries of the four studies discussed below are shown in Appendix 2, Table 5.

##### **Study 1: Hopkins (2005)**

Hopkins (2005) analysed the judges' reasons for sentencing for the companies prosecuted over the Gretley mine disaster in NSW. He found that the need to send a signal to the industry regarding the specific issues involved and the general need for attention to safety formed only a minor element of the basis for the sentences imposed. The key issues that Hopkins identified in his analysis were the culpability of the different defendants in the case, the extent to which individual defendants showed remorse and the need for retribution i.e. imposing appropriate punishment. His analysis suggests that, from the perspective of the regulator and the state, deterring others is only a relatively minor part of the purpose of prosecution of work health and safety offenders.

Hopkins' broad argument is that in this case the need for deterrence played a relatively small role in the judgement and that the larger issue concerned the culpability or blameworthiness of the defendants and the need to impose appropriate punishment. While the argument is based on a detailed analysis of one case, Hopkins suggests that this is likely to be true in general for prosecutions of work health and safety offences.

Whether or not in practice prosecutions actually deter other businesses from offending is explored in the next two studies reviewed.

**Study 2: Jamieson et al. (2010)**

In a study of the impact of work health and safety prosecutions in Australia and the penalties imposed, Jamieson et al. (2010) found that prosecution had a small general deterrent effect. The effect was stronger for larger companies who employed more resources to monitor developments in work health and safety. These larger companies sometimes had managers with specialist knowledge and skills who could analyse the details of the cases to determine what lessons the company could learn and apply to their own safety practice. Small employers were often only aware of prosecutions from newspaper accounts or cases they had heard about themselves from other businesses. They did not have the knowledge or capability to identify lessons for their own safety practice and often saw the potential for prosecution as simply another threat to their business.

Jamieson et al. (2010) concluded that prosecutions do have some impact on the behaviour of other non-prosecuted large businesses. They argue that because of the situation that they operate in and the resources they have available prosecutions have very little impact on the behaviour of other non-prosecuted small businesses.

Their findings suggest that for prosecutions to have an impact on the behaviour of non-prosecuted businesses managers of non-prosecuted businesses need to be:

- aware of the prosecution, and
- able to identify and apply the implications for their businesses' safety practice.

This suggests that, similar to the introduction of a new regulation, the impact of prosecutions on non-prosecuted businesses is influenced by managers' understanding of what their business needs to do to comply.

**Study 3: Thornton, Gunningham and Kagan (2005)**

This study assessed companies' responses to signal cases in environmental regulation in 2005. Thornton et al. (2005) found that knowledge of high profile prosecution has different effects on subgroups of non-prosecuted companies. For "good apples", i.e. those companies that are complying, they provide a reminder of the value of compliance with regulation. For "bad apples", i.e. businesses that are not complying prosecutions may have a deterrent effect if the specific case is close to the circumstances of the individual business. A further issue that Thornton et al. (2005) identify is the historical context of companies' views on compliance with regulation.

Study three suggests that the impact of prosecutions on the "good apples" is partly due to their being reminded of the reputational damage associated with non-compliance. Prosecutions also remind complying businesses of the moral value of compliance with law (Parker 2000). Thornton et al. (2005) note that the US federal government and most states had at that time a history of approximately a quarter of a century of environmental regulation. They suggest that the importance of general deterrence messages may be greater at earlier stages in regulatory programs.

**Study 4: Johnstone (2003)**

This study presents a critical analysis and argument based on empirical data documenting the way in which prosecutions for work health and safety offences are constructed in Victorian Magistrates' courts. Several elements of Johnston's findings are relevant to this review in particular, in an analysis of sentencing outcomes for work health and safety convictions Johnstone found that the average fine imposed was 21.6 per cent of the maximum allowed for the offence. He also found that the Magistrates imposed good behaviour bonds for 17 per cent of those cases resulting in convictions. Johnstone (2003) notes that prosecutions are normally only launched for the most serious work health and safety offences leading to death or significant injury. He argues that as good behaviour bonds are not an appropriate disposition under OHS law for offences leading to serious injury the number of good behaviour bonds seems remarkably high. He argues that the low levels of penalties reflect the way in which work health and safety offences are treated and effectively "trivialised" by the legal system. One key way in which Johnstone finds that the legal system does not deal effectively with work health and safety offences is an emphasis on the specific sequences of events leading to the death or injury rather than dealing with the system failure.

Study four suggests that the process and outcomes of prosecutions for work health and safety offences may reduce the likelihood of their having a deterrent effect. Despite the potential sentences available if the penalties imposed by the courts are seen as being relatively minor this may influence the perceived seriousness of the offences to both the businesses convicted and others. The way in which work health and safety offences are treated in the court system and the focus on individual and specific events rather than the broader context such as the organisation of work and the quality of work health and safety management, may reduce the broader impact of the prosecutions.

**Why prosecutions lead to changes in work health and safety outcomes**

The studies reviewed provide only very limited evidence as to whether prosecutions actually do deter others from offending. Study two suggests that prosecutions have a small general deterrent effect that is more significant for larger businesses. This may be because larger businesses are more concerned about the potential damage to reputation. The findings from Study four suggest two possible explanations for the low level of deterrence associated with prosecutions. First that the courts imposed relatively low levels of penalties and second that the way the cases were treated in the courts tended to focus on the very specific and individual aspects of the events leading to the death or injury rather than the broader context including the quality of work health and safety management and work organisation.

Jamieson et al.'s (2010) results suggest that small businesses had very limited awareness of prosecutions. Their awareness was typically limited to information from the media and personal contacts. When they were aware of court cases they were not able to understand the implications for their businesses. By comparison, large businesses with access to the skills and resources to monitor and interpret work health and safety prosecutions were able to extract relevant information that they could use to improve their own safety practice.

Thornton et al. (2005) suggests that larger businesses' motivation for compliance is to avoid the risk of damage to their reputation. Their findings also suggest that complying and non-complying non-prosecuted businesses may interpret prosecutions differently. The "good apples" see prosecutions as supporting the value of compliance and seek to learn

from them to improve their own practice. By comparison “bad apples” may only be influenced by prosecutions if they see a direct parallel with their own practice.

## **Conclusion**

Prosecutions serve a number of different functions including satisfying community expectations around investigation and punishment of wrong doing as well as deterring others from offending. The treatment of work health and safety cases in the courts and the outcomes are likely to influence how prosecution of work health and safety offences serves both of these objectives. Investigation of the outcomes of work health and safety prosecutions under the model work health and safety legislation will be needed to assess the impact of the new legislation on ways that offences are treated in practice by the courts and whether the new legislation has changed any of the issues that Study four identified for example the low levels of penalties imposed. Systematic collection and analysis of data on the outcomes of prosecutions could be used to inform prosecution policy as well as how regulators publicise the outcomes of prosecutions.

Further research is also needed on the specific and general deterrent impact of prosecution. No evidence was located on the impact of prosecutions on the businesses that were the subject of prosecution and only limited evidence was found on the impact of prosecutions on non-prosecuted businesses.

## **4. Guidance material**

Guidance materials are used by work health and safety regulators as a way to raise awareness and to provide information about hazards and appropriate controls. Despite extensive use of guidance materials and codes of practice by work health and safety regulators there is little evidence of their effectiveness in producing changes in behaviour (Gunningham & Bluff 2009).

A review by Wright et al. (2005) concluded that educational and advisory material in general is an effective means of making businesses aware of hazards and appropriate controls. They also suggested that small and medium size enterprises have difficulty applying general information to their specific circumstances and strongly prefer specific information about what they should do. Gunningham and Bluff (2009) concluded that codes and guidance materials are effective as ways of improving businesses' awareness and understanding of hazards and controls based on reports from industry and inspectors. Gunningham and Bluff (2009) also note that a key problem with the evaluation of guidance materials is that work health and safety regulators do not specify the intended outcomes for guidance materials. The available literature offers very few suggestions regarding how guidance material may influence behaviour. The assumption seems to be that if regulators provide the information then businesses will understand and apply it. A review of evaluations of food safety regulations by Campbell et al. (1998) suggests that regulators explicitly follow this assumption in regards to food safety. This review sought evidence regarding why and for whom guidance materials influence safety practice in organisations.

### **Studies that evaluate the impact of guidance materials**

A total of three studies of the impact of guidance materials were located. Summaries of these studies are presented in Appendix 2, Table 6.

**Study 1: Neathey et al. (2006)**

Neathey et al. (2006) found that awareness of guidance material was associated with increased use of the risk assessment process that the guidance material described. However it was not possible to identify how much awareness of the guidance material contributed to the increased use of the risk assessment process. Neathey et al. showed that overall larger organisations were significantly more likely to be aware of the regulations and guidance materials and to use a risk assessment process.

The findings from Study one suggest that larger organisations may be more able to make use of guidance material. While direct evidence is limited there is some suggestion in the study that this is because these organisations have the knowledge and skills available internally to understand and apply the information in the guidance to their circumstances.

**Study 2: Lancaster et al. (2001)**

Lancaster et al. (2001) found that the guidance material for the UK manual handling and operations regulations was effective in enabling health and safety professionals to understand how to comply with the regulations. However the guidance material provided insufficient information for managers and others without specific training in work health and safety.

Some of the comments in Lancaster et al. (2001) suggest that the guidance material assumed knowledge about processes that organisations need to put in place to enable them to comply. A possible inference from this study is that the impact of guidance material depends on the experience of the target audience.

