Safety and Health at Work 9 (2018) 388–397

Contents lists available at ScienceDirect

Safety and Health at Work

journal homepage: www.e-shaw.org

Original Article

Analysis of Penalties Imposed on Organisations for Breaching Safety and Health Regulations in the United Kingdom

Andrew Oyen Arewa [1,*], Stephen Theophilus [1], Augustine Ifelebuegu [1], Peter Farrell [2]

[1] School of Energy, Construction & Environment, Faculty of Engineering and Computing, Coventry, Coventry, CV1 5FB, UK
[2] School of School of Engineering, The University of Bolton, Deane Road, Bolton, BL3 5AB, UK

ARTICLE INFO

Article history:
Received 27 May 2017
Received in revised form
20 December 2017
Accepted 18 January 2018
Available online 2 February 2018

Keywords:
organizations
penalties
safety and health at work

ABSTRACT

Background: The study analyzes penalties imposed on organizations for breaching safety and health regulations. The research questions are as follows: what are the commonly breached safety and health regulations? How proportional are penalties imposed on organizations for breaching health and safety regulations in the United Kingdom?
Methods: The study employed sequential explanatory mixed research strategies for better understanding of health and safety penalties imposed on organizations. Actual health and safety convictions and penalties data for 10 years (2006 to 2016) were obtained through the United Kingdom Health and Safety Executive (HSE) public register for convictions. Overall, 2,217 health and safety cases were analyzed amounting to total fines of £37,179,916, in addition to other wide-ranging penalties. For thorough understanding, eight interviews were conducted with industry practitioners, lawyers, and HSE officials as part of the study qualitative data.
Results: Findings show that the Health and Safety at Work (HSW) Act accounted for 46% of all HSE prosecution cases in the last decade. This is nearly half of the total safety and health at work prosecutions. Moreover, there is widespread desire for organizations to comply with the HSW Act, but route fines are seen as burdensome and inimical to business growth.
Conclusion: A key deduction from the study reveal significant disproportionality concerning penalties imposed on organizations for breaching safety and health regulations. On aggregate, small companies tend to pay more for health and safety offenses in a ratio of 1:2 compared to large companies. The study also reveals that the HSW Act accounted for nearly half of the total safety and health at work prosecutions in the last decade.

1. Introduction

In the last five decades, various organizations were prosecuted for breaching safety and health at work regulations; albeit, the same period witnessed the most stringent and enforced safety and health at work regulations. However, the last 10 years is of paramount interest concerning penalties imposed on organizations for breaching safety and health at work regulations in the United Kingdom because of eye-watering fines levied on offenders. From government and regulation viewpoint "fines imposed for health and safety failures must be high enough to make a difference to a company and to make all concerned sit up and take notice" [1]. But a complex safety and health penalties landscape seems to be evolving, considering recent astronomical one million pounds (£1M) penalty imposed on Watling Tyre Service Ltd, a small and medium enterprise (SME) engineering company, for breaching the UK Health and Safety at Work (HSW) Act 1974; a case that confirmed failure to safeguard health and safety of both employees and nonemployees at work [2]. This case sent a shock wave to all practitioners and legal luminaries because in the past it was only large organizations with high commerciality and capability that often attracted huge health and safety fines to a turn of a million pounds (£1M) for wrongdoings. Some analyst argued that in recent times the United Kingdom has "routinely seen health and safety fines over £1 million; whereas, in the past it was only very high-profile cases such as rail/airplane crashes, multiple fatalities, and

* Corresponding author.
E-mail addresses: ab6887@coventry.ac.uk (A.O. Arewa), ab2038@coventry.ac.uk (S. Theophilus), aa5876@coventry.ac.uk (A. Ifelebuegu), pf1@bolton.ac.uk (P. Farrell).

2093-7911/$ – see front matter
https://doi.org/10.1016/j.shaw.2018.01.004

oil and gas disasters such as Buncefield and the British Petroleum (BP) Plc's Gulf of Mexico disaster which attracted huge fines" [3].

Arguably, excessive safety and health penalties have direct implications on small organizations that may not have the financial "shock-absorbers" to cushion the impact of seismic safety penalties; thus, small businesses must brace up for positive safety and health culture. Besides, SMEs are dominant entities in major industries such as construction, mining, etc; yet these categories of businesses are 10 times more likely to be prosecuted for breaching health and safety offenses [4]. For example, in Europe, three out of 10 SMEs often go out of business after being hit with health and safety fines [5]. Indeed, adverse effects of safety and health at work on small companies are not far-fetched because of their slim profit margin. Some legal practitioners are of the view that centring health and safety penalties on a company's turnover creates inconsistency, possibly the biggest blunder in our time [6]. In an article titled 'The fine gap in deterrence' [7], the author argued that studies concerning proportionality, trend, and in-depth appraisal of penalties regarding safety and health at work are rare. Thus, this study seeks to review penalties imposed on small and large organizations for breaching safety and health regulations in the United Kingdom.

On the other hand, there is need to examine whether exorbitant fines imposed on organizations in recent times for breaching health and safety rules actually deter businesses to act unsafely. This is imperative because too often organizations fined for breaching safety regulations in the past were subsequently involved in adverse safety incidents [8]. For example, in the last decade, many companies such as Balfour Beatty Plc, British Petroleum (BP) Plc, Muller (UK) Ltd, Merlin Entertainment Group Ltd, etc were consistently fined eye-watering amounts for various health and safety breaches. Coincidentally, these same companies were subsequently involved in reoffending. The reality remains that every accident is preventable; therefore, harm risk resulting from safety and health failures should be punished appropriately. However, the nature of some safety incidents show that accidents can and do occur regardless of due diligence.

2. Materials and Methods

Empirical data relating to fines and penalties imposed on organizations for breaching safety and health regulations are scarce. Yet, there is need for thorough understanding of research in this area of study because the burden of health and safety on businesses can be enormous if not properly managed [8]. The UK government appears to recognize this assertion when the former UK Prime Minister David Cameron stated that "the UK government will ease health and safety encumbrance on small businesses, … the burden of health and safety red tape suffocates many small businesses …we are determined to kill off the health and safety lousy compensation culture and address the fear from businesses of being sued for trivial excessive claims" [8]. Arguably, recent hikes in health and safety fines appear to be a complete departure from earlier promises made by the government.

Indeed, harm risked for breaching of health and safety duty ought and should be punished adequately. Fear of prosecution and its resultant financial consequences for noncompliance to health and safety regulations are the main reason for fewer accidents [9,10]. Health and Safety Executive (HSE) [11] stress that "safety does not come about by accident: most accidents happen because they have not been prevented". The Occupational Health and Safety Administration [12] is of the view that the major reasons for noncompliance with safety in most countries is because of frail rule of law, a weak prosecution system, and a focus on profit maximization. It is often the case that without good legal systems in place businesses will be less willing to comply with standard health and safety norms, mainly due to financial gain [13].

