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Original article

Health and Safety Performance of UK Universities and How to Improve It

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ABSTRACT

Background: This research suggested a method for evaluating health and safety performance as a combination of reactive and active monitoring.
Methods: A number of Freedom of Information requests (FoI) were sent to the Health and safety Executive (HSE) and 100 UK universities. Data on the number of reportable incidents, diseases and dangerous occurrences were compiled for UK universities and combined with the Impact Ranking for good health and well-being. A semi-structured survey was used to identify best H&S practices. Subsequently, the effect of workers' involvement in H&S management on RIDDOR and near-miss reports, was investigated using statistical analysis.
Results: A ranking of UK universities that perform highly in Health and Safety (H&S) was assembled and selected universities were contacted to identify best practices. Best practices were divided into three categories: team management, roles and responsibilities, and H&S performance monitoring. One of the findings demonstrated a reverse dependence between provision of a refresher training in risk assessments and a number of reported RIDDOR incidents.
Conclusion: Health and Safety professionals in the universities may find it useful to reflect on these findings and the identified best practices in order to improve the H&S performance in their own organisations.

1. Introduction

Higher educational (HE) organisations are diverse institutions with varied risk profiles, activities, organisational structure, and management. An attempt to unify the approach to H&S management within universities and measure H&S performance, USHA produced the Health and Safety Management Profile (HASMAP) auditing tool [1]. HASMAP is based on the Health and Safety Executive Guidance HSG 65 'Successful Health and Safety Management' and is also aligned to BS ISO 45001:2018 'Occupational Health and Safety Management Systems'. The HASMAP is seen as a flexible framework to develop a Health and Safety Management System at Universities and to measure the level of assurance based on the University risk profile. The HASMAP was develop to detail how best practices of H&S management outlined in another USHA guidance, Leadership and Management of Health and Safety in Higher Education Institutions [2], should be achieved. However, the applicability of USHA's guidance and the HASMAP varies significantly across the sector: many universities are amending HASMAP tool to match their structure and operational model, while others prefer to use their in-house developed tools of commercially available auditing solutions. The ability to tailor the HASMAP tool to the needs of each university is useful but, combined with the vague marking scale, it would be challenging to use it as a benchmarking tool. As such, there is currently a gap in the measurement and comparison of the performance of universities with regards to health and safety. While some of the online rankings report on the safety of universities in the UK [3,4] and the US [5], they are focused on 'campus security', 'rates of crime' and personal security on campus. These are not the aspects of H&S management that will

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affect the occupational health and safety of the students, researchers, staff and visitors at a university.

The only publicly available reference to a review of universities H&S performance is H&S ranking of 23 UK universities from Russell Group Universities based on the number of health and safety reportable accidents – RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013) reports for the academic year 2014/2015 [6]. RIDDOR accidents are those that are legally required to be reported to the HSE and include, among others, all workplace deaths, specified injuries to workers, over-seven-day incapacitations, non-fatal accidents to non-workers, occupational diseases, dangerous occurrences and gas incidents [7]. However, published results were only concerned 23 Russel Group Universities with no regards to other types of Universities and there is no further publicly available research into safety of Universities with regards to workplace incidents. From 2016 the Higher Education Statistics Agency (HESA) [8] stopped publishing statistics on RIDDOR reports and this data are no longer publicly available.

The number of RIDDOR reports alone is not an effective indicator of H&S performance as they are a measure of failures only [9]. A combination of active and reactive performance indicators must be used for effective performance monitoring [10]. As described above, a common metric of active performance monitoring is the survey. An ideal scenario would be to request the Universities to complete a survey to score the organisational active safety performance as closely as possible and use obtain data to rank them. However, this could be a scope or a separate study. Instead, for this research we used the only existing public ranking which we could at least remotely attribute to active health and safety monitoring at Universities – the Impact Ranking by The Higher Education: good health and well-being [11]. The attribution to the Impact Ranking is based on the alignment of its criteria with aspects related to health and well-being. This ranking measures universities' research on key diseases and conditions, their support for healthcare professions, and the health of students and staff, including adherence to smoke-free policy, collaborations with health institutions to improve health and well-being outcomes, access to health services for students and mental health support for students and staff. This is the only published ranking authors could identify to be used for measuring safety culture in a way described by Boustras et al. (2015). Universities that are not included in the Impact Ranking, or do not have RIDDOR reports, have to be excluded from this review.

