

## Suicides among construction occupations in the UK

Hare, Billy; Lawani, Kenneth; McEwen, Gail

*Published in:*  
Journal of Engineering, Project, and Production Management

*DOI:*  
[10.32738/JEPPM-2024-0017](https://doi.org/10.32738/JEPPM-2024-0017)

*Publication date:*  
2023

*Document Version*  
Publisher's PDF, also known as Version of record

[Link to publication in ResearchOnline](#)

*Citation for published version (Harvard):*  
Hare, B, Lawani, K & McEwen, G 2023, 'Suicides among construction occupations in the UK', *Journal of Engineering, Project, and Production Management*, vol. 14, no. 2, 0017. <https://doi.org/10.32738/JEPPM-2024-0017>

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

### Take down policy

If you believe that this document breaches copyright please view our takedown policy at <https://edshare.gcu.ac.uk/id/eprint/5179> for details of how to contact us.

# Suicides among Construction Occupations in the UK

Billy Hare<sup>1</sup>, Kenneth Lawani<sup>2</sup>, and Gail McEwen<sup>3</sup>

<sup>1</sup>Professor, Department of Construction and Surveying, Glasgow Caledonian University, 70 Cowcaddens Road, Glasgow, UK, E-mail: b.hare@gcu.ac.uk (corresponding author).

<sup>2</sup>Senior Lecturer, Department of Construction and Surveying, Glasgow Caledonian University, 70 Cowcaddens Road, Glasgow, UK, E-mail: Kenneth.Lawani@gcu.ac.uk

<sup>3</sup>Research Assistant, Department of Construction and Surveying, Glasgow Caledonian University, 70 Cowcaddens Road, Glasgow, UK, E-mail: Gail.McEwen@gcu.ac.uk

Project Management

Received June 29, 2023; revised July 15, 2023; accepted October 9, 2023

Available online November 5, 2023

---

**Abstract:** Studies on mental health are increasingly complementing those on safety and physical health within the construction research community, with suicide numbers being an indicative measure of mental health. In the UK, deaths by suicide are approximately 470 per year, which dwarfs fatal accident numbers. The aim of this paper is to review the evidence base about suicide and construction workers. The methods consisted of two approaches: combining secondary data from UK statistical databases to create a suicide rate per 100,000 for construction occupations; and a systematic literature review to help explain the suicide rates observed. Trend analysis of suicide rates, from 2015 to 2021 shows construction occupations to be approximately three times that of the combined non-construction occupations, and steadily rising, whereas non-construction rates have remained relatively steady. Unskilled workers have the highest rate, around seven times managers and professional occupations. Potential reasons for this, found in the literature, included managers/professionals' greater propensity to shift beliefs about suicide stigmas, and skilled workers being more likely to report substance abuse; - rather than hide it, thereby increasing opportunities to discuss and resolve such issues to reduce suicide risk. However, the socio-economic risk associated with unskilled workers means being poor is certainly not good for their mental health. The analysis presented in this paper informs industry policy and practice by uncovering a previously unknown upward trend in suicide rates among UK construction workers, along with a focused list of evidence-based factors to inform further research on why this phenomenon is occurring.

**Keywords:** Suicide, Mental Health, Occupation, Unskilled

Copyright © Journal of Engineering, Project, and Production Management (EPPM-Journal).  
DOI 10.32738/JEPPM-2024-0017

---

## 1. Introduction

### 1.1. Background and Aim

Suicide numbers are considered to be an indicative measure of mental health within any civilized society. In the United Kingdom (UK), the Office for National Statistics (ONS) data on suicide by occupation in England for 2011-2015 identifies around 2000 deaths (circa 400 deaths per year) where construction and/or building appears in the occupation description (ONS, 2017), which indicates an estimated figure for the whole of the UK at around 470 per year (England being 85% of the UK population).

Demographic data in the UK is produced by government bodies such as the ONS and Health and Safety Executive (HSE), as well as the Construction Industry Training Board (CITB). This confirms that construction (like most other countries) is a male-dominated industry and regional variations exist relating to safety, health, and, well-being. Further data is available via devolved administrations e.g. Public Health Scotland, to assess whether further regional variations exist regarding suicide risk among construction workers. In the UK it is estimated that there are 2.4 million construction industry jobs, 6.6% of all jobs (HOCL, 2019), with a high proportion of self-employment (36%), compared to the average of 13%. The UK CITB estimates that the construction industry is split into approximately 65% manual occupations and 35% non-manual (CITB, 2016). Manual occupations in construction are known to have higher accident rates than non-manual (Cameron et al., 2008), however, the relative risks regarding suicide are less understood.

Although research on suicide by occupation is well established, there is less specific to the UK construction industry. Roberts (2013) identified occupations most at risk of suicide in England and Wales for the years 2001 to 2005, which closely align with analysis by Meltzer (2008) for the same timeframe. Roberts (2013) identified laborers in the building trades as high risk for suicide, being 59.1 per 100,000, which is approximately six times the male average of 9.8 (WHO, 2016), although the Office for National Statistics (2016) has the rate for male deaths by suicide at 16.8 per 100,000. Scottish suicides have been found highest among skilled construction workers (25%) (NHS Scotland, 2016). In Ireland, construction workers have also been identified as higher risk of death by suicide than other occupations Arensman (2013). However, UK-specific in-depth analysis of construction occupations lags well behind other countries, such as Australia.