In an article titled 'Step by step to record fines' [3], the author argued that though there is a reasonable reduction in workplace injuries and fatalities across industries; significant casualties still exist in workplaces due to unsafe acts [3,14]. Perhaps, the new health and safety sentencing guideline introduced by the UK government in February 2016 was designed to increase fines and to send deterrent message to offenders. Arguably, "sentencing health and safety offenders in the United Kingdom has always been disproportionate, yet lawyers and practitioners struggled to understand consistency of health and safety fines" [15]. From a legal viewpoint, establishing liability and associated fines for health and safety offenses appears to be more difficult compared to other criminal and civil cases. The quest by practitioners and legal luminaries to make certain "assessment of offender's culpability, offense category, and the harm risked for breaching health and safety duty is generally deemed imprecise. Perhaps, it is due to offense classification and reference to the offender's financial means including consideration of aggravating and mitigating features of the offense" [15]. On the contrary, it maybe that the new health and safety sentencing rules in the United Kingdom, will shift punitive measures imposed on offenders from an art to a science.

2.1. Health and safety legislations in the United Kingdom

Health and Safety regulations in the United Kingdom can be traced back to 1970s. However, the recent health and safety sentencing guidelines 2016 appear to focus on fines and safety regulations [16]. The UK's new sentencing guidelines for health and safety offenses, corporate manslaughter, and hygiene offenses apply to individual and organizations irrespective of date of offense, and it could be argued to be solely responsible for the recent hike in health and safety fines. Moreover, the new sentencing guidelines rely mainly on offense classification that automatically flows into tables that specify a range of penalties based on health and safety offender's financial capabilities [16].

Apart from the new regulation, other health and safety regulations in the United Kingdom are centered on participation and responsibility of duty holders (clients, employers, and workers) concerning work-related duty of care. Some UK health and safety regulations are:

1. Provision and Use of Work Equipment Regulations (1998);
2. Work at Height Regulations (2005);
3. Gas Safety (Installation and Use) Regulations (1998);
4. Management of HSW Regulations (1999);
5. Control of Substances Hazardous to Health Regulations (2002) (COSHH): require employers to assess the risks from hazardous substances and take appropriate precaution;
6. Reporting of Injuries, Diseases and Dangerous Occurrences Regulation (1995) (RIDDOR);
7. The Corporate Manslaughter and Corporate Homicide Act, (2007);
8. The Construction (Design & Management) Regulations (CDM, 2007).

According to HSE [16], these regulations are put in place to help mitigate ill health and accidents in the workplace.

2.2. Health and safety prosecutions in the United Kingdom

In recent times "law courts are increasingly willing to impose a high fine on safety offenders where there is minimal injury … thus the need to understand proportionality of health and safety fines"

Table 1
Average unadjusted health and safety fines per industry in 2009/10 adapted from Fidderman (2014)

HSE industry classification	Average unadjusted fines per offense in 2009/10
Agriculture	£9,633
Construction and related industry	£10,622
Services	£18,509
Manufacturing	£19,761
Extractive and utility supply	£20,273
Mean score	£15,760
Total	£78,798

HSE, Health and Safety Executive.

[7]. A breakdown of health and safety fines obtained from HSE (2011) public register of convictions show that the construction industry alone accounted for 27% of health and safety breaches compared to four main sectors such as extractive/utility supply 2%; agriculture 3%; services 33%, and manufacturing 35%. The unadjusted average in court fines by industries are illustrated in Table 1 for clarity.

Conversely, the average in court unadjusted fines per health and safety offense shown in Table 1 exclude exceptional fines. For example, HSE [17] public register for health and safety convictions average exceptional fines in the extractive and utility supply industry in 5 years to 2009/10 ranged from £17,059 to £747,868. Though, in the same year, there was one fine that amounted to £15 million. Obviously, exceptional fines make it difficult to corroborate why some health and safety cases attract higher fines. Overall, available HSE health and safety convictions data for 2015/16 show that extractive/utility supply and manufacturing industry appears to attract higher fines, while construction and agriculture recorded slightly lower fines [7]. Table 2 shows the 2015/16 average unadjusted health and safety fines per industry. The table reveals a similar trend (with a slight increase) in average unadjusted fines when compared to Table 1.

Largely, HSE [18] data reveal a slight reduction in the number of health and safety cases/breaches in court, but individual and exceptional health and safety fines increased significantly from 2015 to 2016. For example, the recent £1 million penalty levied on SMEs companies such as Watling Tyre Services Ltd and the record £5 million fine imposed on Merlin Attractions, the owners of Alton Towers, UK, for safety breaches are clear indications of how the landscape of health and safety fines has changed. Large companies are not immune from the wave of new fines. Companies such as Scottish Power Generation Ltd, Balfour Beatty, and ConocoPhilips (UK) Ltd were recently fined over £1 million each for two separate health and safety offenses. The proportionality of these fines *vis-a-vis* gravity of offense remains unsubstantiated. Similarly, the symmetry between health and safety fines and use of insurance to cushion adverse effects remain uncorroborated.

Table 2
Average unadjusted health and safety fines per industry in 2015/16

HSE industry classification	Average unadjusted fines per offense in 2015/16
Agriculture	£8,902
Construction and related industry	£10,061
Extractive and utility supply	£21,273
Manufacturing	£19,118
Services	£17,904
Mean score	£15,452
Total	£77,258

HSE, Health and Safety Executive.

However, a clear contrast in recent fines can be drawn from the leisure giant Merlin Attractions operations who were fined £350,000 in April 2012 over the death of a 72-year-old man who was tripped over by a parapet wall at work [14]. Then, four and half years later in September 2016, the same company was fined £5 million over failing to adequately manage the Smiler rollercoaster in Alton Towers Park; which left 16 people injured [14]. The huge increase in fines noticed in recent times appears to be deliberate, systemic, and wholly attributed to the UK's new sentencing guidelines that came into force in February 2016. On the other hand, lawyers and practitioners are concerned that the UK's law courts hasty demand and reliance on company's turnover may also contribute to a disproportionate hike in fines [15,19]. Many safety and health at work observers argued that "there is a need to start thinking of alternatives to high fines; … just because a company has a large turnover does not mean that it is profitable" [14].

2.3. Health and safety offense prosecutions by legislation in the United Kingdom

Fundamentally, the main UK health and safety law is the HSW Act 1974; this act set out general duties that employers will follow or rely upon in dealing with employees and members of the public [17]. The general duties under the Health and Safety Act 1974 rely mainly on principle of "so far it is reasonably practicable". This means that employers do not have to take measures to avoid or reduce the risk if they are technically impossible, excessively problematic, or the cost of the measures would be grossly disproportionate to the risk. Essentially, what the law requires concerning the Health and Safety Act 1974 is good management and common sense [20]. This piece of legislation compels employers to assess likely risks in the workplace that could cause harm to health and safety of employees and third parties and to take sensible measures to tackle them.

