Safety culture, advice and performance

The associations between safety culture and safety performance, health and wellbeing at an individual level, and safety culture, competent occupational safety and health advice, and safety performance at a corporate level

Report submitted to the IOSH Research Committee

Prof Andy P Smith and Dr Emma J K Wadsworth
Cardiff University

research report

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The views expressed in this report are those of the authors and should not be taken to reflect the official position of the sponsors.

Abstract

The prevention of work-related injury and illness is of crucial importance to employees, industry and wider society. Corporate safety culture, which describes shared values within an organisation which influence its members' attitudes, values and beliefs in relation to safety, is now generally accepted as having a strong influence over workplace accidents and injuries. Occupational safety and health (OSH) practitioners or advisers also have a significant role to play in improving health and safety at work, yet little is known about their specific contribution to safety performance. The aim of this study, therefore, was to assess and compare the relative contributions of corporate safety culture and competent OSH advice to safety performance. The results showed that organisational safety culture was consistently and independently associated with corporate safety performance. In addition, the results showed independent associations between advice and corporate safety performance. However, these associations were not consistent in direction, suggesting a complex relationship, perhaps reflecting links with risk levels and industry sectors. A secondary aim of the research was to consider an association between employee perceptions of and attitudes towards safety and individual safety performance, health and wellbeing. Again independent associations were identified, suggesting that using measures of safety climate at an individual level to consider employees' perceptions of workplace safety makes a significant contribution to understanding the profile of factors associated with employees' health and safety. Overall, the study suggests that, while the nature of the relationship with advice requires clarification, both corporate safety culture and competent OSH advice make significant, independent contributions to corporate safety performance.

Executive summary

Background

The prevention of work-related injury and illness is of crucial importance to employees, industry and wider society. Corporate safety culture describes shared values within an organisation which influence its members' attitudes, values and beliefs in relation to safety. In recent years corporate safety culture has been cited as a contributory factor in accidents by many industrial accident investigations, and it is now generally accepted that organisations with a strong safety culture are more effective at preventing workplace accidents and injuries. Occupational safety and health (OSH) practitioners or advisers are an integral part of effective risk management systems and also have a significant role to play in improving health and safety at work. Little is known, however, about the relative contributions of safety culture and advice to safety performance.

Aims

The aim of this study was to assess and compare the relative contributions of corporate safety culture and competent OSH advice to safety performance. In addition, the work was intended to consider the applicability and robustness of associations between culture and performance across organisations drawn from various sectors of industry. A secondary aim was to use measures of safety culture to assess perceptions of and attitudes towards safety at an individual level, and to consider any association with individual safety performance and wellbeing.

Study design and methods

Organisations from across the UK and from various sectors of industry were invited to take part in the study. For each organisation, this involved taking part in three questionnaire surveys:

- climate survey – completed by employees to give a snapshot of safety culture in the organisation
- advice survey – completed by OSH practitioners or advisers to describe their experience and competence
- performance survey – completed on behalf of the organisation to describe its safety performance.

Findings and results

Safety culture (as measured by safety climate) was associated with safety performance at the corporate level. This association was positive, showing that a more favourable safety culture was associated with improved safety performance. It was also independent of other potentially influential factors, such as demographics and job characteristics, as well as industry sector. There were also significant, independent associations between OSH advice and corporate safety performance. However, this relationship was more complex, perhaps reflecting an association with risk level and industry sector. In addition, employees' perceptions of and attitudes towards safety were independently associated with individual safety performance and wellbeing.

Conclusions

Safety culture was consistently and independently associated with safety performance. In addition, employees' perceptions of safety were consistently and independently associated with individual safety performance, health and wellbeing. These associations were not limited to particular sectors of industry, suggesting that they are robust and generally applicable. In addition, the findings suggest that applying measures of safety climate at an individual level to look at perceptions of and attitudes towards workplace safety makes a significant contribution to understanding the profile of factors associated with employee health and safety. The study also highlighted an independent association between health and safety advice and corporate safety performance. However, further research is needed to explore and describe the nature of this relationship. Overall, the study suggests that, while the nature of the relationship with advice requires clarification, both corporate safety culture and competent OSH advice make significant, independent contributions to corporate safety performance.

1 Introduction

1.1 Background

Health and Safety Executive (HSE) figures show that 36 million days (1.5 days per worker) were lost overall as a result of workplace injuries and ill health during 2005/06; 30 million were due to work-related ill health and 6 million due to workplace injury.[1] The cost of this, on an individual, organisational and national level, is huge. Preventing work-related illness and injury through effective risk management is, therefore, crucially important for employees, industry and society.

It is widely accepted that human factors are the main contributory factor in accidents.[2] This human element, of course, extends beyond those personally involved in an incident. It also incorporates all those who influence safety in that workplace, whether directly, consciously and immediately, or indirectly, unintentionally and perhaps with an extended time lag. Effective risk management therefore depends at least in part on the behaviour of all those individuals who are operating in a specific organisational context. Corporate culture describes shared values in an organisation which influence the attitudes and behaviour of its members, and safety culture describes the members' attitudes, values and beliefs in relation to safety.[3]

Since the Chernobyl nuclear power plant accident in 1986, corporate safety culture has become the focus of, and has been implicated in accident causation by, many large-scale industrial accident investigations (of which four examples are given in the references[4–7]). Although there is still considerable debate in the literature about definition, aetiology, causation and mechanism, it is generally accepted that organisations with a strong safety culture are more effective at preventing both these larger-scale industrial accidents and individual injuries at work.[8]

The role of occupational safety and health (OSH) practitioners or advisers, and their contribution to OSH, is also clear and accepted. They are an integral part of effective OSH management systems, and have a significant role to play in improving health and safety at work;[9] guidance from the Institution of Occupational Safety and Health (IOSH) explains that:

> expert advice from competent safety and health practitioners is an essential component ... [in ensuring] that high standards are achieved, and maintained.[10]

Indeed, a delegate at the IOSH 2004 Research Workshop commented that:

> ... in a 'perfect world' OSH practitioners would work themselves out of a job as workers and management became sufficiently competent and resourced in OSH.[11]

However, there has been comparatively little work formally considering their role.

It is increasingly clear that, while both corporate safety culture and OSH advice are integral to many aspects of safety behaviour, little is known about their relative contributions to safety performance, or indeed their relationship with each other.

In addition to safety culture and OSH advice, however, occupational research has established clear links between employees' health, safety and wellbeing and both work characteristics, such as demand and control (see for example Stansfield *et al.*[12]), and interpersonal characteristics, such as bullying (see for example Cowie *et al.*[13]). Similarly, perceived stress at work, which is widespread in the UK,[14] is strongly linked to ill health.[15–18] Furthermore, previous research has shown associations between accidents, injuries or cognitive failures (problems of memory, attention or action – effectively human error) and demographic, personality, mental and physical health, and lifestyle factors, as well as particular occupational characteristics (see for example Wadsworth *et al.*[19] and Simpson *et al.*[20]). Indeed, inherent levels of risk also vary within and between organisations and industrial sectors. Many individual and occupational characteristics, therefore, are potential confounding factors in the relationships between safety performance, culture and advice.

1.2 Rationale

Assessing the relationships between corporate safety culture, competent advice and safety performance will advance understanding of what makes a safe workplace. This will inform the development of policies and practices for helping organisations to work more safely. Making these

assessments in the context of other potentially confounding factors allows these relationships to be considered independently of their potential influence.

This project, therefore, was designed to measure safety performance, culture and advice in a group of participating organisations. Measures of potential confounding factors, such as stress, work characteristics and demographic characteristics, were also incorporated into the design. In addition, the project was intended to extend previous work in the area by:

- applying generic measures of safety culture and performance to organisations from different industrial sectors
- assessing any association between safety culture and corporate safety performance across multiple organisations
- using tools to measure safety culture to assess any association between perceptions of and attitudes towards safety and safety performance and wellbeing at an individual level.

In this regard the intention was also to measure the robustness of associations between culture and performance at the corporate level, and between employees' perceptions of safety and safety performance and wellbeing at the individual level, and to consider to what extent these findings can be generalised.

1.3 Significance

The area of organisational culture, and within that specifically safety culture, is relatively new to occupational research, and is unusual in that it has traditionally been approached at a corporate level. It developed from the nuclear industry; it was extended first to safety-critical areas but is now used further afield. Safety culture describes shared attitudes, values and beliefs in relation to safety in an organisation.[3] It therefore stems from, and is operational at, an individual level.

One area of occupational research that is perhaps more established is that of work stress. Work stress is traditionally measured at an individual level, but it can, at least to some extent, be seen as arising because of the prevailing circumstances of a particular work situation. As such, it also operates at a corporate or organisational level (and arguably perhaps at a professional and industrial level too). However, it is also a generalisable measure which is applicable across industries and workplace settings. This has meant that it is widely used in many contexts, allowing comparisons between situations. It has also been shown to be strongly influential in employee wellbeing[15–18] and safety.[20]

This is the first UK-based study to measure safety culture, advice and performance among a heterogeneous group of participating organisations. It is also an attempt to broaden the applicability of safety culture to performance and so to consider any association at a more fundamental, as well as general, level.

1.4 Definitions

The key concepts in this research are OSH culture, advice and performance. The first phase of the work focused on identifying measures for them. Their definitions in the literature are considered as part of the literature review in Section 2.

1.5 Aims

This study was developed in response to a call for bids from IOSH. IOSH was interested in 'studies into the effect on measured OSH performance from the use of competent OSH advice by employing organisations', and in particular in:

- relations between and the relative contributions of corporate culture and competent OSH advice
- inter- and/or intra-sector comparisons
- the effect of competent OSH advice on changing the style of organisational structure or employment practices, and *vice versa*.

This work was intended to address the first of these three themes and contribute to the second. These were wide-reaching and ambitious themes requiring ambitious, multi-level research.

The study had four main aims:

1 to describe the corporate safety cultures of the participating organisations
2 to collect those organisations' OSH performance measures

3 to describe their OSH practitioners' experiences and competence
4 to assess and compare the relative contributions of corporate safety culture and competent OSH advice to OSH performance.

2 Literature review

This section is not intended as a comprehensive review of safety culture literature. There are already several recent reviews,[25–28] and two special issues of journals (*Work and Stress* 1998; 12 (3) and *Safety Science* 2000; 34), which provide an excellent overview of the area. Rather, the intention here is to set the current research in context.

2.1 Safety culture and climate

The concepts of safety culture and safety climate originated from organisational culture. The term 'safety culture' has been widely used since the International Atomic Energy Agency (IAEA) report into the Chernobyl nuclear accident.[21] The term 'safety climate'[22] has been used over a similar period. However, over 20 years later, and many studies and reviews on, there are still no universally accepted definitions of either term.

2.1.1 Defining safety culture

There are numerous definitions of safety culture. One of the most widely used definitions was put forward by the Human Factors Working Group of the Advisory Committee on Safety in Nuclear Installations (ACSNI), which defined safety culture as:

> …the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation's health and safety management.[23]

More broadly, it has been described elsewhere as relating to the practices and attitudes within an organisation,[24] and is often seen as the core safety values of an organisation.[25] A review by IOSH (1994, cited by Glendon & Stanton[26]), which considered many of the proposed definitions, suggested that safety culture includes or refers to:

- norms and policies related to safety
- common values, beliefs, attitudes and behaviours regarding safety
- the joint values, attitudes, competences and behaviours of individuals and groups that establish organisational commitment to, and style and proficiency of, a safety programme.

A recent review[27] has identified two useful and related ways of treating safety culture. The first is based on Cooper's work in 2000,[3] and distinguishes three inter-related aspects of safety culture:

- psychological (ie how people feel about safety and safety management systems (sometimes referred to as 'safety climate'))
- behavioural (ie what people do – including safety-related activities, actions and behaviours)
- situational (ie what the organisation has – policies, operating procedures, management systems, control systems, communication systems).

The second approach[28] proposes two ways of treating safety culture:

- something an organisation is (the beliefs, attitudes and values of its members about safety) – which is measured with attitude (or climate) surveys
- something an organisation has (structures, policies, practices and controls) – which is measured with safety audits and performance figures.

Corporate culture and, within this, safety culture, are not static concepts, though they are relatively long-lasting and complex, as they reflects fundamental values.[29]

Despite the lack of a universally accepted definition, and the dearth of work focusing on defining 'good' and 'bad' safety cultures,[30,31] safety culture has been identified as perhaps the main recent issue in organisational safety.[32] Most succinctly, the term 'safety culture' is perhaps most often used to mean 'the way we do things round here'.[33]

2.1.2 Defining safety climate

In the first empirical study that considered safety climate,[22] it was defined as 'a summary of molar perceptions that employees share about their work environments'. Although the term is sometimes used interchangeably with 'safety culture' to describe employees' attitudes to safety,[30] safety climate is often

seen as a reflection of an organisation's current underlying culture.[21,38–43] Others, however, consider it a sub-component of safety culture[3,30,44–46] that shows the comparative priority of safety within an organisation.[34] It is generally regarded as more superficial than safety culture,[26] and more transient, and has been described as an indicator of an organisation's overall safety culture[35] or a 'snapshot of the state of safety'[36] based on perceptions regarding safety rather than practices or attitudes.[37] Safety climate and culture have recently been described as 'not separate entities but rather different approaches towards the same goal of determining the importance of safety within an organisation'.[38] This is consistent with the underlying premise that the safest organisations have a culture of safety, and that safety climate is an indirect measure of how close an organisation is to that.[39]

In the main, safety climate is assessed by carrying out a questionnaire survey among employees to measure perceptions of particular dimensions of safety. Indeed, employee perceptions are central to safety climate measurement.[40] Although there are many models and scales for assessing safety climate, there is no universally accepted set of component dimensions or factors. There have been two recent reviews of the area,[37,41] which reflect the broad consensus that management support for, and commitment to, safety and the priority of safety in an organisation are generally accepted as key aspects of safety climate.[22,26,41,42]

From the standpoint that safety climate is a snapshot measure of an organisation's safety culture, the following sections focus on the relationship between safety culture, usually as measured by safety climate, and safety performance and advice.

2.2 Safety culture or climate and performance

Safety performance, like safety culture and climate, is also difficult to define and measure. Performance has often traditionally been measured using self-reported and/or officially recorded accident statistics. However, this can be problematic: for example, because accidents can be relatively rare events, they may not be recorded accurately or routinely, and risk exposure may not be taken into account. Other measures, such as safety behaviour[43,44] and minor injuries,[34] have also been used, and more modern approaches tend to focus on current safety activities and systems to measure success as opposed to failure, perhaps in combination with the more traditional approach.[45] This more predictive approach to safety measurement can also mean that organisations do not have to wait for a system failure before identifying and acting on problem areas.[41]

Poor safety culture has been implicated in many large-scale and high-profile industrial accidents and disasters, including Chernobyl[6] (following which the term safety culture came into widespread use; see above), the space shuttle *Columbia*[4] and the Ladbroke Grove[5] and Clapham Junction[7] rail crashes.

Similarly, researchers have reported an association between safety culture or climate and accidents on a smaller scale[22,46,47] and both self-reported and officially recorded injury rates,[33,39,46,54,57–62] as well as minor injuries[34] and injury severity.[46] Safety climate has also been linked to safety behaviour,[44,56,63–65] and it has been suggested that a more positive safety climate leads to improved health and wellbeing[66–68] and reduced work stress.[48]

This relationship between safety culture and safety performance has been reported across industry sectors, including those with high hazard levels (eg chemicals),[43] high accident rates (eg construction),[34,46,49,50] and low accident rates (eg services).[51] It has, therefore, been argued that the principles of safety culture and climate, which have been developed primarily among the traditional high hazard industries, are applicable in other work settings.[52]

However, only one or two studies have found an association between safety culture or climate and safety performance.[44] A recent paper has also pointed out that much of the research linking safety culture or climate and safety performance has been cross-sectional and that, as a consequence, the possibility of reverse causality has not been ruled out.[53] This work suggests that the findings may reflect, for example, the possibility that those who have accidents feel less safe and then report a poorer safety climate. In addition, little is known about the underlying mechanisms by which safety culture or climate affect safety performance.[53,54]

The increasingly accepted view is that a positive safety climate or culture is necessary for safe working.[55]

2.3 Safety culture or climate and advice

Although it has been suggested that the effectiveness and credibility of OSH practitioners may be influenced by corporate culture,[35] much less research has focused on the relationship between safety

culture or climate and advice, or on the influence of competent safety advice on either safety culture (or climate) or performance. This is, perhaps, surprising given the position and role of the OSH practitioner or adviser. The difficult challenge for safety practitioners, of translating what is known about safety culture into practical policies and procedures that will change behaviour and practice to improve safety performance, has, however, been acknowledged.[8]

Recent work has identified trust as playing a key role in safety culture which is rarely measured by existing models.[76–79] In a related development, the role and impact of leadership style has also recently been considered.[50,51,56] Both of these areas are perhaps indirectly linked to the relationship between safety culture and advice.

More directly, though, early work suggested that more organisations with good safety performance records employed safety officers in high-ranking positions (see Cohen *et al.* (1975) and Cohen (1977), both cited in Mearns *et al.*[55]). And more recently, the presence of a safety manager was one factor identified as affecting safety climate.[57] The impact of how and by whom safety inductions among new employees are carried out has also been identified as influencing safety attitudes and behaviour.[58] This implies that this somewhat neglected area is worthy of further consideration.

It has been suggested that the effectiveness and credibility of OSH practitioners may be influenced by corporate culture.[35] Recent work also suggests that the most comprehensive approach to managing workplace safety may be to merge and integrate the behaviour change and culture change approaches.[59]

2.4 The impact of other factors

There is also evidence that other factors may influence one of more of the three factors of interest – safety culture or climate, safety performance, and advice.

Several studies, for example, have suggested that perceptions of safety may vary with hierarchical level,[33,40,85,86] though some have found little difference across hierarchical levels.[47] Similarly, perceptions have been shown to vary with employment status.[60] Job demands may also affect both safety performance and safety behaviour[61] and recent work has suggested that perceptions of work pressure and clarity may influence accident involvement.[47] High levels of anxiety, stress or job insecurity have also been linked to both poorer safety motivation and compliance[62–64] and poorer safety performance,[68,91] though this relationship may be moderated by safety climate.[64] Trust has also been associated with safety performance,[65] as has leadership.[50,66,67]

Furthermore, safety climate has been associated with a number of demographic (eg sex, educational level, marital status) and individual (eg alcohol consumption, safety knowledge) characteristics.[57,68] Similarly, organisational factors such as size have been associated with safety performance[69] and climate.[70] Recent work has also identified the compatibility between production and safety as being influential over safety behaviour.[71]

The safety culture and performance literature, particularly when considered in combination with occupational research, therefore suggests that other factors are, at least potentially, influential.

3. Study design and methodology

The study was carried out in three phases:

- development – during which the measuring tools and methods were selected and piloted
- recruitment – during which the participating organisations were recruited
- surveys – during which the data were collected.

Each is described in detail below.

3.1 Data collection

3.1.1 Phase 1 – Development

The development phase comprised firstly a literature review and secondly a pilot study.

Literature review

The project needed to measure three factors or key concepts:

- OSH performance
- corporate culture (or the beliefs and values of workers, managers and supervisors that contribute to safety systems and behaviours)
- OSH practitioners' experiences and competence.

To achieve this, the work began with a literature review to identify existing tools for measuring these three key concepts. This was designed to inform the selection of the most appropriate measures for the study. The literature review was carried out between 06 December 2005 and 11 January 2006. In total 10 databases were searched:

- ASSIA
- EMBASE
- IBSS
- Ingenta
- MEDLINE
- OSHROM
- PsychINFO
- PubMed
- SafetyLit
- Web of Knowledge.

The following search terms were selected after test searches across each of the databases:

- (work OR occupational OR corporate OR company) AND (health OR safety) AND (practitioner OR officer OR advi*) AND (measure OR indicator OR tool OR record)
- (work OR occupational OR corporate OR company) AND (climate OR culture) AND (measure OR indicator OR tool OR record)
- (work OR occupational OR corporate OR company) AND (health OR safety) AND (practitioner OR officer OR advi*) AND (measure OR indicator OR tool OR record).

Where possible, searches were limited to the previous ten years (ie 1996–2005) and the results were scanned and selected before downloading. The date range was used for practical reasons; it is of course possible that older but relevant material was missed as a result.

Following these searches, the material identified was checked and duplicate articles, and any articles not directly relevant to the aims of the literature review, were removed. The remaining material was read in detail, with any further articles identified during reading added to the final article set. Each of the articles in this final set was studied and the measures or tools identified were considered against the following criteria:

- data collection method – questionnaire-based
- validation and use – validated and widely used
- industry – appropriate for any industry sector.

These criteria were selected for several reasons. First, the data collection method was important because of the study design. Forty organisations were to be recruited from across the UK and, even with a relatively long data collection window, the small research team would not be able to visit each participating organisation to carry out, for example, focus group discussions. For pragmatic reasons, therefore, the measures considered had to be restricted to questionnaire-based tools that could be applied remotely. Second, it was important that the tools considered for inclusion in the study had been shown to measure what they were intended to measure. The second selection criterion, therefore, was that measures had been validated and widely used. Finally, participating organisations were to be drawn from any sector of industry. It was therefore important that all tools were generic enough to be appropriate for use in any industry sector.

Questionnaires
The literature review informed the development of the study's three questionnaires. Each questionnaire was designed to measure one of the study's three key concepts:

- organisational OSH performance – the performance questionnaire
- corporate safety culture – the climate questionnaire
- OSH practitioners' competence and experience – the advice questionnaire.