The aim of this paper is to review the evidence base on suicides among construction occupations, including understanding the known/hypothesized suicide risk factors, and what is known about causes and reasons for suicide. This review includes international evidence (notably from Australia) and data derived from ONS reports that are in the public domain. The paper presents a description of the methods used to analyze recent trends in suicides among UK construction occupations, as well as a systematic literature review of studies on the factors specific to construction suicides. The results are then presented in the same order, so the international literature can help explain the suicide rates observed.

**2. Methods**

The research questions were: (1) what trends are there in suicides among UK construction occupations; (2) what health, lifestyle, and occupational risks are identified in research on suicides among construction occupations; and (3) what causal factors are identified in research on suicides among construction occupations. The methods to answer these questions consist of two approaches: combining secondary data from UK statistical databases to create a suicide rate per 100,000 for construction occupations; and a systematic literature review to help explain the suicide rates observed.

**2.1. Secondary data analysis**

The most reliable data on suicides by occupation from the UK Government is the ONS ‘Suicide by occupation, England and Wales, 2011 to 2021 registrations’ (ONS, 2022) This data shows occupations recorded at the time of death, using Standard Occupation Codes (SOC) which incorporates a hierarchical numbering system that allows construction occupations to be identified. Some occupations can be clearly identified as ‘construction’ by their title and/or job family. For example, SOC 5 ‘Skilled trades occupations’ includes the occupational group 53 ‘Skilled construction and building trades’, therefore all occupation codes that begin with a ‘5’, followed by a ‘3’ are all sub-sets of occupational group 53 (construction and building) as shown in Table 1. Other occupations identified as purely construction are also shown in Table 1, which account for over 95% of construction workers in the UK. The remaining 5% consists of a long tail of peripheral occupations which would be almost impossible to disentangle construction numbers from for analysis Cameron et al., 2008).

**Table 1.** UK SOC codes - construction occupations (ONS, 2020)

<b>SOC 2020 Unit Group</b>	<b>Description</b>
1122	Production Managers and directors in construction
2121	Civil Engineers
2431	Architects
2433	Quantity Surveyors
2434	Chartered Surveyors
2436	Construction project managers and related professionals
3114	Building and civil engineering technicians
3121	Architectural and town planning technicians
5311	Steel Erectors
5312	Bricklayers and masons
5313	Roofers, roof tilers and slaters
5314	Plumbers and heating and ventilating engineers
5315	Carpenters and joiners
5316	Glaziers, window fabricators and fitters
5319	Construction and building trades
5321	Plasterers
5322	Floorers and wall tilers
5323	Painters and Decorators
5330	Construction and building trades supervisors
8141	Scaffolders, staggers and riggers
8142	Road construction operatives
8143	Rail construction and maintenance operatives
8149	Construction operatives
8229	Mobile machine drivers and operatives (Not Elsewhere Classified) N.E.C.
9120	Elementary construction occupations

In order to create a ‘rate’ of suicides among construction occupations in the UK, an estimate of the numbers employed needs to be made. This requires extraction of similar occupation codes from the UK ONS ‘Nomis’ (official census and labor market statistics) database, which estimates employment figures from regular surveys (ONS, 2020). By combining Nomis

data with the corresponding suicide data per occupation, a rate per 100,000 can be calculated for comparison purposes (see Eq. (1)). In UK employment terminology, ‘workers’ includes employees and the self-employed (ONS, 2020). Whilst these measures are considered crude estimates, subject to fluctuating employment figures, and potentially unreliable with smaller sample numbers, they are currently the most reliable source of data to inform the analysis.

$$Suicide\ Rate = \frac{No.\ of\ Suicides}{No.\ of\ Workers} \times 100,000 \quad (1)$$

## 2.2. Systematic Literature Review

A systematic literature review of research publications was undertaken, using key operational words and phrases related to suicide and occupations identified as building/construction, e.g. building; construction; laborer; skilled/unskilled occupations; professionals such as architect, quantity surveyor, civil engineer. Google Scholar was chosen as the search engine. This provided one single place to perform a search across many disciplines and sources: articles, theses, books, abstracts, and court opinions, from sources such as academic publishers, professional societies, online repositories, universities, and other ‘grey literature’ websites. This initial search returned about 180,000 results, however, limiting the search criteria to only the ‘Title’ of publications, returned a more manageable 165 results. These were saved to Microsoft Excel via the ‘Publish or Perish’ App for manual filtering.

A series of manual filtering processes took place to identify publications within the scope. This began with a manual review of abstracts. Criteria for inclusion included the identification of elements contained in the research questions. This also allowed unrelated publications to be removed as follows:

- Where ‘building’ or ‘construction’ was used in a theory or as a theoretical construct, e.g. ‘building a model’ or ‘social construction’;
- Where ‘building’ or ‘constructing’ was in reference to the development of something not specifically focused on construction industry occupations, e.g. ‘building a database’; ‘constructing a novel vector’;
- Where the publication was not in English.

Once duplicates were removed, 41 publications remained, which were sourced and downloaded. Full paper reviews then took place, with the aid of a template for data extraction. Factors considered for analysis included:

- Quality of publication: healthcare criteria for academic publications (meta-analysis; randomized controlled trials; case-controlled studies; expert opinion) NESTA Standards (Nesta, 2022) for non-academic;
- Type of study, methods used;
- Sample and/or criteria for data collection;
- Main findings.

This data was then classified into topics for discussion and narratives developed to elucidate existing knowledge, in relation to the research questions. These 41 publications constitute the main source of literature used for data extraction and are summarized in the Fig. 1.