The HSE [12] identifies 'worker involvement' as one of 'the core elements' of managing H&S. They specify that consultation – 'not only giving information to your employees but also listening to them and taking account of what they say' – is different from involvement [13].

Popma (2009) identifies that worker involvement correlates with better quality risk assessment (RA) and more preventative measures, although this is not a strong effect. In addition, it was found that worker involvement produced a small but significant increase in the percentage of RAs 'considered adequate': 81.3%, compared to 71.1% (approximately a 10% improvement). While the 'involvement' was not defined in this research, it was stated that it is beyond consultation and is 'direct participation' at 'various levels', including at the 'shop floor' [14].

Involving workers in the RA process should lead to better assessments and better engagement in H&S. It was shown that empowering workers to assess the safety and efficiency of the process with simplified path to formalising the changes leads to better performance of nuclear plants, e.g. higher 'availability rates' [15]. Furthermore, worker involvement in the RA process, should lead to fewer violations, and therefore fewer accidents [16,17].

In 1982, Cox showed that understanding of the risk by workers is more important than the quality of the assessment [18]. The provision of training can affect safety in an organisation, although this is a complex issue – for example, it was identified that education and training was provided more frequently to non-Taiwanese workers and yet they were still more likely to suffer an accident [19]. Questions on H&S training are included in many safety climate tools, including NOSACQ-50 [20] and mathematical models [21]. There is a clear link between H&S training and safety performance.

This research provides an understanding of the best practices identified in the UK university context and can serve as a valuable starting point health and safety professionals worldwide. It offers a framework for reflection and adaptation to suit the specific cultural and organisational contexts in different parts of the world. It is important to note that this process will require careful consideration of national cultural factors [22] as well as local regulations, and stakeholder engagement to ensure effective implementation and alignment with the unique needs of each organisation.

2. Materials and methods

2.1. Data on the reportable incidents

Data on reportable incidents (RIDDORs) were publicly available only prior to 2016 and a Freedom of Information (FOI) request to HSE for the period 2016–2021 was submitted through whatdotheyknow.com [23]. Data analysis was conducted to sieve through the supplied data (data provided by the HSE covered all secondary and tertiary education providers in the UK) and identified the average annual RIDDOR rate per 1000 at risk. Contrary to Tuite (2016), it was decided not to separate the incident rates into student and staff categories, rather calculate RIDDOR rates per 1000 of students and all categories of staff combined, as all of them are at risk in the university environment. This approach was chosen because our primary objective was to evaluate the safety dynamics of everyone regularly at risk on the university premises or engaged in university activities. We aimed for a holistic understanding of safety performance that encompasses the entire university community. However, it is crucial to note that the practicality of directly reapplying this methodology to other universities worldwide may vary. Depending on the type of university, cultural differences, and other contextual factors, the dynamics between students and staff may differ significantly. Therefore, caution should be exercised when generalizing our findings to diverse cultural and institutional settings. It was expected that RIDDOR numbers were affected by universities closures and lower attendance due to the COVID-19 lockdowns in 2020 and 2021, therefore the collection of data was extended to 2016 and the annual average (an average number of submitted RIDDOR reports a year during the 2016–2021) was calculated for the period 2016–2021. More than 160 universities reported RIDDOR incident in 2016–2021. To make the ranking list of a manageable size, universities that reported only one dangerous occurrence or occupational disease and less than 10 specified injuries a year were excluded from the analysis. It worth noting, that HSE data for St. Mary's University indicated that there were 1.12 incidents reported for 1000 at risk. However, this number was outside of the range of all other Universities and we contacted the St. Mary's H&S team who confirmed overreporting for the researched period and provided corrected numbers which we used in our study. We marked the university name with an asterisk (St. Mary's University*) to indicated the amendment.

A separate FOI was sent directly to the top 100 non-private universities the UK by student numbers, less the Open University, to receive further statistical information, including number of near-misses, for the year 2019. Seventy seven responses were used in this study, which used the RIDDOR and Near Miss rate per student, using the internally consistent student numbers provided by the

Higher Education Statistics Agency (HESA). This is a continuation of the already published research [24]. The list of questions and corresponding data for the t-test and ANOVA analysis are presented in the original work.

2.2. Survey of H&S teams at UK Universities to identify current best practices

A semi-structured interview, a common methodology that uses open questions to collect information and is interviewee-led [25], was used to cover the main topics of HSMS in the individual universities, their H&S team structure and visibility of their H&S team. Health and Safety teams from the top 12 universities that were highly ranked by the good health and wellbeing in the UK and had less than 1 annual RIDDOR reports per 1000 at risk on average in the studied period were contacted and their responses collected (see Fig. 4). Nine responses were collected, anonymised and summarised.