**Study 3: Worksafe Victoria (2004)**

Worksafe Victoria (2004) found that a guidance note on prevention of bullying and violence at work was an effective way of raising awareness and promoting implementation of prevention and resolution measures. The results also suggest that the guidance note was an effective way for the regulator to indicate to business that bullying constituted a legitimate work health and safety issue which was not fully accepted by industry at the time.

This study suggests that guidance material is a way that regulators can indicate to business that an issue is important.

**Why guidance materials lead to changes in work health and safety outcomes**

The studies reviewed suggest that it may be overly simplistic to think that guidance materials are a way of providing information that all businesses will understand and apply. Small businesses are less likely to be aware that guidance material exists possibly because they are less likely to actively seek information about work health and safety. The results also suggest that businesses vary in their capability to understand and apply the information provided in guidance materials to their circumstances. Because they often have less access to specialist skills and resources small businesses are often less able to apply the information compared to larger businesses that may have more skills available in-house.

## **Conclusion**

To enable the evaluation of guidance materials regulators need to specify their intended outcomes. Guidance materials should be considered as a policy intervention. Evaluation should be an integrated part of the development of guidance materials.

## **5. Campaigns**

Campaigns appear to work by providing information to enable improved compliance and increasing the perceived likelihood of enforcement. Another approach that has been used in public campaigns focussing on public health and other social goods is the concept of social marketing. Social marketing involves the application of marketing principles to the promotion of social objectives such as health and wellbeing. It involves the use of persuasion as an alternative to information provision or enforcement.

Wright, Marsden and Antonelli (2004) suggest that campaigns are more likely to be effective if they use a combination of enforcement and education. Campaign methods and approaches have been subject to considerable research and development in the areas of road safety and public health in particular. Work from the road safety domain suggests that campaigns need to take into consideration the ways in which different parts of the audience understand and interpret campaign messages and the readiness of members of the target group to make changes. Delhomme et al. (2009) suggest that campaigns are more likely to be effective if they:

- combine communication with enforcement, education and/or legislation
- take into consideration readiness to change, and
- segment the target audience.

Work health and safety industry campaigns typically comprise a planned set of activities including inspections, media releases, distribution of guidance materials and industry workshops or seminars that aim to influence outcomes for a selected safety issue. Typically, the safety issue to be addressed is determined based on statistical indicators. While campaigns are used extensively by work health and safety regulators there is limited information available in the work health and safety domain in terms of either evaluations or consideration of why campaigns are expected to influence behaviour.

### **Studies that evaluate the impact of industry campaigns**

Five studies were located that can contribute to understanding the effect of industry campaigns on business work health and safety practice and outcomes. Summaries of the studies reviewed are shown in Appendix 2, Table 7.

**Study 1: Health and Safety Executive (2006)**

This evaluation of a UK Health and Safety Executive campaign aimed at reducing the risk of musculoskeletal disorders found that the campaign was effective in raising awareness of the issue and showed initial indications of improving outcomes. The campaign strategies used included publicity, inspections, stakeholder engagement and education. The evaluation did not explicitly examine the contribution of different strategies to outcomes. From some of the qualitative material in the report there is some suggestion that education and enforcement were both important. Managers talked about the value of tools and materials that could be used in the workplace. However when they were asked about reasons why the campaign that led them to make changes managers referred to the risk of being caught by the inspector. The authors note that this campaign was longer than most previous HSE campaigns, had a higher level of funding, and unlike previous campaigns included seed funding for activities run by other groups. The campaign explicitly targeted workers and businesses and other stakeholders over a long period with the aim of embedding a new understanding and awareness of the issue. The authors argue that the higher level of funding and longer term focus for the campaign contributed to the successful outcome.

The results of Study one suggest that the longer time frame made the campaign more likely to influence business decisions and embed changes in practice related to manual tasks. This is consistent with research in road safety which suggests that seven to ten years may be required in order to achieve sustained behavioural change (Delhomme et al. 2009). Some of the qualitative material in the report suggests that engaging other groups such as local government enabled the campaign to more effectively influence opinion on the issue.

**Study 2: Ford, Pepper and Reiger (2007)**

Ford, et al.(2007) found that a HSE campaign that aimed to raise awareness of slip and trip accidents and encourage business to take action to reduce hazards had very little impact on behaviour. The campaign used communication only and did not include inspections or enforcement. One of the key findings was that those businesses that took action following the campaign were likely to be either already taking some action or at least relatively well informed regarding work health and safety issues more generally.

The results of Study two suggest that the campaign played an incremental role in pushing those businesses that were already either making or considering changes to accelerate what they were already doing. This suggests that the effectiveness of campaigns may be influenced by readiness for change in the target businesses.

**Study 3: Bannerjee, Archutowski and Horton (2008)**

This study found that a HSE campaign that aimed to raise awareness of the risk of falling from vehicles and provide information to duty holders about the ways of managing risks resulted in significant levels of recall of key messages and some increases in intention to make changes. The campaign included communications only and did not have an enforcement element. There were relatively minor changes in outcomes at follow-up. Most businesses were taking action on falls from vehicles prior to the campaign and the percentages did not change significantly following the campaign.

The results of Study three showed that the impact of the campaign was influenced by participants' perceptions of the regulator. Those businesses with existing positive views were more likely to take up campaign messages than those with a negative view. The authors note that many of the changes needed to reduce the risk of falls from vehicles were likely to be addressed as part of replacing fleet vehicles. They suggest that changes may not have been observed at follow up due to the typical replacement cycle for vehicles of 3-5 years.

**Study 4: Spangenberg et al. (2002)**

Spangenberg, et al. (2002) found a small but significant decrease in accidents following an education-only safety campaign at a major Danish road construction project. Most workers had worked at the site for less than one year and only ten per cent of workers reported that their working routines had been influenced by the safety campaign. The authors suggest that the observed improvement may be a reasonable outcome for an intervention in construction and note that the accident rate for the site was lower than for a number of other large construction projects in Denmark. The authors also suggest that a primary explanation for the limited impact of the campaign may be the fact that most workers spent only a short time working on the project.

The results of Study four suggest that the impact of campaigns may be inherently limited for the construction industry which has a transient workforce and does not have fixed workplaces.

**Study 5: Sorensen et al. (2008)**

Only one study was located that examined the effectiveness of social marketing in the work health and safety domain (Sorensen et al. 2008). This study aimed to persuade farmers in one state in the US where there was no legal requirement to do so to install rollover protection on their tractors. The study found that the farmers who received a social marketing intervention were significantly more likely to be planning to install rollover protection on their tractors following the campaign. The key aspects of the social marketing intervention included developing campaign messages based on detailed research about the needs, motivations and opinions of the target group.

There has been substantial use of this approach in work health and safety community awareness campaigns such as the 'Come Home Safe' advertising by WorkSafe Victoria. However, Study five was the only study located that used a social marketing approach in the work health and safety domain for a compliance campaign.

The study used a well-designed evaluation to assess the effectiveness of a persuasion-only model in producing behavioural change and intention to change. The findings while limited suggest that it may be worthwhile to investigate the potential of persuasion messages.

## **Why industry campaigns lead to changes in work health and safety outcomes**

The available body of evidence regarding the effectiveness of work health and safety industry campaigns is very limited. The evaluations reviewed suggest that campaigns that include both enforcement and education are more likely to be effective than those using only enforcement or education. However, they provided no evidence on the relative

effectiveness of different strategies and only limited insight into why they influenced outcomes. There is a suggestion that mixed method campaigns that include both communications and enforcement may be more effective than campaigns including communication or enforcement only. This suggests that campaigns may work by triggering both a concern for consequences and knowing what is needed to comply. The evaluations reviewed also suggest that achieving change in safety practice may need a longer time frame than is often the case in campaigns. The HSE (2006) study suggests that 3-5 years may be needed to embed new ways of thinking about safety issues. The study by Ford et al. (2007) suggests that changes to improve safety outcomes may be linked to broader business decisions (see also Wells and Greenall, 2005).

## **Conclusion**

The findings suggest that campaigns are more likely to change employers' behaviour if a combination of enforcement and education is used. The studies of the impact of inspections suggest that the threat of enforcement may be a more effective way of changing behaviour among large businesses whereas for small business access to enhanced advice and support services may be more effective. What this suggests is that an approach that considers the needs and capabilities of different businesses may be optimal.

More research is needed on:

- the relative effectiveness of different interventions within campaigns
- the time frame needed to bring about changes in organisational safety practice, and
- the potential for application of persuasion-based approaches employing social marketing principles in work health and safety.

## **6. Enforceable undertakings**

Enforceable undertakings (EUs) are negotiated between the business and the regulator as an alternative to undertaking court proceedings. Once accepted by the regulator they acquire the force of law and companies are subject to penalties if they violate an EU. Undertakings normally operate for a specified period during which time the company is required to do the range of activities and/or make changes to the way they operate that are specified in the EU (see for example Department of Employment and Industrial Relations (nd)). In principle while they are available in several Australian jurisdictions in practice only the Queensland regulator appears to have made substantial use of EUs in work health and safety (Johnstone & King 2008). Due to their relatively recent and infrequent use in work health and safety there have been few evaluations of the effectiveness of EUs within work health and safety. One study carried out by the International Monetary Fund investigated their use in regulation of the finance industry in Australia (International Monetary Foundation 2006). The report notes that EUs have been found to be effective in changing the behaviour of businesses subject to the EU in a number of high profile cases in the finance industry.

