

# BMJ Open Impact of the macro-environment on the reporting of occupational injuries and illnesses by low-income workers compared to middle-income workers in South Africa: a mixed-methods study protocol

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## ABSTRACT

**Introduction** Construction workers, mineworkers and manufacturing employees in South Africa must report occupational injuries and illnesses to their employer as stipulated in section 14 of the Occupational Health and Safety Act and section 22 of the Mine Health and Safety Act. However, under-reporting of workplace injuries and illnesses is common globally.

This protocol seeks to ascertain if macro-environment factors impact reporting of workplace injuries and illnesses and compare reporting between low-income and middle-income workers.

**Methods and analysis** To achieve the objectives of the study, a sequential mixed-methods research design will be adopted. A questionnaire will be distributed among low-income and middle-income workers from nine companies in Gauteng from the construction, mining and manufacturing sectors to establish macro-environment factors that impact their reporting. In addition, a data extraction sheet will be submitted to compensation fund administrators who receive and process workers' compensation claims to determine reporting patterns by low-income and middle-income workers. In-depth interviews will be conducted with occupational health and safety subject matter experts in South Africa to ascertain their opinion regarding factors that impact reporting. Data will be analysed using SPSS V.27.

**Ethics and dissemination** Prior to the commencement of the study, ethical approval and permission will be obtained from the University of Johannesburg Faculty of Health Sciences Research Ethics Committee. The researcher intends to publish the results of the study in peer-reviewed journals and present research papers at scientific conferences and provide feedback to employers and employees across all three industries. The study shall determine associations in reporting between the manufacturing, mining and construction sectors and establish interventions employers can implement for workers to report injuries and illnesses.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Multiple methods shall be used for gathering data used in the research from research participants, compensation authorities/administrators and subject matter experts.
- ⇒ Quantitative data from data extraction sheets shall complement and refine the qualitative data collected through questionnaires and in-depth interviews.
- ⇒ Findings of the study may be generalised to the study population.
- ⇒ Self-administered questionnaires and in-depth interviews may introduce response bias.

## INTRODUCTION

Mining, construction and manufacturing are among the most hazardous industries in the world.<sup>1-3</sup> In South Africa, workers employed in these sectors must report occupational injuries or illnesses to their employer in line with section 14 of the Occupational Health and Safety Act as well as section 22 of the Mine Health and Safety Act.<sup>4 5</sup> However, under-reporting and under-recording of workplace injuries and illnesses are common globally.<sup>6 7</sup>

A large and growing body of research suggests that national surveillance statistics on workplace injuries and illnesses may suffer from significant under-reporting by employees and organisations.<sup>8</sup> Evidence was uncovered of major discrepancies between accidents experienced by employees, what gets reported to organisations and ultimately what organisations report to the regulatory authorities.<sup>8</sup>

There are many factors that influence under-reporting of occupational injuries and illnesses. Studies have found that there is higher exposure to occupational hazards among low-income workers compared with

middle-income and high-income earners due to differences in the nature of their work.<sup>9</sup> Under-reporting bias is common among temporary workers who are assigned dangerous (precarious) tasks as they have less bargaining power.<sup>7</sup>

Fear of reprisal and employer disciplinary programmes among workers causes under-reporting.<sup>6</sup> In addition, under-reporting may be a result of the fear of retaliation against employees which often takes the form of job termination, layoff, demotion, salary pay cuts, reduced work hours, denied promotions and benefits, denied overtime, harassment, intimidation and threats or disciplinary actions for alleged poor performance.<sup>10</sup> Poor employer medical management policies also foster under-reporting and under-recording.<sup>6</sup>

The socioeconomic status of workers is associated with occupational injuries.<sup>11</sup> Studies found that workplace injuries and under-reporting are higher among low-income workers who are young or temporary employees who take up low-wage contingent positions.<sup>12-14</sup>

Previous research conducted on factors influencing under-reporting of workplace injuries and illnesses has been focused on an organisational micro-level. Past studies investigated micro-level factors within organisations such as poor recording of injuries and illnesses by employers, poor recordkeeping by employers, fear of reprisals by workers if they report and lack of reporting injuries or illnesses by employers to authorities.<sup>6-8,10</sup>

Under-reporting occupational injuries and illnesses may result from macro-environment factors. The macro-environment comprises economic, political and legal, demographic, sociocultural and technological factors in society or the wider environment.<sup>15</sup> This study aims to ascertain if macro-environment factors affect reporting of workplace injuries and illnesses and compare reporting between low-income and middle-income workers.

### Research questions

The overall research question for this study is: Do macro-environment forces affect reporting of workplace injuries and illnesses?

This study will attempt to answer the following specific research questions:

1. What is the frequency of reporting work-related injuries and illnesses by low-income and middle-income workers in construction, manufacturing and mining?
2. What is the adequacy of work-related injuries and illnesses reported by low-income and middle-income workers across three different industries?
3. Do macro-environment factors (economic, political and legal, demographic, sociocultural and technological) affect reporting of work-related injuries and illnesses?
4. What are the perceptions of health and safety experts on reporting of work-related injuries and illnesses?
5. What are the differences in reporting of work-related injuries and illnesses between low-income and middle-income workers?