2.3. Statistical analysis to identify the dependence of workers involvement on accident rates

In this research, the following null hypotheses were used:

- Worker involvement in RA has no effect on an organisation's accident rate.
- Providing training to workers on RA has no effect on an organisation's accident rate.

Accident rates can be split into numerous categories with HSE using fatalities, RIDDOR reportable events, and non-fatal injuries, among others [26]. This research used: RIDDOR accidents reported to HSE and near misses reported within the organisations. The methodology of the statistical analysis is described in details elsewhere [24]. It is worth noting that unlike data used for comparison of universities performance, this statistical analysis normalised data to the total number of students in the universities.

Table 1
Applicable survey questions for each null hypothesis

Null hypothesis	Applicable survey question
Worker involvement in RA has no effect on an organisation's accident rate in terms of RIDDOR-reportable incidents or near misses.	Are workers routinely involved in the risk assessment process? Are workers routinely involved in the identification of hazards? Are workers routinely involved in all, most, some, or only relevant risk assessments?
Providing training to workers on RA has no effect on an organisation's accident rate in terms of RIDDOR-reportable incidents or near misses.	Are workers provided with training on risk assessment as part of their training or development? Is training in person, using eLearning, or both? Is refresher training required?

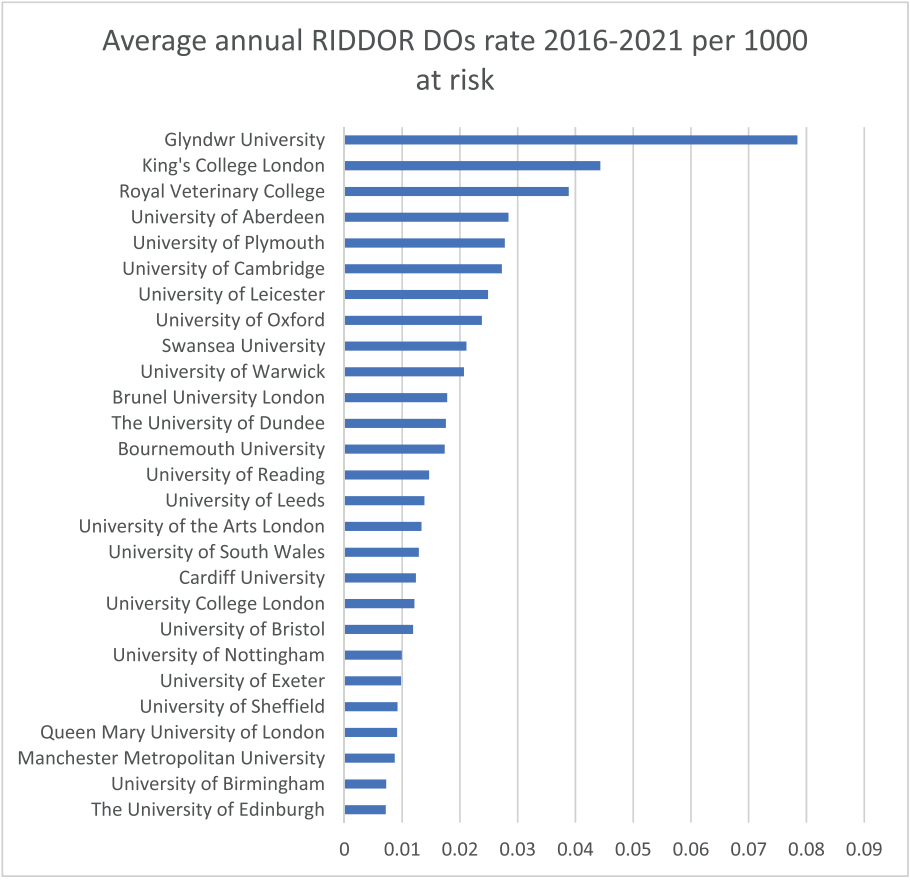

Fig. 1. Average annual rates of dangerous occurrences per 1000 at risk reported by universities in 2016–2021.