Notwithstanding, a review of health and safety prosecutions in the UK construction industry shows that, offenses under the HSW Act accounted for 46% of all HSE prosecution cases between 2010 and 2015. Similarly, HSW Act also accounted for £8,954,043 out of £11,625,312 total fines imposed on organizations for breaching the regulation in the same year [7]. Breach to the HSW Act and its associated fines are common because offenses relating to general duties appear to be more serious than specific regulatory breaches [7].

Moreover, the available data reveal that 230 health and safety convictions were recorded for the construction industry alone in 2016 [20]. Unsurprisingly, 34% of recorded offenses were committed under the HSW regulations, attracting total fines amounting to £6,181,060, with 19 prison sentences. Other fines associated with health and safety regulations in 2016 according to HSE [20] archive are the Gas Safety (Installation and Use) Regulations 1998 resulted in 22% convictions, with total fines amounting to £18,410 and 31 prison sentences and the Construction (Design and Management) Regulations 2015 attracted 17% total fines amounting to £1,883,635, with three prison sentences.

The Work at Height Regulations 2005 leads to 16% convictions, with total fines amounting to £860,486 and five prison sentences. Control of Asbestos Regulations 2012 resulted to 4.65% convictions, with total fines amounting to £11,300 and four prison sentences; the Cooperate Manslaughter regulation led to 0.80% convictions with two prison sentences and no option of fines. The Lifting Operations and Lifting Equipment Regulations 1998 resulted in 4.65% convictions, total fines amounting to £2,500 with no prison sentences; the Provision and Use of Work Equipment Regulation 1998 brought 0.80% convictions, total fines amounting to £30,000 with no prison sentences. Driving at Work Regulation 1997 and

Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 combined lead to 0.80% convictions, total fines amounting to £5,300 with no prison sentences.

2.4. Theory of increasing penalties for offenders

Generically, it is difficult to find theories that link penalties imposed on organizations for breaching safety and health regulations; however, taking the most optimistic view the "Simple Theory of Increasing Penalties for Repeat Offenders" propounded by Miceli and Bucci [21] is somewhat linked to the study subject matter. This theory offer explanation to rising penalties considered in the context of wage discount associated with conviction that arise from prosecution.

The theory considers a population of risk neutral offenders who breaks established laws/regulations in consecutive two periods on the assumption that an offender receives a private return of **"b"** amount of money from each act of offense committed and subsequently face an expected penalty (fines) that depends on the probability of apprehension **"p"** and a sanction that is potentially dependent on their conviction record. The theory is also predicated on a second assumption that on a precise note, if a first-time offender in a specific period is subject to a sanction "$\mathbf{S_1}$" (i.e., fines measured in monetary terms) and the same offender is caught reoffending in a different period (i.e., caught committing another offense), the offender will be subject to another sanction $\mathbf{S_2}$.

Based on the above supposition, the sanction that deters rational offenders is then expressed in a reverse sequence. Thus, a mathematical expression can be derived as shown below. The key assumption behind the expression below is that an offender expected return from breaching regulations (or for committing a crime) is $b-ps_1$, while punishment (or penalties) for acting legally is y. The offender is therefore deterred if:

$$Y > b - ps_1$$

or if

$$S_1 \geq \frac{b-y}{p}$$

On the other hand, if an offender has history of reoffending his expected return for committing a crime say in period two is $b-ps_2$ then sanction for breaching regulation will be $y-\varepsilon$. Therefore, an entity will be deterred for breaching regulation if $y-\varepsilon \geq b-ps_2$.

$$\frac{b+\varepsilon-y}{p} s_2 \geq$$

As noticed, the lower bound of equation S_2 is larger compared to S_1. This simply reflects inferior labor market opportunities for convicted entities for breaching rules and regulations. But there is need to take account of irrationally committed offenses in period two with a probability called "α" regardless of their period. Therefore, rational offender income for breaching rules and regulations in period one can be calculated as:

$$b - ps_1 + (1+\alpha)(y - p\varepsilon) + \alpha\left[b - p^2 s_2 - p(1-p)s_1\right].$$

where $p\varepsilon$ is the expected wage penalty, while the term in square brackets is the expected return from irrational offenses in period two (in addition to consideration for offender's period one behavior). Conversely, an offender's expected lifetime income for acting legally in period one is $y + (1-\alpha)y + \alpha(b-ps1)$. The expected cost of punishing first-timers is thus $p[\alpha(1-\alpha)+\alpha^2(1-p)]s_1$, while the expected cost of punishing repeat offenders is $p^2\alpha^2 s_2$.

Therefore, the total cost (TC) across the two periods and simplifying yields:

$$TC = p\alpha(2 - p\alpha)S_1 + p^2\alpha^2 s_2$$

differentiating (TC) in lines with (s_2, s_1) we have:

$$\frac{\mathbf{ds_2}}{\mathbf{ds_1}} = -\frac{(\mathbf{2} - \mathbf{p\alpha})}{\mathbf{p\alpha})} < 0$$

$$\mathbf{S_1}^* = \frac{\mathbf{b-y}}{\mathbf{p}} \quad \text{and} \quad \mathbf{S_2}^* = \frac{\mathbf{b+\varepsilon-y}}{\mathbf{p}}$$

where key assumptions considered in this theory are as follows: since P is fixed, cost of apprehension is assumed to be fixed cost in each period. Therefore, it was ignored in the derivation of the formula. Another assumption is that society and offender weigh the cost of punishment equally; otherwise if different costs are attached differently, as is likely to be true for prison situation. In this case, it will call for additional weighting factor [22]. Nevertheless, this factor was ignored because it has no impact in the conclusion of the model.

A key deduction from the theory of increasing penalties for offenders is that most studies find no rationale for rising penalties; thus, such studies only provide qualified or qualitative explanations. This theory however provides quantitative explanation based on the existence of wage penalty suffered by offenders or entities that breach rules and regulations. The theory makes sense considering observed pattern of penalties on most penal codes (especially breaching of health and safety offenses in the United Kingdom) that demonstrates rising sanction for new and repeat offenders in Section 2.2 of the study. Health and safety breaches and resultant fines relating to leisure giant Merlin Attractions Plc and Alton Towers Park cited in Section 2.2 are clear demonstration that the theory of increasing penalties for repeat offenders hold true or valid.