From the businesses' perspective, EUs offer a way of avoiding the negative consequences associated with being prosecuted and to regain the good graces of the regulator. From the regulators' perspective they avoid the costs and uncertainty associated with prosecutions and they require the business to make improvements to their safety practice and report on them to the regulator (Johnstone & King 2008). The intention of EUs appears to be to change the way the businesses think about and manage safety.

They do this by requiring a substantial and legally enforceable commitment from the company that goes beyond simply meeting specific regulatory requirements.

### **Studies that evaluate the impact of enforceable undertakings**

Two studies were identified on the effects of enforceable undertakings on outcomes. Summaries of these studies are shown in Appendix 2, Table 8.

#### **Study 1: Parker (2004)**

Parker (2004) found that the effectiveness of EUs was dependent on businesses monitoring and reporting to the regulator on their internal operations and the regulators' capacity to verify the information provided. At the same time EU's generally require companies to put in place management systems and processes for compliance monitoring. Parker also notes that while it was not explicitly part of the intent of EU's in practice they have been used in ways that have required managers in the companies to understand and address the harms the previous behaviour of the business had caused.

Parker suggests that the key mechanisms or reasons why managers made sustained changes in their organisations were:

- the understanding of the consequences of their previous practice that they gained through the process of implementing the EU requirements in their organisation, and
- the feeling of shame about the consequences that this understanding triggered .

Parker develops this argument to suggest that EUs can be seen as incorporating elements of a restorative justice approach.

#### **Study 2: Johnstone and King (2008)**

Johnstone and King (2008) report on several cases where EUs in the work health and safety domain have resulted in significant and apparently ongoing changes in safety practice within the companies that were party to them.

Interviews with managers of businesses suggest that EU's work because they:

- increase management commitment to compliance
- make the business learn how to comply, and
- embed compliance in the organisation.

Johnstone and King (2008) do not explore potential mechanisms however a number of themes may be relevant. The first theme is the weight that EU's carry inside the organisation as legally binding agreements. The legal authority of the EU is seen as a critical factor by the managers responsible for implementing the changes required by the EU in their organisations. The second theme concerns the longer term nature of EU's and the ways that they encourage managers to take ownership of safety. The managers were often positive about the impact of EUs and saw the outcome as having been good for the company.

## **Why enforceable undertakings lead to changes in work health and safety outcomes**

Enforceable undertakings are an alternative to prosecution. They are legal instruments that require businesses to undertake a range of actions and internal changes to ensure that the changes in practice are embedded in the organisation. There is currently very little evidence available regarding whether enforceable undertakings are an effective way of changing work health and safety practice. There is no evidence available as to how they compare with prosecutions. The study by Johnstone and King suggests that in some cases EUs have been effective. Some possible mechanisms that may lead to EUs bringing about changes in work health and safety practice include:

- shame - making managers understand the consequences of the businesses past practice
- understanding what the business needs to do to comply, and
- authority of the law - the perceived authority attached to EUs as legally binding agreements.

## **Conclusion**

It appears that EUs may be effective in bringing about change in behaviour in organisations. Developing a better understanding of why EUs work could enable regulators to use them more effectively in future. More information is needed on the long term outcomes for organisations that are subject to EUs and on what happens in terms of safety practice after businesses are prosecuted. Comparing changes in safety practice in businesses that have been prosecuted for work health and safety offences and those that have been subject to EUs has the potential to inform prosecution policy.

## **7. Voluntary partnerships and incentives**

Voluntary partnerships and incentive schemes constitute an attempt by regulators to produce improvements in safety outcomes outside the standard model of introducing and enforcing regulations. Voluntary partnership schemes may offer incentives to businesses to participate in the form of either financial rewards, access to information and support services or public recognition of excellent performance in the target area. The use of incentives as a tool for regulators has received relatively little attention in the work health and safety domain.

Two broad explanations have been proposed for why incentives may be an effective way for regulators to bring about changes in behaviour. The first argument is that businesses know better than regulators how to manage their own behaviour. By offering incentives individual businesses will come up with the most efficient and cost effective solutions for their situation. This argument has been particularly developed in the context of environmental regulation. The second and related argument holds that good environmental performance is good business, that is, that companies can derive business benefits from good environmental performance (Davies & Mazurek 1996). Pransky et. al (1999) suggested that the following broad principles of effective performance management programs can be applied to voluntary partnership schemes:

- providing a clear statement to participants about the goals and methods of the program
- using appropriate, fair and objective measures

- providing instructions on how to achieve a reasonable target performance level
- providing a clear and visible stimulus for participants to make changes that will lead to the target outcome which should be of value to employees as well as the employer, and
- careful consideration of the potential for unintended consequences.

A key requirement for success of voluntary schemes is that businesses actually choose to take part. To be successful, schemes then need to provide the factors necessary for businesses to change their safety practice. This review sought evidence about why businesses choose to take part in voluntary schemes and why incentives and voluntary partnership schemes may lead to businesses improving their safety practice.

### **Studies that evaluate the impact of incentives and voluntary partnership schemes**

Four studies were located that can provide some insights into the mechanisms that result in voluntary partnerships and incentives leading to changes in business safety practice. Summaries of these studies are shown in Appendix 2, Table 9.

#### **Study 1: Laitinen and Paivarinta (2010)**

Laitinen and Paivarinta (2010) found that a safety program in the form of a contest that aimed to improve safety in the construction industry in Finland led to a decrease of sixty three per cent in failures to provide good fall protection. The authors estimate that the program prevents four thousand accidents and three deaths a year. The authors suggest that key success factors for the program included:

- use of an objective measure, and
- close cooperation between the construction industry association, trade unions and safety inspectorates.

Laitinen and Paivarinta (2010) suggested that close collaboration between the regulator, industry and unions was a key success factor for the safety contest. In their description of the contest the authors suggest that employers' perception of the fairness of the contest and its broad acceptance by the industry was also critical to the success of the contest in motivating business to improve safety outcomes.

By comparison Davies and Mazurek (1996) concluded that the voluntary incentive-based programs they reviewed in the environmental protection domain were relatively unsuccessful due mainly to the historically poor relationships between environmental groups, business and the federal government in the US. This suggests that trust between business and the regulator may be important for the success of voluntary programs.

#### **Study 2: Davies and Mazurek (1996)**

This study identified a number of features of US government incentive programs in environmental protection and work, health and safety. Simplicity, having clear goals and objectives and requiring minimal additional commitment of time and resources from business were key features of the relatively more successful programs. Assuming they saw value in doing so, businesses were more likely to participate in voluntary programs offered by regulators that mirrored what the business was already doing. That is, they were participating in the scheme as a way to gain recognition for what they were doing already.

Despite the fact that the programs had been running for fourteen years when the evaluation was conducted Davies and Mazurek (1996) noted that participation in the programs reviewed was low. They suggest that this was due to businesses with good internal health and safety programs seeing the benefits of program participation as marginal.

**Study 3: Wright et al. (2008)**

Of the eleven areas reviewed in the UK manufacturing sector, five showed evidence that injury rates declined faster after the initiatives started and at a faster rate than for manufacturing as a whole. One of the positive motivations for businesses taking part in the schemes was the recognition of the HSE brand. Some companies cited their participation in the scheme as a contributing factor in their winning national and international contracts.

The results of Study three suggest that perceived value of the association with the regulator may be a key factor leading to companies' participation in voluntary schemes run by the regulator.

**Study 4: Versteegen (2011)**

This was an evaluation of a free work health and safety consultancy service offered by WorkSafe Victoria that aimed to enable small business to independently:

- identify hazards and implement controls
- set up basic OHS management systems, and
- manage health and safety.

Businesses were given a follow-up inspection and if they had implemented the recommended changes they received a certificate of recognition that they could display. The service was very highly rated by businesses that took part and nearly all respondents said they had made changes to their safety practice as a result of the consultancy.

The findings suggest that the primary factor leading businesses to participate in this program was the free consultancy service.

### **Why voluntary partnerships and incentives lead to changes in work health and safety outcomes**

Study three was the only study located that provided any systematic evidence regarding which businesses these interventions work for and in what circumstances. Wright et al. (2008) found evidence of a decline in injury rates associated with participation in a voluntary partnership scheme in the UK. This study does not report on details of the groups for whom the intervention was and was not effective.

The other studies reviewed suggest that the historical relationships between the parties involved in Finland compared to the situation in the US may have an impact on the effectiveness of voluntary initiatives such as incentive based systems. Laitinen and Paivarinta, (2010) saw the historically close collaboration between the regulator, industry and unions in Finland as a key factor underlying the success of the Finnish program. By comparison Davies and Mazurek (1996) note that in the US regulatory system in general

and especially in environmental protection “programs that depend for their success on cooperation, voluntariness and trust do not fare well”. This suggests that these programs tend to be unsuccessful in the US system due to the historically low levels of trust between business and the regulator. These two findings suggest that for voluntary schemes to be successful there needs to be a pre-existing relationship of trust between business and the regulator.

An additional factor suggested by the US and UK schemes is that participation in the scheme needs to have an added value for business. In the UK, Wright et al. (2008) found that for large companies that were involved in international contracts being able to use the regulators’ brand on their safety procedures was an advantage of participation in the schemes.