Fig. 1. Systematic literature review

## 3. Results

### 3.1. Suicide Rates in the UK

Fig. 2 shows the suicide rates per 100,000 for all combined construction occupations, over the period from 2015 to 2021, compared to the rates for all other occupations over the same period. Note that the figure for all other occupations is lower than the ONS published figures which includes construction, for example, the published rate for 2021 is 10.5, whereas the analysis in Fig. 2 is 9.14 due to construction occupations being shown separately. The number of suicides for people working in construction occupations in 2021 was 507, with most being male (503). This is a rise of 24 from the previous year and 25 more than the previous five-year average. This is against a backdrop of steadily falling numbers employed in construction,

which if all other factors were equal should see a drop in the absolute number of suicides. The suicide rate for construction occupations in 2021 was 33.82 per 100,000. This is the highest rate since the authors began analysis of this data (from 2015) and the first time the rate has breached the 30/100,000 threshold. The rate for 2021 is 6.6 (24%) higher than the previous rolling five-year average of 27.22.

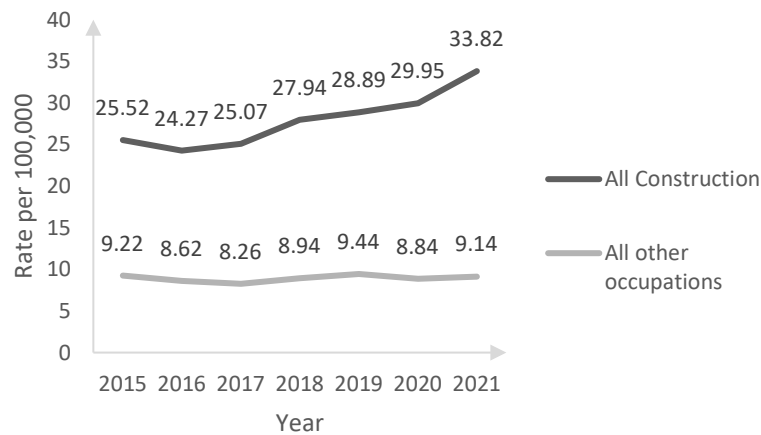


Fig. 2. Suicide rate: construction v. all other occupations

Fig. 3 shows the suicide rates per 100,000 for the main SOC Groups of Management and Professional; Skilled; Process and Plant; and Unskilled. Management and professional occupations (dashed line in Fig. 3) have had the lowest rates of suicide and have been relatively stable. Having said this, the rate for this occupational group doubled in 2021, from 4.9 to 11.2 deaths per 100,000. This is a rise of 5.1 (84%) on the rolling five-year average and is the highest it's been since 2015. The rate for skilled workers has increased by 21% on the five-year average, whilst 'plant and process' and 'unskilled' workers rose 18% and 16% respectively, even though the rate for these occupations fell slightly from the previous year.

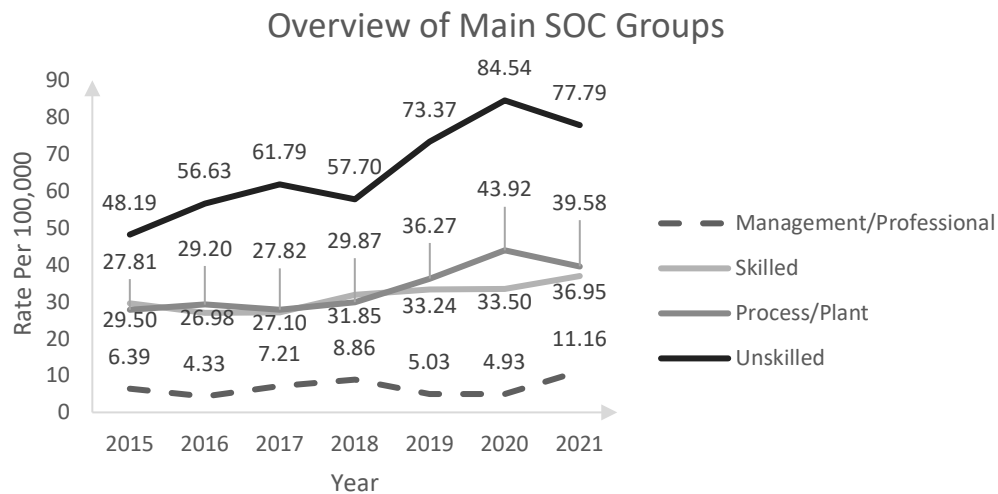


Fig. 3. Suicide Rate: Main SOC Groups

It can be seen from this analysis that construction occupations have a suicide rate more than three times non-construction occupations. This result is not unusual, considering that construction workers are predominately male, and males historically have higher rates of suicide than females. However, the upward trend is at odds with the relatively static non-construction trend line, which is an important finding that requires further investigation. The largest gap is between managers and professionals – invariably in higher socioeconomic salary bands – and lower-paid occupations, especially unskilled workers – typically general laborers and ground workers. Unskilled workers have suicide rates approximately seven times that of managers and professionals, showing a steeply rising trend over time. This analysis has answered research question one.

### 3.2. Systematic Literature Review

#### 3.2.1. Quality of evidence

The highest quality of evidence for peer-reviewed academic research in the field of health is weighted towards meta-analysis and randomized controlled trials. However, studies of this type are rare regarding research on suicide, and the highest level of evidence observed from the literature was intervention studies. The remaining academic publications fell into various

levels of study design from peer-reviewed to non-reviewed, based on interpretive and descriptive analysis, mainly using expert opinion. Non-academic literature identified in the review could only be considered Nesta level 2 (gathering data) at best, or level 1 (describing good/best practice).