Both the climate and advice questionnaires also included measures of stress, wellbeing, work characteristics and other lifestyle and demographic factors. Questionnaires and other materials are available from the authors on request.

Electronic data collection
During this development phase of the work, it became clear that being able to offer electronic versions of all three questionnaires might provide significant advantages. In part, this followed informal discussions with potential organisational and individual participants. It was also, however, the result of pragmatic consideration of the scale and scope of the study: the aim was to collect data from three separate surveys in 40 organisations from different sectors of industry across the UK. Electronic data collection offered not only a much-reduced workload for participating organisations, but also considerable savings in terms of printing, postage, data entry and data checking. Some time was therefore spent researching the possibilities, and a bespoke software package which offered both paper and electronic questionnaire design, as well as electronic data collection (via the web and/or email), was selected as most closely meeting the study's needs.

Pilot study
Following the literature review and compilation of the three questionnaires, a pilot study was carried out. This was intended to test the acceptability of both the questionnaires and the electronic data collection system. The pilot study was carried out in a university unit which was asked to supply completed questionnaires from each survey.

3.1.2 Phase 2 – Recruitment
The second phase of the study involved recruiting organisations to take part in the research. The aim was to recruit 40 organisations from different sectors of industry from across the UK. The only inclusion criterion was that participating organisations should have at least 50 employees. In addition, it was decided that larger organisations would participate as one or more separate business units, within each of which the three surveys would be carried out. This followed informal discussions with potential participants, who felt that, in such large organisations, very different OSH cultures could exist from department to department, and also pointed out that departments often had their own OSH management systems and teams. This is also consistent with the recent acknowledgment that potentially distinct cultures may exist within sub-sections of large organisations which have their own history, management, approaches and aims.[39]

Several sources were used to approach organisations:

- IOSH Safety Sciences Group
- the Universities Safety and Health Association
- the Confederation of British Industry
- the Royal Society for the Prevention of Accidents (RoSPA)
- local OSH training organisations
- personal contacts.

Several methods were used to advertise to organisations, including direct email messages, both paper and electronic newsletter entries, personal contacts and word of mouth.

All those who replied to the research team were provided with further details about the study, including a letter, information sheet and single page summary describing what participation would involve. All contacts were also followed up by telephone.

3.1.3 Phase 3 – Surveys

Participating organisations' surveys
All participating organisations' business units took part in all three questionnaire surveys. Each invited its employees to complete the climate questionnaire and its OSH practitioner(s) to complete the advice questionnaire.* One performance questionnaire was completed on behalf of each participating unit. Organisations were able to choose between:

- electronic questionnaires, which were supplied as email links to be forwarded to relevant groups of individuals
- traditional paper questionnaires, which were supplied packaged with covering letters and reply-paid envelopes to be distributed to relevant individuals
- a mixture of the two methods.

In addition, paper versions of each questionnaire could be downloaded individually from the website for each survey.

Organisations received telephone and email reminders until they had completed and supplied one performance and at least one advice questionnaire per participating business unit. In addition, they were regularly updated with the numbers of climate questionnaires that had been returned, and were asked to remind their staff and encourage participation as appropriate.

Feedback to participating organisations
At the end of their participation, each organisation was supplied with a feedback report based on their aggregated responses. Those organisations which had taken part as more than one business unit were given feedback for each unit separately, as well as for the organisation as a whole.

General workers' climate survey
A further climate survey was carried out among a control group of workers who had not been recruited via their employing organisation. This survey was carried out to allow comparisons with the main study climate survey carried out among the employees of the participating organisations. Several recruitment strategies were used. First, individuals selected at random from the Cardiff electoral roll were sent letters inviting them to participate in the study either by completing it online or by requesting a paper questionnaire. The approach, however, yielded a poor response, not least because the sampling frame included many non-workers who received letters despite not being eligible to take part. A second approach was therefore tried. An advertisement containing a link to the electronic version of the survey, and highlighting the incentive of entry into a prize draw to win one of four £50 shopping vouchers, was placed in the RoSPA e-newsletter.

3.2 Sampling
The sections above describe the sampling approach used to recruit organisations and individuals to the study. Several methods were used to recruit samples matching the study's goals.

3.3 Validity and reliability
As described above, the tools used to measure the study's three key concepts (organisational OSH performance, corporate safety culture and OSH practitioners' competence and experience) were identified during the literature review. One of the criteria against which potential tools were considered was their previous validation and use. The climate and advice questionnaires also contained other measures of stress, wellbeing,[72,73] work characteristics[74,75] and other lifestyle and demographic factors which had previously been used together in a study of workers identified from community samples.[14,101,102]

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* Advice surveys were completed by individuals designated by their organisations as OSH practitioners. This term has therefore been used to describe all respondents to the advice questionnaire, regardless of their reported level of formal qualification for their role.

In addition, the climate questionnaire was completed by a sample of workers not identified through participating organisations. This allowed for an assessment of the representativeness of the samples provided by participating organisations' employees.

3.4 Data analysis

All analyses were carried out using SPSS version 12.0.2. The numbers used in each analysis vary slightly according to the numbers completing the questions involved. At the univariate level, analysis of variance (ANOVA) was used to compare group means, chi-square tests to assess differences in proportions, and Spearman's rho to consider correlations. At the multivariate level, backward stepwise logistic regression and backward linear regression modelling were used to consider associations while controlling for the influence of other, potentially confounding, factors. These *backward* methods include all predictor variables in the model and then remove any that are not making a statistically significant contribution in a stepwise fashion (ie one at a time, re-estimating the model with the remaining predictor variables after each variable) until only those variables making a significant contribution remain. This approach is used particularly for exploratory model building, and so is appropriate here.

3.5 Ethics

The study was approved by the Cardiff University School of Psychology Ethics Committee. Contacts at the participating organisations were provided with information sheets, and each questionnaire was accompanied by a covering letter. All questionnaires collected the respondent's organisation and department name. However, no information which could be used to identify any individual was collected and questionnaires were not marked with serial numbers until after they were completed and returned.

3.6 Limitations

The study had several limitations, mostly relating to four key areas.

First, some limitations arose because decisions had to be taken before organisations could be recruited. For example, the tools selected for use in the questionnaires were chosen to be appropriate for small and medium sized enterprises (SMEs). At the design stage, this category seemed the most likely source of organisational participants. However, during recruitment it became apparent that large organisations also wanted to take part, and, indeed, were more likely to employ their own OSH advisers. Furthermore, many of these organisations had separate safety systems and management practices in place for separate divisions, sections or sites and so were often keen to participate as separate, smaller, business units.

Second, all the study data were cross-sectional. This meant that the study could not make any assessment of causality about the relationships it was considering. The data were also all self-reported, introducing potential problems of bias at individual and organisational level.

Third, organisational (and individual) participation in the study was voluntary. Organisations were, of course, informed of the study's aims in all the recruitment information they received. An inherent problem in research of this nature is the possibility of participating organisations representing only the 'best' end of the OSH spectrum.

Finally, practitioners working in an organisation are, necessarily, part of and subject to that organisation's OSH culture. Further research would be necessary to consider this in more detail. In addition, it was not possible to be certain that those who took part in the general workers' climate survey did not work for any of the participating organisations as this information was not collected.

4 Findings and results

The presentation of the findings and results begins by outlining the development and recruitment phases of the study. The bulk of the section, though, is devoted to describing the third phase – the surveys. Here the results are presented in three broad sub-sections. The first describes safety performance, advice and culture among the participating organisations. The second focuses on the association between employee perceptions of and attitudes towards safety and individual safety performance, health and wellbeing. The third sub-section draws the safety performance, advice and culture findings together and considers associations between these three factors.

4.1 Phase 1 – Development

In this section the results of the literature review, carried out to identify measures of the study's main concepts, and the pilot study, carried out to test the acceptability of the measures and methods, are briefly described.

4.1.1 Literature review

The literature review was carried out to identify measures of the study's three main concepts: (corporate) health and safety performance, culture and advice. In total 3,825 references were identified by the literature searches. After the identification of duplicates (816) and articles not immediately relevant to the aims of the literature review (2,834), 175 were selected for detailed study. During the reading process further relevant material was identified, bringing the total considered in detail to 232.

Health and safety performance measures

Nine tools or measures of organisational OSH performance were identified (see Appendix 1, Table 43). Only the HSE's Performance Indicator Tool met all the criteria set for measure selection.

Safety culture or climate

Many safety culture and climate measures were identified by the literature search. However, several excellent reviews were also found.[23,31,102–105] Table 44 in Appendix 1 principally consists of information taken from the 2003 review by the Keil Centre,[76] with additional review papers also sourced (it was considered of little benefit to duplicate work of an exhaustive nature already published). The rest of the literature review process, therefore, focused on searching for measures described and developed since 2003. In the Keil Centre's review, the HSE's Climate Survey Tool was given the highest score in terms of its value for studying the rail industry. When factors of validity, usability and extent of use are considered, the Climate Survey Tool also came out as clearly the most appropriate for the present study, with tools developed since 2003 showing no advantage.

Practitioner competence and experience

Only one existing measure of OSH practitioners' experience was identified (see Appendix 1, Table 45). Although it did not entirely meet all the criteria, it was selected for use. The chairman of the IOSH Safety Sciences Group was also consulted, and the questionnaire was adapted and extended so that it could be applied across industry sectors.

Measures selected

Following the literature review, three tools were selected for measuring the study's key concepts:

- The HSE's Climate Survey Tool[77] was used to measure corporate safety culture
- The HSE's Health and Safety Performance Indicator (HSPI)[78] was used to measure organisational OSH performance
- The Competency in Health and Safety Advice Questionnaire[79] was used as the basis for measuring OSH practitioners' competence and experience.

The Climate Survey Tool

The HSE's Climate Survey Tool measures 10 areas of health and safety climate, and in addition gives an indication of general job satisfaction. These areas are summarised below.

Factor 1: Organisational commitment and communication

The perceived level of organisational commitment to health and safety is a major influence on health and safety performance in practice. The questions making up this factor sought people's opinion of this commitment as evidenced, for example, by their views on senior management's interest in health

and safety, the provision of resources for health and safety, and the relative status of health and safety. Some issues associated with communication and involvement were also considered.

Factor 2: Line management commitment
An important indicator of an organisation's commitment to health and safety is how people regard the importance their immediate boss places on health and safety. Most people attempt to deliver what they think is important to their immediate boss. The questions making up this factor explored people's views of the extent to which their immediate boss promotes health and safety and reacts to health and safety issues that may be raised.

Factor 3: Supervisor's role
Supervisors have an important part to play in promoting safe behaviour. This series of questions sought people's views on the contribution and effectiveness of their supervisors.

Factor 4: Personal role
Sustained success in ensuring health and safety at work demands that everyone recognise the importance of health and safety and actively support the health and safety effort. The questions in this factor explored individuals' view of their own contribution and the relative importance of health and safety.

Factor 5: Workmates' influence
A strong influence on the way individuals behave at work is their immediate workmates or peer group. This factor sought people's views on the importance which their workmates give to health and safety. The questions in this section were only asked of supervisors and workers.

Factor 6: Competence
People need to have a sufficient understanding of their responsibilities, the risks associated with their work and the instructions, rules and procedures in place if they are to work safely. The questions in this section explored people's views of their health and safety training and the level of understanding that they thought they have achieved.

Factor 7: Risk-taking behaviour and some contributory influence
Previous sections of the questionnaire explored some organisational issues and some factors which contribute to the general health and safety environment in which people work and therefore to the way they behave with respect to health and safety. The questions making up this factor were essentially in two sections. The first explored the extent to which people consider that other take risks or behave unsafely at work. The second explored some reasons why such practices may take place; for example, people are pressured to work unsafely, managers are not held accountable and workers have a poor understanding of the risks associated with their work.

Factor 8: Some obstacles to safe behaviour
One of the main controls employed by organisations to ensure health and safety is instructions, rules and procedures. This section explored people's views of the relevance and practicality of their organisation's health and safety rules and procedures as well as their ability and willingness to comply with them.

*Factor 9: Permit to work**
Another commonly used means of ensuring a safe method of working is a permit to work system. The statements in this section examined people's views of the relevance and ease of use of the permit system.

Factor 10: Reporting of accidents and near misses
A reliable accident and near miss reporting system is vital if accurate reactive measurement data are to be collected and used to inform the organisation's improvement process. The statements in this section sought people's views of the reliability of the accident and near miss reporting systems.

General job satisfaction
This is made up of two questions which explored some issues of general job satisfaction.

The percentage of favourable, neutral and unfavourable responses is calculated for each of the 10 factors and the general job satisfaction measure described above. The responses to the questions and factors that

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* The 'Permit to work' factor is not applicable to all organisations and so has not been described in this report.

summarise them are, of course, based on respondents' views at the time of the survey. The statements give reasonable coverage of several of the issues surrounding health and safety but they are not exhaustive. While these results provide an insight into opinions, they are likely to be indicative rather than definitive. The number of respondents in some groups was small, so caution should be taken when considering the results.

The HSPI[78]
The HSPI gives overall scores for incident and hazard management. In addition, hazard management is broken down into 10 areas, with a separate score provided for each. These areas are:

- dangerous machinery
- hand-held equipment
- hazardous substances
- job stress
- manual handling
- noise level
- repetitive movement
- slips and trips
- vehicle handling
- working at height.

All these scores can also be compared against benchmark data for similar organisations (in terms of size, industry sector and business type) in the same geographical area. This allows comparisons of performance against other similar local organisations.

The Competency in Health and Safety Advice Questionnaire[79]
This tool was used as the basis for measuring safety and health practitioners' competence and experience. Designed to assess the overall access organisations have to health and safety advice and support, the questionnaire investigates the key responsibilities of the personnel involved in health and safety management, their competence and information and training available to them to perform their tasks effectively. Although industry specific, and the only one available this tool was adapted to have wider applicability across industry sectors.

Individual safety performance
Safety performance was also measured at an individual level. Respondents were asked about:

- accidents in the previous 12 months requiring medical attention
- minor injuries in the previous 12 months not requiring medical attention
- cognitive failures – problems of memory (eg forgetting where you put things), attention (eg failures of concentration) or action (eg doing the wrong thing).

These measures were used in previous studies.[80–82]

4.1.2 Pilot study
In addition to completed questionnaires for each of the three surveys, the university unit which took part in the pilot study also provided detailed feedback on the acceptability of both the questionnaires themselves and the electronic data collection system. All the results and feedback were positive, so no significant changes were made to the content of the questionnaires or to the data collection method.

4.2 Phase 2 – Recruitment
In total, 79 organisations contacted the research team expressing serious interest in taking part in the study. Forty-five subsequently chose not to take part. For most this was because a management committee felt the organisation was too busy to take part within the study's timeframe. In a few cases it followed a change of personnel, in particular where the contact individual was made redundant. The remaining 34 organisations agreed to take part. This group represented 54 participating business units.

4.2.1 Organisational participants
The organisations that agreed to take part in the study represented a variety of industry sectors from across the UK, as shown in Table 1.

4.3 Phase 3 – Surveys
Following recruitment, six organisations, contributing 18 business units, withdrew from the study, and one other chose to take part as a single participating unit instead of as four units. Those that

Sector	Number of business units
Manufacturing	17
Education	14
Health	5
Science	4
Retail	3
Property management	2
Construction	2
Transport	2
Communications	2
Finance	1
Utilities	1
Health and safety	1
Total	**54**

Table 1
Industrial sectors of the business units that agreed to take part in the study

withdrew did so because they were unable to complete the surveys within the study's timeframe (four organisations, 12 units) or because they were unable to find enough employees willing to complete the questionnaire (two organisations, six units). When these changes occurred it was too late in the study's timeframe to recruit further organisations in their place. Table 2 shows the industry sectors of the remaining participating units and outlines their businesses.

Each participating business unit supplied one performance questionnaire ($n = 33$) and at least one advice questionnaire ($n = 37$). In total, approximately 14,774 climate questionnaires were distributed by these 33 units, covering 57 per cent of their employees. The total is approximate because some organisations were able only to estimate the number of email messages they had sent out. Overall, 1,752 completed climate questionnaires were returned, giving an approximate response rate of 12 per cent. There was, however, a wide variation in response rates, with two units' rates as high as 84 per cent. Excluding those units that were unable to estimate their questionnaire distribution, a total of 6,224 questionnaires were distributed, with 1,550 returned, a response rate of 25 per cent. Distribution and response rates are shown in Table 3. Organisations were encouraged to distribute questionnaires to all their employees, and 16 did so. Where full distribution was not possible, participating organisations were encouraged to distribute questionnaires to as many employees as possible, and to sample employees at random. A further nine distributed to at least half their employees, and in total 57 per cent of the participating organisations' employees were approached.

4.3.1 Performance survey

This section focuses on the performance survey, and addresses the project's second aim by describing the participating organisations' OSH performance measures.

Each of the 33 participating business units completed a performance questionnaire. The HSPI gives overall hazard management and incident scores as well as scores for 10 specific hazard management areas, as listed on page 22. All scores are out of 10, with a higher score indicating better safety performance. In addition, the HSPI also has a benchmarking facility. For each of the incident and hazard management scores, the benchmarking facility compares an organisation's performance scores with those of other similar businesses in their area and gives one of five grades (poor (1), below average, average, above average, best (5)). The best grade represents the top 20 per cent of scores; the above average grade covers the next 20 per cent, and so on.

The specific hazard management scores, however, are difficult to interpret because organisations which report that their employees never face a particular hazard get the maximum score and do not

Table 2
Industrial sectors of the business units that completed the study

Sector	Nature of organisations	Number of business units
Manufacturing	1 transport assembly organisation 4 transport design and assembly organisations 1 defence equipment manufacturer 2 industrial parts design and manufacturing departments	8
Health	1 healthcare trust 1 patient care department of a healthcare trust 1 service department of a healthcare trust 1 local health board 1 nursing home operator	5
Education	2 higher education teaching and research departments 2 further education teaching departments	4
Science	3 scientific research departments 1 forensic science organisation	4
Retail	2 retail organisations 1 warehouse distribution organisation	3
Construction	1 housing contractor 1 civil engineering and construction organisation	2
Transport	1 passenger transport operator 1 public transport and road tunnel operator	2
Communications	2 telecommunications departments	2
Finance	1 commercial finance organisation	1
Utilities	1 utilities service	1
Health and safety	1 health and safety consultancy	1
Total		33

complete any other questions on this hazard. It is therefore not possible to tell whether their response reflects effective control of a hazard, or that the organisation simply never has come and would never come up against that hazard in the course of its business. Those giving this response, therefore, were excluded from these analyses. Table 4 (page 26) presents performance and benchmark scores after these exclusions. The table also shows mean overall absolute and benchmark hazard management scores calculated from the 10 individual scores after the exclusions.

The participating organisations' overall hazard management and incident scores, calculated using the HSPI, were relatively high (over 6), as were mean individual hazard scores calculated after those whose employees were never exposed to certain hazards had been excluded. Similarly their mean benchmark overall hazard management and incident scores were in the 'average' range. The pattern was similar for their absolute and benchmark scores on the individual hazard measures. This suggests generally good corporate safety performance across the participating organisations.

Figures 1 and 2 (page 27) show the individual participating units' overall absolute and benchmark incident management scores. They show a wide range of scores both across the units and within sectors.

Figures 3 and 4 (page 28) show variations in the participating organisations' mean absolute and benchmark hazard management scores.