Table 1 lists survey questions which were considered for each of the null hypotheses, which are based on the factors outlined in part 2 of *HSG 65* of evidence of effective management of H&S [12]. For null hypothesis 1, questions were selected to gauge the extent, frequency, and comprehensiveness of worker involvement. Null hypothesis 2's questions were designed to evaluate the integration, delivery modalities, and sustainability of risk assessment training.

3. Analysis and discussion

3.1. Universities H&S ranking

As it was concluded during the analysis of the available literature, the best way to evaluate H&S performance is to combine a reactive measurement of HSMS failures, such as RIDDOR rates, with an active measurement of safety culture, which can be obtained via surveys.

As the last openly available data were collected by Tuite for 2014/2015 (Tuite, 2016), a Freedom of Information (FOI) request to HSE was submitted, asking for information on RIDDOR reports from universities dating from the 1st of January 2016 until the 31st of December 2021. RIDDORs were reported for workers and those visitors who received hospital treatment directly after the injury. After the initial data analysis, the results returned with three categories of data available.

- **Numbers of dangerous occurrences (DOs):** DOs are near misses with a high potential to cause death or very serious injury, which mainly indicate failures in maintenance, equipment management, and unsafe systems of work (especially at specified workshops with high-risk profiles, such as mines and offshore workplaces). Fig. 1 presents the number of DOs reported by universities in 2016–2021 per 1000 of students and staff.
- **Number of occupational diseases (ODs):** ODs include a range of musculoskeletal disorders, occupational cancer, and diseases associated with exposure to biological agents. These mainly occur when there is insufficient assessment of such risks, when the controls are inadequate, or instruction is not followed. See Fig. 2 for the ranking of universities that reported such RIDDOR during 2016–2021.
- **Number of specified injuries.** The bulk of RIDDOR reports are reports of specified injuries that, in the majority of cases, incapacitated a worker for some time, or required an immediate treatment to a visitor.

Fig. 3 presents the ranking of these universities for the average annual number of specified injuries reported in 2016–2021 per 1000 at risk.

It seems obvious to assume that the lower the number of reports the safer an environment is, however, it may also be an indicator of a bad safety culture and underreporting. Therefore, a combination of evidence of reporting RIDDOR incidents and a good health and well-being ranking were chosen as a representation of safety culture [11]. Fig. 4 is a overall ranking of universities in order of their good-health and well-being ranking (with the position in the rank numbered) vs the number of RIDDOR reports (OD + DO + specified injuries) submitted per year on average in the years 2016–2021.

From the Fig. 4 it can be seen that the good health and well-being ranking does not have a good correlation with the number of submitted RIDDOR reports. However, among other parameters, the