Table 2 shows the breakdown of the literature reviewed, using these criteria. Intervention studies were mostly passive before and after studies. Those actively measuring interventions (involved in designing the intervention) also had limitations, falling short of being described as ‘controlled trials’. The majority of peer-reviewed papers were based on survey questionnaires, interviews, and extracting data from existing databases. This approach was also favored by non-peer-reviewed studies. The grey literature reviewed was limited to describing good or ‘best’ practice and collecting descriptive data. The remainder of this section of results uses a numerical sequence number for each piece of literature reviewed, as shown in the Appendix, with the lists of factors that follow providing answers to research questions two and three.

**Table 2.** Quality of Evidence

<b>Publication type</b>	<b>Evidence level (high to low)</b>	<b>N.</b>
Peer reviewed journal papers	Interventions (5); intervention evaluation (1); qualitative comparator (1)	7
	Cohort study (1); Interpretative (4) and descriptive (6) studies (interviews, surveys, database analysis)	11
Peer reviewed conference papers	Descriptive studies	3
Reports/conferences (no -peer review)	Interpretive (1) and descriptive (16) studies	17
Grey literature	Level 2 – captured data	1
	Level 1 – good practice	2
<b>TOTAL</b>		<b>41</b>

**3.2.2. Literature review analysis: health and lifestyle**

Table 3 summarizes data extracted on the theme of ‘health and lifestyle’. The generic terms ‘mental’ health/distress/illness were mentioned in three studies in relation to health issues (two of which were published in peer-reviewed journals). Pre-existing psychiatric conditions were mentioned in three publications, two of which were peer-reviewed. One of these reported the condition as being untreated in the 15-24 age group. Specific conditions identified in the data were:

- Depression (top issue in two peer-reviewed papers and one commissioned report), followed by single cases of;
- Schizophrenia;
- Attention Deficit Disorder;
- Bipolar;
- Panic disorder and generalized anxiety;
- Personality disorders;
- Eating disorders;
- Mood disorders.

One mental health issue was also described as ‘unspecified’. Substance use and abuse featured prominently in lifestyle factors. Alcohol was mentioned in three peer-reviewed publications, as well as one commissioned report and the grey literature:

- Alcohol consumption preceding death;
- Alcohol-related problems;
- Resorting to alcohol... for comfort.

Other substance use, and/or abuse was mentioned in virtually the same publications/studies, with cannabis and amphetamines being specifically identified. However, one single study reported no statistical differences in substantial mental distress between two groups on issues of drugs and alcohol consumption. Other ‘lifestyle’ factors identified from the analysis were as follows:

- Financial hardships/problems (reported in three peer-reviewed studies and the grey literature);
- Relationship problems/separation/divorce (reported in each of: peer-reviewed, commissioned report; grey literature) followed by single studies citing;
- Child custody problems;
- LGBTI+ bullying among apprentices;

- Single living resulting in less family support.

**Table 3.** Literature review analysis: health and lifestyle

Ref.	Health factors	Lifestyle factors
1	Age group: 15-24 years; untreated psychiatric conditions.	Alcohol consumption/relationship problems/stressful life events/less likely to seek professional help prior to death; age group: 15-24 relationship problems/separation/divorce.
6	Mental health issues prior to death: chronic illness, substance abuse; 'mental disorders', including depression, schizophrenia, attention deficit disorder, bipolar, and unspecified.	Financial/legal problems; relationship breakdown/child custody problems; substance abuse.
16		Substance use/abuse.
39	Substantial mental distress; 'mental disorders'; including depression, panic disorder/anxiety; personality disorders; eating disorders; suicide risk, substance abuse, and mood disorders.	No significant differences between groups regarding: having/not having substantial mental distress; smoking (average number of cigarettes per day); or alcohol consumption (average number of days per week).
34	Pre-existing psychiatric conditions.	Resorting to alcohol and drugs for comfort.
19		Poor financial management.
18	Higher psychological distress; lower well-being associated with suicidal thoughts.	Higher substance use associated with suicidal thoughts. Apprentices identifying as LGBTI+ (lesbian, gay, bisexual, transgender and intersex) vulnerable to bullying.
24	Psychiatric diagnoses in approximately one-sixth of suicide cases, most common was depression; undiagnosed or untreated psychiatric disorder.	Alcohol consumption prior to death history of suicide attempts, communicated suicidal intent; alcohol-related problems; drug use, mainly cannabis and amphetamines.
27		Single living/less family support.
35	Mental illness.	Drug/alcohol issues; financial/legal problems; relationship problems.

### 3.2.3. Literature review analysis: risk per occupation

Table 4 summarizes data extracted on the theme of 'risk per occupation'. The literature analysis included one peer-reviewed study encapsulating the UK, which identified an unskilled worker suicide rate of 21.1 per 100,000, compared to 14.6 for skilled workers. Similar findings were made in two further international peer-reviewed studies. The only contradiction to this was one peer-reviewed study identifying a decreased rate for lesser-skilled workers. However, this study grouped low-skilled workers with machine operators. The body of evidence points to 'laborer' as the main occupation with higher risk, which is also aligned with elementary occupations' very high mortality rate.

Other international evidence on occupational risk included managers and professionals showing a greater propensity to shift beliefs (about suicide stigmas) than laborers and plant operators; skilled workers – specifically electricians – having similar suicide rates to other occupations; lack of career path (dead end jobs) affecting suicide risk; and skilled workers being more likely to report substance abuse;- rather than hide it, thereby increasing opportunities to discuss and resolve such issues to reduce suicide risk. These factors reinforce the evidence base, suggesting that lower-skilled workers are at higher risk, partially linked to the nature of the work they undertake and their reluctance to talk openly about problems that are known to increase suicide risk.