Incidents in the previous year

The overall incident score is derived from organisations' experience of 11 difference incident types. These incident types, and the number of organisations reporting experiencing each at least once in the previous year, are shown in Table 5 (page 29). Almost all the participating organisations reported that there had been at least one accident or incident in the previous year. Accident or incident rates varied from under 1 per 100 employees (transport) to 49 per 100 employees (health). A little over half of the

Table 3
Climate survey distribution, returns and response rates

Unit	Total employees *n*	Surveys distributed		Returns *n*	Response rate %
		n	% of total workforce		
Retail 3	25	25	100	21	84
Science 4	25	25	100	21	84
Manufacturing 4	1000	70	7	38	54
Health and safety 1	59	59	100	31	53
Manufacturing 1	500	120	24	61	51
Manufacturing 7	1000	837	84	413	49
Manufacturing 3	3500	164	5	77	47
Health 4	70	70	100	30	43
Retail 1	1000	129	13	46	36
Retail 2	800	66	8	23	35
Manufacturing 6	500	130	26	42	32
Construction 2	130	130	100	39	30
Utilities 1	85	85	100	23	27
Health 5	50	50	100	12	24
Education 2	100	74	74	17	23
Finance 1	50	50	100	11	22
Manufacturing 8	1000	837	84	174	21
Health 2	415	362	87	76	21
Science 1	100	100	100	20	20
Health 3	744	632	85	120	19
Science 3	350	350	100	62	18
Science 2	100	100	100	17	17
Education 1	100	100	100	16	16
Transport 2	500	230	46	35	15
Transport 1	500	100	20	13	13
Manufacturing 5	1020	800	78	84	11
Construction 1	150	150	100	15	10
Communications 1	400	400	100	30	8*
Education 3	200	200	100	9	5*
Education 4	450	379	84	13	3
Health 1	7000	4850	69	126	3*
Communications 2	400	400	100	11	3*
Manufacturing 2	3600	2700	75	26	1*
Total	**25923**	**14774**	**57**	**1752**	**12***

* These units were unable to estimate electronic questionnaire distribution, so gave approximate response rates

Table 4
Performance scores

Area	Performance scores						Benchmark scores					
	Mean	sd	Median	Min	Max	No. excl.	Mean	sd	Median	Min	Max	No. excl.
Overall incident	6.39	2.96	7.00	0	10.00	NA	3.27	1.26	4.00	1.00	5.00	NA
Overall hazard mgt*	6.64	1.49	6.7	3.85	9.30	NA	3.09	1.33	3.00	1.00	5.00	NA
Manual handling	5.73	1.70	5.50	2.50	9.00	1	3.63	1.13	4.00	2.00	5.00	1
Repetitive movement	5.70	1.66	5.50	3.00	10.00	6	3.63	1.08	4.00	1.00	5.00	6
Hazardous substances	6.23	1.23	6.00	4.50	10.00	7	3.12	0.95	3.00	1.00	5.00	7
Working at height	6.25	1.48	6.00	3.50	9.00	7	3.19	1.47	3.00	1.00	5.00	7
Dangerous machinery	5.59	1.80	5.75	3.00	10.00	11	2.59	1.33	2.00	1.00	5.00	11
Job stress	6.02	1.65	6.00	3.00	10.00	2	3.00	1.06	3.00	1.00	5.00	2
Vehicle handling	4.55	1.21	5.00	2.50	6.50	12	3.14	1.24	3.00	1.00	5.00	12
Slips and trips	6.02	1.72	6.00	3.00	10.00	8	2.80	1.29	3.00	1.00	5.00	8
Noise	5.13	1.50	5.25	3.00	9.00	13	2.50	1.19	2.00	1.00	4.00	13
Handheld equipment	4.63	1.77	4.75	2.00	8.50	11	2.59	1.44	2.50	1.00	5.00	11
Mean overall hazard mgt score	5.84	1.26	5.80	3.85	10.00	0	3.08	0.88	3.00	1.83	5.00	0

*Calculated by the Performance Indicator Tool, so no organisations were excluded

organisations reported at least one injury recordable under HSE rules* in the previous year; most (13, 76 per cent) had a rate of 1 or less per 100 employees, one had 5 per 100 (in the science sector) and two had 10 per 100 (in the health and construction sectors). Just under half reported that one or more employees were referred to a general practitioner due to a work-related injury, eight (67 per cent) at a rate of 1 or less per 100, two at 2 per 100 (both in Science), one at 5 per 100 (also Science) and one at 10 per 100 (Construction). A similar number reported one or more compensation claims from an employee or member of the public, all but one at a rate of 1 per 100 or less, and one at 3 per 100 (Manufacturing). Approximately a quarter of the organisations reported one or more fires or leaks attended by the fire brigade (all but one had a rate of 1 or less per 100 employees, and one had a rate of 5 per 100 (Construction)), and a similar number reported one or more dangerous occurrences covered by RIDDOR (all had a rate of 1 or less per 100 employees). Three organisations reported one or two spillages, escapes or losses of more than 1 litre of a dangerous substance (Education, Science and Manufacturing). Finally, one organisation reported an Improvement Notice issued by the HSE or an environmental health officer (EHO) in the previous year (Manufacturing), one a Prohibition Notice (Communications), and one an early retirement due to work-related injury (Health). None of the participating organisations had been prosecuted under health and safety law in the previous year.

* Injuries that require first aid treatment must be recorded in the organisation's accident book under the Health and Safety (First Aid) Regulations 1981 (as amended).

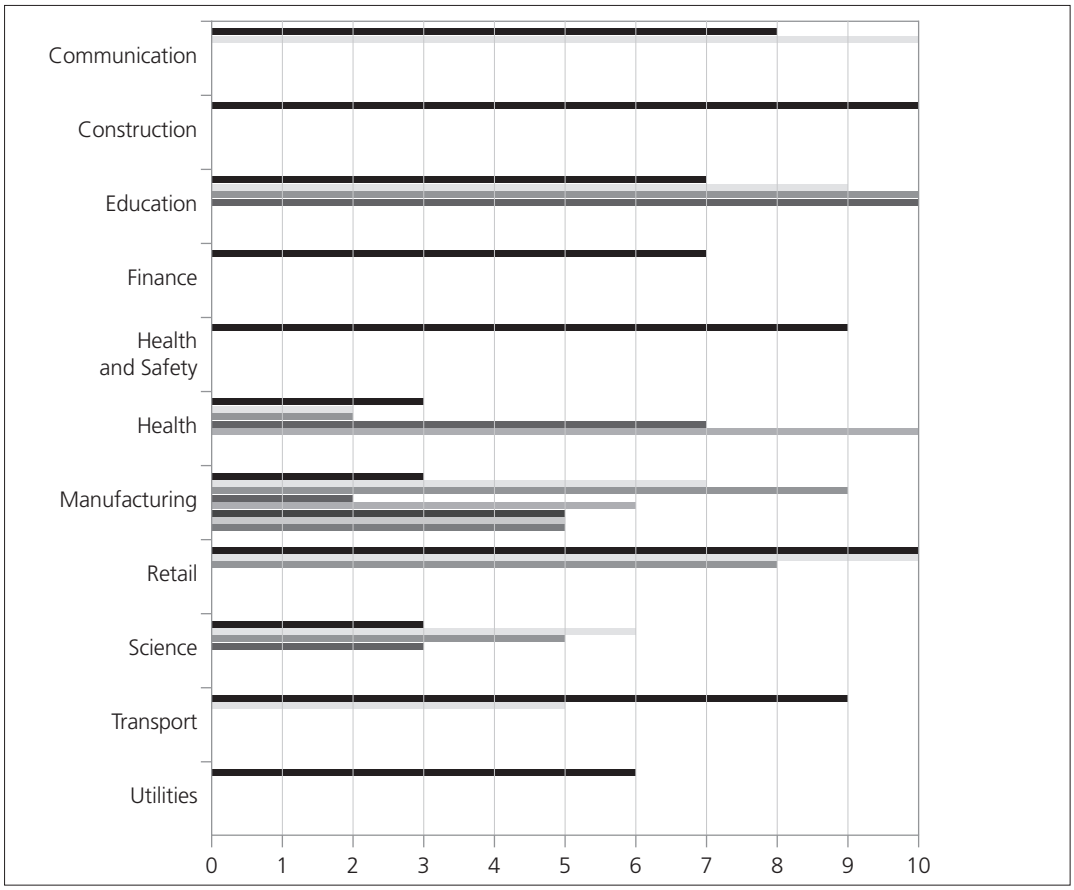

Figure 1
Participating units' overall incident scores

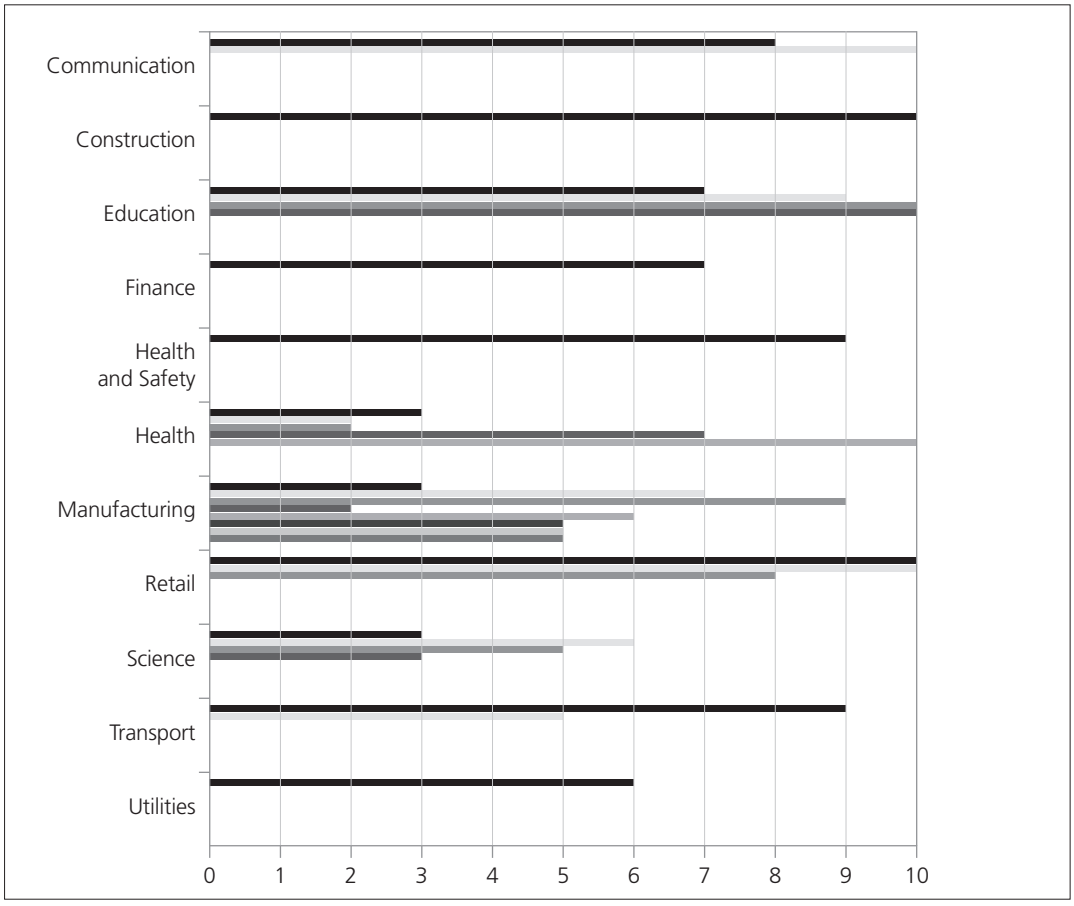

Figure 2
Participating units' benchmark incident scores

Figure 3
Participating units' mean hazard management scores

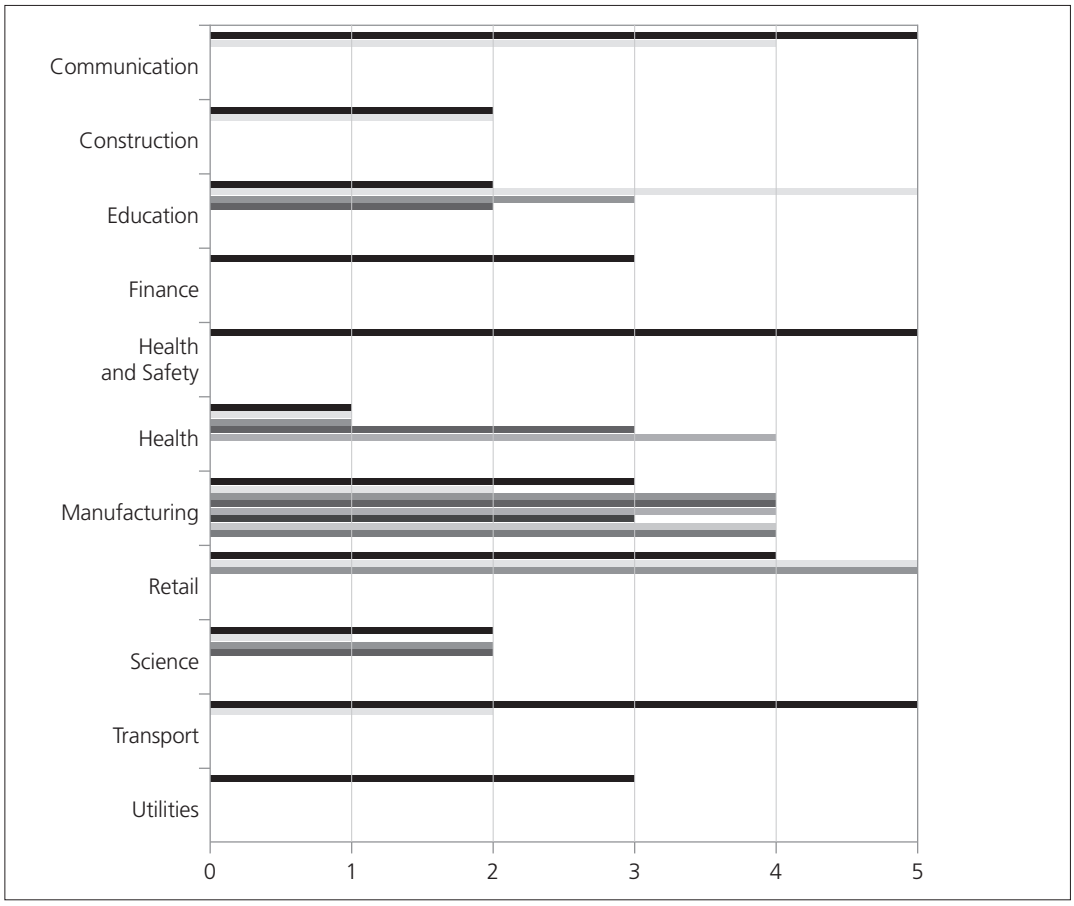

Figure 4
Participating units' benchmark hazard management scores

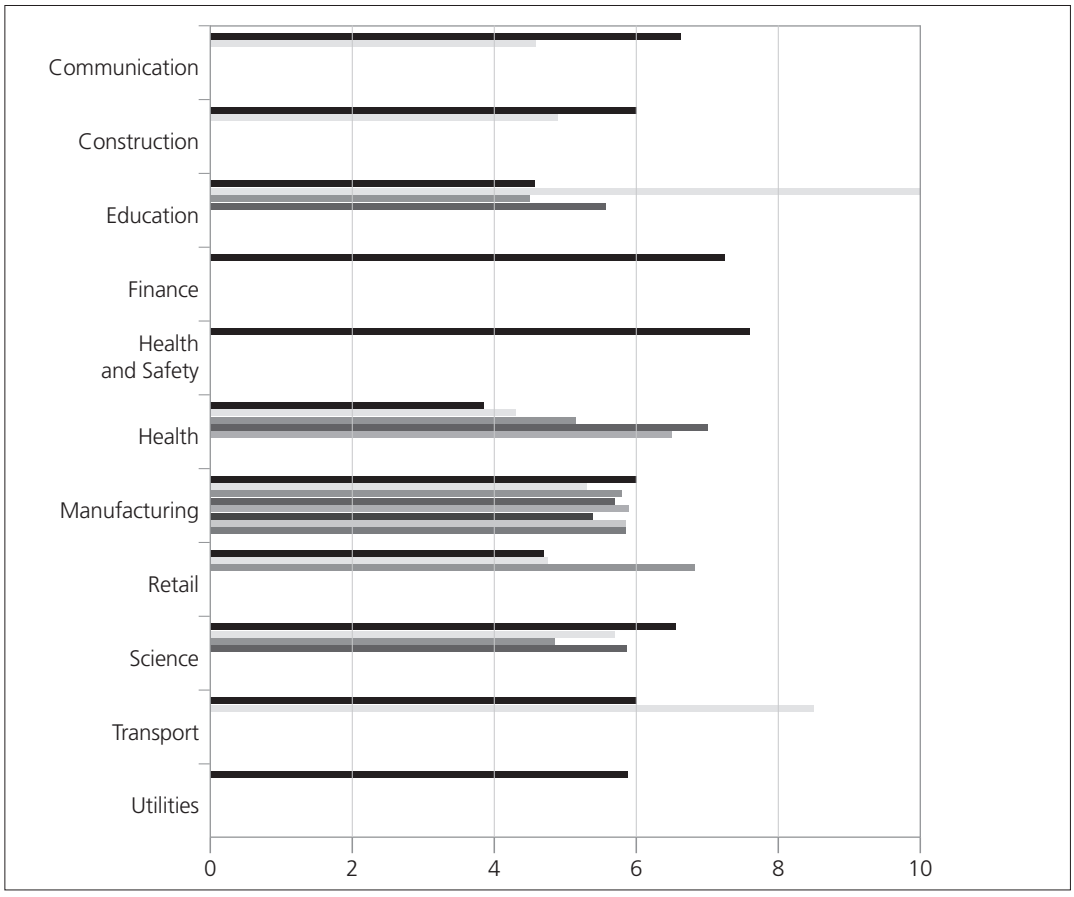

Table 5
Incident data for the previous year

Incident type	Organisations reporting	
	n	%
Accidents or incidents of any type (including minor and reportable)	26	90
Employees referred to a GP due to a work-related injury	12	48
Spillages, escapes or losses of more than 1 litre of a dangerous substance (not reportable as a dangerous occurrence under HSE rules)	3	10
Incidents of injury covered by HSE reporting rules	17	59
Improvement notices issued by HSE or EHO	1	3
Prohibition notices issued by HSE or EHO	1	3
Prosecutions under health and safety law	0	0
Claims for compensation from an employee or member of the public for injury or illness	12	46
Early retirements due to work-related injury	1	3
Fires or leaks attended by the fire brigade	8	25
Dangerous occurrences covered by RIDDOR	8	26

All of these data show that incidents and injuries did occur across the spectrum of participating organisations. Most specific incident types, however, were relatively rare among these business units.

Performance and sector
Table 6 (pages 30–31) shows performance scores by business units' industrial sector. Overall hazard management scores ranged from 8.90 (Finance) to 5.45 (Construction), and overall incident scores ranged from 9.33 (Retail) to 4.25 (Science). There was also considerable variation between sectors on individual hazard management scores. Of course, the hazards an organisation or business unit will actually face and the frequency with which they will face them vary enormously even within industrial sectors. However, two which they may all have to deal with fairly regularly are job stress and manual handling. Again these show variation, from 10.00 (Transport) to 4.00 (Communications) and from 9.00 (Finance) to 4.50 (Retail) respectively. Mean hazard scores varied from 7.60 (Health and safety) to 5.36 (Health). Considering all sectors together, the participating units' highest mean score was for working at height and their lowest mean score was for vehicle handling.

Similar comparisons were made for the benchmarked scores. Mean scores for each sector are shown in Table 7 (pages 32–33). Again there was considerable variation, with overall hazard management benchmark scores ranging from 5.00 (Health and safety) to 1.75 (Science), overall incident benchmark scores ranging from 4.00 (Communications, Health and safety and Finance) to 1.00 (Science), and mean benchmark hazard management scores ranging from 3.80 (Manufacturing) to 2.38 (Utilities). Focusing on job stress and manual handling showed a range from 5.00 (Transport) to 2.00 (Health and safety, Utilities and Finance) and from 5.00 (Health and safety) to 2.00 (Utilities) respectively. The highest individual mean benchmark scores were for manual handling and repetitive movement and the lowest was for noise.

Finally, organisations were split into two groups depending on whether they operated in traditionally more hazardous sectors of industry (construction, transport, manufacturing, health and utilities) or less hazardous sectors (education, science, communications, health and safety, finance and retail). This categorisation, made to allow for comparison, was decided simply on an 'intuitive' basis after discussion with several colleagues, and a different categorisation would, of course, have given different results. In terms of absolute scores, those operating in the more hazardous sectors had poorer overall incident and hazard management scores, but there were no significant differences on individual hazard management areas or mean hazard management. However, those operating in less hazardous sectors had generally poorer benchmark scores, though the only significant difference was for handheld equipment (Tables 8 and 9, pages 32–33).