3. Research methods

The study research paradigm is hinged on pragmatism because the research problem focuses on practicality that seeks to determine the current trend concerning health and safety fines. A pragmatic paradigm provides an underlying philosophical framework for mixed methods research [23,24]. The multimethods research design used QUAN-QUAL concept [25], meaning that quantitative method is the lead data collection instrument while qualitative data are used to support and validate the quantitative findings. The study adopted sequential explanatory type of mixed methods design strategies because the qualitative inquiry is designed to assist in explaining and interpreting the study quantitative findings, as illustrated in Sections 3.6 and 4.0. Ethical approval was granted by Coventry University and aimed at reviewing study participant care against predefined criteria.

3.1. Research questions, study key assumptions, and hypotheses

The main aim of the study is to appraise penalties imposed on large and small organizations for breaching safety and health at work regulation in the United Kingdom. The research questions are as follows: what are the most commonly breached safety and health regulations in the United Kingdom? How consistent are penalties imposed on organizations for breaching health and safety regulations? The following hypotheses (H_1 and H_2) in Table 3 were set to allow for better understanding of the study variables. The hypotheses are underpinned by theory of increasing penalties for repeat offender discussed in Section 2.4, relating to rational and

Table 3
Study key assumptions and hypotheses

S/No.	Null hypothesis H_1	Alternate hypothesis H_2
1	There is no significant difference between specific safety and health regulation and penalties imposed on large and SMEs companies	There is significant difference between specific safety and health regulation and penalties imposed on large and SMEs companies
2	Penalties imposed on entities for breaching health and safety regulations are not proportional when similar rules are contravened	Penalties imposed on entities for breaching health and safety regulations are proportional when similar rules are contravened

SMEs, small and medium enterprises.

irrational offender's income for breaching rules and regulations in specific period as discussed in Section 2.4.

To effectively measure and test these hypotheses, the study uses 10 years of health and safety prosecution (convictions) and companies' financial data to conduct series of statistical tests.

3.2. Study location and population sample

All data collected for this study relate to health and safety and financial performance of organizations in the United Kingdom. Prosecution data collected were based on the HSE five broad categories of industries namely: (i) agriculture, hunting, forestry, and fishing; (ii) construction; (iii) extractive industries, utilities, sewerage, waste management, and remediation activities; (iv) manufacturing; and (v) services. The population sample of interviewees comprises of companies' directors, senior health and safety officer, project/construction/commercial managers, and lawyers.

3.3. Data collection technique

Two distinctive data sets (quantitative and qualitative) were collected and used for analysis. For thorough understanding of the research problem, the study relied on 10 years (2006 to 2016) health and safety convictions data obtained from the HSE public convictions records and companies' financial performance data from Companies House (UK) Ltd. For consistency, all the data collected cuts across the HSE main industry categories stated above. However, the construction industry data were filtered and subsequently used for analysis because the data represented a good spectrum of both large and SMEs convictions data. Moreover, the construction industry is generally perceived to be dangerous, with a high rate of health and safety convictions [26].

Therefore, a cross-sectional analysis of construction companies' convictions (fines) data and subsequent financial performance records were examined to ascertain proportionality of fines *vis-à-vis* gravity of offenses. A total of 2217 companies' data concerning health and safety convictions and fines were collected via the UK HSE public conviction register. In addition, 52 financial performances (profit and loss account) of various companies were collected to facilitate a robust analysis concerning proportionality of health and safety fines and its impact on an organizations performance. The quantitative data were subsequently categorized into case/breach reference numbers, defendant's name, hearing date, result of court (case) outcome, fine imposed on defenders, and health and safety act/regulation breached as shown in Appendix A.

In the second phase of the study research methods, semistructured interviews were conducted with eight industry practitioners in the following order: two companies' directors; two health and safety managers, one project manager in the construction industry, one commercial manager in the transportation (rail) industry; and two lawyers with a specialty in industrial accidents. The qualitative data collected were used to support and validate the quantitative findings. A nonprobability and purposive sampling method was adopted for interviews. The study participants were professionals with over 8 years working experience in the United Kingdom.

The interviewees were from the private sector and quasi-government organizations. Face-to-face interviews were conducted with professionals. The interview questions were pilot-tested with academics and industry practitioners in managerial capacity. The purpose of the pilot study was to ascertain whether the interview questions and instructions were clear, unambiguous, and to see if participants would find the questions appropriate. Questions that were improper were removed or reconstructed. Study participants preferred to be anonymous. As a precaution, all information linked to individuals and organizations that participated in the study was removed. The interview data were subsequently analyzed using Nvivo 10 software to filter and sort findings. Data from interviews were recorded using an audiotape recorder and subsequently transcribed for clarity.

3.4. Data analysis

All quantitative data obtained were entered into XLSTAT 2016 spread sheet using standardized data entry protocol. XLSTAT 2016 software was then used to conduct correspondence, principal coordinate, and Z test statistical analysis. The purpose of Z test is to determine hypothesized difference (. i.e., proportionality) of health and safety penalties with regard to health and safety breaches. Construction industry HSE prosecution and convictions data covering 10 years (2006 to 2016) were categorized into size of organizations, number of cases per year, imprisonment/suspended sentences, etc as illustrated in Tables 4 and 5.

Table 4
Five years' summary of UK construction industry health and safety prosecution data 2007 to 2011

Category of construction companies/individual prosecuted for various health and safety offenses	No. of cases 2007	No. of cases 2008	No. of cases 2009	No. of cases 2010	No. of cases 2011	Imprisonment/ suspended sentences	Five years average	Total amount of health and safety fines in 5 years (£)
Large companies	7	11	8	7	8	0	8	41
SMEs	133	106	105	103	99	27	109	546
Individual cases	41	39	25	19	20	40	29	144
Total number of cases	181	156	138	129	127	67	146	731
Mean of total fines	13,926	16,677	14,585	12,587	21,589	34	15873	79,364
Total amount of fines	2,534,576	2,618,337	2,027,257	1,636,296	2,763,370	—	2,315,967	11,579,836

SMEs, small and medium enterprises.

Table 5
Five years' summary of UK construction industry health and safety prosecution data 2012 to 2016

Category of construction companies/individual prosecuted for various health and safety offenses	No. of cases 2012	No. of cases 2013	No. of cases 2014	No. of cases 2015	No. of cases 2016	Imprisonment/ suspended sentences	Five years average	Total amount of health and safety fines in 5 years (£)
Large companies	5	8	9	8	7	0	7	37
SMEs	104	110	108	187	172	42	136	681
Individual cases	31	19	29	26	51	40	31	156
Total number of cases	140	137	146	221	230	82	175	874
Mean of total fines	16,578	15,579	22,411	27,540	38,793	41	24,180	120,901
Total amount of fines	2,337,538	2,411,653	5,428,887	6,111,751	9,310,251	—	5,120,016	25,600,080

SMEs, small and medium enterprises.