**Table 4.** Literature review analysis: risk per occupation

Ref.	Occupation-specific factors
2	Lower-skilled workers were higher risk of suicide
5	Managers and professionals more inclined to shift beliefs; laborer, machine operators and drivers least likely.
8	Suicide rates higher for lesser skilled workers (machine operators/laborer); than skilled trades
10	Risk of suicide not increased among electricians as a result of exposure to EMF
15	Lower skilled workers at higher risk; cited higher increase of suicides among laborers (worldwide) after the global financial crisis of 2007-2009.
16	Construction work seen as dead-end career; trapped; uneducated.
38	Journeymen (skilled workers) more likely to report substance abuse than all others.
12	Cited: unskilled worker rate per 100,000 (2001-2010): 21.1 versus skilled: 14.6.

### 3.2.4. Literature review analysis: causes and reasons

Table 5 summarizes occupational causes and reasons for suicide identified in the literature reviewed. These can be grouped under the headings of: Exogenous – working environment; Exogenous – outside of work; Endogenous – lifestyle; Endogenous – mental health.

**Table 5.** Literature review analysis: causes and reasons for suicide

<b>Ref.</b>	<b>Causes/Reasons</b>
38	Stigma associated with psychological distress and reduced sleep; prevalence of stigma on sites, masculine culture, and job insecurity all contributed to stigma.
39	Substantial mental distress associated with injury rate/self-reported pain; association between having substantial mental distress and pain in lower-back/wrist/forearm.
34	Lack of access to support/counselling; poor work conditions; bullying and work-family conflicts were causes of suicidal ideation.
19	Personal status, i.e. married/single; poor financial management; leading to: long hours working; job insecurity; high work demands; bullying; not airing problems.
18	Factors associated with bullying: aged 18–25 years, work for a large employer, working for a training organization, currently not in work.
22	Economic downturns; political priorities; industry/union tensions; technology/atomization; changing cultures.
24	Relationship problems/pending legal matters/stressful life events in the three months preceding suicide.
27	Impulsive behavior from young men seeking approval/feedback from social media.
35	Unpredictable economic cycles; male/macho culture; non-acceptance of diversity; undervalued career path; high customer demands; intergenerational problems; occupational injuries.
40	Access to lethal means macho culture; physical strain and psychological trauma; culture of substance abuse; transitory employment; humiliation and shame; entrapment; structures associated with suicide; job insecurity; sleep disruption.
41	Manual workers: lack of adequate toilets/noise levels/inadequate temperature control/uncertainty of work locations, all stressful; experienced stress due to unrealistic deadlines/time pressures/high workload/bullying. Senior staff stress due to: cost pressures/excluded from decision-making/inadequate staffing. All workers experienced stress due to poor communication.

#### **3.2.4.1. Exogenous–working environment**

Factors relating to the wider ‘culture’ and working conditions of the construction industry have been identified as follows:

- bullying/discrimination/work tensions/poor leadership (6 Peer reviewed + 5)
- transient work under/unemployed/industry downturn (6 Peer reviewed + 4)
- long working hours, workplace pressure/work-family (6 Peer reviewed + 3)
- stigma/macho culture (5 Peer reviewed + 3)
- workplace injury/illness (3 Peer reviewed + 1)
- working in harsh conditions/lone working (2 Peer reviewed + 2)
- poor communication (1 Peer reviewed)
- lack of career path (2)
- access to lethal means (2)
- technology and automation (1)
- culture of substance abuse (1)
- poor welfare facilities (1)

#### **3.2.4.2. Exogenous–outside of work**

I identified these factors alongside work factors:

- separation/divorce, relationship problems (3 Peer reviewed + 1)
- financial and legal problems (1 Peer reviewed)
- lack of professional counselling and support (1 Peer reviewed)



- political priorities (1)
- multiple stressful life events (1)
- impact of social media (1)

### **3.2.4.3. Endogenous–lifestyle**

Although most publications focused on occupational factors, these lifestyle factors were also cited as causal:

- substance abuse (1 Peer reviewed)
- single (1 Peer reviewed)
- poor financial management (1 Peer reviewed)
- pending legal matters (1)
- alcohol consumption (1)

### **3.2.4.4. Endogenous–mental health**

These factors were made worse by or were interrelated with work factors:

- unable to sleep/insomnia (1 Peer reviewed +1)
- general mental health problems including depression (1 Peer reviewed)
- untreated psychiatric conditions (1 Peer reviewed)
- lack of resilience (1 Peer reviewed)
- not discussing problems (1 Peer reviewed)
- impulsive behavior (1)

## **4. Discussion**

There was a dearth of UK-specific data from the literature search. Very little data on life expectancy or mortality rates were identified from the literature reviewed. UK Government analysis of life expectancy focuses on socio-economic position (ONS, 2015), utilizing a seven-point classification scale:

1. Higher Managerial and Professional (HMP)
2. Lower Managerial and Professional (LMP)
3. Intermediate
4. Small Employers Own Account Workers (SEOAW)
5. Lower Supervisory and Technical (LST)
6. Semi-Routine
7. Routine

In addition to this, there is an ‘unclassified’ category, usually listed after Class 7. Life expectancy increases the higher a person is on the socio-economic list, with ‘HMP’ at 82.5 years and ‘Unclassified’ at 74 years, for males in England and Wales (ONS, 2015). The figures for females in each class are all higher than males. With construction being male-dominated, and employing predominately manual occupations (CITB, 2016), life expectancy can presume to be lower than average. Mortality rates reflect this assumption, with elementary construction occupations being the highest in the UK at 701 deaths per 100,000 person-years (Srinivasa Vittal Katikireddi, 2017). This suggests that the occupational group with the highest suicide rates in Fig. 3, i.e. ‘unskilled’ construction laborer also appears to be the highest of any occupation in the UK.