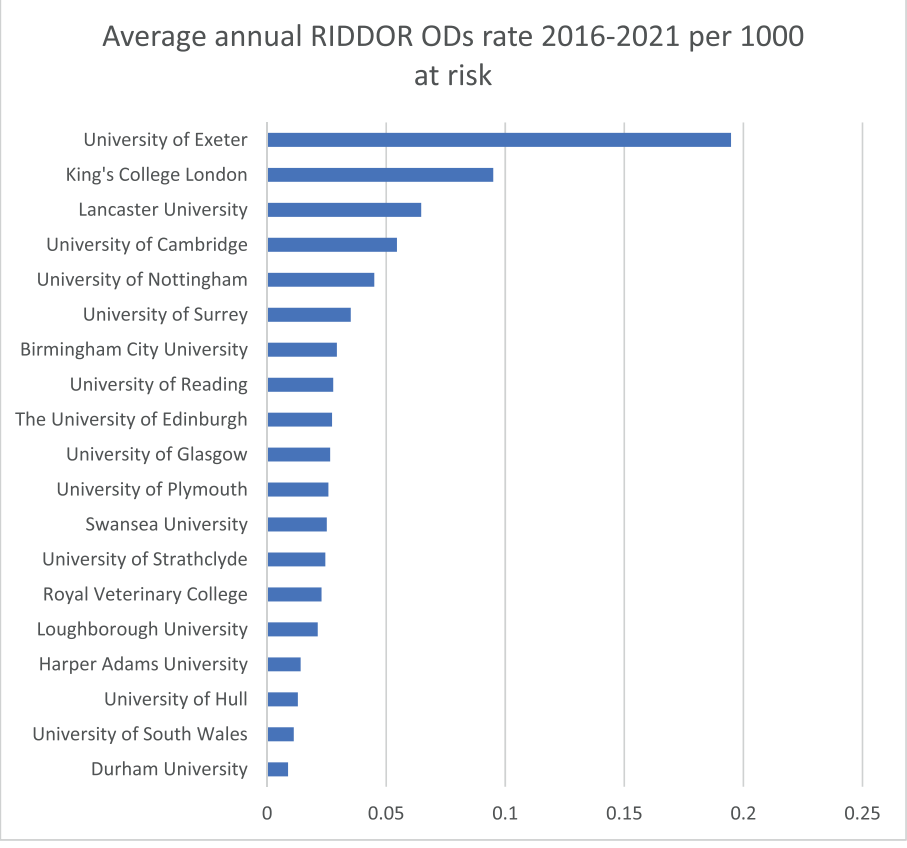

Fig. 2. Average annual rates of occupational diseases per 1000 at risk, reported by universities in 2016–2021.

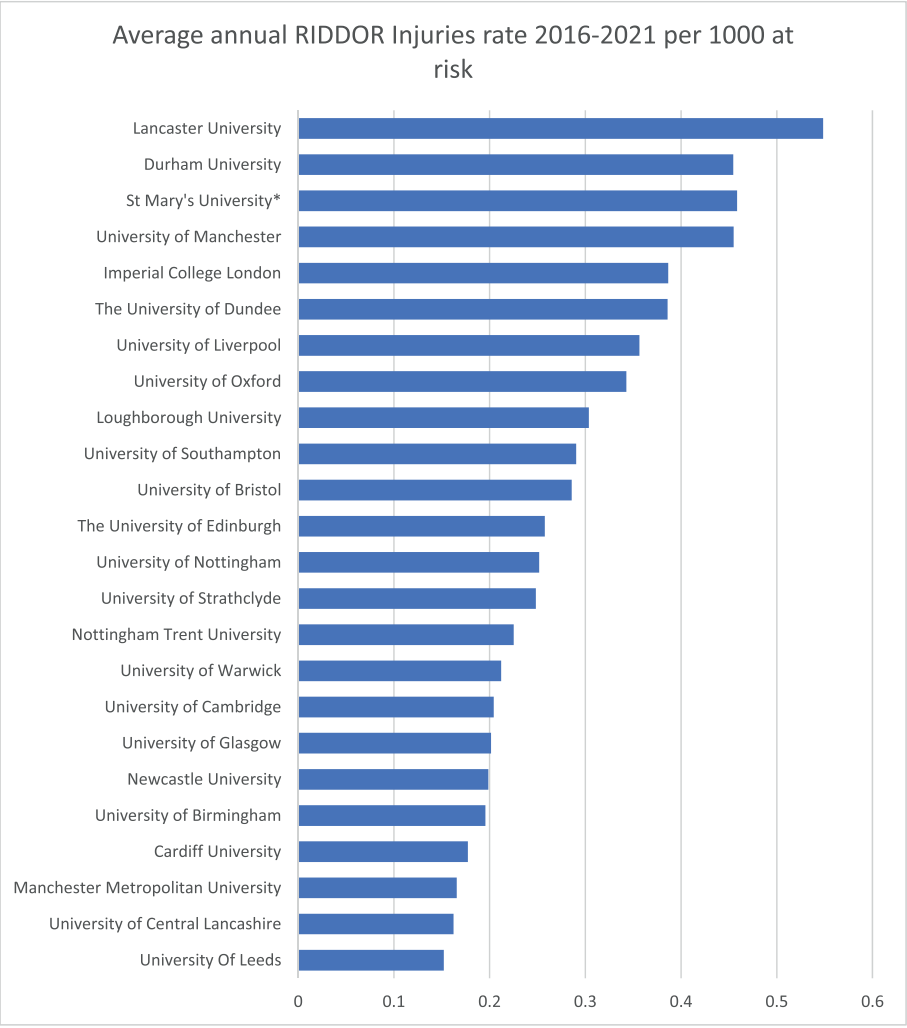

Fig. 3. Average annual rates of specified injuries per 1000 at risk, reported by universities in 2016–2021. *Amended as described in methods section.

Ranking measured adherence to a policy aimed to improve health and health attitudes on campus and efforts in provision health and wellbeing support for students and staff. Therefore, authors speculate that those universities who are higher up in the Impact Ranking (positive active performance) and have lower rates of RIDDOR (positive reactive performance) should have a good HSMS system in place and are better in H&S performance.