Table 6
Performance scores by industry sector (*continued opposite*)

	Education		Construction		Transport		Health		Science		Communi-cations	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Overall hazard management	7.28	1.38	5.45	0.78	6.60	2.26	6.27	2.56	6.68	1.28	7.70	1.34
Overall incident	9.00	1.41	5.00	7.07	7.00	2.83	4.80	3.56	4.25	1.50	9.00	1.41
Manual handling	4.67	0.76	6.00	0.00	5.75	3.18	6.00	2.67	5.50	0.41	5.50	2.83
Repetitive movement	3.50	-	4.75	0.35	9.25	1.06	5.25	0.96	6.00	0.41	5.75	0.35
Hazardous substances	6.50	0.87	6.25	1.06	8.00	2.83	5.00	0.41	5.88	0.25	-	-
Working at height	6.50	2.12	5.75	0.35	5.75	3.18	5.83	0.58	6.50	1.80	7.75	1.77
Dangerous machinery	5.50	0.87	6.50	0.71	6.75	4.60	4.17	1.15	5.00	1.41	-	-
Job stress	6.83	2.25	5.00	2.83	10.00	-	5.00	1.66	6.50	1.00	4.00	0.71
Vehicle handling	3.00	-	6.00	0.00	4.25	1.77	4.17	2.08	3.75	1.06	-	-
Slips and trips	10.00	-	4.50	0.71	6.00	2.83	5.00	2.00	5.38	0.63	6.00	-
Noise	4.25	1.06	4.75	2.47	6.00	4.24	3.67	0.76	5.00	0.71	-	-
Handheld equipment	2.83	0.76	5.00	0.71	6.50	2.12	3.00	1.32	6.00	3.54	2.00	-
Mean hazard management	6.16	2.61	5.45	0.78	6.75	2.47	5.36	1.36	5.74	0.70	5.60	1.44

Table 6
Continued

	Health and safety		Utilities		Retail		Finance		Manu-facturing		Total	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Overall hazard management	8.80	-	6.70	-	7.43	0.63	8.90	-	5.73	0.25	6.64	1.49
Overall incident	9.00	-	6.00	-	9.33	1.15	7.00	-	5.25	2.19	6.39	2.96
Manual handling	8.00	-	5.00	-	4.50	1.80	9.00	-	5.94	1.15	5.73	1.70
Repetitive movement	6.00	-	-	-	3.25	0.35	5.50	-	6.00	1.73	5.70	1.66
Hazardous substances	9.00	-	7.00	-	7.00	-	-	-	5.94	0.73	6.23	1.23
Working at height	-	-	5.50	-	4.83	1.26	-	-	6.75	1.31	6.25	1.48
Dangerous machinery	-	-	8.00	-	9.00	-	-	-	5.06	1.18	5.59	1.80
Job stress	6.00	-	6.50	-	7.50	0.50	6.00	-	5.75	1.00	6.02	1.65
Vehicle handling	-	-	-	-	4.33	1.53	-	-	4.88	0.58	4.55	1.21
Slips and trips	9.00	-	4.00	-	7.00	-	8.50	-	6.06	1.08	6.02	1.72
Noise	-	-	6.00	-	-	-	-	-	5.56	0.73	5.13	1.50
Handheld equipment	-	-	5.00	-	-	-	-	-	5.30	0.77	4.63	1.77
Mean hazard management	7.60	-	5.88	-	5.43	1.22	7.25	-	5.72	0.25	5.84	1.26

Table 7
Benchmark performance scores by industry sector (*continued opposite*)

	Education		Construction		Transport		Health		Science		Communi-cations	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Overall hazard management	3.00	1.41	2.00	0.00	3.50	2.12	2.00	1.41	1.75	0.50	4.50	0.71
Overall incident	3.75	0.96	3.00	2.83	3.50	0.71	3.40	0.55	1.00	0.00	4.00	0.00
Manual handling	3.00	1.00	4.50	0.71	3.50	2.12	3.40	0.89	2.57	0.50	3.00	1.41
Repetitive movement	1.00	-	2.00	1.41	4.50	0.71	3.25	0.50	3.75	0.50	4.00	0.00
Hazardous substances	2.67	0.58	2.50	0.71	4.00	1.41	2.50	1.00	2.25	0.96	-	-
Working at height	1.50	0.71	2.50	2.12	2.50	2.12	2.33	0.58	2.67	1.53	4.50	0.71
Dangerous machinery	2.67	1.15	3.00	1.41	3.50	2.12	1.00	0.00	1.00	0.00	-	-
Job stress	2.33	0.58	2.50	0.71	5.00	-	2.20	1.10	3.25	0.96	2.50	0.71
Vehicle handling	1.00	-	3.00	1.41	3.00	1.41	2.00	0.00	2.00	1.41	-	-
Slips and trips	5.00	-	1.50	0.71	3.00	1.41	3.00	1.00	2.00	1.41	4.00	-
Noise	1.50	0.71	2.00	0.00	2.50	2.12	1.00	0.00	2.00	0.00	-	-
Handheld equipment	1.00	0.00	2.50	0.71	3.50	0.71	1.00	0.00	2.00	0.00	1.00	-
Mean hazard management	2.74	1.52	2.60	0.71	3.47	1.37	2.39	0.35	2.46	0.39	3.42	0.82

Table 8
Comparison of the mean absolute performance scores of organisations from higher- and lower-hazard sectors of industry

	Lower-risk sectors		Higher-risk sectors		F	*p*
	Mean	se	Mean	se		
Overall hazard management	7.41	0.31	6.00	0.34	9.26	0.005
Overall incident	7.67	0.64	5.33	0.70	5.87	0.02
Manual handling	5.54	0.47	5.89	0.40	0.33	0.57
Repetitive movement	5.18	0.37	6.06	0.46	1.90	0.18
Hazardous substances	6.56	0.37	6.06	0.31	0.96	0.34
Working at height	6.25	0.56	6.25	0.34	0.00	1.00
Dangerous machinery	5.92	0.71	5.47	0.47	0.26	0.62
Job stress	6.36	0.41	5.74	0.42	1.09	0.30
Vehicle handling	3.92	0.49	4.80	0.30	2.43	0.14
Slips and trips	6.89	0.62	5.53	0.37	4.03	0.06
Noise	4.88	0.52	5.19	0.41	0.13	0.72
Handheld equipment	3.75	0.99	4.96	0.35	2.17	0.16
Mean hazard management	6.00	0.39	5.71	0.24	0.40	0.53

Table 7
Continued

	Health and safety		Utilities		Retail		Finance		Manu-facturing		Total	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Overall hazard management	5.00	-	3.00	-	4.67	0.58	3.00	-	3.50	0.76	3.09	1.33
Overall incident	4.00	-	3.00	-	3.67	1.15	4.00	-	3.63	1.19	3.27	1.26
Manual handling	5.00	-	2.00	-	3.67	1.53	3.00	-	4.50	0.76	3.63	1.13
Repetitive movement	3.00	-	-	-	3.00	0.00	3.00	-	4.50	0.76	3.63	1.08
Hazardous substances	4.00	-	4.00	-	3.00	-	-	-	3.75	0.46	3.12	0.95
Working at height	-	-	2.00	-	2.67	0.58	-	-	4.50	1.07	3.19	1.47
Dangerous machinery	-	-	3.00	-	4.00	-	-	-	3.00	1.20	2.59	1.33
Job stress	2.00	-	2.00	-	4.33	0.58	2.00	-	3.50	0.76	3.00	1.06
Vehicle handling	-	-	-	-	4.00	1.00	-	-	3.88	0.83	3.14	1.24
Slips and trips	4.00	-	1.00	-	5.00	-	2.00	-	2.88	0.99	2.80	1.29
Noise	-	-	3.00	-	-	-	-	-	3.50	0.76	2.50	1.19
Handheld equipment	-	-	2.00	-	-	-	-	-	4.00	0.93	2.59	1.44
Mean hazard management	4.00	-	3.00	-	3.64	0.17	2.50	-	3.80	0.52	3.08	0.88

Table 9
Comparison of the mean benchmark performance scores of organisations from higher- and lower-hazard sectors of industry

	Lower-risk sectors		Higher-risk sectors		F	*p*
	Mean	se	Mean	se		
Overall hazard management	3.33	0.37	2.89	0.29	0.91	0.35
Overall incident	3.07	0.37	3.44	0.26	0.73	0.40
Manual handling	3.21	0.28	3.94	0.26	3.57	0.07
Repetitive movement	3.28	0.27	3.88	0.29	2.12	0.16
Hazardous substances	2.67	0.29	3.35	0.23	3.35	0.08
Working at height	2.80	0.42	3.44	0.39	1.17	0.29
Dangerous machinery	2.33	0.56	2.69	0.34	0.30	0.59
Job stress	3.00	0.28	3.00	0.27	0.00	1.00
Vehicle handling	2.83	0.65	3.27	0.28	0.51	0.48
Slips and trips	3.11	0.54	2.63	0.27	0.81	0.38
Noise	1.75	0.25	2.69	0.31	2.09	0.17
Handheld equipment	1.33	0.21	3.06	0.35	8.62	0.008
Mean hazard management	2.98	0.24	3.16	0.20	0.34	0.57

Performance and organisation size

The performance questionnaire also collected information about organisation size. Most of the respondents described their organisation as having over 250 employees ($n = 21$, 64 per cent), with three (9 per cent) having 100–250 employees, seven (21 per cent) 50–99 and the remaining two (6 per cent) 10–50 employees.

Comparisons were made between those with over 250 employees and those with fewer (Tables 9 and 10). The only significant difference in terms of overall scores was for overall hazard management ($F = 6.01$, $p = 0.02$), where smaller organisations had higher scores (Table 10).

Table 10 Absolute performance scores by organisation size

	Organisation size			
	250 or under		Over 250	
	Mean	se	Mean	se
Overall hazard management	7.43	0.40	6.19	0.30
Overall incident	7.25	0.91	5.90	0.61
Manual handling	5.82	0.60	5.69	0.34
Repetitive movement	5.21	0.36	5.88	0.41
Hazardous substances	6.56	0.40	6.06	0.30
Working at height	6.00	0.42	6.34	0.37
Dangerous machinery	6.30	0.58	5.38	0.46
Job stress	6.68	0.46	5.65	0.36
Vehicle handling	4.50	0.87	4.56	0.27
Slips and trips	6.50	0.74	5.75	0.34
Noise	4.80	0.68	5.23	0.40
Handheld equipment	4.00	0.65	4.82	0.45
Mean hazard management	6.25	0.44	5.61	0.23

However, larger organisations had generally higher benchmark performance scores (Table 11), with significant differences for repetitive movement ($F = 5.72$, $p = 0.03$); hazardous substances ($F = 9.04$, $p = 0.006$); and working at height ($F = 4.09$, $p = 0.05$).

Differences in safety performance by organisation size, however, may to some extent reflect their industrial sector. More of the organisations with 250 or fewer employees operated in lower-risk sectors of industry (eight, or 67 per cent, compared with four, or 33 per cent, of those with more than 250 employees: $\chi^2 = 3.42$, 1 df, $p = 0.06$).

Summary of performance survey

These findings show relatively high mean levels of corporate health and safety performance across the participating organisations. However, they also show some variation between participants, and both across and between industrial sectors. There was also some variation according to organisation size, with smaller organisations having generally higher absolute scores and larger ones having generally higher benchmark scores.

4.3.2 Advice survey

The advice survey was carried out among the participating organisations' OSH practitioners or advisers. It was intended to describe their roles, experiences and competence. The findings showed that:

- OSH practitioners spent most of their time on health and safety, though they also had other roles
- OSH practitioners had a variety of training and qualifications

Table 11
Benchmark performance scores by organisation size

	Organisation size			
	250 or under		Over 250	
	Mean	se	Mean	se
Overall hazard management	3.00	0.39	3.14	0.30
Overall incident	3.08	0.42	3.38	0.25
Manual handling	3.18	0.35	3.86	0.23
Repetitive movement	2.86	0.34	3.90	0.23
Hazardous substances	2.44	0.38	3.47	0.15
Working at height	2.29	0.42	3.53	0.34
Dangerous machinery	2..60	0.40	2.59	0.35
Job stress	2.55	0.28	3.25	0.24
Vehicle handling	2.50	0.65	3.29	0.29
Slips and trips	2.44	0.58	3.00	0.24
Noise	2.00	0.32	2.67	0.33
Handheld equipment	1.80	0.37	2.82	0.37
Mean hazard management	2.71	0.27	3.29	0.17

- Most felt their organisation was supportive of them and they had influence over health and safety decisions.

The UK Management of Health and Safety at Work Regulations 1999[83] state that employers must appoint one or more competent persons for health and safety assistance, and they define a competent person as having 'sufficient training and experience or knowledge and other qualities properly to undertake' the necessary measures to comply with the statutory requirements and prohibitions. In this context, therefore, the project's third aim is addressed here by describing the training, qualification and experience of the participating organisations' OSH practitioners – in effect to detail, as far as possible, their competence.

Respondents
In total, 37 respondents completed the advice survey, 33 of whom were the main health and safety practitioner or adviser for their business unit. Their demographic characteristics and some of their work characteristics are summarised in Table 12 (page 36).

The following sections (unless otherwise indicated) focus only on those respondents with main responsibility for health and safety in their business unit.

Advisers' roles
The majority of the advisers (27, 82 per cent) had other functions as part of their roles (such as administration (16, 49 per cent), environment (17, 52 per cent) or security (9, 27 per cent)) in addition to health and safety. Despite this, however, most (22, 67 per cent) spent over 20 hours per week on health and safety issues, with only six (18 per cent) reporting spending five hours or less per week. Just under half (16, 49 per cent) had worked in the role of health and safety adviser for over eight years, and most (23, 70 per cent) had been in their current industry for over eight years. Just over one third (12, 36 per cent) were the designated competent person at a site employing over 1,000 staff, with a further six (18 per cent) acting as the designated competent person to 501–1,000 staff. Ten (30 per cent) were the designated competent person on sites with 51–100 staff (6, 18 per cent) or 50 or fewer staff (4, 12 per cent). Table 13 (page 37) shows the areas in which they felt they gave competent advice.

Most of the respondents (29, 88 per cent) felt they had sufficient knowledge to give advice in the areas they were responsible for, but one respondent did not and a further three did not know.

Table 12
Demographic data on advice survey respondents

		All respondents (*n* = 37)	Respondents with main responsibility (*n* = 33)
Sex: male	*n*	27	24
	%	75	75
Age	Mean	45.75	46.06
	sd	10.22	9.41
	Range	23–63	29–60
Marital status: married or cohabiting	*n*	28	26
	%	80	84
Education: degree, higher degree or equivalent professional qualification	*n*	24	24
	%	67	73
Ethnicity: white	*n*	37	33
	%	100	100
Contract: permanent	*n*	37	33
	%	100	100
Level: manager or supervisor	*n*	31	31
	%	84	94
Years in post	Mean	5.76	5.73
	sd	6.55	6.75
	Range	< 1–30	< 1–30
Working hours per week	Mean	41.08	41.21
	sd	6.54	6.85
	Range	20–55	20–55
Enjoy job: really	*n*	13	12
	%	35	36
Suffer from work stress: very or extremely	*n*	4	4
	%	11	12

Advisers' training, education and qualifications

Most advisers (28, 85 per cent) also felt that had adequate training and education for their role. The training respondents had received is listed in Table 14. Three had no formal training at all. The qualifications and training courses shown in Table 14 were categorised as follows:

- IOSH *Managing safely* (awareness training course)
- NEBOSH Certificate
- NEBOSH Diploma (awarded before 2000, part 1 or part 2)
- degree, diploma of higher education, postgraduate diplioma or masters in health and safety
- other (contractor's passport, British Safety Council Certificate or Diploma, S/NVQ level 3 or 4).

According to these groups, 11 respondents (33 per cent) had one category of training qualification, a further 11 (33 per cent) had two, six (18 per cent) had three, and two (6 per cent) had four.

Table 13
Hazards on which advisers provided competent advice

Hazard	Advice given	
	n	%
Slips, trips and falls	30	91
Display screen equipment	28	85
Maintenance or repair	26	79
Manual handling	25	76
Noise	25	76
Fire	23	70
Chemicals	22	67
Electrical hazards	22	67
Stress	20	61
Machinery	19	58
Transport	19	58
Thermal hazards	12	36
Non-ionising radiation	11	33
Biological agents	7	21
Ionising radiation	7	21
Other (eg vibration)	7	21

Table 14
Advisers' training and/or qualification level

Training and qualification level	Held by	
	n	%
None	3	9
Contractor's passport	3	9
British Safety Council Certificate in Safety Management	1	3
British Safety Council Diploma in Safety Management	2	6
Managing safely (IOSH awareness training course)	11	33
S/NVQ level 3	1	3
S/NVQ level 4	8	24
NEBOSH Certificate	19	58
NEBOSH Diploma (awarded before 2000)	5	15
NEBOSH Diploma (part 1)	4	12
NEBOSH Diploma (part 2)	3	9
Degree or diploma of higher education in health and safety	7	21
Postgraduate diploma or master's degree in health and safety	4	12

Table 15 shows advisers' training, education and qualification categories by industrial sector. Each of the categories crossed sectors, and the three advisers with no training each worked in a different sector (manufacturing, education and science).

Table 15
Training and qualifications by adviser's industry sector

Sector	Total number of advisers	Number of advisers with...					
		No training	IOSH *Managing safely*	NEBOSH Cert	NEBOSH Diploma	Degree	Other
Manufacturing	8	1	3	6	2	2	3
Health	5	0	1	1	3	2	1
Education	4	1	1	2	0	1	1
Science	4	1	2	1	1	0	0
Retail	3	0	0	3	0	0	3
Construction	2	0	1	1	1	2	0
Transport	2	0	1	1	0	2	0
Communications	2	0	0	1	1	1	1
Finance	1	0	1	1	0	0	0
Utilities	1	0	1	1	1	0	1
Health and safety	1	0	0	1	0	0	0
Total		3	11	19	9	10	10

Table 16 shows advisers' training and qualification categories by the number of employees on the site at which they were the competent person. Again the categories were each represented in a range of site sizes. Two of the advisers with no training were the designated competent person on sites with 51–100 staff, and the third on a site with 1,001 or more staff.

The advisers, therefore, had a range of training and qualifications, and a minority had no training at all. The kinds of qualification held by the advisers were not specific to either the industrial sector they worked in or the size of the site on which they were the competent person.

Table 16
Training and qualifications by number of employees on site at which the adviser is a competent person

Number of employees	Number of advisers with...					
	No training	IOSH *Managing safely*	NEBOSH Cert	NEBOSH Diploma	Degree	Other
Up to 50	0	2	3	1	1	0
51–100	2	3	2	1	1	1
101–250	0	1	2	0	0	0
251–500	0	1	2	0	1	2
501–1,000	0	2	3	3	3	2
1,001 or more	1	2	7	4	4	5
Total	3	11	19	9	10	10

IOSH membership

Two thirds of the respondents (22, 67 per cent) were members of IOSH: 15 were Chartered members, two were Graduate members, one was a Technician member, and four did not specify their membership type.

Advisers' training varied with IOSH membership category. None of those with no training were IOSH members, while all or virtually all of those with a NEBOSH Diploma, degree or other qualification were IOSH members. Just under half of those with the IOSH *Managing safely* awareness training course certificate were members, as were nearly 80 per cent of those with a NEBOSH Certificate (Table 17).

Table 17
IOSH membership by training and qualifications

	IOSH members		Non-IOSH members		Total	
	n	%	*n*	%	*n*	%
No training	0	0	3	100	3	100
IOSH *Managing safely*	5	45	6	55	11	100
NEBOSH Certificate	15	79	4	21	19	100
NEBOSH Diploma	9	100	0	0	9	100
Degree	10	100	0	0	10	100
Other	9	90	1	10	10	100

Almost all the industrial sectors represented in the study had at least one adviser who was an IOSH member (Table 18).

Table 18
IOSH membership by adviser's industry sector

Sector	IOSH members		Non-IOSH members		Total	
	n	%	*n*	%	*n*	%
Manufacturing	6	75	2	25	8	100
Health	4	80	1	20	5	100
Education	2	50	2	50	4	100
Science	1	25	3	75	4	100
Retail	3	100	0	0	3	100
Construction	2	100	0	0	2	100
Transport	2	100	0	0	2	100
Communications	1	50	1	50	2	100
Finance	0	0	1	100	1	100
Utilities	1	100	0	0	1	100
Health and safety	0	0	1	100	1	100
Total	22	67	11	33	33	100

There was, however, a suggestion that the proportion of advisers who were IOSH members increased with the number of employees on the site at which the adviser was the competent person (Table 19).

Table 19
IOSH membership by number of employees on site at which the adviser is a competent person

Number of employees	IOSH members		Non-IOSH members		Total	
	n	%	*n*	%	*n*	%
Up to 50	1	25	3	75	4	100
51–100	2	33	4	67	6	100
101–250	1	50	1	50	2	100
251–500	2	67	1	33	3	100
501–1,000	6	100	0	0	6	100
1,001 or more	10	83	2	17	12	100
Total	22	67	11	33	33	100

Advisers and their organisations

The majority of the advisers described their organisation as very (19, 58 per cent) or extremely (7, 21 per cent) supportive of their continuing professional development.

Most described their organisation as having, or working towards, accreditation by:

- the ISO 9000 quality system (19, 58 per cent)
- Investors in People (20, 61 per cent)
- the ISO 14001 environmental system (20, 61 per cent).

In addition:

- 11 (33 per cent) had or were working towards accreditation under the OHSAS 18001 health and safety management system
- five (15 per cent) had or were working towards accreditation under the British Safety Council's Five Star health and safety management system
- one (3 per cent) had accreditation under the International Safety Rating System.

Table 20 shows which safety systems and policies advisers reported were in place and how effective they felt each was. Considering each system or policy individually, most advisers reported having them in place. However, for several of the systems or policies over one third felt there was room for improvement:

- workforce involvement in proposing improvements
- risk assessments
- health and safety committee
- workforce involvement in identifying hazards
- audits and inspections.

Considering all the systems and policies together, a little under two thirds (20, 61 per cent) of the advisers reported that their business were missing one or more of the policies and systems listed in Table 20. When asked about the policies and systems that were in place, just over three quarters (25, 76 per cent) of the advisers felt that at least one of them needed improvement. A lower proportion of IOSH members reported having one or more missing system or policy (12, or 55 per cent, compared to 8, or 73 per cent, of non-IOSH members) though this difference did not reach significance ($p = 0.46$). However a significantly higher proportion of IOSH members reported having one or more system or policy that needed improvement (20, or 91 per cent, compared to 5, or 45 per cent, of non-IOSH members; $p = 0.008$). These comparisons were repeated using a 'training' variable which comprised two groups:

- those who had no formal qualifications, IOSH *Managing safely* or a NEBOSH Certificate (training groups 'no training', A and B above), numbering 12 or 36 per cent
- those who had a NEBOSH Diploma, degree or other formal qualification (training groups C, D and E above), numbering 21 or 64 per cent.

Table 20
Safety systems and policies

Aspect of safety system and policy	In place		Very effective		Adequate		Needs improvement	
	n	%	*n*	%	*n*	%	*n*	%
Risk assessments	33	100	11	33	9	27	13	39
Documented health and safety policy	33	100	15	46	11	33	7	21
Workforce involvement in identifying hazards	32	97	5	16	16	50	11	34
Senior management committed to health and safety	32	97	14	44	10	31	8	25
Health and safety information easily available for workers	31	94	10	32	18	58	3	10
Health and safety committee	31	94	9	29	11	36	11	36
Health and safety reviews	31	94	7	23	16	52	8	26
Workforce involvement in proposing improvements	31	94	7	23	11	36	13	42
Clearly defined structure for health and safety responsibility	30	91	15	50	8	27	7	23
Accident/incident analysis	29	88	10	35	17	59	2	7
Audits/inspections	29	88	10	35	9	31	10	35
Refresher training	28	85	8	29	11	39	9	32
Training	28	85	13	46	7	25	8	29
Documented, tested and reviewed emergency plans	28	85	8	29	13	46	7	25
Documented safe systems	26	79	5	19	13	50	8	31
Well defined, reviewed and achieved health and safety targets	24	73	7	29	13	54	4	17

This categorisation is, in fact, very similar to IOSH membership, with all but two IOSH members in the second category and all but one non-IOSH member in the first. The results, therefore, were very similar (Table 21).