Davies and Mazurek (1996) found that business in the US saw the benefits of participation in a number of schemes as marginal. This in part resulted in participation in the schemes being low. In summary the review findings suggest that businesses are more likely to take part in voluntary schemes that offer incentives that are valued by business and where there is already a high level of trust between business and the regulator.

## **Conclusion**

There is evidence that voluntary and incentive based schemes can be effective in improving safety outcomes. Little is known about the kinds of incentives that would be valued by business in Australia and further investigation is needed.

## Conclusions: Which interventions work for whom and why

This review undertook to develop explanatory models for why interventions work for whom and in what circumstances. The reason for undertaking this task was to provide practical guidance to assist policy makers in designing and implementing interventions. The previous sections of the review have attempted to synthesise explanations for why each of the different intervention strategies lead to changes in work health and safety outcomes, for whom and in what circumstances these explanations or mechanisms apply. This final section aims to bring together the explanations developed in the previous sections in order to identify what kinds of intervention strategies would be expected to lead to changes in outcomes for different sub groups of businesses in different situations.

Before proceeding further it is appropriate to acknowledge the limitations of this review. The primary limitation is the paucity of available research on intervention effectiveness within the work health and safety domain. This is particularly the case in Australia where for most of the interventions discussed there is currently no published research available. In addition, most published research on intervention effectiveness in work health and safety has focussed on whether or not interventions work and paid no attention to developing explanations for how or why they work. Consistent with the review method described in Appendix 1, these limitations have been addressed by drawing on international research and studies evaluating similar interventions outside work health and safety such as environmental protection and food safety. The other major limitation of the body of research is the shortage of evidence about the impact of circumstances on the effectiveness of regulatory interventions. Taking into consideration the limitations of the evidence base this section aims to answer two questions:

1. Which mechanisms and intervention strategies work for whom?
2. How do circumstances influence the ways that intervention strategies lead to changes in safety outcomes?

Table 1 below shows a summary view of the relationships between intervention strategies, mechanisms and the context in which the strategy is implemented. The relationships summarised in the table represent a potential explanation of the findings reviewed in the previous sections. The second column sets out those aspects of context in which strategies are implemented that may influence the mechanisms triggered. The third column sets out mechanisms identified that explain why the intervention has an impact on businesses behaviour. The table suggests that as well as the unique mechanisms associated with each strategy there are a common set of mechanisms across strategies. These include:

- concern for reputation
- understanding what is need to comply, and
- how the authority of the law is perceived.

The operation and relevance of these mechanisms differs between groups of businesses. For example, large businesses may be more concerned about and responsive to things that could influence their reputation. In contrast the primary consideration for small businesses is likely to be their understanding of what they need to do in order to comply.

**Table 1: Why interventions work, for whom in what circumstances**

Intervention	Implementation context of the intervention	Mechanisms triggered by the intervention
Introducing new regulations	Economic climate and business activity level	Awareness of the regulation
	Business demographics: business size , industry sector Workforce demographics: age level of education, cultural differences, union workforce (US)	Ability to comply with regulation  Business's understanding of what they need to do to comply
		Industry sectors' perception of relevance of work health and safety to their industry
Inspections	Business demographics: size of business, prior experience with inspections	Draw managers attention to safety overall
	Union workplaces (US research)	Positive engagement between business and the regulator
	Length and/or intensity of the inspections	Concern for reputation
	Approach taken during the inspection i.e. educational and relationship building compared to strict enforcement	Business's understanding of what they need to do to comply  How the authority of the law is perceived

<b>Intervention</b>	<b>Implementation context of the intervention</b>	<b>Mechanisms triggered by the intervention</b>
Prosecutions	Size of business Attitude towards compliance	Perceived value of complying with the law Concern for reputation Concern for consequences
Guidance material	Size of business: may be more effective for larger businesses who are more likely to have the capacity to understand and apply guidance material to their circumstances	Understanding what I need to do to comply
Campaigns	Businesses perception of the regulator  Broader business decision making e.g. readiness to invest in new equipment  May be less effective for industries with temporary work locations and or rapidly changing workforces such as construction.	Understanding what I need to do to comply  Concern for consequences
Enforceable undertakings		Shame Knowing what I need to do to comply Perceived authority of the law
Voluntary partnerships and incentive schemes	Effectiveness may depend on pre-existing level of trust between business and the regulators	Perceived value to businesses of incentives offered

## Policy implications

The aim of this review was to develop some overall guidelines to assist regulators with the design and implementation of future interventions. Rather than providing specific rules about which interventions to use for whom and when, the results suggest an approach that is responsive to the particular group or circumstance. Taking into consideration the information gaps identified in the review, the results suggest some key questions to consider in the design and implementation of interventions.

For regulations, inspections, guidance materials, prosecutions and campaigns key questions include:

1. Does the target group for the intervention comprise predominantly large or small businesses or a mix of both?
  - Small and large business could potentially benefit from different models of regulation. For large businesses a model emphasising easy access to information and strict enforcement of non-compliance may be more effective. For small business a more appropriate model may be to provide most with extensive information and support to enable them to become compliant. Enforcement should be reserved for more serious violations and those businesses that are not willing to work with the regulator.
2. What is the attitude of the target group towards the regulator?
  - If businesses have a negative attitude towards the regulator they may be less likely to comply. The adoption of responsive regulation can enable the regulator to shift business attitudes towards the regulator.

For voluntary partnerships and incentive schemes key questions include:

1. What is the level of trust between the industry sector and the regulator?
  - If there is a low level of trust schemes may not be taken up by industry.
  - Consider how trust may be built and the sources of trust. There are several factors that work in combination: the efficiency and effectiveness of the regulator; industries' view about what they will get out of the interaction; whether the regulator cares about the best interests of the group.
2. What is known about incentives that would be valued by industry and how will the value of participation be clear to industry?
  - Consider how partnerships schemes can clearly show the value of participation.
  - Conduct research to determine which incentives are valued by which industries.

There is very little information available on the:

- effectiveness of any regulatory interventions in Australia
- impact of circumstances such as the economic climate on the effectiveness of work health and safety interventions, and
- effectiveness of prosecutions, guidance material, enforceable undertakings and incentives and voluntary partnership schemes.

These information gaps need filling to have any clarity about why interventions work, for whom and in what circumstances.

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## Appendix 1: Review Method

This review has used, as far as possible, a realist approach. Pawson (2006) and others (see for example Shepperd et al. 2009) have argued that current methods for the systematic review of intervention studies such as meta-analysis are not appropriate for the systematic review of evaluations of policy interventions. In particular they argue that meta-analysis is not designed for:

- the analysis of complex outcome sequences
- policy interventions where the intervention outcome is primarily determined by the choices that individuals make in particular circumstances in response to the resources and incentives that the intervention provides, and
- understanding the effect of circumstances on program outcomes.

In the realist approach to evaluation outcomes are seen as being jointly determined by the ways that program participants understand and engage with the resources the programs offer and the circumstances in which they do so, that is, the mechanism(s) and the context. Systematic reviews use a structured procedure to summarise the evidence for whether a particular kind of intervention such as imposing fines leads to changes in outcomes. What this review does is to develop and refine models for why an intervention leads to changes in outcomes, for whom and in what circumstances. This is known as a realist review.

Realist reviews focus on identifying and/or developing middle range theories that may account for observed outcome patterns across evaluations. Middle range theories explain why mechanisms operate as they do in different contexts to produce the observed patterns of outcomes.

While realist reviews have parallels with other kinds of theory-guided reviews they have some key differences. In particular, realist reviews explicitly assume that prediction of the choices that program participants will make in different circumstances is necessarily imperfect. For example, the realist view suggests that many but not all businesses in a given industry in similar circumstances would be expected to respond in similar ways to receiving a work health and safety inspection while similar businesses in different circumstances may respond differently.

Because the focus is on developing explanations for why and for whom the different types of interventions work the review brings together enough evidence to enable the development of explanations rather than comprehensively reviewing the available literature for each area. The review also seeks evidence of the effectiveness of similar interventions in other policy domains.

### Search strategy

The search keywords used are listed below. All variants of each term were used with a boolean search to produce the final search set.

**Table 2: Search terms**

Search term
Occupation*
Safety
Intervention
Effective*
Regulation
Inspection
Prosecution
Campaign, industry campaign
Guidance material
Code of practice
Enforceable undertaking
Incentive
Voluntary partnership (US)
Targeted initiative (UK)
Evaluation

\* all extensions

The databases searched were identified in consultation with a research librarian and included:

- Academic Search Premier
- Proquest
- Wiley Press
- Science Direct
- OSH Update.
- Scopus.

Identification of relevant papers from the results of the searches used a two stage process. First a list of titles and abstracts for all studies retrieved was reviewed to identify those clearly out of scope. For those studies not removed in the first stage, the full text of the document was reviewed for relevance.

## **Quality assessment**

Because the focus of the review is on model development or “theory building” the review uses a different quality assessment method than that used in conventional systematic reviews that aim to aggregate across study outcomes. The approach used proceeds in two stages:

- Stage 1: Can the study contribute to developing an explanatory model for the impact of the intervention?
- Stage 2: An assessment of the strength and validity of the findings and inferences about mechanisms that the review draws on.

Issues considered in Stage 2 include whether the specific finding is derived from the data through sound inference and whether it is supported by other studies. Where a proposed mechanism is not supported by evidence or is based on an inference that is not clearly justified it has been excluded. One-off findings that are not consistent with other evidence or theory are also excluded. For several of the intervention types this requirement was relaxed due to the shortage of available studies.