The literature analysis provided some insights as to why unskilled workers have the highest suicide rates. Managers and professionals were shown to have a greater propensity to shift beliefs about suicide stigmas than laborers and plant operators, which may help with their own understanding of mental health and thereby cope better, as well as access the various services offered, such as Employee Assistance Programme (Greiner et. al., 2022). Skilled workers were reported to be more likely to report substance abuse; - rather than hide it, thereby increasing opportunities to discuss and resolve such issues to reduce suicide risk. These are just some of the factors found in the literature which may explain the differences between unskilled workers and others, and the top ‘working environment’ factors from the causal analysis were more applicable to this occupational group (as a subset of manual workers) e.g. bullying/intimidation; employment uncertainty; long working hours; macho culture; workplace injuries; harsh working conditions; lack of career path; poor welfare facilities.

The socio-economic factor is further underlined by the upward trajectory of construction suicides over recent years. As the UK falls deeper into a cost of living crises, factors such as job insecurity and financial hardships may become more significant to worker mental health (Andersen and Reeves, 2022). There are also early signs of an increase in managers and professionals’ suicide rates, but this is based on one years’ increase, which cannot be taken in isolation. However, the factors

uncovered in the systematic literature review show that mental health is a complex issue, with many interrelated factors. This also makes causality itself very difficult to prove.

## 5. Conclusions

The analysis presented in this paper goes further than previous studies on UK construction suicide figures. The trend analysis has uncovered a worrying rise in suicide rates among construction occupations, whilst others remain relatively static. This upward trend needs to be acknowledged by the UK Government and acted upon urgently. I often used construction industry data as an indicator of a country's economic health as it is usually one of the first to show changes in direction. Likewise, this analysis may be an early warning of the state of the UK's mental health, possibly fueled by the current cost-of-living crises. There has been no attempt to correlate suicides with factors such as 'Brexit' (the UK's exit from the EU), but this is worth exploring as part of future research.

Whilst the reasons for suicide rates being higher in lower socio-economic groups are difficult to prove, the fact remains that unskilled construction workers are the most prone to death by suicide within construction, and indeed across all industries. It is often said that money cannot buy happiness, but being poorer is certainly not good for construction workers' mental health. The overall industry trend analysis draws from valid data sources, however, the smaller sample sizes for individual occupational groups should be treated with caution and is an acknowledged limitation of the study. But the analysis presented informs industry policy and practice by uncovering a previously unknown upward trend in UK suicide rates among construction workers, along with a focused list of evidence-based factors to inform further research on why this phenomenon is occurring. Age-adjusted analysis, followed by empirical analysis of interventions, based on the wide range of Australian studies cited, is recommended for future UK research.

## Author Contributions

Billy Hare contributed to methodology, identifying data sources, systematic literature search, first level literature review and main author of introduction, methodology, discussion, conclusions. Kenneth Lawani contributed to methodology, data extraction of literature, and main author of systematic literature review. Gail McEwan contributed to methodology, sourcing secondary data for quantitative analysis, undertaking the quantitative analysis, and main author of the suicide trend analysis results.

## Funding

The research presented in this paper was funded by the Samaritans and the Lighthouse Club; the construction industry charity. The authors would like to thank them for their funding and support.

## Institutional Review Board Statement

Not applicable.

## References

- Andersen K. and Reeves A. (2022). The cost of living crisis is harming mental health, partly because of previous cuts to social security *BMJ* 2022; 377 :o1336
- Aronson, E., Wall, A., McAuliffe, C., Corcoran, P., Williamson, E., McCarthy, J., Perry, I. J., (2013). Second report of the suicide support and information system, Cork, Ireland: *National Suicide Research Foundation*
- Cameron, I., Hare, B., Davies R. (2008). Fatal and major construction accidents: a comparison between Scotland and the rest of Great Britain. *Safety Sci.* 46, 692–708.
- CITB, (2016). Survey of Employment by Occupation in the Construction Industry, *Construction Industry Training Board*
- Greiner, B.A., Leduc, C., O'Brien, C., Cresswell-Smith, J., Rugulies, R., Wahlbeck, K., Abdulla, K., Amann, B.L., Pashoja, A.C., Coppens, E. and Corcoran, P., (2022). The effectiveness of organisational-level workplace mental health interventions on mental health and wellbeing in construction workers: A systematic review and recommended research agenda. *Plos one*, 17(11).
- Meltzer, H. Griffiths. C. Brock. A. Rooney. C. and. Jenkins. R., (2008). Patterns of suicide by occupation in England and Wales: 2001–2005. *The British Journal of Psychiatry*, 193(1), 73-76.
- NHS Scotland, (2016). A profile of deaths by suicide in Scotland 2009-2014.
- NESTA, (2022). Nesta Standards of Evidence, available online: <https://www.nesta.org.uk/feature/innovation-methods/standards-evidence/>
- ONS, (2015). Trend in life expectancy at birth and at age 65 by socio-economic position based on the National Statistics Socio-economic Classification, England and Wales: 1982—1986 to 2007—2011. [Online] Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/bulletins/trendinlifeexpectancyatbirthandage65bysocioeconomicpositionbasedonthenationalstatistics socioeconomicclassificationenglandandwales/2015-10-21>
- ONS, (2017). Suicide by occupation: England, main data tables. *Office for National Statistics*. [Online] Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/suicidebyoccupationenglandmaindatatables>
- ONS, (2020). nomis official labour market statistics, *Office for National Statistics*. [Online] Available at: <https://www.nomisweb.co.uk/datasets/aps168/reports/employment-by-occupation?compare=K02000001>
- ONS, (2022). Suicide by occupation, England and Wales, 2011 to 2021 registrations, *Office for National Statistics*. [Online] Available at:

<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/adhocs/15043suicidebyoccupationenglandandwales2011to2021registrations>

Roberts S. E., Jaremin B. and Lloyd K., (2013). High-risk occupations for suicide. *Psychological Medicine*, 43(6), 1231-1240.

Srinivasa V. K., Leyland, A. H., McKee M., Ralston K., Stuckler D., (2017). Patterns of mortality by occupation in the UK, 1991–2011: a comparative analysis of linked census and mortality records. *Lancet Public Health*, 2(11), E501-E512.

WHO, (2016). Suicide Rates: Data by Country 2012, *Geneva: World Health Organization*.



Professor Billy Hare PhD, BSc (Hon), BA, MCIIOB. Deputy Director BEAM Research Centre, Construction & Surveying, School of Computing, Engineering and Built Environment, Glasgow Caledonian University.



Dr Kenneth Lawani PhD, MSc, BSc (Hons), PgC, LTHE, FHEA C. Build E MCABE, BEAM Research Centre, Construction & Surveying, School of Computing, Engineering and Built Environment, Glasgow Caledonian University.



Gail McEwen BSc (Hons), Research Assistant & PhD Student, BEAM Research Centre, Construction & Surveying, School of Computing, Engineering and Built Environment, Glasgow Caledonian University.

#### **Appendix: Publications used in Systematic Literature Review**

1. Heller, T.S., Hawgood J.L., Leo D.D. (2007). Correlates of suicide in building industry workers, *Archives of Suicide Research*
2. A Milner, H Niven, A LaMontagne. (2014). Suicide by occupational skill level in the Australian construction industry: Data from 2001 to 2010, *Australian and New Zealand Journal of Public Health*
3. J Gullestrup, B Lequertier, G Martin. (2011). MATES in construction: impact of a multimodal, community-based program for suicide prevention in the construction industry, *International Journal of Environmental Research and Public Health*
4. CM Doran, R Ling, J Gullestrup, S Swannell, A Milner. (2015). The impact of a suicide prevention strategy on reducing the economic cost of suicide in the New South Wales construction industry, *Crisis*
5. Tania L. King, Jorgen Gullestrup, Philip J. Batterham, Brian Kelly, Chris Lockwood, Helen Lingard, Samuel B. Harvey, Anthony D. LaMontagne and Allison Milner. (2018). Shifting beliefs about suicide: Pre-post evaluation of the effectiveness of a program for workers in the construction industry, *International Journal of Environmental Research and Public Health*
6. Allison Milner, Humaira Maheen, Dianne Currier and Anthony D LaMontagne. (2017). Male suicide among construction workers in Australia: a qualitative analysis of the major stressors precipitating death, *BMC Public Health*
7. Tania L. King, Philip J. Batterham, Helen Lingard, Jorgen Gullestrup, Chris Lockwood, Samuel B. Harvey, Brian Kelly, Anthony D. LaMontagne and Allison Milner (2019). Are young men getting the message? Age differences in suicide prevention literacy among male construction workers, *International Journal of Environmental Research and Public Health*
8. Martin G, Swannell S, Milner A and Gullestrup J. (2016). Mates in construction suicide prevention program: A five year review, *Journal of Community Medicine & Health Education*