Tables 4 and 5 show that on average there has been a significant increase in health and safety fines. Total average fines of £2,315,967 were recorded from 2007 to 2011 periods compared to £5,120,016 from 2012 to 2016 period. These figures represent an approximate ratio of 1:2. Moreover, there is no particular pattern in terms of numbers of health and safety cases per annum. Average and total health and safety fines figures denote exponential increase as illustrated in Fig. 1.

Using XLSTAT 2016 software the construction industries health and safety conviction data was further categorized into three broad classes: large companies, SMEs and individual convictions as illustrated in Table 6.

Further statistical tests were conducted using XLSTAT 2016 software to ascertain the degree of proportionality of health and safety fines imposed on large and SME organizations across industries as illustrated in Table 7. Health and safety penalty data (2010 to 2015) were selected at random from HSE five main industries categories for effective analysis of data.

Table 7 illustrates health and safety fines imposed on both large and SMEs companies based on selected regulations such as HSW Act; Lifting Operations and Lifting Equipment Regulations; Construction (Design & Management) Regulations; Offshore Prevention of Fire; and Provision and Use of Work Equip Regulations. Z-test was then conducted using XLSTAT 2016 software. Z test is a statistical test that compares mean of two populations and can be used to ascertain proportionality/consistency of two sets of variables. Z test formula is express as:

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Where

σ = Population standard deviation
x_i = Numbers given in the data
$\bar{X}\,\bar{x}$ = Mean of the data
n = Total number of items.

Population sample of $N = 27$ represent total data considered for proportionality analysis and $N = 21$ relates to health and safety breaches concerning HSW Act. The result of XLSTAT analysis is presented in Table 8 as follows:

Test interpretation for both population sample show that since p value is greater than the significance level alpha = 0.05, the alternative hypothesis H0 can be rejected and the null hypothesis can be upheld. The meaning of upholding the null hypothesis is that, penalties imposed on entities for breaching health and safety regulations not proportional. This test confirms data analysis in Tables 4 and 5 demonstrating that small companies tend to pay more for health and safety offenses in a ratio of 1:2.

3.5. Financial performance of organizations

Table 9 shows average operating profits of 25 out of 27 companies, listed in Table 7, that were convicted for various health and safety offenses from 2010 to 2015. Companies' financial data were obtained via subscription to UK Companies House Ltd, in order to obtain annual financial details such as gross/operating profit and return of capital employed. There financial data were calculated to establish relationship between health and safety fines and financial performance of both large and SME organizations. Using XLSTAT 2016, correlation analysis was conducted to ascertain the degree of association between two variables, in this case health and safety fines, (in Table 7) and average five years' operating profit (financial performance) in Table 9. Correlation coefficients of **0.48** and **0.42** for SMEs

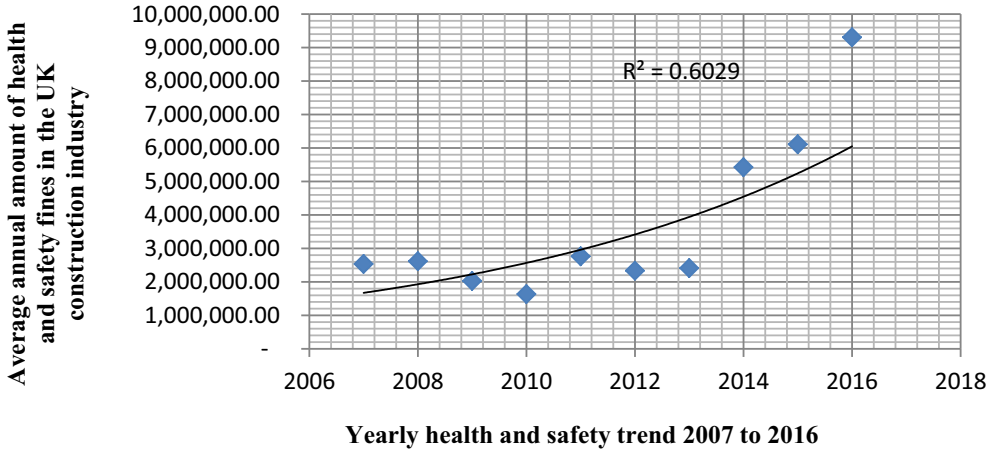

Fig. 1. Trend of health and safety fines from 2007 to 2016.

Table 6
Health and safety fines based on category of organizations

Category of construction companies/individual prosecuted for various health and safety offenses	Imprisonment/ suspended sentences	Total amount of health and safety fines in five years (£)
Large companies	0	3,218,871
SMEs	27	7,502,899
Individual cases	146	858,066
Total	173	11,579,836

SMEs, small and medium enterprises.

Table 8
Result and interpretation of Z test of proportionality

Test variables	Values
Difference	−43
z (observed value)	−12,056
z (critical value)	−1.645
p-value (one-tailed)	0.5
Alpha	0.05

and large companies were obtained, respectively. The correlation coefficient denotes a weak relationship between fines imposed on SMEs and their financial performance for both categories of companies. However, there is need to consider other factors that directly influence SMEs financial performance such as poor management, economic circumstances, training of workforce, etc.

Subsequently, profit margin data of companies in Table 9 was subjected to correspondence and principal coordinate analysis using XLSTAT 2016 to understand pair values of financial performance of companies fined for health and safety offenses. The analysis provided an opportunity to display interrelational data as points in a quadrant chart or dimensional space map as illustrated in Fig. 2 below. The principal coordinate's analysis return a behavioral value of −0.11. The value indicates that on average companies fined for breaching health and safety regulations are likely to have negative operating profit.

3.6. Interviews

There are endless theoretical arguments about validity, often defined as "truth" or "true knowledge in research" concerning qualitative inquiry [27,28]. To avoid philosophical arguments about validity of qualitative research, the authors accept the standpoint of Kuzmanić [29] that there is a "pure form of truth" somewhere out there, which can be discovered through (construct, external, and internal validity) using appropriate and most importantly valid research methods. For straightforwardness, the study infers valid qualitative research to credibly represent different social worlds (construct) or different interpretations to the readers.

To uphold credibility or true knowledge of the research, validity was addressed throughout the entire research process, specifically, in three main areas: production (design of interview questions, interview process, and recording of the data), presentation (replicability, valid inference, and arrangement of the data) and interpretation (meaningful discussion of data). The interview data were analyzed using content analysis for easy inferences to antecedents of discussions between the internees and interviewer, in addition to effects of communication that transpired concerning the study subject matter.