From Fig. 4 selected universities were surveyed to identify best practices in H&S management. The main approaches and best practices identified are listed below:

1. Team structure and management.
   - H&S team members have specified areas of responsibility but work together, and can overlap and interchange.
   - Business partner model, where an H&S partner is responsible for a specific faculty/department.
   - The H&S team is visible to students and staff by providing training, toolbox talks, and attending university events, such as graduation, etc.
   - H&S team members are empowered to make decisions.
   - No performance bonuses are specified.
2. Roles and responsibilities
   - Appointed safety specialists.
   - Staff with part-time safety roles.
   - Regular meetings with local safety reps.
   - Renumeration for some additional H&S roles, such as first aiders.
   - Dedicated staff wellbeing team.
3. H&S performance monitoring
   - Inspections are done by local safety personnel, who are responsible for setting the schedule.
   - Safety representatives from one department are invited to inspections in other departments.
   - Audits are done by trained internal staff.

Additionally, all of the respondents emphasised the importance of communication between H&S professionals, academics, students, and support workers. The active involvement of everyone in supporting good health and safety practices was acknowledged to be paramount.

3.2. *Improving safety performance by workers involvement*

While there are a number of aspects which affects H&S performance, this research will focus on worker's recognition of hazards and safe practices by involvements in risk assessment process. Of the 78 respondents, 100% answered the question on worker involvement, with 79.49% indicating that workers were involved in the RA process. This shows that the majority of organisations either already involve workers or know that they should. Data presented

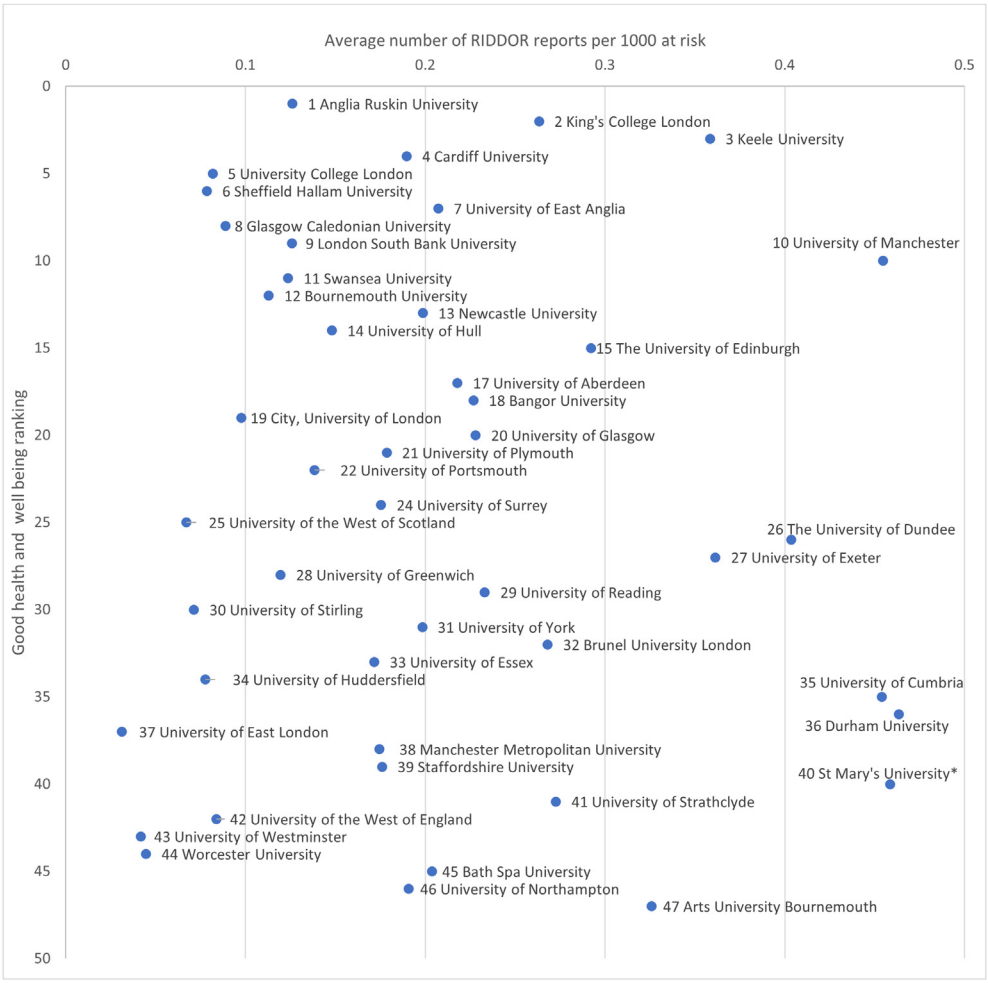

Fig. 4. Total number of average annual RIDDOR reports (made up of those for dangerous occurrences, occupational diseases and specified injuries) per 1000 at risk (2016–2021) among universities ranked in good health and well-being (2022), listed in order of their UK ranking 1–47, excluding those that did not report any RIDDORs during the researched period. *Amended as described in methods section.