6. Are there associations between reporting work-related injuries and illnesses and macro-environment factors?

### Aim and objectives

To achieve the aim of this study, the following research objectives were formulated:

- a. To establish the frequency of reporting work-related injuries and illnesses by low-income and middle-income workers in construction, manufacturing and mining.
- b. To determine the adequacy of work-related injuries and illnesses reported by low-income and middle-income workers across three different industries.
- c. To ascertain if macro-environment factors (economic, political and legal, demographic, sociocultural and technological) affect reporting of work-related injuries and illnesses.
- d. To assess the perceptions of health and safety experts on reporting of work-related injuries and illnesses.
- e. To compare reporting of work-related injuries and illnesses between low-income and middle-income workers from data collected through compensation fund administrators.
- f. To establish if there are associations between reporting work-related injuries and illnesses and macro-environment factors.

### Core hypothesis

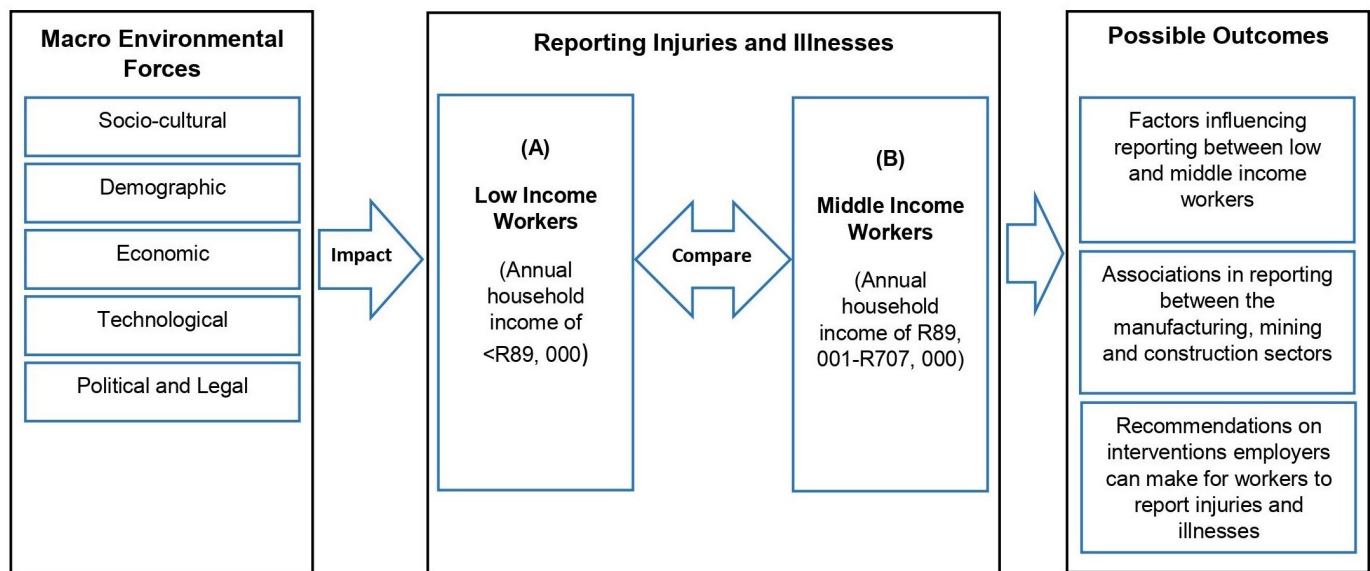
In alignment with all research objectives above, the hypothesis formulated for this study is that: there is a relationship between reporting work-related injuries and illnesses and macro-environment factors.

### METHODS AND ANALYSIS

This study is a sequential mixed-methods research which shall be conducted from 01 September to 30 November 2022. The research shall make use of multilevel qualitative and quantitative data collected through different data collection techniques. Although integrated together intentionally, qualitative data shall be the dominant strand (questionnaires and interviews) with quantitative data (data extraction sheets) used to inform the qualitative strand.

The sequence of data collection shall start first by having quantitative data collected through a standard questionnaire distributed among low-income and middle-income workers from nine companies in Gauteng from the construction, mining and manufacturing sectors (n=9).

Second, quantitative data on reported injuries and illnesses shall be collected through a data extraction sheet submitted to compensation fund administrators who receive and process workers' compensation claims. Lastly, qualitative data shall be collected through in-depth interviews with occupational health and safety (OHS) subject matter experts in South Africa.



**Figure 1** Conceptual framework of the study.

### Conceptual framework

This study shall interrogate if macro-environmental factors (economic, political and legal, demographic, sociocultural and technological) impact reporting injuries and illnesses by (a) low-income workers (earning less than R89 000 per year) as well as (b) middle-income workers (earning R89 001–R707 000 per year) (see figure 1: conceptual framework of the study).