Contradictory findings represent a source of potential evidence for this review. They may indicate that different mechanisms operate for different sub groups or for different circumstances.

## **Data analysis**

Each paper was reviewed for claims that speak to the explanatory theories for each kind of intervention. This process involved identifying key sections relevant to specific aspects of each theory or proposing alternative explanations. The analysis involves identification of potential mechanisms and how these work in different sub groups in different situations. The realist review methodology emphasises that the analysis process should use a traceable and reproducible method. The developers of the method suggest that the data obtained from the studies should be published as appendices to the final report. A modified approach has been adopted for the present paper. Short summaries of each of the papers reviewed have been included as appendices.

## **Review approach**

The approach taken in this review was to develop and refine explanatory models for each of the different kinds of interventions. However for prosecutions, enforceable undertakings and voluntary partnerships only small numbers of reasonable quality evaluations in work health and safety were located. As a result a less formal review approach was undertaken for these interventions.

The models are similar to program theories for an individual intervention but are specified at a more abstract level. An advantage of this approach is that the models developed can be directly related to the design of future interventions. The models aim to identify the sequence of intermediate outcomes and mechanisms involved in each intervention. The models also include the effects of different sub groups and different circumstances on mechanisms.

It should be noted that what the review looks for is not whether this kind of intervention works or whether a particular strategy produces a given outcome. What the review seeks is evidence about why a strategy produced an outcome, that is, what mechanisms were involved. The analysis of each study outcome included in the review focuses on why the outcome occurred as a result of the intervention.

The reviews also looked for evidence about groups where the outcomes suggest that different mechanisms may have operated and situations where the outcomes suggest that different mechanisms may operate. For example, different patterns of outcomes for small compared to large businesses in response to a new regulation might suggest that different mechanisms drive the responses to regulations for these groups.

## Appendix 2: Details of Studies

**Table 3: Summaries of evaluations of regulations**

Study	Reference	Summary
1.	House of Lords – Merits of Statutory Instruments Committee (2009)	This report evaluated the impact of the 2005 Work at Height regulation in the UK as part of an evaluation of a body of secondary legislation conducted by the House of Lords. The report concluded that the legislation appeared to have achieved its key objective of a reduction in the number of falls from height although this conclusion is based only on a change in the outcome measure without consideration of any other changes that may have occurred in the industry. A key finding of the evaluation was that there were a number of unintended consequences associated with introduction of the legislation. Sales of ladders fell significantly due to a rumour that they were banned under the legislation which was not correct. There were also a number of cases of alternative products being introduced to replace ladders that actually increased the risks and resulted in some accidents.
2	Martinez, Aires, Rubio, Gamez and Gibb (2009)	This study evaluated the impact of European Directive 92/57/EEC on the implementation of the minimum safety and health requirements at temporary or mobile work sites, on accident rates in the construction industry. The paper deals with the issues in the adoption of the EU directive by member countries and evaluates the impact of adoption on standardised accident rates. The authors also point to other ways in which health and safety outcomes were influenced by contextual variation. In particular the authors discuss an example of differences between outcomes across EU countries that were associated with level of education in different countries. Countries with the highest accident rate also had the highest number of high school dropouts. The authors note that in these countries there is strong evidence that many high school dropouts work in construction. They argue that the lower educational level of the workforce may make it more difficult to implement improved safety standards. Differences in the ways in which the directive was adopted into law in different countries appear to have also influenced outcomes.

Study	Reference	Summary
3	Foley, Silverstein, Polissar, & Neradilek (2009)	<p>Foley et al. (2009) carried out a comprehensive evaluation of the impact of the Washington State ergonomics rule. The evaluation is unusual because comprehensive data on work related musculoskeletal disorders (WMSDs) was available prior to enactment of the rule in 2000 and also because the rule was subsequently repealed following an industry sponsored citizens referendum in late 2003. The authors were thus able to analyse changes in rates of WMSDs from before to after enactment of the rule and following repeal of the rule. The paper documents in detail the circumstances leading to the enactment of the rule, the political and legal conflict leading to repeal of the rule and also refers to the economic circumstances in Washington State during the period of the evaluation. The key findings were that:</p> <ul style="list-style-type: none"> <li>• there was a significant reduction in rates of WMSDs following enactment of the rule and a rebound in rates after the bill was repealed</li> <li>• the most important reasons employers cited for making changes was a desire to reduce workers' injuries, improve productivity and reduce absenteeism.</li> </ul> <p>The study found that there was a noticeable decline in impact of the rule, measured by numbers of employers who reported making changes, from shortly after its introduction compared to the survey in 2003 shortly before the bill was repealed. The results showed demonstrated increases in employer reported exposures to ergonomic hazards and reduced efforts to reduce these hazards once the political climate was such that it was clear that the ergonomics rule was unlikely to survive.</p>
4	Lipscomb, Li and Dement, (2003)	<p>Lipscomb, et al. (2003) evaluated the impact of the Washington State vertical fall arrest standard on work related falls among union carpenters. While the authors do not comment specifically on the significance of the carpenters being unionised it is likely that this group are able to exert more pressure on employers for appropriate safety standards. The study used ten years of data on union carpenters working in the state between 1989 and 1998. The outcome data used was workers' compensation claims during this period. The study was able to link data on hours worked over the ten year period with workers compensation claims at an individual level in order to create event histories for people in the study.</p>

Study	Reference	Summary
		<p>The authors found evidence of a significant decrease in the number of work related falls following introduction of the standard. The decrease occurred very shortly after the standard was introduced. Lipscomb et al (2003) argue that the results suggest that industry made changes before the standard was formally introduced. They note that there was extensive promotion of the standard by the state authority prior to its introduction and suggest this may have resulted in industry making changes at an early stage. They suggest that communication may be a particularly important for the construction sector due to the mobility of the workforce and the extensive use of contractors.</p>
5	Vickers, et al. (2005)	<p>This study investigated small firms' awareness of and responses to health and safety legislation. The key findings were that awareness varied by industry sector, by the ethnic background of the owner/manager of the business and size of the business. Retail businesses were less likely to be able to identify relevant health and safety legislation and micro businesses were less likely to be aware of legislation. The study found no overall differences between white-owned and ethnic minority-owned/managed businesses however there were significant differences between ethnic minority groups. Pakistani and Bangladeshi businesses were the least likely to be aware of legislation. The authors do not identify a clear explanation for this finding but suggest it might be linked with other cultural variables including acceptance of authority.</p> <p>Vickers et al (205) note that some small businesses may actually work in relatively safe manner while being unaware of work health and safety regulations. Inspectors described these businesses as lacking in formal systems and paperwork but showing good health and safety practice. This was seen as being due to a commitment to "good housekeeping" and organisation of the business as well as a concern for the workforce. Where these businesses had significant problems this tended to be due to less obvious issues such as exposure to hazardous substances.</p>

Study	Reference	Summary
6	Swan, Weyman, Oakley, and Crook (2002)	This study reported on an evaluation of the Control of Substances Hazardous to Health (COSHH) Schedule 9 - for assessing biological risks, that was conducted by the UK Health and Safety Executive. The evaluation was conducted as part of HSE's policy to evaluate new legislation following introduction to assess its impact. The research comprised face-to-face interviews with 32 staff working in laboratories whose work involved routine handling of biological agents. The research also included focus group discussions involving health and safety representatives from a range of businesses where personnel may be exposed to biological agents. The key finding relevant to this review was that the representatives from businesses saw the application of the legislation as difficult due to its technical language and approach. This despite the fact that ten of the fourteen paragraphs are intended to be general in application with only four paragraphs referring to intentionally working with biological agents as distinct to incidental exposure.
7	Suruda, Whitaker, Bloswick, Philips and Sesek (2002)	Suruda et al. (2002) evaluated the impact of a revision of the OSHA trench and excavation standard along with a targeted inspection program on the rates of fatal injuries in the construction industry in 47 US states. The study examined fatal injuries from trench cave-ins for five year periods before and after the revision of the standard. The study found a significant decline in fatality rates following introduction of the standard. Fatality rates for trench cave-ins declined significantly more than fatality rates for all other causes suggesting that the decline was not due to an overall change in construction activity. Also the decline persisted following an economic upturn in the industry suggesting that the decline was not due to reduced business activity overall. Suruda et al note that the revision to the standard removed previous ambiguity in the standard and suggest that this reduction in ambiguity along with a targeted program of inspections caused the reduction in fatalities observed. Two other key observations were the lower rates of fatalities at larger firms and unionised firms.
8	Smitha et al. (2001)	Smitha et Al. (2001) evaluated the impact on occupational injury rates in the manufacturing sector in the US of four types of state-level workplace safety regulations:

Study	Reference	Summary
		<ul style="list-style-type: none"> <li>• mandatory employer health and safety programs</li> <li>• mandatory employee safety committee requirements</li> <li>• enforcement initiatives targeted towards high accident or claim rate employers</li> <li>• state regulation of workers compensation insurance carriers.</li> </ul> <p>The dataset used in this study comprised a panel of data organised by state and year that included data from 42 states with 3286 observations from 1992 to 1997. This paper is unusual in the extent to which it attempts to take account of demographic factors, the impact of changes in workers' compensation costs and the impact of OSHA regulations and inspections. The study found effects due to inspections, consultations and fines, employer size, workers compensation variables, workforce age, union presence and unemployment rates. Laws that required establishment of safety committees and establishment of safety programs were both found to be effective ways of reducing injury rates. Targeting programs that require employers with above average injury rates to implement specific safety requirements were not found to be effective in reducing overall injury rates.</p>
9	Addison and Burgess (2002)	<p>This study investigated compliance with manual handling regulations in a random sample of two hundred and thirty businesses with between five and 50 employees in one business district in Shropshire, England. Addison and Burgess found that 42 per cent of the companies in the study either did not know about the regulations or thought that they did not apply to them. Awareness of the regulations varied greatly by industry type with metals and engineering being the highest and food and drink being the lowest. The authors also note that it may well be the case that small businesses are using safe working practices although they are not aware of the legislation. They found that 84 per cent provided employees with some form of health and safety training which suggests that they are aware of the risks in the work being performed. The findings from this study suggest that smaller businesses are less likely to be aware of regulations but that this lower level of awareness does not necessarily imply worse safety outcomes.</p>

Study	Reference	Summary
10	Wells and Greenall (2005)	<p>Wells and Greenall (2005) evaluated the effectiveness of the control of hazardous substances (COSHH) legislation, new technology and work methods on reducing occupational exposures in the foundry industry. This is an unusually detailed investigation of the ways in which legislation influenced change in the foundry industry. It used a case study approach to analyse a large body of data on occupational exposures maintained by one UK metal casting company. The results showed that reductions in exposures were associated with legislative changes on a number of occasions. The findings suggest a complex interaction between companies investing in new plant, changes in work practice and legislation.</p> <p>One section of the report looked at the impact on occupational exposures in cases where local exposure ventilation was required. The report found that in most cases foundries had installed local exposure ventilation prior to the COSHH legislation being introduced and believed that they would comply with the required exposure levels. The discussion notes that the effect of the legislation was to drive increased monitoring of exposure levels leading to detection of non-compliant levels. This was followed by interventions that then led to reduced exposure levels over several years. For work requiring local exposure ventilation the results show clear evidence of reduced exposure as a result of COSHH.</p>
11	Henson and Heasman (1998)	<p>Henson and Heasman (1998) investigated the process that food businesses follow in complying with food safety regulations. They investigated the compliance process through a survey and in-depth interviews with a sample of UK food manufacturers and retailers. They concluded that despite some variations firms follow a common sequence of activities when deciding to comply with a new regulation.</p> <p>Many of the companies interviewed by Henson and Heasman reported that the decision to comply was often not based on a calculation of the relative costs and benefits of compliance and non-compliance and instead reflected a concern not to be seen as operating outside the rules.</p>

**Table 4: Summaries of evaluations of inspections**

Study	Reference	Summary of findings
1.	Gray and Jones (1991)	This study investigated the effectiveness of health inspections by the Occupational Safety and Health Administration in reducing hazard exposures. There is a large body of published research looking at the effectiveness of OSHA inspections on reducing injury rates but relatively few studies have investigated the effect of inspections on hazard exposure. The study had a robust outcome measure because exposures were measured based on samples taken by OSHA inspectors at the plants they visited. The other outcome was the number of violations of OSHA standards cited for a plant. Gray & Jones found a significant reduction in hazard exposures on subsequent inspections.
2.	Burby and Paterson (1993)	This study tested two approaches to improving compliance with environmental regulations. This was a complex study involving a large number of issues that are not relevant to this review. One aspect of the study however focussed on the effectiveness of cooperative versus deterrent approaches by the regulator in obtaining compliance. Based on available records inspections were classified as either focussing on building compliance capacity and emphasising the social and moral basis of compliance or on deterrence and application of sanctions for violations. The study found that provided inspections were carried out frequently, deterrence via inspections and the threat of sanction was an effective method of securing compliance with specification-based standards. However they found that a cooperative approach was more effective for securing compliance with performance-based standards.

Study	Reference	Summary of findings
3.	Nielsen (2007)	Nielsen (2007) investigated the effect of the communicative interaction between inspectors and businesses in a sample of Danish businesses. The study looked at how the amount of communication between the inspector and the business influenced the treatment that businesses received from the inspector. The aim of the study was to explore factors leading to differential treatment of businesses by inspectors. The study involved a detailed analysis of the records of communication between inspectors and businesses. Nielsen's analyses showed that higher levels of communicative interaction between the inspector and the company resulted in the company receiving more lenient treatment from the inspector. Higher levels of communication also resulted in businesses being more likely to make changes as a result of the inspection.
4	Weil (1996)	This study investigated the effect of OSHA inspections on compliance with regulations and the effect of compliance on injury rates and lost days due to injury. The analyses reported used a longitudinal sample of wood manufacturing companies in the US. The major focus of the analyses was on a standard requiring use of guards on wood manufacturing machines. The findings demonstrated a strong impact of inspections on compliance with regulations as measured by the number of violations that companies were cited for in subsequent years. However the relationship between compliance with regulations and injury rates was ambiguous. The findings suggest that either compliance with regulations has the effect of reducing less serious injuries and/or that the effect of compliance with regulations on injury rates was limited to those companies that were inspected.

Study	Reference	Summary of findings
5.	Weil (1999)	<p>This study investigated the effect of enforcement in two longitudinal samples drawn from the US construction industry. The samples were drawn from a group of large scale construction companies operating nationally and mid-size contractors operating at a regional level. These companies had all previously received high levels of scrutiny from the regulator. The findings showed that for both groups the impact of inspections and penalties on subsequent behaviour was relatively small compared to findings from other studies of businesses that had received less prior regulatory attention. Weil noted that at the time this study was conducted many of the large businesses could potentially have had twenty or more years of experience with the regulatory regime. He suggested that there may be limits to the extent to which inspections can bring about improvements in safety practice. Weil proposed that inspections would be more effective if the regulator focussed more on small and medium size businesses that have received less attention in the past.</p>
6	Scholz and Gray (1990)	<p>Scholz and Gray (1990) investigated the effect of OSHA enforcement on workplace injuries. This study focused on large, frequently inspected firms with higher than average accident rates. This study is one of the studies conducted by US researchers using linked data from OSHA and the Bureau of Labour Statistics. They found significant effects for both specific and general deterrence with a greater impact of general deterrence. The results also showed that the size of penalties was less important than receiving any penalty.</p>

Study	Reference	Summary of findings
7	Ko, Mendeloff & Gray (2010)	<p>Ko, Mendeloff and Gray (2010) investigated the effect of repeated inspections and the length of time between inspections on businesses compliance with OSHA standards. Their key finding was a drop of between 30 to 50 per cent in the number of violations cited from the first to the second inspection. From the perspective of the current review there is also an interesting secondary finding that when an employee accompanies the inspector the number of violations cited increases by about 30 per cent in union workplaces. This is consistent with other US work suggesting that unionised workforces are able to exert more pressure on employers for safety. The study concluded that the first inspection that a business ever receives has a major impact on subsequent compliance.</p>
8	Gray and Shadbegian (2005)	<p>This paper investigated the effect of inspections on compliance with air pollution regulations in the paper manufacturing industry in the US. The study also looked at the relationship between compliance with one area of regulation that is air pollution and other areas that is water pollution and OSHA regulations. The group of firms studied all owned several plants. The findings of interest for the current review were:</p> <ul style="list-style-type: none"> <li>• Plants owned by larger firms were less responsive to inspections</li> <li>• Plants owned by large firms were more responsive to the prospect of enforcement action</li> <li>• Compliance behaviour by plant owners in one regulatory area appeared to carry over into others e.g. knowing a plant's compliance with water pollution regulations provided an indication of whether it was likely to be in compliance with OSHA regulations.</li> </ul> <p>Gray and Shadbegian (2005) suggest that larger firms may have better developed programs in relation to regulation and be less likely to be surprised by routine inspections. They also suggest that large firms were better able to focus resources on plants with serious problems or those likely to face enforcement action by regulators. By comparison small</p>

Study	Reference	Summary of findings
		<p>firms might be more surprised by inspections, less able to put resources into plants with serious problems and less concerned about the negative publicity associated with enforcement action. The authors note that when this study was conducted the level of fines and penalties in the US system was small and unlikely to present a major disincentive even for the smaller firms in the study.</p>
9	Fairman and Yapp (2005)	<p>In a study commissioned by the UK Health and Safety Executive, Fairman and Yapp investigated the factors influencing compliance with health and safety legislation in a sample of hairdressing salons in six local authorities in the England. Fairman and Yapp conducted on-site interviews with all of the businesses studied and at the conclusion of the interviews conducted a full inspection of the business. Any areas of non-compliance with standards were recorded and the business was questioned about the reasons for non-compliance. Some of the key findings of the study were:</p> <ul style="list-style-type: none"> <li>• For these small businesses compliance meant doing what they were told to do by inspectors</li> <li>• Many of the managers were aware of ongoing health issues for employees including back pain and dermatitis but they did not connect these issues and health and safety problems in the workplace</li> <li>• When they were told they had to make changes by an inspector they normally did so without delay or argument.</li> <li>• Their motivation for compliance was fear of penalties and or customers taking legal action.</li> </ul>