Table 21
OSH policies and systems by adviser's training and qualifications

	No training, A or B		C, D or E		χ^2	df	*p*
	n	%	*n*	%			
One or missing policy	8	67	12	57	0.29	1	0.72
One or more policy needing improvement	5	42	20	95	11.93	1	0.001

A: IOSH *Managing safely*
B: NEBOSH Certificate
C: NEBOSH Diploma (awarded before 2000, part 1 or part 2)
D: Degree, diploma of higher education, postgraduate diploma or masters in health and safety
E: Other (contractor's passport, BSC Certificate or Diploma, S/NVQ level 3 or 4)

Though these analyses should be interpreted extremely cautiously because of the small numbers involved, they suggest an association between awareness of the need for improvement in health and safety systems and policies and advisers' training and IOSH membership. They also suggest a possible trend whereby more IOSH members and those in training groups C, D or E had all the listed health and safety systems and policies in place.

Most of the advisers felt they had a good knowledge of all health and safety legislation (26, 73 per cent) and a good understanding of health and safety risks in their organisation (31, 100 per cent). The majority also felt they were aware of when they needed to seek additional support (31, 94 per cent).

Similarly, most advisers (30, 91 per cent) felt they were able to influence the decisions of directors on health and safety issues. However, nine (27 per cent) reported not being able to influence the level at which the health and safety budget was set, and a further eight (24 per cent) reported working in organisations without a health and safety budget. In addition, only one third (11, 33 per cent) felt that health and safety was given equal priority to other aspects of the business.

Advice survey summary

In summary, most of the respondents to the advice survey had other roles in addition to health and safety but spent most of their working time on health and safety matters. They had a range of training and qualifications in health and safety, but three had no health and safety training at all and five did not feel they had adequate training for their role.* Two thirds were members of IOSH. They described their organisations, in the main, as having safety systems and policies in place, though in some cases they felt there was room for improvement on this, and both these factors showed some variation with advisers' training and IOSH membership. Finally, most reported working in organisations that were supportive of their continuing professional development, and most felt they had influence over health and safety decisions, even though only one third felt health and safety had equal priority with other aspects of the business.

4.3.3 Climate survey

The climate survey was carried out among the participating organisations' employees. It was intended to describe their organisations' safety climates, giving a snapshot of their underlying safety cultures. The findings showed that:

- safety climate varied across the participating organisations
- safety climate also varied both within and between industry sectors
- organisations operating in traditionally higher risk sectors of industry had more favourable safety climates; this may reflect greater awareness of the importance of safety among those facing high risk levels.

The participating organisations' safety climates are described below. This addresses the project's first aim.

The Safety Climate Tool scoring system shows proportions of each participating organisation's employees giving favourable, neutral and unfavourable responses. Figure 5 shows the proportion of favourable responses in each participating organisation for 'organisational commitment to safety'. The proportion of favourable responses ranged from 42 per cent (Communications 2) to 85 per cent (Transport 1). Variation was apparent both between organisations and within and between industrial sectors.

Across all the climate measures, the lowest proportion of favourable responses was 18 per cent for 'reporting accidents' (Communications 2), while the highest was 97 per cent for 'competence' (Health 5). An overall mean score for all climate measures combined was also calculated for each participating business unit. These mean scores ranged from 41 per cent favourable responses (Communications 2) to 85 per cent (Health 5), with an overall mean for the participating organisations of 59.73 (sd = 10.79).

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* The level of qualification, experience and skills necessary to provide competent advice will vary according to the complexity of the situation. However, for the most basic level of advice, it has been suggested that OSH practitioners should be qualified to meet the National Occupational Standard level 3.[84] Clearly, some of the levels of training and qualification reported by these respondents fall below this most basic level.

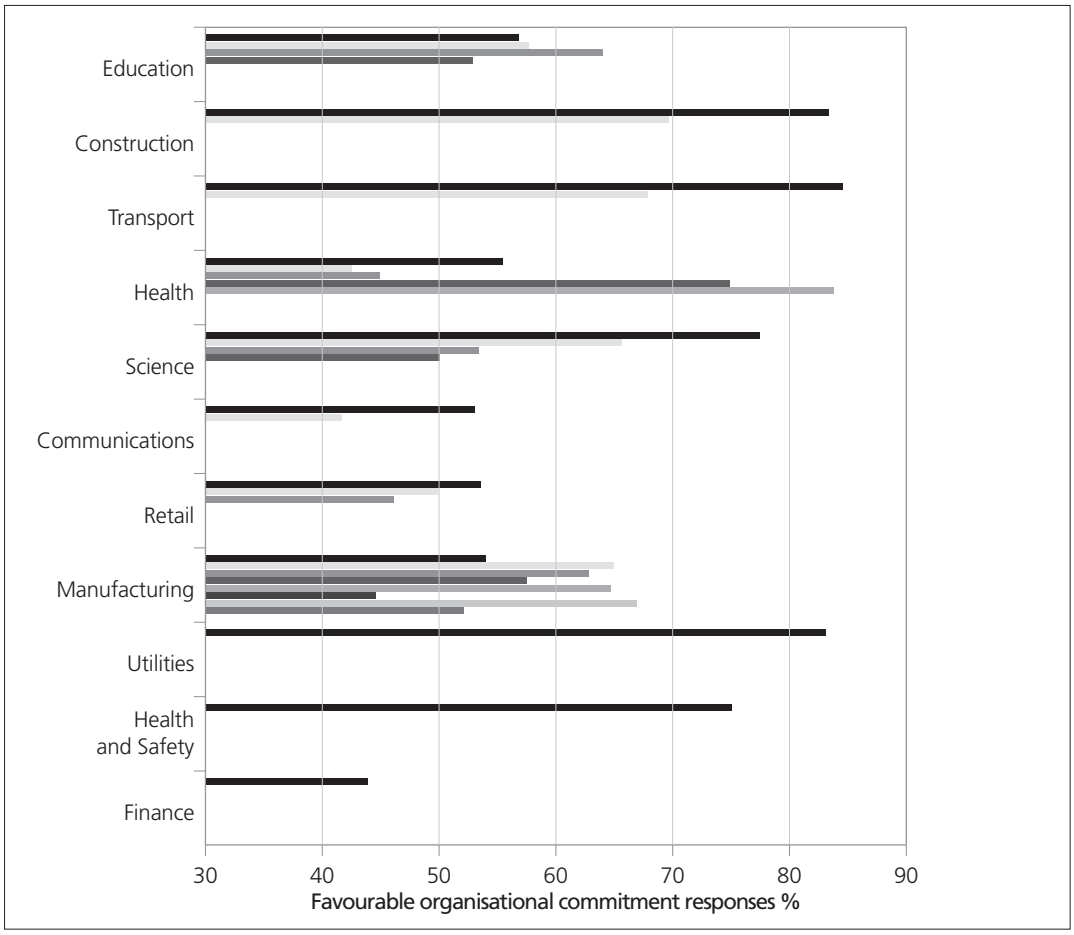

Figure 5
Proportion of respondents with favourable 'organisational commitment' responses in each participating organisation

The proportion of favourable responses also varied significantly by industrial sector for many of the climate measures, including:

- 'organisational commitment': $F = 2.31$, $p = 0.05$, range 43.90 (Finance) to 83.10 (Utilities)
- 'line management commitment': $F = 4.94$, $p = 0.001$, range 22.70 (Finance) to 91.30 (Utilities)
- 'supervisor's role': $F = 4.03$, $p = 0.003$, range 34.75 (Communications) to 83.10 (Construction)
- 'personal role': $F = 4.42$, $p = 0.002$, range 40.90 (Finance) to 89.10 (Utilities)
- 'workmates' influence': $F = 2.80$, $p = 0.02$, range 50.45 (Communications) to 85.00 (Construction)
- 'competence': $F = 4.48$, $p = 0.002$, range 47.30 (Finance) to 89.70 (Transport)
- 'reporting accidents': $F = 2.96$, $p = 0.02$, range 29.45 (Communications) to 69.40 (Health and safety)
- overall mean: $F = 2.81$, $p = 0.02$, range 44.77 (Finance) to 74.36 (Transport).

Finally, organisations were split into two groups according to whether they operated in traditionally higher-hazard sectors of industry (construction, transport, manufacturing, health and utilities) or lower-hazard sectors (education, science, communications, health and safety, finance and retail). Here significant differences were apparent for 'line management commitment to safety', 'personal role', 'workmates' influence', 'competence', 'reporting accidents' and overall mean score (Table 22). In each case, organisations from lower-hazard sectors of industry had lower mean proportions of favourable responses. This pattern was similar across the factors where no significant difference was apparent, suggesting a consistent difference in safety climate by industrial sector.

Climate survey summary

The participating organisations' safety climates varied considerably both within and between industry sectors. Comparing higher- and lower-hazard sectors of industry also showed significant differences, with those from riskier sectors having higher proportions of employees giving favourable responses on the climate measures. A generally more favourable safety climate in sectors with more inherent risks may reflect a greater awareness and perhaps more serious approach to safety among those working with greater levels of risk.

Table 22
Mean proportions of favourable climate responses by industry sector

Safety climate response	Lower-risk sectors		Higher-risk sectors		F	*p*
	Mean	sd	Mean	sd		
Organisational commitment	56.10	10.49	64.33	13.92	3.55	0.07
Line management commitment	53.52	11.87	64.90	13.96	6.21	0.02
Supervisor's role	53.55	11.22	59.44	16.32	1.40	0.25
Personal role	60.61	9.97	73.09	10.32	12.34	0.001
Workmates' influence	57.97	8.91	67.39	13.44	5.39	0.03
Competence	71.25	9.11	78.17	8.92	4.83	0.04
Risk-taking behaviour	51.21	9.81	55.47	15.37	0.86	0.36
Obstacles to safety	44.61	9.01	50.81	13.40	2.32	0.14
Reporting accidents	40.24	15.71	56.06	11.95	10.78	0.003
Job satisfaction	65.75	16.29	63.09	12.07	0.29	0.59
Overall mean	55.48	8.76	63.27	11.26	4.77	0.04

4.3.4 Perceptions of safety and individual safety performance

The two climate surveys (carried out among a sample of general workers and among participating organisations' employees) allowed the assessment of any association between perceptions of and attitudes towards safety and individual safety performance. The analyses were also extended to consider any association between perceptions of safety and individual health and wellbeing. These two surveys showed that:

- perceptions of and attitudes towards safety are independently associated with individual safety performance
- this association seems primarily to reflect perceptions of management approach to safety
- perceptions of and attitudes towards safety are independently associated with individual health and wellbeing
- this association reflects a consistent link with poor job satisfaction.

Findings between the two surveys were consistent, suggesting that:

- perceptions of and attitudes towards safety can be measured at an individual level using the Climate Survey Tool
- the associations between perceptions of and attitudes towards safety and individual safety performance, health and wellbeing are robust and generally applicable across industry sectors.

This section focuses on the association between perceptions of and attitudes towards safety, and individual safety performance. First, the climate survey carried out among the participating organisations' employees is considered.

4.3.5 Climate survey

This section describes findings from the climate survey of the main study, which aimed to gauge the participating organisations' safety climates in order to give a snapshot measure of their underlying safety culture. However, it also provided the opportunity to consider any associations between perceptions of and attitudes towards safety and individual safety performance, health and wellbeing. This section, therefore, explores the possibility of measuring perceptions of and attitudes towards safety at an individual level using the Climate Survey Tool, and assessing their association with both individual safety performance and health and wellbeing.

Respondents

In total 1,752 people completed the climate survey. Most were men (1,095, 64 per cent), their mean age was 42.23 years (sd = 11.31, range 17 to 66), most were married (958, 57 per cent) or cohabiting (255, 15 per cent), and virtually all were white (1,642, 97 per cent). A little over one third (656, 39 per cent)

had a bachelor's degree, a higher degree or a professional qualification at an equivalent level; 46 per cent (771) had A levels or equivalent, City and Guilds qualifications, or a national diploma or certificate; and 15 per cent (245) had O levels or equivalent, or no formal educational qualifications. Almost all the respondents worked full time (1,575, 91 per cent) in permanent jobs (1,653, 96 per cent). Two thirds described themselves as employees (1136, 66 per cent) rather than managers (364, 21 per cent) or supervisors (218, 13 per cent). Occupational coding with the Computer Aided Structured Coding Tool (CASCOT)[85] showed that:

- just under one fifth (300, 18 per cent) of the respondents were managers or senior officials
- 11 per cent (173) had professional occupations
- 22 per cent (355) worked in associated professional or technical occupations
- 11 per cent (184) had administrative or secretarial occupations
- the remainder worked in:
  - skilled trades (223, 14 per cent)
  - personal service occupations (56, 3 per cent)
  - sales or customer service occupations (78, 5 per cent)
  - process, plant or machine operation (251, 15 per cent)
  - elementary occupations (27, 2 per cent).

The mean number of years in their current position was 7.11 (sd = 8.08, range 0–43 years), and mean number of hours worked per week was 38.69 (sd = 7.71, range 2–70 hours). Approximately a quarter (444, 26 per cent) reported really enjoying their job, with 6 per cent (107) reporting that they did not really enjoy their job.

Safety performance
In total, 140 respondents (8 per cent) reported having had at least one accident at work in the previous 12 months which required medical attention. Just under a quarter (396, 23 per cent) reported occasional, quite or very frequent minor injuries at work in the previous 12 months, and 43 per cent (752) reported occasional, quite or very frequent cognitive failures at work.

Health and wellbeing
Just over two fifths (699, 41 per cent) reported taking no days of sick leave in the last 12 months (mean = 5.97, sd = 17.75, range 0–365 days), and just under one third (499, 30 per cent) reported no GP visits in the previous 12 months (mean = 1.87, sd = 2.44, range 0–32). Just over three quarters described their general health as good or very good (1,318, 76 per cent), and 15 per cent (261) described their job as very or extremely stressful. The mean Hospital Anxiety and Depression (HAD)[72] anxiety score was 5.62 (sd = 3.72, range 0–19), with 12 per cent (200) at or above the clinical cut-off point of 11. The mean HAD depression score was 3.52 (sd = 3.21, range 0–19), with 3 per cent (53) at or above the clinical cut-off point of 11. In addition, 18 per cent (307) reported having suffered an illness that they thought was caused or made worse by work in the previous 12 months.

Safety climate
The HSE Climate Survey Tool gives proportions of favourable, neutral and unfavourable responses made to the questions which combine to calculate each factor. Here, however, standardised scores were calculated on an individual basis to give measures of perceptions of and attitudes towards safety (Table 23). These individual scores were standardised to allow direct comparison of the factors, each of which is made up of a different number of questions.

Associations between perceptions of and attitudes towards safety and individual safety performance
Univariate analyses were used to consider any association between the Climate Survey Tool factors scored on an individual basis and individual safety performance (Tables 24–26). These analyses suggest strong associations between overall safety perceptions and both personal accidents and less serious injuries, and cognitive failures. Considering the individual safety perception factors, each factor was strongly associated with each individual performance outcome measure.

Associations between perceptions of and attitudes towards safety and individual health and wellbeing
Similar univariate analyses were carried out to consider any association between perceptions of and attitudes towards safety and individual health and wellbeing. The results are summarised in Table 27.

Again overall safety perceptions were strongly associated with each of the measures of health and wellbeing. The safety perception factors considered individually also showed strong association between all of the factors and each of the outcome measures.

Table 23
Climate Survey Tool factor responses

Factor	Individual coding*	
	Mean	sd
Organisational commitment	71.63	23.03
Line management commitment	70.77	28.27
Supervisor's role	67.75	30.76
Personal role	74.99	22.90
Workmates' influence	73.69	27.48
Competence	82.90	21.72
Risk-taking behaviour	63.31	25.13
Obstacles to safety	57.49	26.55
Reporting accidents	62.55	34.82
General job satisfaction	69.43	30.35

* Factor scores calculated per individual and standardised to a 0–100 scale. A higher score indicates a more favourable response

Table 24
Safety perception factor scores by individual safety performance: number of accidents at work in the last 12 months

Factor	No accidents		1 or more accidents		F	df	*p*
	Mean	se	Mean	se			
Organisational commitment	72.70	0.58	57.70	2.39	51.45	1629	<0.0001
Line management commitment	71.79	0.70	57.87	2.75	30.67	1688	<0.0001
Supervisor's role	69.27	0.76	49.72	2.98	51.74	1681	<0.0001
Personal role	75.88	0.57	65.29	2.18	26.58	1672	<0.0001
Workmates' influence	74.89	0.84	59.82	3.02	27.53	1118	<0.0001
Competence	83.57	0.55	74.74	2.08	20.65	1670	<0.0001
Risk-taking behaviour	64.67	0.63	47.28	2.30	61.38	1642	<0.0001
Obstacles to safety	58.55	0.67	43.51	2.22	39.66	1650	<0.0001
Reporting accidents	63.61	0.87	48.54	3.33	23.84	1698	<0.0001
Job satisfaction	70.68	0.76	54.41	2.81	36.69	1689	<0.0001
Overall score*	70.22	0.51	54.91	2.07	68.87	1447	<0.0001

* Overall score = average of all factors except number 5 (workmates' influence), which was not answered by managers or supervisors

Table 25
Safety perception factor scores by individual safety performance: number of minor injuries at work in the last 12 months

Factor	No or rare minor injuries		Frequent minor injuries		F	df	*p*
	Mean	se	Mean	se			
Organisational commitment	75.33	0.59	58.45	1.33	168.17	1631	<0.0001
Line management commitment	73.48	0.74	60.98	1.59	59.98	1689	<0.0001
Supervisor's role	71.37	0.80	55.36	1.71	84.70	1682	<0.0001
Personal role	76.90	0.62	68.42	1.24	41.51	1671	<0.0001
Workmates' influence	77.39	0.90	63.42	1.67	61.42	1118	<0.0001
Competence	84.47	0.59	77.78	1.17	28.59	1672	<0.0001
Risk-taking behaviour	67.05	0.66	50.33	1.36	139.55	1643	<0.0001
Obstacles to safety	61.17	0.71	44.46	1.38	123.91	1651	<0.0001
Reporting accidents	65.61	0.92	51.66	1.89	49.65	1699	<0.0001
Job satisfaction	72.58	0.80	58.83	1.64	63.79	1689	<0.0001
Overall score*	71.90	0.53	58.83	1.14	125.17	1447	<0.0001

* Overall score = average of all factors except number 5 (workmates' influence), which was not answered by managers or supervisors

Table 26
Safety perception factor scores by individual safety performance: number of cognitive failures at work in the last 12 months

Factor	No or rare cognitive failures		Frequent cognitive failures		F	df	*p*
	Mean	se	Mean	se			
Organisational commitment	73.49	0.74	69.01	0.88	15.32	1636	<0.0001
Line management commitment	72.88	0.90	67.76	1.05	13.74	1695	<0.0001
Supervisor's role	69.92	0.98	64.80	1.15	11.56	1687	0.001
Personal role	77.26	0.71	71.99	0.88	22.05	1679	<0.0001
Workmates' influence	76.75	1.08	69.61	1.23	19.03	1124	<0.0001
Competence	84.65	0.70	80.62	0.81	14.30	1678	<0.0001
Risk-taking behaviour	65.99	0.82	59.62	0.93	26.44	1648	<0.0001
Obstacles to safety	60.87	0.85	53.03	0.99	36.45	1658	<0.0001
Reporting accidents	64.89	1.09	59.23	1.31	11.15	1705	0.001
Job satisfaction	73.15	0.94	64.46	1.15	34.73	1696	<0.0001
Overall score*	71.44	0.66	65.90	0.77	30.12	1453	<0.0001

* Overall score = average of all factors except number 5 (workmates' influence), which was not answered by managers or supervisors

Table 27 Univariate associations (*F*, *p*) between safety perception factors and health and wellbeing measures

Factor	Sick leave		Stress		Work illness	
	F	*p*	F	*p*	F	*p*
Organisational commitment	53.90	<0.0001	35.14	<0.0001	62.55	<0.0001
Line management commitment	28.88	<0.0001	31.67	<0.0001	60.04	<0.0001
Supervisor's role	34.17	<0.0001	22.73	<0.0001	39.36	<0.0001
Personal role	10.18	0.001	4.01	0.05	14.28	<0.0001
Workmates' influence	10.23	0.001	14.21	<0.0001	13.68	<0.0001
Competence	18.06	<0.0001	15.87	<0.0001	19.67	<0.0001
Risk-taking behaviour	38.77	<0.0001	52.39	<0.0001	62.80	<0.0001
Obstacles to safety	23.52	<0.0001	34.84	<0.0001	35.52	<0.0001
Reporting accidents	11.56	0.001	18.54	<0.0001	26.87	<0.0001
Job satisfaction	59.46	<0.0001	34.85	<0.0001	75.69	<0.0001
Overall score	53.15	<0.0001	47.06	<0.0001	75.47	<0.0001

Perceptions of and attitudes towards safety – multivariate analyses

Multivariate analyses were used to consider further the associations between perceptions of and attitudes towards safety and both individual safety performance and individual health and wellbeing. Backward stepwise logistic regression was used to assess these associations while controlling for the influence of other, potentially confounding, factors. These analyses were carried out in blocks representing:

- demographic and individual factors (such as age, sex, alcohol use)
- job characteristics (such as years in post, hours per week)
- work characteristics (such as job demand, control)
- health (such as anxiety, depression)
- safety perceptions.