For example, interviewees were asked to express their view concerning penalties imposed on organizations regarding safety and health offenses in the United Kingdom. Some textual contents

Table 7
Health and safety fines imposed on organizations based on selected regulations

S/No.	HSE case/breach reference number	Regulation that led conviction	Description	SMEs health and safety fines	Large companies health and safety
1	44435350/01 44424570/02	HSW	Fatal accident at work	80,400	120,000
2	44489050/01 43660340/01	lolE	Employee death at work	9,000	66,000
3	44062050/01 &44213440/01	lolE	Employee death at work	15,000	565
4	44072170/01 44435150/01		CO_2 poisoning	50,000	134,000
5	44150040/02	HSW	Failure to prevent a fall	30,000	6,600
6	4446740/01	HSW	Operative trapped beneath concrete	70,000	500,000
7	44178570/01 & 44435320/01	HSW	Employee fell through a fragile	16,000	500,000
8	44449550/01 & 44254430/01	CDM	Unsafe roof work	15,000	100,000
9	44396700/01 & 44065100/01	HSW	Design fault	15,000	300,000
10	44270260/01 & 44405270/02	OPF	Failure prevent fire	166,000	3,000,000
11	44227070/01 & 43974660/01	HSW	Unsafe system of work	45,000	80,000
12	44001270/03 & 44218350/01	HSW	Employee death whilst at work	25,000	1,000,000
13	44243410/01 & 44271590/01	HSW	Failed to prevent a fall	45,000	270,000
14	43539020/01 & 44527220/01	HSW	Failed to provide safe system	10,000	10,000
15	44413030/01 & 44263590/01	HSW	Dead injuries at work	30,000	100,00
16	44392600/01 & 44285410/03	HSW	Death at work	70,000	300,000
17	44618200/01 & 44460860/02	HSW	Failed to comply with HSE	17,500	800,000
18	4444407/01 & 44202350/01	HSW	Fatality at work	25,000	1,000,000
19	44397720/01 & 44460860/02	HSW	Fatal accident at work	75,000	120,120
20	44192660/01 & 44606720/01	HSW	Fatal accident leading to amputation finger	120,000	1,800,000
21	44540960/01 & 44435350/01	HSW	Fatal accident at work	10,000	75,000
22	44628150/01 & 44549600/01	PUWE	Fatal accident at work	30,000	10,000
23	44430220/04 & 44337430/01	HSW	Failed to comply with HSE	36,120	250,000
24	44313590/02 & 44394110/01	HSW	Fatal accident at work	30,000	100,000
25	44491930/01 & 43539020/01	HSW	Fatal accident at work	5,000	10,000
26	44005060/01 & 44424570/02	HSW	Fatal accident at work	386,000	120,000
27	44331140/01 & 44498980/01	HSW	Fatal accident at work	8,000	50,000

CDM, Construction (Design and Management) Regulations; HSW, Health and Safety at Work; lolE, Lifting Operations and Lifting Equipment Regulations; OPF, Offshore Prevention of Fire; PUWE, Provision and Use of Work Equip Regulations; SMEs, small and medium enterprises.

Table 9
Average five years' financial performance of companies fined for unsafe act

S/no.	Companies investigated	2010 profit margin based on operating profit	2011 profit margin based on operating profit	2012 profit margin based on operating profit	2013 profit margin based on operating profit	2014 profit margin based on operating profit	2015 profit margin based on operating profit
1	Company 1	—	11.94	−11.99	−18.27‡	−5.74‡	−19.70‡
2	Company 2	0.00	0.50	−0.19	−0.30	0.19	0.10
3	Company 3	23.29	−10.11‡	12.95	11.92	7.22	4.10
4	Company 4	4.45	6.06	1.54	4.19	1.39	0.24*
5	Company 5	2.96	3.38*	3.38	3.58	3.05	1.60
6	Company 6	0.18	0.50	−0.03*	−0.14	−0.01	0.08
7	Company 7	6.13	2.24*	1.71*	−1.57	1.12	0.58
8	Company 8	9.78	1.06†	23.49	6.96	1.13	2.28
9	Company 9	2.45	2.70	1.86‡	3.16	3.58†	3.64
10	Company 10	38.31	38.37	27.78	21.60‡	31.09	32.00
11	Company 11	0.04	1.39	1.24*	2.60	1.98	1.02
12	Company 12	9.40	−8.97‡	−5.66	−12.33	11.45	17.89
13	Company 13	5.11	5.14	0.25‡	0.29*	1.74	1.51*
14	Company 14	5.04	5.03	3.32‡	2.97	3.18	2.59
15	Company 15	5.42	7.27	5.58*	2.04	10.48	8.93
16	Company 16	−2.32†	7.86	11.65	4.57	10.49	9.36
17	Company 17	2.18	0.22*	0.22	1.47	1.43	0.05
18	Company 18	1.84	2.04	1.78	1.94‡	−0.21‡	0.63
19	Company 19	1.48	1.42	1.08	2.26	0.47*	0.95
20	Company 20	−0.48	0.67	−1.82*	25.31	−15.12‡	8.95
21	Company 21	1.03	2.13	0.99	−0.02	0.800*	0.91
22	Company 22	0.074*	0.45	0.41	0.25	0.23	0.79
23	Company 23	4.52	3.94	3.65	1.74*	2.25*	2.07
24	Company 24	18.88	5.25	0.36*	0.30‡	6.43	6.16
25	Company 25	2.80	3.49	0.40†	1.19	2.43	0.34

* Companies with exceptional items deducted in profit/loss account.
† Companies with exceptional items costs deducted and huge amount of overhead deduction.
‡ Companies prosecuted/fined for health and safety breaches and have 'exceptional items' costs deduction.

of the interview data (transcribed into manuscript, inputted into Nvivo 10 software, and coded using key study themes) are subsequently trimmed for better understanding and spontaneity of the interaction between the researcher and the study participants. Some textual excerpts are expressed verbatim; as illustrated below for confirmability and better understanding of participants' views.

"… recent penalties concerning health and safety offensces are mind-boggling… perhaps right time to start thinking of alterative punitive measures … " (Director of a Medium Size Company — Croydon London UK).