below are an expansion on the previously published research on effect of workers involvement on students' safety [24]. Searle (2023) has identified that formalisation of worker involvement in RA within a policy saw an 18% increase in the number of RIDDOR-reportable incidents – an increase of 4.688 x 10^{-5} RIDDOR reports per student at risk. For a university of 10,000 students this is equivalent to an extra 0.47 RIDDOR reported per annum. However, this was not statistically significant, with $p = 0.157$.

In contrast, the formalisation of worker involvement in RA within a policy was statistically significant for near misses ($p = 0.029$), with a mean difference of 0.03 near misses reported per student at risk – equivalent to an additional 300 near misses being reported per annum for a university of 10,000 students.

3.3. *Effect of the involvement of workers in risk assessment on accident rates*

Analysis of the null hypothesis 1 'Worker involvement in RA has no effect on an organisation's accident rate' revealed that, while a reduction in reported RIDDOR incidents was identified for worker involvement in RA and the identification of hazards, neither were statistically significant ($p = 0.076$ and $p = 0.282$ respectively).

Worker involvement in RA and worker involvement in control measure identification both resulted in more near misses being reported ($t = 0.735$ and $t = 0.084$, respectively), although in neither case was it statistically significant ($p = 0.232$ and $p = 0.2$, respectively). Worker involvement in the identification of hazards resulted in a reduction of the near misses reported, although this was also not statistically significant ($t = -0.72$, $p = 0.242$).

There was no statistically significant difference between the organisations that involved workers on all, most, some, or only relevant RA in terms of the number of near misses reported. Again, the reason for this is not clear but could be more relevant to the type of RA in which workers were involved [27].

This research cannot identify why the RIDDOR rate would be unaffected, particularly as the data suggest a relationship between the two rates as outlined in the Fig. 5 below. The severity of incidents, and legal requirement, can be reasonably assumed to make RIDDOR reporting more consistent, while the number of near misses occurring is essentially impossible to determine with any accuracy although they are what accidents are made from [28]. Therefore, the discrepancy could be explained by the reporting of near misses that previously had gone unacknowledged, with the accident rate no being effected.

Furthermore, with the numerous elements having been identified as part of, or effecting, safety culture the identification of causation will be much more complex than identifying correlation; this is worthy of further research.

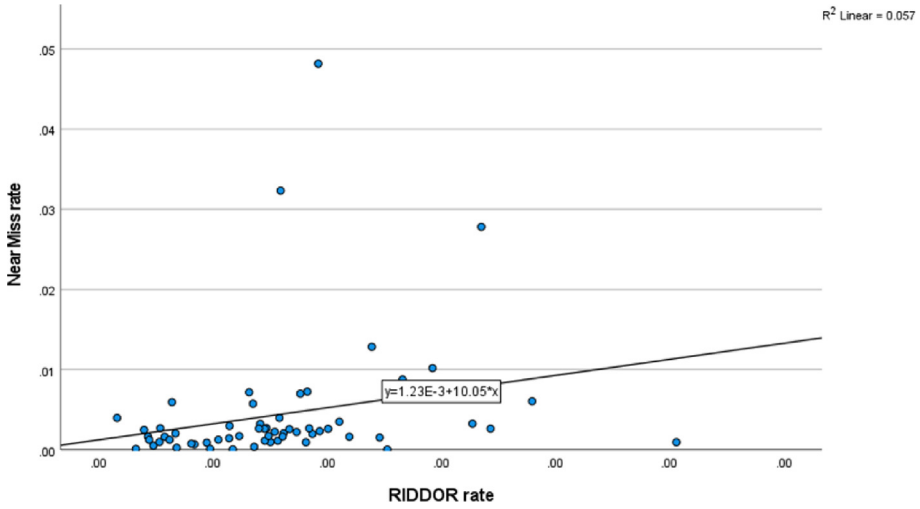

Fig. 5. Correlation between near-miss and RIDDOR rates at selected UK universities in 2019.