These blocks are outlined in Table 46 in Appendix 2. Blocks were run in the order indicated in Table 46, and any significant factors were retained and included with the factors from the next block. Safety perception factors were included as the final block. Two versions of this block were run: the first included each individual safety perception factor, and the second included a single overall item. This blocked approach was used for several reasons. First, it was not possible to include all the variables in a single model. Second, it allowed for the inclusion of factors known to be associated with the outcomes first, followed by the variables of interest (safety perceptions), so building up a parsimonious model based on past research.

In addition, a second complete set of analyses was run as described above but including an industry sector variable (categorised as Health, Manufacturing, Science, Retail, Other) at block two (job characteristics). The sections below show the safety perception measures from the final blocks from the first set of analyses. The final blocks from the second set of analyses are shown only if they were different from the first set, so if sector differences are not referred to, then they were not significant.

Perceptions of and attitudes towards safety and individual safety performance

Table 28 shows only the safety perception measures remaining in the final blocks of the work accidents models. It gives odds ratios for all those safety perception factors that were independently associated with reporting an accident at work that required medical attention in the previous year. For example, in the case of 'supervisor's role', those with a score of 51–100 (ie favourable) are the reference group and, in comparison to this group, those with a score of 0–50 (ie unfavourable) have an odds ratio of 1.80, indicating that those with unfavourable scores were a little under twice as likely as those with favourable scores to report having had an accident at work in the previous year. In fact, Table 28 shows that, when the safety perception factors were considered individually, reporting an accident at work was associated with two of them: 'supervisor's role' and 'obstacles to

Table 28
Safety perceptions and work accidents

Factor	Categorisation	OR	CI	*p*
Block 5a – individual safety perception factors				
Supervisor's role	Favourable	1.00		0.02
	Unfavourable	1.80	1.10–2.93	
Obstacles to safety	Favourable	1.00		0.01
	Unfavourable	1.89	1.15–3.12	
Block 5b – overall safety perceptions				
Overall	Favourable	1.00		0.004
	Unfavourable	2.12	1.28–3.51	

safety'. When the overall measure was considered, unfavourable overall safety perceptions were also associated with reporting an accident at work.

More frequent minor injuries were also associated with safety perceptions. When considered individually, the factors showed associations with unfavourable perceptions of 'risk-taking behaviour' and 'obstacles to safety'. There was also association between unfavourable overall safety perceptions and more frequent minor injuries (Table 29).

Table 29
Safety perceptions and minor injuries

Factor	Categorisation	OR	CI	*p*
Block 5a – individual safety perception factors				
Risk-taking behaviour	Favourable	1.00		0.006
	Unfavourable	1.76	1.18–2.62	
Obstacles to safety	Favourable	1.00		0.001
	Unfavourable	1.92	1.29–2.85	
Block 5b – overall safety perceptions				
Overall	Favourable	1.00		0.002
	Unfavourable	1.94	1.28–2.95	

Adding industry sector to the analyses made no difference to the associations with individual or overall safety perceptions (Table 30). However, there was also an association with sector, with those in the manufacturing, science and other sectors less likely to report frequent minor injuries than those in the health and retail sectors.

Similarly, more frequent cognitive failures at work were associated with both overall safety perceptions and the individual factors 'personal role' and 'job satisfaction' (Table 31).

These analyses show significant associations between individual safety and safety perceptions independent of other demographic factors, job characteristics, work characteristics and health factors. All three individual safety performance outcomes were associated with both unfavourable overall safety perceptions and unfavourable individual safety perception factors.

Table 30
Safety perceptions and minor injuries – including industry sector

Factor	Categorisation	OR	CI	*p*
Block 5a – individual safety perception factors				
Risk-taking behaviour	Favourable	1.00		0.002
	Unfavourable	1.94	1.28–2.93	
Obstacles to safety	Favourable	1.00		0.02
	Unfavourable	1.65	1.09–2.50	
Sector	Health	1.00		<0.0001
	Manufacturing	0.30	0.17–0.54	
	Science	0.52	0.23–1.19	
	Retail	1.63	0.50–5.35	
	Other	0.38	0.18–0.82	
Block 5b – overall safety perceptions				
Overall	Favourable	1.00		0.009
	Unfavourable	1.77	1.15–2.73	
Sector	Health	1.00		<0.0001
	Manufacturing	0.26	0.14–0.46	
	Science	0.47	0.20–1.10	
	Retail	1.26	0.39–4.07	
	Other	0.33	0.15–0.69	

Table 31
Safety perceptions and cognitive failures

Factor	Categorisation	OR	CI	*p*
Block 5a – individual safety perception factors				
Personal role	Favourable	1.00		0.003
	Unfavourable	1.81	1.22–2.67	
Job satisfaction	Favourable	1.00		0.03
	Unfavourable	1.43	1.03–2.00	
Block 5b – overall safety perceptions				
Overall	Favourable	1.00		0.02
	Unfavourable	1.66	1.09–2.51	

Perceptions of and attitudes towards safety and individual health and wellbeing
Table 32 shows that more sick leave was associated with unfavourable overall safety perceptions, and unfavourable perceptions of 'line management commitment to safety', 'risk-taking behaviour' and 'job satisfaction', while favourable perceptions of 'reporting of accidents' approached significance. Reporting a work-related illness was associated with unfavourable overall safety perceptions, and with unfavourable perceptions of 'obstacles to safety', while unfavourable perceptions of 'job satisfaction' approached significance (Table 33). High work stress was associated with unfavourable overall safety perceptions, and with unfavourable perceptions of 'risk-taking behaviour' and 'job satisfaction' (Table 34).

Again, these analyses show significant independent associations between individual health and wellbeing and both individual safety perceptions factors and overall safety perceptions.

Table 32
Safety perceptions and sick leave

Factor	Categorisation	OR	CI	*p*
Block 5a – individual safety perception factors				
Line management	Favourable	1.00		0.03
	Unfavourable	1.44	1.03–2.02	
Risk-taking behaviour	Favourable	1.00		0.04
	Unfavourable	1.42	1.02–1.98	
Reporting accidents	Favourable	1.00		0.10
	Unfavourable	0.77	0.56–1.05	
Job satisfaction	Favourable	1.00		0.02
	Unfavourable	1.43	1.06–1.94	
Block 5b – overall safety perceptions				
Overall	Favourable	1.00		0.02
	Unfavourable	1.51	1.06–2.16	

Table 33
Safety perceptions and work-related illness

Factor	Categorisation	OR	CI	*p*
Block 5a – individual safety perception factors				
Obstacles to safety	Favourable	1.00		0.02
	Unfavourable	1.51	1.07–2.12	
Job satisfaction	Favourable	1.00		0.09
	Unfavourable	1.39	0.96–2.01	
Block 5b – overall safety perceptions				
Overall	Favourable	1.00		0.02
	Unfavourable	1.58	1.07–2.33	

Table 34
Safety perceptions and work stress

Factor	Categorisation	OR	CI	*p*
Block 5a – individual safety perception factors				
Risk-taking behaviour	Favourable	1.00		0.03
	Unfavourable	1.52	1.04–2.24	
Job satisfaction	Favourable	1.00		0.004
	Unfavourable	1.79	1.20–2.67	
Block 5b – overall safety perceptions				
Overall	Favourable	1.00		0.05
	Unfavourable	1.57	1.00–2.46	

Summary of perceptions of and attitudes towards safety and both individual safety performance and health and wellbeing

The associations between perceptions of and attitudes towards safety and both individual safety performance and health and wellbeing are summarised in Table 35.

Table 35 Summary of associations between perceptions of and attitudes towards safety and both individual safety performance and health and wellbeing

	Individual safety performance			Health and wellbeing		
	Accidents	Minor injuries	Cognitive failures	Sick leave	Work illness	Stress
Associations with individual safety perception factors						
Organisational commitment to safety						
Line management commitment to safety				Yes		
Supervisor's role	Yes					
Personal role			Yes			
Risk-taking behaviour		Yes		Yes		Yes
Obstacles to safety	Yes	Yes			Yes	
Reporting accidents				(Yes)*		
Job satisfaction			Yes	Yes	(Yes)*	Yes
Associations with overall safety perceptions						
Overall	Yes	Yes	Yes	Yes	Yes	Yes

* Association with favourable factor approached significance

Unfavourable perceptions of 'line management commitment to safety' were associated with taking more sick leave, suggesting an association with perceived management approach to safety. Similarly, unfavourable perceptions of 'supervisor's role' were associated with work accidents, suggesting a link with the perception of the approach of senior staff to safety. In addition, unfavourable perceptions of 'personal role' were associated with more frequent cognitive failures, while unfavourable perceptions of 'risk-taking behaviour' were associated with more frequent minor injuries, sick leave and high work stress, suggesting an association with the perception of individual (one's own and others') behaviour and contributions. Unfavourable perceptions of 'obstacles to safety' were associated with work accidents, more frequent minor injuries and work-related illness, suggesting a link between both safety performance and health and wellbeing, and the perception of safety rules that are somehow inappropriate for the job. Favourable perceptions of 'reporting accidents' approached significance with sick leave, which may perhaps reflect workers feeling able to take time off when they are ill in workplaces which they also feel have a reliable accident and near miss reporting system. Unfavourable 'job satisfaction' was associated with more frequent cognitive failures, sick leave and high work stress. Finally, unfavourable overall safety perceptions were associated with all three individual safety performance outcome measures and all three individual health and wellbeing outcome measures.

Overall, these results suggest a general association between perceptions of and attitudes towards safety and both individual safety performance and individual health and wellbeing. In particular, this seems to reflect an association between the perception of management approach to safety and safety performance, and between poor job satisfaction and health and wellbeing.

4.3.6 General workers' climate survey

The original aim of the general workers' climate survey was to assess the representativeness of those who took part in the main climate survey by repeating the survey among a sample of general workers. However, it also provided the opportunity to consider whether the associations between perceptions of and attitudes towards safety and individual safety performance, health and wellbeing among the main climate survey respondents were replicable among another sample.

Respondents

In total 475 people completed the general workers' climate survey. Just over half were men (258, 56 per cent), their mean age was 46.18 years (sd = 9.60, range 18–71), most were married (297, 66 per cent) or cohabiting (79, 17 per cent), and virtually all were white (446, 99 per cent). Just over half (262, 55 per cent) had a degree, a higher degree or a professional qualification at an equivalent level.

Almost all the respondents worked full time (430, 93 per cent) in permanent jobs (444, 96 per cent). The majority described themselves as managers (242, 53 per cent) or supervisors (55, 12 per cent) rather than employees (163, 35 per cent). A wide range of occupations from various sectors of industry were represented (including, for example, administration, civil service, nursing, police, teaching and truck driving). However, health and safety occupations were over-represented, with 37 per cent (175) recording health and safety as part of their job title or description. This over-representation reflects the sampling strategies used to obtain the sample. Occupational coding with the Computer Aided Structured Coding Tool (CASCOT)[85] showed that:

- one third (151, 33 per cent) of the respondents were managers or senior officials
- 6 per cent (28) had professional occupations
- 42 per cent (193) worked in associate professional or technical occupations
- 11 per cent (50) had administrative or secretarial occupations and the remainder had skilled trade occupations (9, 2 per cent), personal service occupations (15, 3 per cent), sales or customer service occupations (3, < 1 per cent), were process, plant or machine operatives (11, 2 per cent) or had elementary occupations (4, < 1 per cent).

The mean number of years in their current position was 5.87 (sd = 6.90, range 0–41 years), and mean number of hours worked per week was 40.03 (sd = 7.56, range 10–60 hours). One third (158, 34 per cent) reported really enjoying their job, with only 5 per cent (24) saying that they really did not enjoy their job.

Comparisons between the general workers' and main climate surveys

Respondents

Comparing the 1,752 main climate survey respondents with the 475 respondents to the general workers' climate survey showed many significant demographic differences. A higher proportion of the main study respondents were male (64 per cent compared to 56 per cent; $\chi^2 = 9.76$, 1 df, $p = 0.002$), fewer were married or cohabiting (72 per cent compared to 82 per cent, $\chi^2 = 18.18$, 1 df, $p < 0.0001$), fewer were white (97 per cent compared to 99 per cent, $\chi^2 = 3.58$, 1 df, $p = 0.06$), fewer had a degree, higher degree or professional qualification (39 per cent compared to 55 per cent, $\chi^2 = 38.42$, 2 df, $p < 0.0001$) and their mean age was younger (42.23 (sd = 11.31) compared to 46.18 (sd = 9.60), $F = 46.82$, $p < 0.0001$).

There were also significant differences in job characteristics between the two groups. Although similar proportions had permanent posts (96 per cent each, $p = 0.91$) and their mean number of years in post were similar (7.11 (sd = 8.08) among main study respondents compared to 6.50 (sd = 6.98) in the general workers' study, $p = 0.16$), more main study respondents described themselves as employees (66 per cent compared to 35 per cent, $\chi^2 = 141.97$, 1 df, $p < 0.0001$) and fewer had managerial, professional, associate professional or technical occupations (50 per cent compared to 80 per cent, $\chi^2 = 131.92$, 1 df, $p < 0.0001$). The main study respondents' average working week was shorter (38.69 hours (sd = 7.71) compared to 40.03 (sd = 7.56), $F = 11.04$, $p = 0.001$), and fewer reported enjoying their jobs (60 per cent compared to 71 per cent, $\chi^2 = 19.86$, 2 df, $p < 0.0001$).

Safety performance

Table 36 shows individual safety performance in the main climate study and the general workers' climate survey. Again there were significant differences, with more main study respondents reporting accidents or injuries, but fewer reporting cognitive failures.

Health and wellbeing

The two groups also differed in terms of their health and wellbeing (Table 37). More of the main study respondents had taken five or more days' sick leave in the previous year, but fewer described their general health as bad or very bad and fewer were clinically depressed. Their mean anxiety scores (5.62 (sd = 3.72) compared to 5.63 (sd = 3.86), $p = 0.95$) and depression (3.52 (sd = 3.21) compared to 3.63 (sd = 3.41), $p = 0.51$), however, were similar. Although the proportions reporting high work stress did not differ significantly, slightly more of those in the general workers' survey reported high work stress. Proportions of those reporting an illness caused or made worse by work in the previous year were similar.

Table 36
Individual safety performance by climate survey

Factor	Main study		General workers		χ^2 (1 df)	*p*
	n	%	*n*	%		
Accident	140	8	21	5	6.98	0.008
Minor injuries	396	23	64	14	18.18	<0.0001
Cognitive failures	752	43	233	50	6.78	0.009

Table 37
Individual health and wellbeing by climate survey

Factor	Main study		General workers		χ^2 (1 df)	*p*
	n	%	*n*	%		
Five or more days' sick leave	484	29	108	23	5.02	0.03
High work stress	261	15	85	18	2.65	0.10
Work-related illness	307	18	76	16	0.64	0.42
Poor general health	75	4	39	8	12.32	<0.0001
Clinical anxiety	200	12	52	11	0.08	0.78
Clinical depression	53	3	23	5	3.88	0.05

Perceptions of and attitudes towards safety

Finally, comparisons were made between the main climate survey and general workers' climate survey respondents' perceptions of and attitudes towards safety. The main study respondents' mean scores were significantly less favourable for 'line management commitment', 'personal role', 'competence', 'obstacles to safety' and 'job satisfaction' (Table 38). However, their mean scores were significantly more favourable for 'supervisor's role' and 'risk-taking behaviour'. There was no difference in the mean overall safety perceptions score, though the main study respondents' mean was less favourable.

Table 38
Safety perception factors by climate survey

Factor	Main study		General workers		χ^2 (1 df)	*p*
	Mean	sd	Mean	sd		
Organisational commitment	71.63	23.03	73.69	25.83	2.60	0.11
Line management commitment	70.77	28.27	78.21	29.98	24.44	<0.0001
Supervisor's role	67.75	30.76	59.02	35.83	26.66	<0.0001
Personal role	74.99	22.90	85.42	18.25	80.70	<0.0001
Workmates' influence	73.69	27.48	75.96	29.99	1.23	0.27
Competence	82.90	21.72	87.70	18.89	18.52	<0.0001
Risk-taking behaviour	63.31	25.13	55.84	29.12	28.44	<0.0001
Obstacles to safety	57.49	26.55	63.45	26.46	17.55	<0.0001
Reporting accidents	62.55	34.82	59.49	36.83	2.74	0.10
Job satisfaction	69.43	30.35	76.52	28.45	20.35	<0.0001
Overall*	69.09	19.26	71.00	19.60	2.85	0.09

* Overall score = average of all factors except number 5 (workmates' influence), which was not answered by managers or supervisors

These comparisons clearly show major differences between the two samples. This is very likely to reflect the sampling differences, with the general workers' sample in fact being made up of many respondents with managerial positions, often in a health and safety setting. Given this, the finding that, in general, perceptions of and attitudes towards safety were less favourable among the main study respondents is not surprising. As a result, it was not possible to use the general workers' sample to assess the representativeness of the main study sample. However, it was still possible to compare the two studies' findings on the associations between perceptions of and attitudes towards safety and individual safety performance, health and wellbeing.

Associations between perceptions of and attitudes towards safety and individual safety performance
Analyses were carried out in the same way as for those described for the main study respondents. The final blocks of the models considering associations with perceptions of and attitudes towards safety are shown in Appendix 4.

Comparisons with general workers' survey findings
Table 39 summarises the associations between perceptions of and attitudes towards safety and both individual safety performance and health and wellbeing for the main climate survey and the general workers' climate survey.

	Individual safety performance			Health and wellbeing		
	Accidents	Minor injuries	Cognitive failures	Sick leave	Work illness	Stress
Associations with individual safety perception factors						
Organisational commitment to safety		Yes				
Line management commitment to safety	Yes			*Yes*		Yes
Supervisor's role	Yes *Yes*					(Yes)*
Personal role			*Yes*			
Risk-taking behaviour	(Yes)*	*Yes*		*Yes*	Yes	*Yes*
Obstacles to safety	Yes *Yes*	*Yes*			*Yes*	
Reporting accidents				(*Yes*)*		
Job satisfaction		Yes	*Yes*	Yes *Yes*	(Yes)* (*Yes*)*	Yes *Yes*
Associations with overall safety perceptions						
Overall	Yes *Yes*	Yes *Yes*	(Yes)* *Yes*	*Yes*	*Yes*	*Yes*

* Association with favourable factor approached significance

Table 39
Summary of associations between perceptions of and attitudes towards safety and both individual safety performance and health and wellbeing – for general workers (in roman text) and *main study participants* (in italics)

In both studies, despite the significant differences between the two samples, individual safety performance was associated with unfavourable overall perceptions of safety. This association was also apparent for individual health and wellbeing in the main climate survey, though not the general workers' climate survey.

The safety perception factors were then considered individually. Reporting an accident at work was associated with perceptions of 'supervisor's role' and 'obstacles to safety' in both surveys. Similarly, job satisfaction was associated with all three health and wellbeing outcomes (and approached

significance for work-related illness) in both surveys. Other individual factors, however, were associated with an outcome in only one of the two studies.

The findings were broadly consistent with those of the main climate survey. This supports the suggestion that perceptions of and attitudes towards safety can be measured individually using the Climate Survey Tool, and applied to individual safety performance, health and wellbeing. It also corroborates the suggestion that measuring perceptions of and attitudes towards safety at this level is appropriate and makes a useful additional contribution. In both surveys, many other potentially influential demographic, occupational and individual factors were controlled for in the analyses. These other factors included measures of mental health. The fact that perceptions of and attitudes towards safety are consistently and independently associated with safety performance, therefore, also suggests that this association is not simply a reflection of more general negative employee attitudes.

4.4 Safety climate, advice and performance

Finally, data from the participating organisations' climate, advice and performance surveys were drawn together to consider the associations between safety climate, advice and performance at a corporate level. This showed that:

- safety climate was associated with corporate safety performance
- advice was also associated with corporate safety performance.

However, organisations in higher risk industry sectors are also more likely to employ better qualified OSH practitioners. The relationship between advice and performance may, therefore, be complicated by industry sector.

Analyses were carried out to consider the associations between corporate safety performance and both safety climate and advice. This process addressed the project's fourth aim to assess and compare the relative contributions of corporate safety culture and competent OSH advice to OSH performance. It also extends previous work by considering the role of advice in the relationship between culture and performance.