"... we have routinely seen eye-watering health and safety fines .... burden of health and safety is huge on businesses .... at the same

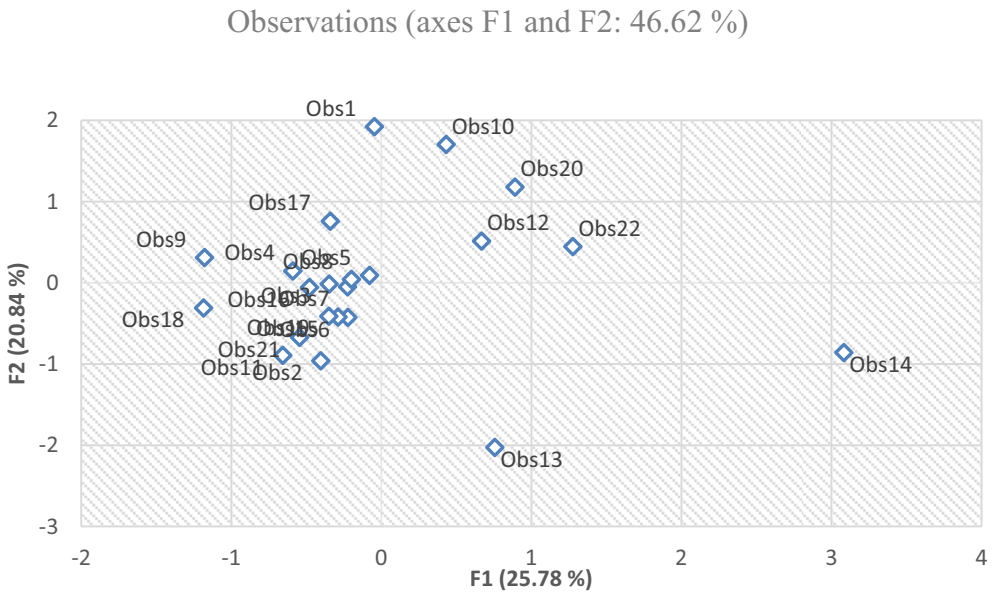

Fig. 2. Behavior of operating profits of companies convicted for health and safety offenses.

time businesses will not take safety seriously without stiff rule and retaliatory measures" (Officer of Health and Safety Executive).

"… current safety development means entrepreneurs need to tread cautiously ... financial outcomes of safety incidents are unpredictable … hike in safety fines are purely intentional and a clear indication of future and shape of things to come" (Commercial Manager Rail Company —Birmingham UK).

The extracts above show that professionals interviewed painted mixed view about penalties associated with health and safety breaches. Most small company owners are of the view that recent health and safety penalties are mind-boggling and disproportionate and practitioners need to be mindful of health and safety regulations. However, there are some lone voices that appear to argue that "businesses will not take safety seriously without stiff rule and retaliatory measures". Their response was expected because these categories of interviewees are officers of HSE, the body that regulates health and safety activities in the United Kingdom. However, when participants were probed further regarding consistency of penalties imposed on organizations for breaching safety and health regulations their answers were wide-ranging. Some participants' responses are presented thus:

"... health and safety penalties are not designed to be commensurate with offensces committed … but to send a deterrence message to offenders … but the rush by judicial systems to rely on turnover of corporate offenders need to be reviewed ... otherwise recent hike in fines may be adjudged unfair, impost, and rent seeking" (Senior Solicitor —law firm London).

"... recent penalties or fines are not only disproportionate they are designed to pierce corporate veil; ... I have seen small companies with little or no financial shock-absorber go out of business, because of a single health and safety incident; … I know of a safety incident that was unavoidable ... yet the company management paid dearly for it" (Director of a small company—Milton Keynes UK).

"…the message is very clear; … if you cannot carry out a job safely at work don't proceed with the task; it may cost you 30 times more than expected profit. … (Health and safety lawyer— London).

"…arguably, legislative requirement for HSWealth and Safety at Work Act 1974 is broad and wide-ranging … I am not surprised that it is the most commonly breached safety regulation in the UK … (Project Manager SME Scaffolding company —Birmingham UK)

4. Discussion

A common deduction from the study shows that the HSW Act accounted for 46% of all HSE prosecutions in the last decade to 2016; this single Act is responsible for nearly half of the total safety and health at work prosecutions. This finding is in line with the Organisation for Economic Co-operation and Development guidance [30] and asserts that safety performance is likely to be retarded in high risk industry, where there are weak health and safety rules. Perhaps, legislative requirement for this Act are burdensome and wide-ranging for most vulnerable organizations. Also, finding from the study shows exponential increase in safety and health penalties as illustrated in Fig. 1. Majority of the study participants are of the view that entrepreneurs need to understand recent development about safety penalties and tread cautiously in carrying out their daily duties. Legal experts interviewed were emphatic that health and safety penalties are not designed to be proportionate (or commensurate) with offenses committed but to send a deterrence message to offenders.

The study literature suggested that the UK new sentencing guidelines and law courts reliance on business entities' turnover and commerciality are somewhat responsible for the significant hike in fines. Though, there is the need to bear in mind that the procedure behind issuing of health and safety fines to a certain degree is not an exact science rather an imprecise art. The study reveals inconsistency in penalties levied on SMEs compared to large organizations. Thus, small businesses are perceived to be seemingly squeezed and constrained by excessive safety and health at work penalties.

The study identified some siren voices that believe "*recent safety and health penalties breaks decent companies …* they are not only disproportionate but designed to pierce the corporate veil … perhaps it is the right time to start thinking of alternative health and safety punitive measures". However, the nature and pattern of suggested alternatives to health and safety penalties seem elusive. There is a need to advance research on affordable SMEs health and safety insurance scheme and alternatives to costly health and safety penalties.

The study examined penalties imposed on organizations for breaching safety and health regulations in the United Kingdom. For thorough understanding, the study probed two key issues concerning: what are the most commonly breached safety and health regulations in the United Kingdom? How commensurate are penalties imposed on organizations for breaching health and safety regulations? Available literature reveals that the HSW Act accounted for nearly half of the total safety and health at work prosecutions in the last decade. The study quantitative and qualitative inquiries reveal an upward trend in health and safety fines as illustrated in Fig. 1; perhaps, circuitously influenced by turnover, scalability, and commerciality of corporate offenders.

The study also discovered that on aggregate small companies tend to pay more for health and safety offenses in a ratio of 1:2, compared to large companies. But there is need to bear in mind that nine out of 10 (90%) of health and safety prosecutions in the United Kingdom involves SMEs, and these categories of firms makes up 97% of companies doing business in high risk sectors of the economy. Therefore, the multiplier effect of health and safety fines together with volume of SMEs help explain heavier burden of health and safety fines on SMEs in the United Kingdom. In general, large companies predominantly pay more for health and safety fines on case by case basis. Arguably, the idea of imposing fines on corporate offenders based on their turnover is likely to cause disparity in fines and potentially put an entire venture at risk. Judicial system need to be aware that turnover is not a true representation of a company's financial performance. On the other hand, practitioners often see excessive penalties imposed on small businesses as persecution as opposed to prosecution, considering imbalances in fines between large and small businesses especially when similar safety regulations are breached. In conclusion, the perception of most legal luminaries is that health and safety sentencing guidelines and associated fines levied on offenders are grossly inconsistent and in some cases high-handed on small organizations. The symmetry between hikes in penalties and health and safety insurance is likely to influence the overall cost of running a business. Thus, there is need for the UK government to review current health and safety sentencing guidelines in line with economically disadvantaged SMEs.

Conflicts of interest

The authors have no conflict of interest to declare.