3.4. Safety training

Investigation of the null hypothesis 3 'Providing training to workers on RA has no effect on an organisation's accident rate in terms of RIDDOR-reportable incidents or near misses' showed some interesting results.

Where training in RA is provided to workers as standard, there is a 9.4% decrease in the number of RIDDOR-reportable incidents, although this is not statistically significant ($p = 0.281$). However, where refresher training is provided, there is a 25.8% decrease in the number of RIDDOR-reportable incidents and this is statistically significant ($p = 0.002$). This is equivalent to 1.22 fewer RIDDOR-reportable incidents per year for a university of 10,000 students. Our survey identified that only 60% of participants mandate refresher training, with the frequency varying between one and five years, averaging every three years. For organisations with training in place, it takes little additional resource to require refresher training and there is a demonstrable benefit.

The use of training is an important factor in knowledge retention and this in turn suggests that periodic retraining would be effective [29]. This appears to be the case in terms of the RIDDOR-reportable rate. In the global meta-analysis of the safety training reports in the latest decade it was suggested that for the training to 'stick', the organisation should invest in training engagement which is identified by pre-training factors. They also identified that refresher training is a key aspect of knowledge transfer that requires further research and suggested that refresher training is more effective when provided within weeks and months rather than years [30].

In terms of the number of near misses reported, neither the provision of training nor the requirement for refresher training produced a statistically significant result ($p = 0.142$ and $p = 0.093$, respectively). Furthermore, the provision of training results in more near misses being reported, while the provision of refresher training results in fewer.

The measurement of the safety culture through near misses can be complex. More near miss reports could be a result of an increase in the occurrence of unsafe acts, or a greater awareness of H&S, resulting in the reporting of unsafe acts or conditions that were already occurring. In any one organisation, it would be logical for the introduction of training to increase near miss reporting (as more events are reported) and, over time, the numbers to decrease (as fewer unsafe acts or conditions occur). However, this is a cross-sectional study and the cause of this change cannot be determined without further research.

Universities were asked whether the training offered was provided in person, via eLearning, or through both routes. ANOVA tests on the three options did not show any statistically significant different for RIDDOR-reportable incidents or near misses ($p = 0.093$ and $p = 0.190$, respectively). Therefore, no further conclusions can be drawn on the best way to deliver training.

While Petty (2002) outlined the modes of teaching used in this research, this is another complex area [31]. The VARK model of learning preference and its associated questionnaire is commonly used as a means of identifying learning styles, with over 180,000 using the website over a six-month period [32]. This model suggests that a learner's preferred form of communication (visual, auditory, reading, and kinaesthetic) affect the learning outcome. However, many studies have found no link with outcomes [33,34]. Therefore, the mode of teaching may not be relevant when compared to the content being delivered – the fact that training is occurring appears to be more relevant than how it is provided.

4. Conclusion

In this research, an optimal method of assessment of H&S performance was suggested and applied to UK universities. RIDDOR reports were used as a metric for reactive performance and results of the good-health and well-being ranking were chosen as the best alternative to active performance indicators. Using a combination of these two metrics, university H&S performance ranking was suggested. Selected universities identified as strong H&S performers were surveyed to share best H&S management practices, which were segregated into three categories: team management, roles and responsibilities and performance monitoring. All surveyed universities highlighted the importance of worker involvement in H&S management. Therefore, a relationship between worker involvement in assessing workplace risks and safety performance (RIDDOR and near-miss rates) was analysed. Formalising worker involvement in RA within an organisational policy did provide a statistically significant reduction in the number of RIDDOR-reportable incidents. While there is not a statistically significant difference to the provision of risk assessment training for workers in general, there is a clear decrease in the number of RIDDOR-reportable incidents in organisations where staff are provided with RA training and where the refresher training is mandated. Only 60% of surveyed universities mandated refresher training; this is a relatively simple and low-cost measure that

would result in a meaningful decrease in number of RIDDOR incidents reported.

Further improvement to the suggested approach of measuring H&S performance would include referring to an active performance indicator metric more specific for the H&S management at universities that could assess the presence and quality of the H&S policies, attendance and provision of H&S training, inspections and other monitoring arrangements (similar to HASMAP, but perhaps with a more detailed marking scale/specific questions). Additionally, including other reactive performance indicators, such as sick days and near-misses or reported building defects would further improve the quality of the H&S performance assessment.

Conflicts of interest

The authors declare no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.shaw.2024.02.002.

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