Study	Reference	Summary of findings
10	Mendeloff and Gray (2005a)	<p>Mendeloff and Gray (2005a) investigated how OSHA inspections lead to reductions in workplace injuries. They explore three alternative models for the effect of inspections on injury rates. The focus was on inspections resulting in penalties which they had previously found to reduce injury rates and in workplaces with less than two hundred and fifty employees.</p> <p>The first model tested was a specific deterrence model which assumed that citations for violation of a standard would lead to reductions in injuries associated with that standard. The second model was a general deterrence model which assumed that citation for a specific standard would have a broader effect such that injuries related to violation of any OSHA standards will be less likely. The third model assumed that inspections draw managers' attention to the issue of safety as a whole so that they are likely to reduce all hazards including those not covered by specific standards leading to an overall reduction in injury. The authors note that their first and second models are also consistent with a normative view where employers seek to be "law abiding". Mendeloff and Gray conclude that their findings support a behavioural model that is the effect of inspections with penalties appears to lead to a reduction in all injuries including those not covered by standards. This suggests that rather than deterring violations of the standards, inspections and penalties work by making managers pay attention to safety as an issue. The research also found that inspections had a bigger effect on smaller rather than larger workplaces and on non-union rather than union workplaces.</p>

Study	Reference	Summary of findings
11	Baggs et al (2003)	<p>This study investigated the effects of enforcement and consultation on workers' compensation claim rates in Washington State in the US. Washington State has a program that allows for consultation-only visits by inspectors to assist employers to remedy any standards violations without threat of receiving a penalty as a result. Baggs et al compared the levels of workers compensation claims before and after visits that included penalties with rates of claims before and after visits under the consultation only program. They found a significant decrease in claims associated with enforcement visits but no decrease in claims with the consultation only visits.</p>
12	Gray and Scholtz (1991)	<p>Gray and Scholtz (1991) investigated the equity and efficiency of OSHA enforcement. They define equity in terms of ensuring that all workers receive the same level of safety protection in the workplace whereas efficiency is defined in terms of achieving the greatest reduction in deaths and injuries for the expenditure of regulatory resources.</p> <p>This is another of the group of studies using the linked data base of OSHA inspections and Bureau of Labour statistics outcomes data. In their analyses of OSHA's inspection practice they found that:</p> <ul style="list-style-type: none"> <li>• enforcement actions against mid-size firms were more effective in reducing injuries than those against smaller or larger firms</li> <li>• more intensive inspections regardless of the focus tended to have more impact on outcomes than less intensive inspections</li> <li>• larger penalties did not reduce the likelihood of future citations for either the same breach or any breach. Small penalties reduced the likelihood of injuries as much as larger ones and required less inspection time.</li> </ul>

Study	Reference	Summary of findings
13	Cooke and Gautschi (1981)	<p>Cooke and Gautschi investigated the effect of OSHA inspections on average days lost due to injury. They argued that this was a more appropriate measure than focussing on injury rates overall because the effect of standards may be to reduce injury severity rather than overall rates of injury. Their study used OSHA inspection data and injuries data from the US State of Maine for the period from 1971-76. They found that inspections significantly reduced days lost due to injuries for firms with more than 300 employees. They also found a significant impact of business activity level such that as business activity level declined the injury rate also decline.</p> <p>The authors suggest that because standards are aimed at more serious hazards they may have the effect of reducing the severity of injuries rather than eliminating them. The study is relatively old and is based on data from one US state so some caution should be exercised in relation to these findings.</p>
14	Gray and Mendeloff, (2005)	<p>This study investigated the effect of OSHA inspections on injuries in manufacturing plants. It built on several previous studies these authors have conducted in this area and used a similar modelling strategy and parts of the same data set. Their key finding is that the effect of inspections on injuries that they reported for the period from 1979-1985 declines in subsequent years and becomes non-significant in the period 1992-1998. The authors are unable to fully account for the findings but suggest that what may be happening is a relabelling of existing injuries into the category of restricted work. This would suggest that the injury rate is not declining but that other factors are leading to injuries being classified differently.</p>

Table 5: Summaries of evaluations of prosecutions

Study	Reference	Summary of findings
1	Hopkins (2005)	<p>This paper presents a detailed case study analysis of a high profile prosecution for work health and safety in Australia. Hopkins analyses the rationale for the court decision in relation to the prosecution of the mining company responsible for the Gretley mine disaster in NSW. Hopkins analyses in detail the factors underlying the sentencing in the case based on the judges published decision.</p> <p>In relation to deterrence Hopkins notes that general deterrence, the need to send a signal to the industry regarding the specific issues involved and the general need for attention to safety formed only a minor element in the decision about sentences in the case. His analysis suggests that from the perspective of the regulator and the state deterring others is only a relatively minor part of the purpose of prosecution. While the argument is based on a detailed analysis of one case Hopkins suggests that this is likely to be true in general for prosecutions of work health and safety offenses. Whether or not in practice prosecutions actually deter other businesses from offending is explored in the next two studies reviewed.</p>
2.	Jamieson, Reeve, Schofield and McCallum (2010)	<p>Jamieson, et al. (2010) investigated whether prosecutions deter other companies from offending and why. Their research involved interviews with prosecuted and non-prosecuted employers in NSW and Victoria. They found that prosecution have a small general deterrent effect overall and a stronger effect on larger companies. The stronger effect on larger companies was because this group had greater capacity to understand and analyse the implications of court decisions for their businesses. They suggested that prosecutions have less impact on the behaviour of small business overall. They found that small employers with less understanding of the law often saw</p>

Study	Reference	Summary of findings
		<p>it as unfair that they could potentially be held responsible and punished when employees are injured or killed due to what they saw as the workers irresponsible behaviour.</p> <p>Jamieson et al (2010) argued that prosecution influence employers behaviour because they force employers to accept responsibility for work health and safety and to engage with workers and union to do so. They suggest however that this mechanism is less effective for small businesses because they were both less aware of prosecutions and usually lacked the resources and capabilities to understand the implications of court decisions for their business.</p>
3.	Thornton, Gunningham and Kagan (2005)	<p>Thornton et al (2005) investigated the effect of prosecutions on compliance with environmental regulations in the US. The research investigated the effect of managers' knowledge of so called "signal cases" where severe penalties were imposed on non- compliance. The research found only very weak support for general deterrence as commonly understood. They conclude that these cases serve different functions with different groups of companies. For companies that are normally compliant that is "good apples" signal cases reassure them of the merits of compliance and prompt them to check that they are still compliant. For the "bad apples" cases that are directly comparable to their circumstances may be a deterrent.</p> <p>Thornton et al (2005) reinterpreted deterrence as a mechanism that can be triggered in specific circumstances for specific companies. This is in contrast to deterrence theory as generally understood, where deterrence is seen as a general process applicable to all companies in all circumstances. This study suggests an alternative view of the effect of prosecutions on compliance where groups with a history of different behaviour adopt characteristic responses.</p>

Study	Reference	Summary of findings
4	Johnstone (2003)	<p>Johnstone reviewed and critically analysed the treatment of work health and safety prosecutions in Victorian Magistrates courts. This paper develops an argument about the treatment of work health and safety offences by the legal system as part of a broader argument regarding the socio-political role of work health and safety in capitalism which is outside the scope of this review. However a number of Johnstone's key findings are relevant to understanding the potential impact of work health and safety prosecutions. In particular Johnston draws attention to the low level of penalties imposed for work health and safety offences an average of only 21.6 per cent of the maximum available and the use by the courts of good behaviour bonds in 17 per cent of these cases.</p> <p>Johnstone also found that the way these cases are handled in the courts leads to a focus on the individual and specific events leading to the injury or death that resulted in the prosecution. He argues that this leads to neglect of the broader context including the organisation of work and the quality of work health and safety management at the workplace.</p>

**Table 6: Summaries of evaluations of guidance materials**

Study	Reference	Summary of findings
1	Neathey et al (2006)	<p>Neathey et al (2006) investigated the impact of the “Five steps to risk assessment” guidance document in a study commissioned by the HSE. The study is the only example found that investigated both the dissemination of guidance materials and the use of risk assessment methods by the target audience. They found that use of the guidance materials and the risk assessment process was more frequent in large compared to medium size or small businesses. Those small businesses that were aware of the guidance material were more likely to report that it had increased their knowledge of risk assessment.</p> <p>Awareness of the guidance material was associated with increased use of the risk assessment process but it was not possible to identify how much the guidance contributed.</p>
2	Lancaster et al (2001)	<p>Lancaster et al (2001) evaluated the impact of the UK manual handling and operations regulations and guidance. The evaluation of the guidance materials suggested that they were effective in enabling organisations to understand how to comply with the regulations. However they did not provide any guidance on the processes that organisations needed to have in place in order to support improved safety practice. The report concluded that the materials were useful for health and safety professionals but provided insufficient guidance for managers and others without specific training in work health and safety.</p>
3.	Worksafe Victoria (2004)	<p>Worksafe Victoria evaluated the effectiveness of a guidance note on prevention of bullying and violence at work. Their findings suggest that providing the guidance material was an effective way of raising awareness and promoting implementation of prevention and resolution measures (Worksafe Victoria 2004).</p>