Acknowledgment

The authors wish to thank Coventry University UK, the University of Bolton UK, the Royal Institution of Chartered Surveyors (RICS), Board of Quantity Surveyors Malaysia (BQSM), the Association of South African Quantity Surveyors (ASAQS), the Australian Cost Engineering Society (ACES); the International Cost Engineering Council (ICEC), the Health and Safety Executive (HSE) and host of construction contracting companies, Law firms in the UK, and project management consulting firms for their contribution and support to the development of this study.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.shaw.2018.01.004.

References

[1] Hallett L. Court of appeal ruling about fines for health and safety crimes. London: Health and Safety Board; 1998. 13 p. HSB Report 304.
[2] Choi GH, Loh BG. Control of industrial safety based on dynamic characteristics of a safety budget-industrial accident rate model in Republic of Korea. Saf Health Work 2017;8:189–97.
[3] Warburton C. Step by step to record fines. Health and safety at work Magazine [internet]. 2016 [cited 2017 March 14]. Available from: https://www.healthandsafetyatwork.com/regulation/step-by-step-to-record-fines.
[4] Arewa AO, Farrell P. A review of construction SME's safety performance; where are we and why? In: Proceedings of the 11th International Postgraduate Research Conference (IPGRC) Salford, England 2013. 19 p.
[5] OECD. 'Occupational Accidents in OECD Countries. Luxembourg: The Organisation for Economic Cooperation and Development Workplace Accident; 2012. Report GRI 43.
[6] Augustin K. The 2016 health and safety sentencing guidelines: How have things changed for companies? [internet]. 2017 [cited 2015 April 28]. Saf Health Practitioners 2017;11:3–5. Available from: https://www.shponline.co.uk/the-2016-health-and-safety-sentencing guidelines-how-have-things-changed-for-companies/.
[7] Fidderman H. The fine gap in deterrence [internet]; 2014 [cited 2015 April 12]. Available from: https://www.healthandsafetyatwork.com/hsb-deterrence.
[8] Löfstedt RE. Reclaiming health and safety for all: an independent review of health and safety legislation. London: Health and Safety Review Team Department for Work and Pensions; 2011 November. 41 p.
[9] Bailey S, Jorgensen K, Koch C, Kruger W, Litske H. An innovative economic incentive model for improvement of the working environment in Europe, 5. Luxemburg: European Foundation Centre; 1995. Report No. EFC2824.
[10] BERR Improving outcomes from health and safety. A report to Government by the better regulation executive. London: Department for Business Enterprises and Regulatory Reform; 2008 August. 29 p. Report No. 224.
[11] HSE. Making an impact on SME compliance behaviour: an evaluation of the effect of interventions upon compliance with health and safety legislation in small and medium sized enterprises. Kings College London; Health and Safety Executive; 2005. 66 p. Report No. 366.
[12] OSHA. Occupational safety and health and economic performance in small and medium-sized enterprises: a review [cited 2011 March 14]. In: Working environment information – working paper, 7. The EU-OSHA Occupational Health and Safety Administration. 2009. p. 5–8. Available from: http://osha.europa.eu/en/publications/reports/TE8009640ENN_occupational_safety_health_econom ic_performance small_ medium.
[13] Arewa AO, Farrell P. A review of compliance with health and safety and safety regulations and economic performance in construction SMEs. In: Proceedings of the 28th ARCOM conference, September 3rd – 5th Edinburgh, Scotland 2012. 231 p.
[14] Knutt E. Warburtons hit with £2m fine for worker's mixer fall [Internet]. Health + Safety at work Magazine. 2017 [cited 2017 May 19]. Available from: https://www.healthandsafetyatwork.com/work-at-height/warburtons-fine-workers-mixer-fall.
[15] Sheret R. The shape of future health and safety fines; (2016) [Internet]; 2017 [cited 2017 May 29]. Available from: https://www.solicitorsjournal.com/comment/ shape-future-health-and-safety-fines.
[16] IOSH. Health and safety sentencing guidelines one year on: the rise in fines and the actions companies can take to prevent them. A joint report by the Institution of Occupational Safety and Health (IOSH) and Osborne Clarke; 2017. p. 01–3. Report No. MKT4163/260117.
[17] HSE. Managing for health and safety. Guidance for regulatory staff on the practice of assessing health and safety management. Sudbury, Suffolk: Health and Safety Executive Books; 2010. 25 p.
[18] HSE. Firm fines £1million after young worker killed by exploding tyre [Internet]; 2017 [cited 2017 March 7]. Health and Safety Executive Brief. Available from: http://press.hse.gov.uk/2016/firm-fines-1million-after-young-worker-killed-by-exploding-tyre/.
[19] DWF. Magistrates can now levy unlimited fines in Health & Safety cases [Internet]; 2015 [cited 2016 November 22]. Available from: https://www.dwf.law/news-events/legal-updates/2015/03/magistrates-can-now-levy-unlimited-fines-in-health-safety-cases/.
[20] HSE. Industries. Estimated rate of self-reported work-related illness and non-fatal injury by industry1 for people working in the last 12 months [Internet]; 2017 [cited 2017 February 7]. Health and Safety Executive article. Available from: http://www.hse.gov.uk/Statistics/industry/.
[21] Miceli TJ, Bucci C. "A simple theory of increasing penalties for repeat offenders" economics working papers; 2004. 39 p.
[22] Polinsky AM, Shavell S. The Economic theory of public law enforcement. J Econ Lit 2000;38:76.
[23] Tashakkori A, Teddlie C. Handbook of mixed methods in social and behavioural research. 1st ed. New York. Thousand Oaks, CA: Sage; 2003. 42 p.
[24] Somekh B, Lewin C. Research methods in the social sciences. 2nd ed. New Delhi: Sage; 2005. 37 p.
[25] Creswell JW. Research design: qualitative, quantitative and mixed methods approaches. 2nd ed. London: Sage Publications; 2003. p. 11–39.
[26] HSE. Better business [Internet]; 2009 [cited 2012 May 19]. Health and Safety Executive article. Available from: http://www.hse.gov.uk/betterbusiness/large/index.htm.
[27] Gaskell G, Bauer MW. Towards public accountability: beyond sampling, reliability and validity. In: Bauer MW, Gaskell G, editors. Qualitative research with text, image and sound. London: Sage; 2000. p. 336–50.
[28] Kvale S. InterViews: an introduction to qualitative research interviewing. London: Sage; 1996. 37 p.
[29] Kuzmanić M. Validity in qualitative research: interview and the appearance of truth through dialogue. Horizons Psychol 2009;18(2):39–50.
[30] OECD. Guidance on developing safety performance indicators related to chemical accident prevention, preparedness and response guidance for industry. The Organisation for Economic Cooperation and Development OCED Environment, health and safety; 2008. 34 p. Report No. 19.