4.4.1 Safety climate and corporate safety performance

First, associations between corporate safety performance and safety climate were considered. Correlations between corporate safety performance and the proportions of favourable responses on the safety climate measures showed several significant associations:

- overall hazard management and risk taking behaviour: Spearman's rho = 0.36, $p = 0.04$
- hazardous substances and competence: 0.39, 0.05; and risk-taking behaviour: 0.40, 0.04
- manual handling and obstacles to safety: 0.39, 0.03; and accident reporting: 0.37, 0.04
- repetitive movement and obstacles to safety: 0.40, 0.04
- dangerous machinery and organisational commitment: 0.47, 0.03; and supervisor's role: 0.44, 0.04
- stress and risk-taking behaviour: 0.42, 0.02
- vehicle handling and accident reporting: 0.51, 0.02
- noise and organisational commitment: 0.51, 0.02; and obstacles to safety: 0.50, 0.03
- handheld equipment and organisational commitment: 0.57, 0.005; and risk-taking behaviour: 0.43, 0.04; and obstacles to safety: 0.52, 0.01; and accident reporting: 0.50, 0.02; and mean favourable score: 0.48, 0.02
- mean hazard management and organisational commitment: 0.37, 0.04; and obstacles to safety: 0.45, 0.009
- benchmark manual handling and accident reporting: 0.38, 0.03
- benchmark hazardous substances and accident reporting: 0.41, 0.04.

These data suggest that higher proportions of favourable climate responses among employees were associated with more positive corporate safety performance.

4.4.2 Advice and corporate safety performance

Some associations between advice and corporate safety performance were also apparent at the univariate level (Table 40). Examination of absolute scores suggested that both IOSH membership and more training were associated with poorer overall hazard management and slips and trips management. However, IOSH membership was also associated with better benchmark levels for management of hazardous substances, stress and vehicle handling.

Table 40
Corporate safety performance and advice – mean scores

	IOSH member		Not IOSH member		F	*p*	Less training*		More training†		F	*p*
	n	se	*n*	se			*n*	se	*n*	se		
Absolute scores												
Overall hazard management	6.24	0.30	7.45	0.43	5.46	0.03	7.43	0.38	6.19	0.31	6.17	0.02
Slips and trips	5.47	0.35	7.00	0.63	5.38	0.03	7.17	0.57	5.38	0.35	8.06	0.009
Benchmark scores												
Hazardous substances	3.39	0.18	2.50	0.38	5.75	0.03						
Stress	3.30	0.25	2.45	0.21	5.09	0.03						
Vehicle handling	3.41	0.27	2.00	0.58	5.08	0.04						

* No training, IOSH *Managing safely* or NEBOSH Certificate
† NEBOSH Diploma, degree or other

Some of these findings are, perhaps, counterintuitive. To consider this further, the participating organisations were categorised into two groups: one including sectors traditionally considered as more hazardous (construction, transport, utilities, manufacturing and health), and the other covering lower hazard sectors (education, science, communications, health and safety, finance and retail). More organisations in the higher hazard sectors had an adviser who was an IOSH member (83 per cent (15) compared to 47 per cent (7) in the lower hazard sectors; $\chi^2 = 4.95$, $p = 0.03$), and more had advisers with higher formal qualifications (83 per cent (15) compared to 40 per cent (6), $\chi^2 = 6.64$, $p = 0.01$). These findings may, therefore, reflect the fact that organisations in more hazardous industry sectors are more likely to ensure that they have more highly qualified OSH practitioners and are more likely to have lower safety performance scores. Unfortunately it was not possible to assess this formally because of the small numbers in some groups. It is also possible that poorer performance scores may reflect more accurate reporting of incidents and hazard management by more highly qualified OSH practitioners.

4.4.3 Safety climate and advice

Comparing mean safety climate scores with advice showed only one significant difference: a higher mean 'competence' score was associated with IOSH membership (83.62 (se = 1.27) compared to 78.16 (2.29), $F = 5.12$, $p = 0.03$). Similarly, comparing mean levels of favourable response on the climate factors showed only two significant differences: higher levels of favourable 'competence' responses associated with IOSH membership (77.43 (1.70) compared to 70.20 (3.28), $F = 4.71$, $p = 0.04$); and higher levels of favourable 'job satisfaction' responses associated with IOSH membership (52.65 (2.91) compared to 41.31 (5.30), $F = 4.18$, $p = 0.05$).

This suggests little association between safety climate and advice. It should, however, be borne in mind that the OSH practitioners and advisers in this study were employees of the participating organisations, and as such were inherently part of the existing safety climate.

4.4.4 Safety climate, advice and corporate safety performance

Finally, analyses were carried out to consider the associations of both safety climate and advice with corporate safety performance. The significant associations from the sections above were considered further using multivariate backward regression modelling. This allowed the assessment of the associations between performance and both climate and advice independently of other potentially influential factors. Each model, therefore, also included industry sector and all those variables associated with individual safety performance (age, alcohol consumption, employment level, full-time or part-time employment, years in post, occupational category, control, bullying, anxiety, education, smoking, number of employees in organisation, intrinsic reward, hours worked per week and depression). Table 41 shows the significant associations between performance, climate and advice. These analyses show that the positive associations between corporate safety performance and safety climate (where more positive performance scores are associated with higher levels of favourable climate measure responses) remain, independent of all the other factors, for:

- overall hazard management and risk-taking behaviour, competence, reporting accidents and mean favourable score
- hazardous substances and competence
- repetitive movement and obstacles to safety
- vehicle handling and reporting accidents
- noise and organisational commitment
- hand-held equipment and organisational commitment, risk-taking behaviour, obstacles to safety and mean favourable score
- benchmark manual handling and reporting accidents
- benchmark hazardous substances and reporting accidents
- overall incident management and competence and reporting accidents
- benchmark hazard management and competence
- mean hazard management score and reporting accidents
- mean benchmark hazard management score and reporting accidents.

Associations between corporate safety performance and advice also remained independent of all the other factors for:

- overall hazard management and IOSH membership and training
- hazardous substances and IOSH membership
- repetitive movement and IOSH membership*
- noise and IOSH membership and training*
- hand-held equipment and IOSH membership
- slips and trips and training
- vehicle handling and training*
- benchmark hazard management and IOSH membership*
- mean hazard management score and training
- mean benchmark hazard management score and IOSH membership.*

The majority of these associations with advice were negative (ie more positive safety performance was associated with not having IOSH membership or with lower formal qualifications). Associations showing a positive association are marked with an asterisk above.

Finally, similar models were run for all the summarising corporate performance measures (overall hazard management, overall incident, benchmark overall hazard management, benchmark overall incident, mean hazard management, and benchmark mean hazard management). Each model also included a general measure of safety climate (mean favourable score) and one of the advice measures (IOSH membership or training), as well as all the other factors previously associated with individual safety performance (listed above). The significant associations are shown in Table 42 (page 61). These analyses suggested strong positive associations between favourable safety climate and safety performance. They also suggested negative associations between safety advice and safety performance, with the exception of a positive association between IOSH membership and mean benchmark hazard management score.

4.4.5 Summary of safety climate, advice and performance

Taken together, these analyses suggest that safety climate is associated with corporate safety performance. Any association with advice, though, is complicated, and this may reflect a link with risk level and industry sector since the findings here imply that organisations operating in higher risk sectors of industry are more likely to employ health and safety advisers and practitioners with higher levels of formal OSH training. However, positive associations between advice and both specific hazard management areas (repetitive movement, noise and vehicle handling) and benchmark hazard management suggest that more competent advice may also be linked to improved safety performance.

Table 41
Climate, advice and performance

		B	se B	β	*p*
Overall hazard management	Risk-taking behaviour	0.06	0.02	0.50	0.001
	IOSH membership	0.97	0.44	0.31	0.04
Overall hazard management	Risk-taking behaviour	0.04	0.02	0.31	0.03
	Training	–1.16	0.44	–0.38	0.01
Hazardous substances	Competence	0.06	0.02	0.34	0.02
	IOSH membership	0.76	0.31	0.29	0.03
Repetitive movement	Obstacles to safety	0.11	0.03	0.77	0.001
	IOSH membership	–1.54	0.67	–0.44	0.04
Repetitive movement	Obstacles to safety	0.09	0.03	0.64	0.005
	Training	–	–	–	–
Vehicle handling	Reporting accidents	0.09	0.02	0.92	0.003
	IOSH membership	–	–	–	–
Vehicle handling	Reporting accidents	0.09	0.02	0.92	0.003
	Training	–	–	–	–
Noise	Organisational commitment	0.14	0.00	1.19	0.001
	IOSH membership	2.36	0.12	0.58	0.002
Noise	Organisational commitment	0.26	0.02	2.22	<0.0001
	Training	1.47	0.39	0.40	0.02
Handheld equipment	Organisational commitment	0.11	0.02	0.83	<0.0001
	IOSH membership	–	–	–	–
Handheld equipment	Organisational commitment	0.11	0.02	0.83	<0.0001
	Training	–	–	–	–
Handheld equipment	Risk-taking behaviour	0.12	0.02	0.88	<0.0001
	IOSH membership	1.45	0.58	0.35	0.03
Handheld equipment	Obstacles to safety	0.08	0.03	0.57	0.02
	IOSH membership	3.05	1.20	0.74	0.03
Handheld equipment	Obstacles to safety	0.10	0.03	0.73	0.004
	Training	–	–	–	–
Handheld equipment	Mean favourable score	0.18	0.03	1.05	<0.0001
	IOSH membership	1.86	0.56	0.45	0.006
Benchmark manual handling	Reporting accidents	0.03	0.01	0.39	0.02
	IOSH membership	–	–	–	–
Benchmark manual handling	Reporting accidents	0.03	0.01	0.39	0.02
	Training	–	–	–	–

Table 41
Continued

		B	se B	β	*p*
Benchmark hazardous substances	Reporting accidents	0.04	0.01	0.61	<0.0001
	IOSH membership	–	–	–	–
Benchmark hazardous substances	Reporting accidents	0.04	0.01	0.61	<0.0001
	Training	–	–	–	–
Overall hazard management	Mean favourable score	0.08	0.02	0.55	0.001
	IOSH membership	1.31	0.47	0.42	0.009
Overall hazard management	Mean favourable score	0.04	0.02	0.30	0.07
	Training	–1.17	0.45	–0.38	0.02
Slips and trips	Mean favourable score	–	–	–	–
	Training	–2.36	0.56	–0.67	0.001
Vehicle handling	Mean favourable score	–	–	–	–
	Training	1.97	0.57	0.65	0.003
Overall hazard management	Competence	–	–	–	–
	IOSH membership	1.38	0.44	0.44	0.004
Overall hazard management	Competence	–	–	–	–
	Training	–1.20	0.47	–0.39	0.02
Benchmark hazard management	Competence	–	–	–	–
	IOSH membership	–0.60	0.27	–0.33	0.04
Overall hazard management	Competence	0.07	0.02	0.47	0.005
	IOSH membership	1.51	0.52	0.48	0.007
Overall hazard management	Competence	–	–	–	–
	Training	–1.20	0.47	–0.39	0.02
Overall incident management	Competence	0.13	0.05	0.41	0.02
	IOSH membership	–	–	–	–
Overall incident management	Competence	0.15	0.05	0.48	0.006
	Training	–	–	–	–
Benchmark hazard management	Competence	0.04	0.02	0.44	0.02
	Training	–	–	–	–
Overall hazard management	Reporting accidents	0.08	0.02	0.82	<0.0001
	IOSH membership	1.25	0.40	0.40	0.004
Overall hazard management	Reporting accidents	0.05	0.02	0.53	0.004
	Training	–1.30	0.43	–0.42	0.006
Overall incident management	Reporting accidents	0.20	0.04	1.08	<0.0001
	IOSH membership	–	–	–	–

Table 41
Continued

		B	se B	β	*p*
Overall incident management	Reporting accidents	0.20	0.04	1.08	<0.0001
	Training	–	–	–	–
Mean hazard management score	Reporting accidents	0.04	0.02	0.48	0.03
	Training	–0.75	0.44	–0.29	0.10
Mean benchmark hazard management score	Reporting accidents	–	–	–	–
	IOSH membership	–0.60	0.27	–0.33	0.04
Mean benchmark hazard management score	Reporting accidents	0.03	0.01	0.48	0.007
	Training	–	–	–	–

Table 42
Climate, advice and performance – general measures

		B	se B	β	*p*
Overall hazard management	Mean favourable score	0.08	0.02	0.55	0.001
	IOSH membership	1.31	0.47	0.42	0.009
Overall hazard management	Mean favourable score	0.04	0.02	0.30	0.07
	Training	–1.17	0.45	–0.38	0.02
Overall incident management	Mean favourable score	0.16	0.04	0.59	0.001
	IOSH membership	–	–	–	–
Overall incident management	Mean favourable score	0.16	0.04	0.59	0.001
	Training	–	–	–	–
Benchmark overall hazard management	Mean favourable score	0.06	0.02	0.46	0.01
	IOSH membership	–	–	–	–
Benchmark overall hazard management	Mean favourable score	0.06	0.02	0.46	0.01
	Training	–	–	–	–
Benchmark mean hazard management	Mean favourable score	–	–	–	–
	IOSH membership	–0.60	0.27	–0.33	0.04

4.5 Findings summary

The aims of this study were to:

- describe the corporate safety cultures of the participating organisations
- collect their OSH performance measures
- describe their OSH practitioners' experience and competence
- assess and compare the relative contributions of corporate safety culture and competent OSH advice to OSH performance.

In addition, its rationale was to extend previous work in the area by:

- applying generic measures of safety culture and performance to organisations from different sectors of industry
- assessing any association between safety culture and corporate safety performance across multiple organisations
- using safety climate measures to assess individual perceptions of and attitudes towards safety, so that associations with individual safety performance and health and wellbeing could also be considered.

This was intended to allow consideration of the robustness of any associations between culture and performance, and between employee perceptions of and attitudes towards safety and individual safety performance and wellbeing, as well as the extent to which these associations could be generalised.

The surveys carried out in the participating organisations showed:

- considerable variation in safety climate (as a snapshot measure of safety culture) between the participating organisations
- a range of training and qualifications among advisers
- a variety of corporate OSH performance levels both within and between industry sectors.

In addition, the study found associations between perceptions of and attitudes towards safety and both individual safety performance and individual health and wellbeing. Both individual safety performance and health and wellbeing were associated with overall safety perceptions. The findings also suggested that the association with safety performance reflected perceptions of management approach to safety, while that with health and wellbeing was linked more to job satisfaction. These findings were independent of other potential influences, such as demographic factors and job and occupational characteristics, including industry sector. The pattern of results was similar from both the survey carried out in participating organisations and that carried out among workers not selected on the basis of their organisation. These consistent findings suggested that the association between safety perceptions and individual safety performance is robust and capable of generalisation at this level. They also suggest that safety climate measures can be used to assess perceptions of and attitudes towards safety individually and applied to individual safety performance, health and wellbeing at a general (ie cross-organisational, cross-industrial) level.

The study also found associations between safety climate and corporate safety performance. In addition, although there were differences between industry sectors in terms of both corporate safety performance and corporate safety climate, the association between safety climate and performance was independent of industry sector (as well as other potentially influential factors). Again, this suggests that this is a robust and generalisable association.

The relationship between corporate safety performance and advice, however, was more complex, and further research is needed to explore this influential relationship further.

Taken together, the findings suggest that perceptions of and attitudes towards safety culture are strongly linked to individual safety performance, health and wellbeing, and to corporate safety performance, and that these associations are not limited to particular sectors of industry. They also suggest that, at an individual level, measuring safety perceptions and attitudes makes a significant contribution to understanding the profile of factors associated with employee health and safety.

5 Discussion

The aim of this project was to assess and compare the relative contributions of corporate safety culture and competent occupational health and safety advice to safety performance. To do this the project recruited organisations from across the UK and from different sectors of industry to take part in three surveys which collected information about their safety cultures, performance measures and practitioners' experiences and competence. In addition, the study was able to consider any association between employee attitudes towards and perceptions of safety and individual safety performance, health and wellbeing.

5.1 Perceptions of and attitudes towards safety and individual safety performance

The association between perceptions of and attitudes towards safety and individual safety performance was considered both in samples of workers from the participating organisations and in a general population sample of workers. This allowed comparisons between the two groups in terms of both the employees themselves and their safety perceptions. However, there were many significant differences between employees from the participating organisations and those from the general workers' sample. Differences were apparent in terms of demographic and occupational factors and job characteristics. In particular, these differences seemed to reflect the disproportionate number of participants from the general workers' sample with health and safety-related occupations. In addition, more employees of participating organisations reported accidents and injuries at work. Similarly, in terms of safety perceptions, employees from the participating organisations had generally less favourable scores than workers from the general sample. This was probably because the general sample was predominantly made up of managers and/or those with a health and safety background, who might be expected to have more favourable perceptions of and attitudes towards safety.

Despite these significant differences, however, both studies showed strong associations between perceptions of and attitudes towards safety and individual safety performance, indicating that those with less favourable perception scores were more likely to indicate that they had had accidents, injuries and cognitive failures (failures of attention, memory or concentration) at work. These associations were independent of other factors that can influence individual safety performance, such as demographics and occupational and individual factors. In particular, they seemed to reflect an association with perception of management approach to safety on individual safety performance. This is consistent with research suggesting that effective leadership can improve safety performance.[66]

In addition, safety perceptions were associated with individual health and wellbeing in both studies. Again, these associations were independent of other potentially influential factors. In this case there seemed to be a particular link between poor job satisfaction and individual health and wellbeing.

Considering perceptions of and attitudes towards safety and individual safety performance, health and wellbeing in this way in these two studies has extended previous work in this area by measuring safety as perceived at an individual level. Safety culture describes shared attitudes, values and beliefs in relation to safety in an organisation.[3] It is most often assessed, as in this study, by using an employee safety climate survey to give a snapshot of an organisation's prevailing safety culture. Safety climate is viewed as a current-state reflection of the underlying safety culture.[55,86] Here, however, in addition to considering safety culture at a corporate level using group measures, individual measures have been calculated to assess perceptions of and attitudes towards safety at an individual employee level. This kind of approach has been used before,[70] though not often. Perceptions are likely to differ at an individual level, even within a single organisation or part of an organisation,[70] and several studies have suggested that perceptions of safety may vary with hierarchical level.[33,40,85,86] The consistency of findings between the participating organisations' employees sample and the general workers' sample suggest that safety perceptions can be measured at an individual level in this way and applied to individual safety performance, health and wellbeing. In addition, the fact that these safety perception measurements were independent of other potentially influential factors, including mental health, suggests that they are not simply a reflection of more general negative employee attitudes. Furthermore, the findings suggest that measuring safety perceptions and attitudes at this level in this way makes a useful, and independent, additional contribution to understanding of the profile of factors associated with employee health and safety.

Recent work by the Keil Centre[87] has also identified links between psychological ill health, stress and safety, suggesting that employees' frame of mind can influence safety performance, behaviour and human error. This work has also found that there are common risk factors for psychological distress

and human error and that these common factors are also associated with common fundamental accident causes. The Keil Centre authors suggest that assessments in one area, such as stress, therefore have the potential to inform safety impacts in other areas.

Safety perceptions and attitudes may, therefore, be at least in part a measure of a more overall or general organisational 'temperature' or context. The findings reported here relate to specific individual (and, below, corporate) safety performance and health and wellbeing. They could perhaps be interpreted as different manifestations of this more general context. This interpretation would be consistent with the range of sometimes contradictory findings in this area, as it implies possible variation on many levels and with predictor, confounder and outcome measures. However, it also suggests that improvements in one organisational area, such as stress, may have significant knock-on effects in other, perhaps intuitively less obvious, areas such as safety.

5.2 Safety culture and corporate safety performance

The study also found consistent, independent associations between safety culture and corporate safety performance. These suggested that higher levels of favourable safety climate measures were associated with more positive corporate safety performance.

5.3 Safety perceptions, culture and performance

Overall, therefore, the project suggested strong links between both safety perceptions and attitudes and individual safety performance, and safety culture and corporate safety performance and management. This is consistent with previous research.[26,33,38,46,54–62] Similarly, the association between safety perceptions and individual health and wellbeing supports previous suggestions that a more positive safety climate leads to improved health and wellbeing[66–68] and reduced work stress.[48] These associations were also independent of other factors, including industry sector, and were apparent across multiple organisations. This extends previous research and adds weight to the argument that the principles of safety culture and climate, which have been developed primarily in the traditional high-hazard industries, are applicable in other work settings.[52]

5.4 Advice and safety performance

The study also found strong independent associations between advice and corporate safety performance. However, some of these associations were counterintuitive, in that they suggested that less positive corporate safety performance was associated with more competent health and safety advice. Further consideration showed that organisations operating in what might be regarded as more hazardous sectors of industry (such as construction and manufacturing) were more likely to employ OSH advisers or practitioners with higher levels of formal training qualifications. This counterintuitive finding could, therefore, reflect the fact that organisations in more hazardous industry sectors are more likely to ensure that they have highly qualified OSH professionals in place to manage their higher risk levels. Unfortunately, the study did not include enough organisations from higher and lower risk industry sectors with sufficient practitioners with different qualification levels to test this formally. However, there were also positive associations between safety performance and advice, raising the possibility that more competent advice may be linked to improved safety performance in some circumstances. Further research on more OSH professionals from organisations with varying levels of risk and from different industry sectors may clarify these findings.

Although most of the practitioner respondents spent over half of their time on health and safety, the great majority also had other responsibilities. Most described themselves as having sufficient knowledge and adequate training for their health and safety role, a good knowledge of both health and safety legislation and the risks in their organisation, and being aware of when they needed to seek support. In addition, most practitioners described their organisation as supportive of their continuing professional development. However, most also felt that at least one of the safety systems or policies in place in their organisation needed improvement. A particularly common example was in the area of workforce involvement. Almost all of the practitioners felt they were able to influence management decisions on health and safety issues, but just over a quarter were not able to influence the level of the health and safety budget, while a further quarter worked in organisations with no health and safety budget. Only one in three felt that health and safety was given equal priority to other aspects of the business. These findings suggest that many OSH practitioners are working in complex roles, often with somewhat mixed management support. They also point to the continuing need to 'raise the profile' of health and safety in some organisations, particularly in terms of employing fully trained and qualified OSH practitioners and involving the workforce in health and safety issues and decision making.