**Table 7: Summaries of evaluations of industry campaigns**

Study	Reference	Summary of findings
1.	Health and Safety Executive (2006)	<p>This paper reported on the evaluation of a campaign conducted by the UK Health and Safety Executive during the period 2005-2008 that aimed to reduce the risk of musculoskeletal disorders (MSDs) (Health and Safety Executive 2006). The campaign included four main strands; publicity, inspections, engagement with a range of national stakeholder and education. The evaluation suggested the campaign was effective in raising awareness and while the sample size was small there was evidence of improvements in outcomes over several years.</p> <p>The campaign was longer than most previous HSE campaigns had a higher level of funding, and included seed funding for activities run by other groups. The authors argue that the higher level of funding and the longer term for the campaign were key factors leading to the campaign producing sustained changes. This is consistent with research in road safety which suggests that seven to ten years may be required in order to achieve sustained behavioural change (Delhomme et al. 2009).</p> <p>The design of the campaign included a number of the strategies identified by (Delhomme et al. 2009) as being important to campaign effectiveness. The campaign combined communication, enforcement and education, it had a single theme and the target audience was segmented by production of separate information materials in collaboration with the partner organisations e.g. one group produced materials aimed specifically at women.</p>
2.	Ford, Pepper, and Reiger (2007)	<p>This study evaluated the impact of an HSE campaign that aimed to raise awareness of slip and trip accidents and motivate employers and employees to take action to prevent them. The campaign comprised a communications and public relations drive, a mix of inspections and educational site visits and meetings, workshops and communications activities aimed at</p>

Study	Reference	Summary of findings
		<p>influencing stakeholders who included trade unions, businesses and employer organisations.</p> <p>A key finding of the campaign evaluation was that those businesses that took action following the campaign were likely to be either already taking some action or at least relatively well informed regarding work health and safety issues more generally. The evaluation was relatively unusual in that it investigated awareness of the issue within the organisation historically and at the time of the campaign. The results suggest that businesses awareness of the issue and perceived need to change were associated with likelihood of having made changes as a result of the campaign.</p> <p>The campaign itself appears to have played a relatively small role in directly causing most businesses to make changes, except where businesses received improvement notices during the campaign. The results suggest that the campaign played an incremental role in pushing those businesses that were already either making or considering changes to accelerate what they were already doing. The campaign design used a combination of communication, enforcement and education and had a single theme.</p>
3.	Banerjee, Archutowski, and Horton (2008)	<p>A study by Bannerjee, et al. (2008) evaluated the effectiveness of an HSE campaign that aimed to raise awareness of the risk of falling from vehicles and provide information to duty holders about the ways to manage risk. The campaign achieved significant levels of recall of key messages however it had relatively little impact on behaviour.</p> <p>The evaluation results suggested that because drivers were used to receiving all their information and instructions from their managers, safety messages also would be most effectively communicated via managers. This is interesting as it suggests that to communicate effectively with workers; campaigns need to take account of</p>

Study	Reference	Summary of findings
		<p>the nature of their work situation and usual modes of communication. The results also suggest that the effectiveness of the campaign was influenced by participants existing perceptions of the regulator. Those with existing positive perceptions were more likely to take up campaign messages than those with negative perceptions.</p> <p>Most businesses were taking action on falls from vehicles prior to the campaign and the percentages did not change significantly following the campaign. There was some evidence at later follow-up of increased numbers planning to take action although this could not be definitely attributed to the campaign. The campaign used communication only and had a single theme. The target audience was not segmented.</p>
4.	Spangenberg, Mikkelsen, Kines, Dyreborg and Baarts (2002)	<p>Spangenberg, et al. (2002) investigated the impact of a multi-faceted safety campaign at a major road construction project in Denmark. This study is unusual because it was able to directly measure the impact of the campaign on accident rates at a single very large construction site. The primary focus of the campaign was on communication with the workforce, it aimed to change attitudes and behaviour regarding safety on the worksite. The campaign involved use of communication materials on the site, publicising information about accident rates at different areas of the site and providing incentives in the form of a prize awarded twice a year for the areas of the site that achieved the lowest accident rates.</p> <p>The results showed a twenty five per cent decrease in accidents overall from before to after the campaign. However when the researchers controlled for the kinds of work being undertaken before and after the campaign the difference in accident rates was marginally statistically significant. The authors suggest that this may be a reasonable outcome for an intervention in construction and note that the accident rate for the site was lower than for a number of</p>

Study	Reference	Summary of findings
		<p>other large construction projects in Denmark. The authors also suggest that a primary explanation for the limited impact of the campaign may be the fact that most workers spent only a short time working on the project. Only ten per cent of workers reported that their working routines had been influenced by the safety campaign and most workers had worked at the site for less than one year. The authors could not directly examine the association between length of time on site and impact on work routines due to the available data however it is suggested that those who had spent less time on site were less likely to have changed their work routine as a result of the campaign.</p>
5	Sorensen et al. (2008)	<p>This study evaluated the effectiveness of a social marketing campaign in one US state that aimed to encourage the installation of rollover protection equipment on tractors. A key point to note is that the state had no legislative requirement for rollover protection when the study was conducted. Research conducted before the campaign indicated that the predominantly older male farmers did not see themselves as being at risk from rollovers due to their skill and experience. Preliminary research also indicated that farmers' wives had a major influence on decision making for the farm.</p> <p>A key element of the campaign was to focus on the risk to family members such as sons learning to use tractor. The campaign focussed these messages at farmers and their immediate families. The results indicated that following the campaign farmer's perception of the pressure from their immediate family was the strongest predictor of intention to retrofit.</p>

**Table 8: Summaries of evaluations of enforceable undertakings**

Study	Reference	Summary of Findings
1.	Parker (2004)	Parker investigated the effectiveness of EUs in business regulation by the Australian Competition and Consumer Commission (ACCC). She found that the effectiveness of EUs depended substantially on the capacity for internal regulation by business. To monitor compliance effectively regulators need to have the skills and resources to verify what the business reports regarding their internal operating procedures. Parker noted this may be more complex and resource intensive than monitoring compliance with the law.
2.	Johnstone and King (2008)	Johnstone and King (2008) undertook a preliminary evaluation of the effectiveness of EUs as an enforcement option in work health and safety. Their evaluation suggested that EUs can be effective and report on several cases where EUs have resulted in significant and apparently ongoing changes in safety practice within the companies that were party to them. Comments from managers suggest that EU's work because they require changes to safety practices and for these to happen managers have to take ownership of safety resulting in an increased commitment to compliance. However Johnstone and King (2008) suggest that monitoring of compliance with EUs is critical to their credibility and effectiveness. Monitoring compliance may be a particularly challenging area for regulators due to the resources required and the need to be able to validate information provided by companies regarding what they have done internally to comply with the specifications of the EU.

**Table 9: Summaries of evaluations of incentives and voluntary partnership schemes**

Study	Reference	Summary of Findings
1.	Laitinen and Paivarinta (2010)	<p>This study evaluated the effectiveness an innovative program that aimed to improve safety in the construction industry in Finland. The program took the form of an annual competition. Safety inspectors conducted unannounced inspections at participating companies. They used a widely accepted and objective measure of safety practice to assess each business' safety performance.</p> <p>The best performing companies received awards at an industry seminar held annually. The authors noted that while the program was voluntary more than seventy per cent of construction sites in the target area had taken part. There was substantial evidence that the program was effective including a decrease of sixty three per cent in failures to provide good fall protection. The authors estimate that the program prevents four thousand accidents and three deaths a year. The authors suggest that key success factors for the program included:</p> <ul style="list-style-type: none"> <li>• use of an objective measure, and</li> <li>• close cooperation between the construction industry association, trade unions and safety inspectorates.</li> </ul>
2.	Davies and Mazurek (1996)	<p>This study evaluated a number of US government incentive programs in environmental protection and work, health and safety. The OSHA voluntary participation programs are voluntary, cooperative agreements among labour, management and the federal government. There are three separate programs with different requirements for businesses to take part. For all programs businesses are required to demonstrate some level of health and safety capability to be allowed to enter the program. Businesses accepted into the programs are removed from OSHA's inspections list which frees up inspector resources. The primary incentive for businesses to take part in the programs is that the regulator undertakes to attempt initially to resolve any complaints</p>

Study	Reference	Summary of Findings
		<p>cooperatively with the business. There is however limited evidence that the programs work because no data is collected on businesses work health and safety performance before they enter the programs. The authors also note that participation of small businesses is low because many small businesses lack the resources to qualify for entry to the programs.</p> <p>The findings did not provide any clear indication regarding what kinds of incentives were more appealing to business e.g. financial, public recognition, or a close relationship with the regulator. They were able to identify features of the programs they reviewed that were appealing to business. Simplicity, having clear goals and objectives and requiring minimal additional commitment of time and resources from business were key features of the relatively more successful programs. Assuming they saw value in doing so, businesses were more likely to participate in voluntary programs offered by regulators that mirrored what the business was already doing.</p>
3.	Wright et al.(2008)	<p>Wright et al. (2008) reviewed the effectiveness of targeted initiatives in the UK manufacturing sector. Targeted initiatives are described as voluntary agreements involving businesses the regulator and to some extent and in some cases unions. Wright et al found that of the eleven areas in the review, five showed evidence that injury rates declined faster after the initiatives started and at a faster rate than for manufacturing as a whole. The review also included comparing data from companies that had been involved in initiatives with comparison groups. Businesses that had been involved in initiatives showed superior ratings on a set of health and safety management scales compared to those that had not. However, there was no evidence that this difference did not predate participation in the schemes. The authors acknowledge the lack of baseline data and point to the need for improved evaluation in future. The responses from industry suggest</p>

Study	Reference	Summary of Findings
		that the role of the Health and Safety Executive was initially one of leadership, persuasion and assistance and became one of ongoing monitoring and support as the schemes progressed.

## Enquiries

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