9. Victoria Ross, Neil Caton, Jorgen Gullestrup and Kairi Kõlves. (2020). A longitudinal assessment of two suicide prevention training programs for the construction industry, *International Journal of Environmental Research and Public Health*
10. B Järholm, A Stenberg. (2002). Suicide mortality among electricians in the Swedish construction industry, *Occupational & Environmental Medicine*
11. Milner, T. L. King, A. J. Scovelle, P. J. Batterham, B. Kelly, A. D. LaMontagne, S. B. Harvey, J. Gullestrup and C. Lockwood. (2019). A blended face-to-face and smartphone intervention for suicide prevention in the construction industry: protocol for a randomized controlled trial with MATES in Construction, *BMC Psychiatry*
12. M Turner, T Mills, B Kleiner, H Lingard. (2017). Suicide in the construction industry: it's time to talk, *CIB W099 Conference Proceedings*
13. Christopher M Doran, Rod Ling, Allison Milner and Irina Kinchin. (2016). The economic cost of suicide and non-fatal suicidal behaviour in the Australian construction industry, *International Journal of Mental Health & Psychiatry*
14. Robyn Broadbent, Tim Corney, Karin du Plessis & Theo Papadopoulos. (2013). Using generalist youth work practice in suicide prevention: A program for young construction workers, *Youth Studies Australia*
15. Tania L. King & Anthony D. Lamontagne. (2021). COVID-19 and suicide risk in the construction sector: preparing for a perfect storm, *Scandinavian Journal of Public Health*
16. Cian Guerin, John P. Spillane. (2021). The role of the construction project manager in developing a culture of suicide prevention, *Proceedings of the Institution of Civil Engineers - Management, Procurement and Law*
17. Christopher M Doran, Rod Ling, Allison Milner. (2015). The economic cost of suicide and suicide behaviour in the South Australian Construction Industry, *Report for Mates in Construction*
18. Dr Victoria Ross, Ms Rachmania Wardhani and Dr Kairi Kõlves. (2020). The impact of workplace bullying on mental health and suicidality in queensland construction industry apprentices, *Report for Mates in Construction*
19. Michael Bowles, Pushpitha Kalutara, Darryl O'Brien, Peter Lawrence, Phillip Harrison. (2019). an investigation into higher suicide rate in australian construction industry-critical review, *Proceedings of the 43rd Australasian Universities Building Education Association Conference*
20. Allison Milner, Heather Niven, and Irina Tchernitskaia. (2014). Suicide in the construction industry: an in-depth investigation of deaths occurring among Cbus Superannuation (Cbus) members, 2008, *Report for Cbus Superannuation Fund*
21. Christopher M Doran, Rod Ling, Allison Milner, (2015). The economic cost of suicide and non-fatal suicidal behaviour in the Australian construction industry by state and territory, *Report for Mates in Construction*
22. Anthony D. LaMontagne and Clare Shann. (2020). Mates in Construction Workplace Suicide Prevention Program: Articulation of Program Logic, *Report for Mates in Construction*
23. Humaira Maheen, Anthony D. LaMontagne, and Tania King. (2020). SUICIDE IN THE CONSTRUCTION INDUSTRY: 2001-2018, *Report for Mates in Construction*
24. Australian Institute of Suicide Research and Prevention. (2006). Suicide in Queensland's Commercial Building and Construction Industry: An investigation of factors associated with suicide and recommendations for the prevention of suicide, *Report for Queensland's Commercial Building Construction Industry*
25. Rezvani, Azadeh, Rezvani, Sami, Khosravi, Pouria, & Asadi, Shahla. (2019). Construction workers' well-being: Time to fly the flag for suicide prevention in Australia, *19th Annual European Academy of Management (EURAM) Conference (unpublished)*
26. Christopher M Doran, Rod Ling, Allison Milner. (2015). The economic cost of suicide and suicide behaviour in the Queensland Construction Industry, *Report for Mates in Construction*
27. Myfanwy Maple, Sarah Wayland, Tania Pearce, Lyndal Bugeja, Tara Lal, Nikki Jamieson. (2020). Reducing the impact of critical incidence and suicide on construction workers: A rapid review and qualitative study, *Report for Mates in Construction*
28. Christopher M Doran, Rod Ling, Allison Milner. (2015). The economic cost of suicide and suicide behaviour in the New South Wales Construction Industry, *Report for Mates in Construction*
29. Christopher M Doran, Rod Ling, Allison Milner. (2015). The economic cost of suicide and suicide behaviour in the Australian Capital Territory Construction Industry, *Report for Mates in Construction*
30. Christopher M Doran, Rod Ling, Allison Milner. (2015). The economic cost of suicide and suicide behaviour in the Western Australian Construction Industry, *Report for Mates in Construction*
31. Christopher M Doran, Rod Ling, Allison Milner. (2015). The economic cost of suicide and suicide behaviour in the Victorian Construction Industry, *Report for Mates in Construction*

32. Christopher M Doran, Rod Ling, Allison Milner. (2015). The economic cost of suicide and suicide behaviour in the Northern Territory Construction Industry, *Report for Mates in Construction*
33. Christopher M Doran, Rod Ling, Allison Milner. (2015). The economic cost of suicide and suicide behaviour in the Tasmanian Construction Industry, *Report for Mates in Construction*
34. I Kamardeen, M Loosemore. (2016). Suicide in the construction industry: A cross-sectional analysis (abstract), *RICS COBRA Conference (abstract)*
35. Liesje Donkin, Workplace wellness and suicide prevention: a case for focusing on the building and construction industry, *Clinical Advisory Services Aotearoa (CASA)*
36. Savannah Smith, Kerianne Chandler, Hailey Judd, Jessica Duke. (2019). Building Hope: Suicide Prevention in Construction Occupations (abstract), *APHA 2019 Annual meeting and expo (abstract)*
37. Yuting Chen, Brenda McCabe, Douglas Hyatt. (2017). Impact of individual resilience and safety climate on safety performance and psychological stress of construction workers: A case study of the Ontario construction industry, *Journal of Safety Research*
38. Mara Eyllon, Steven P. Vallas, Jack T. Dennerlein, Suzanne Garverich, Daniel Weinstein, Kathleen Owens, and Alisa K. Lincoln. (2020). Mental Health Stigma and Wellbeing Among Commercial Construction Workers, *Journal of Occupational and Environmental Medicine*
39. Henrik Borsting Jacobsen, Alberto Caban-Martinez, Lynn C. Onyebeke, Glorian Sorensen, Jack T. Dennerlein, and Silje Endresen Reme. (2013). *Construction Workers Struggle with a High Prevalence of Mental Distress and this is Associated with Their Pain and Injuries*, *Journal of Occupational and Environmental Medicine*
40. Carson J Spencer Foundation & National Action Alliance for Suicide Prevention. (2015). *A Construction Industry Blueprint: Suicide Prevention in the Workplace*, Carson J Spencer Foundation
41. Daisy Rees-Evans. (2020). Understanding Mental Health in the Built Environment, *Chartered Institute of Building (CIOB)*