5.5 Culture, advice and performance

The study showed associations between corporate safety performance and both advice and safety culture, which have been further described elsewhere.[116] These associations were independent not only of other potentially influential factors, but also of each other. This suggests that both culture and advice have an important role to play in corporate safety performance. The relationship with advice, however, is complex, perhaps reflecting the association with industry sector.

The relationship between safety culture and advice was not the main focus of this work, but was also touched on in the analyses. In fact, these suggest little association between safety culture and advice, but that any association was positive. Bearing in mind that the participating OSH practitioners were inherently part of the existing safety culture of their organisations, it is not possible to determine whether practitioners require a favourable safety culture to function effectively, or whether the role of the practitioner is to influence culture change, for example by recruiting top management to their cause. However, the difficult challenge for OSH practitioners – of translating what is known about safety culture into practical policies and procedures that will change behaviour and practice to improve safety performance – has been acknowledged.[8] As described previously, early work suggested that more organisations with good safety performance records employed safety officers in high ranking positions (Cohen *et al.* 1975, Cohen 1977, both cited in Mearns *et al.*[55]). And more recently, the presence of a safety manager was one factor identified as affecting safety climate.[57] The impact of how and by whom safety inductions among new employees are carried out has also been identified as having an influence on safety attitudes and behaviour,[58] and it has been suggested that the effectiveness and credibility of OSH practitioners may be influenced by corporate culture.[35] More research is therefore needed to consider this relationship in more depth.

5.5.1 The relative contributions of safety culture and advice to performance

As described above, the aim of this project was to assess and compare the relative contributions of corporate safety culture and competent OSH advice to safety performance. On the face of it the study's findings suggest that, while both are making a contribution, that of safety culture is more important. However, OSH advisers or practitioners necessarily operate within their organisation's safety culture. Disentangling the precise, relative contributions of culture and advice, therefore, is problematic. So, while the contribution of safety culture appears from these data to be greater than that of safety advice, this should be considered further. Such further research should also consider the possibility that the contribution of advice may differ according to the industrial setting in which it is being applied. This study, however, has taken an important initial step by being the first to measure safety culture, advice and performance together in a sample of UK organisations from various sectors of industry. It has also extended this initial step by measuring and controlling for many other potentially influential factors. Thus it adds to understanding of the area by showing statistically independent associations between corporate safety performance and both competent advice and corporate safety culture; and it opens up a future area of research to clarify these relationships, in particular by considering whether the apparently greater contribution of safety culture is independent of the confounding relationships between advice, industry sector and culture.

5.6 Limitations

The study had several limitations, some of which have been described above. In particular, all data were cross-sectional, so no assessment of causality or underlying mechanisms could be considered. In addition, all the data were self-reported, which introduces bias at individual and organisational levels, and in some cases response rates were low. The climate questionnaires were also long, which may have contributed to the low response rates in some cases. The nature of the work also meant that some analyses, particularly at the corporate level, are based on small numbers and so should be considered with appropriate caution. This problem was exacerbated in part because the Performance Indicator Tool gives maximum scores to businesses reporting that their employees are never exposed to a particular hazard but does not distinguish between those who have successfully controlled an existing hazard and those who have never had to face the hazard. Adding a clarifying question to the tool would resolve this problem. Furthermore, many analyses were carried out, making it likely that some significant associations arose by chance. Appropriate caution should therefore be used in interpreting the findings, particularly for larger p-values. The large number of analyses was carried out, at least in part, because of the exploratory, model-building nature of the study. Indeed, there are other ways in which these data could have been analysed, several of which have been applied but not presented here as this report is not intended to explore all of the data exhaustively, but rather to give an overview of the whole of the project.

Participation at all levels was also, of course, voluntary, so it might be expected that only organisations with particularly favourable safety cultures would agree to take part. However, anecdotal reports from (OSH practitioner) participants suggested that providing feedback offered the organisations which took part the opportunity to find out about their safety culture, and this was seen as an incentive to participation. The general workers' survey was also intended, in part, to address this, but sampling difficulties arose. Initial recruitment approaches had very low response levels. Offering an incentive and inviting people to take part via the RoSPA website improved this considerably, but using this route resulted in a disproportionately large number of respondents with occupations related to health and safety. The sample, therefore, was not appropriate as a comparison group of employees. However, it was still useful as a dataset for comparing associations between perceptions of and attitudes towards safety and employee safety performance and wellbeing.

One aim of the study was to apply measures of culture, performance and advice to multiple organisations across various sectors of industry. For this, well-established generic measures were selected. However, the advice questionnaire had to be developed from the only existing tool available, which was industry specific. Future work could develop this further both theoretically and by working on a measure which could be completed by someone other than practitioners themselves.

The study was designed to include and control for the influence of many factors outside the specific areas of interest. However, not all potentially important variables were measured. Future work could, for example, consider other influences, such as the local regulatory regime, trade union input, attitudes towards enforcement and penalties for failure.

Lastly, participating organisations were drawn from several sectors of industry. This proved to be both a limitation and an advantage. On the positive side, applying generic measures of safety culture and performance to organisations from different sectors of industry made it possible for the study to extend previous work in the area by establishing the consistency of associations independent of industry sector. On the other hand, however, this also meant that it was not possible to disentangle confounding relationships between industry sector, advice and safety performance.

5.7 Conclusions and future research

Further research is needed to explore and describe the nature of the relationship between competent health and safety advice and corporate safety performance. However, the independent associations between advice and performance suggest that the relationship between these two factors is influential. Such research needs to cross industry sectors and be on a scale large enough to address the possible confounding relationships with both industry sector and culture.

Safety culture is consistently and independently associated with safety performance. In addition, employee perceptions of and attitudes towards safety are consistently and independent associated with individual health and wellbeing. These associations are not limited to particular sectors of industry. This suggests that they are robust and generally applicable. The findings also suggest that measuring safety perceptions at an individual level makes a significant contribution to understanding the profile of factors associated with employee health and safety.

Overall, the study suggests that, while the nature of the relationship with advice requires clarification, both corporate safety culture and competent OSH advice make significant, independent contributions to corporate safety performance.

Appendix 1: Selection of measures of performance, climate and advice

Table 43
Health and safety performance tools

Tool developer and name (if applicable)	Data collection methods	Validation and use	Industry	Source of information (see References)
Trethewy *et al.* 2001 (Site Safety Management Tool)	Based on site inspections	Validated, used in construction industry	Developed in construction industry	88
National Occupational Health and Safety Commission (Positive Performance Indicators)	Based on site appraisals	Validated, used in construction and postal delivery industries	Developed in construction and postal delivery industries	113–115
Fowler *et al.* 1996 (Rehabilitation Success Rate)	Single indicator	Validated, used in public sector	Developed in public sector	89
HSE (Guide to measuring health and safety performance)	Guidelines	Guidelines	For any industry	90
HSE (Health and Safety Performance Indicator)	Questionnaires	Validated, widely used	For any industry	77
University of Michigan (Universal Assessment Instrument)	Questionnaires	Validated	For any industry	91–93
Neal *et al.* 2000	Questionnaires	Validated, used in a hospital	Developed in a hospital setting	94
Cheung *et al.* 2004 (Construction Safety and Health Monitoring System)	Web-based system	Information not available	Developed in construction industry	95
Chen and Yang 2004 (Predictive Risk Index)	Observation	Validated, used in petrochemical plant	Developed in petrochemical plant	96

Table 44
Safety culture or climate tools

Tool developer and name (if applicable)	Data collection methods	Validation and use	Industry	Source of information (see References)
HSE (Health and Safety Climate Survey Tool)	Questionnaires	Extensive validation, widely used in a range of industry sectors	Generic – for use in any industry	23, 31, 103, 104, 106
RSSB (RSSB safety culture tool)	Questionnaires	Validated, widely used in rail industry	Developed in rail industry	27, 76
The Keil Centre (The Keil Centre safety culture maturity model)	Workshops	Validated, widely used in rail industry	Developed in rail industry	76
Occupational Psychology Centre (Occupational Psychology Centre Safety Culture Questionnnaire (SafeCQ))	Questionnaires	Validated, used in rail industry	Developed in rail industry	27, 76
Loughborough University (Loughborough University Safety Climate Assessment Toolkit)	Questionnaires, interviews, focus groups, behavioural indicators	Validated, used in offshore industry	Developed in offshore industry	27, 76, 97, 98

Table 44
Continued

Tool developer and name (if applicable)	Data collection methods	Validation and use	Industry	Source of information (see References)
British Safety Council (British Safety Council Safety Culture Assessment)	Questionnaires, interviews, workshops, documentary assessments, observation	Validated, moderately used	For any industry	76
University of St Andrews (University of St Andrews Safety Culture Tool)	Questionnaires, focus groups	Validated, widely used outside UK	Developed in nuclear industry	76
Aberdeen University (Offshore Safety Climate Questionnaire OSQ99)	Questionnaires	Validated, used in offshore industry	Developed in offshore industry	27, 76, 97
Aberdeen University (Offshore Safety Questionnaire OSQv1)	Questionnaires	Validated, used in offshore industry	Developed in offshore industry	76, 97, 99
Marsh (Marsh Fleet Safety Culture Survey)	Questionnaires or focus groups	Information not available	Supplier tailors for each organisation	76
Quest Evaluations and Databases Ltd (Quest Safety Climate Questionnaire)	Questionnaires	Validated, used in oil and gas industry	Developed in oil and gas industry	27, 76, 97
SERCO Assurance (SERCO Assurance Safety Culture Assessment Tool)	Questionnaires and interviews	Validation information not available, moderately used	Developed in nuclear, rail, oil and gas, and energy industries	27, 76
ATSB (Australian Transportation Safety Board BASI Indicate Safety Programme)	Questionnaires and safety recording system	Validated, widely used in Australian aviation industry	Developed in aviation industry	76
Robert Gordon University (Computerised Safety Climate Questionnaire)	Electronic questionnaires	Validation information not available, used in oil and gas industry	Developed in oil and gas industry	27, 76, 97
Grote and Kunzler 2000	Questionnaires	Validated, used in petrochemical industry	Developed in petrochemical industry	100, 101
Harvey *et al.* 2002	Questionnaires	Validated, used in nuclear industry	Developed in nuclear industry	101, 102
Glendon *et al.* 1994 (Safety Climate Questionnaire)	Questionnaires	Validated, used in construction industry	Developed in construction industry	44, 101
Lee and Harrison 2000; developed from the Sellafield Questionnaire (Lee 1998) (Safety culture in nuclear power stations)	Questionnaires	Validated, used in nuclear industry	Developed in nuclear industry	101, 103
Rundmo and Hale 1999 (Managers' attitudes to safety)	Questionnaires	Validated, used in oil, energy and aluminium industries	Developed in oil, energy and aluminium industries	101
Williamson *et al.* 1997; developed from Cox and Cox 1991 and Dedobbeleer and Beland 1991 (Safety perceptions and attitudes measure)	Questionnaires	Validated, used in manufacturing industry	Developed in a range of industries (light manufacture to outdoor work)	23, 105, 125

Table 44
Continued

Tool developer and name (if applicable)	Data collection methods	Validation and use	Industry	Source of information (see References)
Håvold 2005 (Safety orientation)	Questionnaires	Validated, used in shipping industry	Developed in shipping industry	101
Cox and Cox 1991	Questionnaires	Not validated, used in gas industry	Developed in gas industry	41
Ostrom *et al.* 1993	Questionnaires	Validation information not available, used in nuclear industry	Developed in nuclear industry	41
Alexander *et al.* 1995	Questionnaires	Not validated, used in oil industry	Developed in oil industry	41
Budworth 1997	Questionnaires	Not validated, used in chemical industry	Developed in chemical industry	41
Carroll 1998	Questionnaires	Not validated, used in nuclear industry	Developed in nuclear industry	41
Zohar 1980	Questionnaires	Validated, used in manufacturing industry	Developed in manufacturing industry	41
Brown and Holmes 1986; developed from Zohar 1980	Questionnaires	Validated, used in manufacturing industry	Developed in manufacturing industry	41, 49
Phillips *et al.* 1993; developed from Zohar 1980	Questionnaires	Not validated, used in manufacturing industry	Developed in manufacturing industry	41
Janssens *et al.* 1995	Questionnaires	Not validated, used in manufacturing industry	Developed in manufacturing industry	41
Diaz and Cabrera 1997	Questionnaires	Validated, used in aviation industry	Developed in aviation industry	41, 104
McDonald *et al.* 2000; developed from Diaz and Cabrera 1997)	Questionnaires	Validated, used in aviation industry	Developed in aviation industry	105
Dedobbeleer and Beland 1991; developed from Brown and Holmes 1986 (Safety Climate Measure for Construction Sites)	Questionnaires	Not validated, used in construction industry	Developed in construction industry	23, 51, 55
Niskanen 1994	Questionnaires	Validated, used in road construction industry	Developed in road construction industry	41
HSE (HMRI Safety Inspection Toolkit)	Question set, pocket card, overview diagram, guide for inspectors	Validated, used in rail industry	Developed in rail industry	106
Alhemood *et al.* 2004	Questionnaires	Limited validation, not widely used	Developed in public sector	107
French 2004; developed from Dedobbeleer and Beland 1991 (Health and safety environment climate survey)	Questionnaires	Not validated, used in chemical industry	Developed in chemical industry	108

Table 44
Continued

Tool developer and name (if applicable)	Data collection methods	Validation and use	Industry	Source of information (see References)
Zacharatos *et al.* 2005; developed from Neal *et al.* 2000	Questionnaires	Validated, used in manufacturing industry	Developed in manufacturing industry	65
Donald and Canter 1993 (Safety Attitude Questionnaire)	Questionnaires	Validated, used in steel, chemical and construction industries	Developed in steel, chemical and construction industries	23, 68, 132
Zohar 2000	Questionnaires	Validated, not widely used	Developed in the manufacturing industry	34
Rundmo 2000	Questionnaires	Validated, used in agricultural, aluminium, magnesium and petrochemical industries	Developed in the agricultural, aluminium, magnesium and petrochemical industries	109
Neal *et al.* 2000	Questionnaires	Validated, used in a hospital	Developed in a hospital setting	94
Griffin and Neal 2000	Questionnaires	Validated, used in manufacturing industry and mining	Developed in manufacturing industry and mining	40
AEA Technology plc (Safety Culture Assessment Tool)	Questionnaires and interviews	Validated, used in nuclear, electricity, transport and oil and gas industries	Developed in nuclear, electricity, transport and oil and gas industries	110
Coyle *et al.* 1995; includes items from Zohar 1980 and Glennon 1982 (ORG Questionnaire)	Questionnaire	Validated, used in clerical and service industries	Developed in clerical and service industries	111
Arboleda *et al.* 2003	Questionnaire	Not validated, not widely used	Developed in haulage industry	112
Mohamed 2003; developed from Kaplan and Norton 1992 (Balanced Scorecard)	Framework	Not validated, used in construction industry	Developed in construction industry	113
Huang *et al.* 2006	Questionnaires	Validated, used in manufacturing, construction, service and transport industries	Developed in manufacturing, construction, service and transport industries	114
Cooper and Phillips 2004; developed from Zohar 1980	Questionnaires	Validated, used in manufacturing industry	Developed in manufacturing industry	45
Carder and Ragan 2003; developed from the Minnesota Safety Perception Survey	Questionnaire	Validated, used in chemical industry	Developed in chemical industry	115

Table 45
OSH practitioner competence and experience tools

Tool developer and name (if applicable)	Data collection methods	Validation and use	Industry	Source of information (see References)
Hinde and Ager, for HSE, 2003 (Competency in Health and Safety Advice)	Questionnaires	Limited validation and use	Developed in engineering industry	79

Appendix 2: Multivariate analyses

Table 46
Factors included in the analyses by block

Factor	Categorisation
Individual performance outcome measures	
Accident at work in the previous year requiring medical attention	None; 1 or more
Minor injuries at work in the previous year not requiring medical attention	Not at all, rarely; occasionally, quite frequently, very frequently
Cognitive failures at work	Not at all, rarely; occasionally, quite frequently, very frequently
Individual health and wellbeing outcome measures	
Sick leave	4 days or fewer in the previous year; 5 days or more
Work illness in the previous year	No; yes
Work stress	Not at all, mild or moderate; very or extremely
Block 1 – Demographic and individual	
Sex	Male; female
Age	Continuous
Marital status	Married or cohabiting; other
Education	Below degree level; degree or higher
Smoking	No; yes
Alcohol use	Within guidelines (14 units or fewer per week for women, 21 or fewer for men); more than guidelines
Block 2 – Job characteristics	
Number of employees in organisation	50 or fewer; 51 to 250; 251 to 1,000; 1001 or more
Years in post	1 or under; 2 to 5; 6 to 10; 11 or more
Hours per week	37.5 or fewer; 38 to 40; 41 or more
Enjoy the job	High; neutral; low
Level	Manager or supervisor; employee
Occupational category	Manager, professional or associate professional; other
Full time	Yes; no
Contract	Permanent; other
Block 3 – Work characteristics	
Job demand	Median split
Social support	Median split
Control	Median split
Intrinsic reward	Median split

Table 46
Continued

Factor	Categorisation
Intrinsic effort	Median split
Extrinsic effort	Median split
Bullying	None; racial abuse, sexual harassment, bullying
Block 4 – Health	
General health	Very good, good or fair; bad or very bad
Anxiety	No; yes
Depression	No; yes
Block 5a – Safety perceptions: individual factors*	
Organisational commitment	Favourable (score 51–100); unfavourable (score 0–50; *n* = 82, 19%)
Line management commitment	Favourable (score 51–100); unfavourable (score 0–50; *n* = 98, 21%)
Supervisor's role	Favourable (score 51–100); unfavourable (score 0–50; *n* = 193, 43%)
Personal safety	Favourable (score 51–100); unfavourable (score 0–50; *n* = 34, 8%)
Competence	Favourable (score 51–100); unfavourable (score 0–50; *n* = 23, 5%)
Risk-taking behaviour	Favourable (score 51–100); unfavourable (score 0–50; *n* = 189, 43%)
Obstacles to safety	Favourable (score 51–100); unfavourable (score 0–50; *n* = 152, 35%)
Reporting accidents	Favourable (score 51–100); unfavourable (score 0–50; *n* = 242, 53%)
Job satisfaction	Favourable (score 51–100); unfavourable (score 0–50; *n* = 146, 32%)
Block 5b – Safety perceptions: overall measure	
Mean overall safety perceptions	Favourable (score 51–100); unfavourable (score 0–50; *n* = 66, 18%)

* Workmates' influence was excluded as not all respondents answered

Appendix 3: General workers survey

Table 47
Safety perceptions and accidents at work

Factor	Categorisation	OR	CI	*p*
Block 5a – Safety perceptions: individual factors				
Line management	Favourable Unfavourable	1.00 4.32	 1.29–14.48	0.02
Supervisor's role	Favourable Unfavourable	1.00 4.59	 1.27–16.50	0.02
Risk taking	Favourable Unfavourable	1.00 0.12	 0.03–0.49	0.003
Obstacles to safety	Favourable Unfavourable	1.00 6.04	 1.88–19.36	0.003
Block 5b – Safety perceptions: overall				
Overall	Favourable Unfavourable	1.00 4.47	 1.74–11.50	0.002

Table 48
Safety perceptions and minor injuries at work

Factor	Categorisation	OR	CI	*p*
Block 5a – Safety perceptions: individual factors				
Organisational commitment	Favourable Unfavourable	1.00 2.86	 1.30–6.29	0.009
Job satisfaction	Favourable Unfavourable	1.00 2.37	 1.13–4.95	0.02
Block 5b – Safety perceptions: overall				
Overall	Favourable Unfavourable	1.00 3.86	 1.78–8.37	0.001

Table 49
Safety perceptions and cognitive failures at work

Factor	Categorisation	OR	CI	*p*
Block 5a – Safety perceptions: individual factors				
No significant associations				
Block 5b – Safety perceptions: overall				
Overall	Favourable Unfavourable	1.00 0.56	 0.31–1.03	0.06

Table 50
Safety perceptions and sick leave

Factor	Categorisation	OR	CI	*p*
Block 5a – Safety perceptions: individual factors				
Job satisfaction	Favourable Unfavourable	1.00 2.06	 1.10–3.84	0.02
Block 5b – Safety perceptions: overall				
No significant association				

Table 51
Safety perceptions and work-related illness

Factor	Categorisation	OR	CI	*p*
Block 5a – Safety perceptions: individual factors				
Risk taking	Favourable Unfavourable	1.00 2.26	 1.14–4.52	0.02
Job satisfaction	Favourable Unfavourable	1.00 1.86	 0.92–3.73	0.08
Block 5b – Safety perceptions: overall				
No significant association				

Table 52
Safety perceptions and work stress

Factor	Categorisation	OR	CI	*p*
Block 5a – Safety perceptions: individual factors				
Line management	Favourable Unfavourable	1.00 2.70	 1.19–6.12	0.02
Supervisor's role	Favourable Unfavourable	1.00 0.48	 0.22–1.05	0.07
Job satisfaction	Favourable Unfavourable	1.00 2.85	 1.42–5.70	0.003
Block 5b – Safety perceptions: overall				
No significant association				

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