Furthermore, the study shall compare reporting injuries and illnesses between (a) low-income workers and (b) middle-income workers. Low-income workers have been found to have high exposure to occupational hazards when compared with middle-income and high-income earners.<sup>9</sup>

Possible outcomes of this research include identifying factors which influence reporting between low-income and middle-income workers, associations in reporting between the manufacturing, mining and construction sectors as well as recommendations on interventions employers can make for workers to report injuries and illnesses.

### Population, sampling and sample size

Convenience sampling will be used to select nine large-scale companies (n=9) operating in Gauteng province, South Africa which is made up of three in the mining sector, three in the manufacturing sector and three construction companies.

Random sampling will be used to distribute questionnaires among research participants employed in the nine companies. The Bureau of Market Research household income groups will be used to stratify low-income and middle-income workers from the nine companies who will participate in the study as research participants based on their income levels.<sup>16</sup>

Due to a combined total workforce of 913 000 workers across all three sectors in Gauteng province,<sup>17</sup> the minimal sample size will be 384 workers (n=384) based on a confidence level of 95%, CI of 5 and a prevalence of 50% (as there are no data available on the prevalence of not reporting).

In-depth interviews will be conducted with OHS subject matter experts from the organisations selected through purposive sampling as they are located along the OHS data value chain in South Africa from institutions that collect, process, publish, uptake or impact of data regarding occupational injuries and illnesses of workers. The sample size for in-depth interviews in this study shall be nine subject matter experts, which is the minimum required to reach code saturation.<sup>18</sup>

Data extraction sheets shall be sent to compensation fund administrators which include the Compensation Fund, Rand Mutual Assurance Company Limited and Federated Employers Mutual Assurance Company. The data extraction sheets will retrieve data on all claims for occupational injuries and illnesses submitted by employers between the years 2015 and 2021.

### Patient and public involvement

Patients and/or the public were not involved in this research.

### Data gathering

Upon obtaining ethical clearance and permission from the nine companies, compensation fund administrators and interviewees, all research participants who will volunteer to participate in the study either as an interviewee or by completing the self-administered questionnaire shall receive a study information letter and sign a consent form (online supplemental appendix 1) before their participation.

### Questionnaires

A self-administered questionnaire (online supplemental appendix 1) will be distributed to low-income and middle-income workers from the nine companies. The questionnaire which comprised of single, multiple-response and Likert-type questions was designed to elicit data on socio-demographic information, workplace health and safety as well as the economic, political and legal, demographic, sociocultural and technological macro-environmental forces that affect reporting of workplace injuries and illnesses by both low-income and middle-income workers to their employers.

To prevent data clustering in occupational settings, all research participants shall receive a questionnaire in a sealed envelope after they complete their shift work at a construction site, mine shaft or manufacturing plant. Participants shall complete the questionnaires at home and return them in the sealed envelope.

The following steps shall be taken to obtain high response rates and to minimise the potential for different types of selection bias:

1. A study information letter shall be used to prepare respondents so that they are aware of what the study is about, how long it will take to participate and importance of their participation.
2. Questionnaires shall be distributed to mineworkers, construction workers and factory workers who will not have a lot of time so the questionnaire shall be short in length.
3. The questionnaire shall be distributed in person by the researcher to participants as they go home from their worksites and collected by the researcher the next day after completion.
4. The questionnaire has simple wording to ensure that it is straightforward and non-ambiguous.
5. The questionnaire was translated into isiZulu and Sesotho local languages to cater for possible low levels of literacy among low-income workers and eliminate selection bias of having only workers who understand English to complete the questionnaire.
6. The important questions to establish the workers' perceptions of macro-environmental factors which influence reporting shall be put first.

### Data extraction sheets

A standardised data extraction sheet (online supplemental appendix 3) will be submitted to the Compensation Fund, Rand Mutual Assurance Company Limited and Federated Employers Mutual Assurance Company. The data sheets shall extract quantitative data on the injuries and illnesses reported by employers to compensation fund administrators. Data such as age, sex, occupation of injured or ill workers, income/earnings level, types of injuries/illnesses and the amount of injuries and illnesses shall be obtained through the data extraction sheets. These quantitative data, which are contained in claim forms submitted by employers for compensation to the three institutions, shall be used in comparison with

qualitative data obtained through questionnaires and in-depth interviews.

### In-depth interviews

The researcher shall conduct in-depth interviews with subject matter experts using an interview guide that was tested prior to the commencement of the study to ensure the credibility, transferability, dependability and confirmability of the qualitative data.

Interviews will be conducted face-to-face, telephonically or via electronic media depending on the medium that the interviewee is comfortable with. All face-to-face interviews shall be conducted in line with national COVID-19 protocols such as wearing of masks, social distancing, hand washing and hand sanitisation, and participants will be interviewed in a well-ventilated area.

The researcher shall record interviews via voice or video platforms which shall be documented on interview transcripts. Both open-ended and closed questions will be used to obtain as much information from interviewees as possible and allow for probing.

### Data storage and management plan

Data collected throughout the study will be managed in accordance with the Research Ethics Committee (REC)/Higher Degrees Committee (HDC) Research Data and Document Management Standard Operating Procedures. All completed questionnaires, interview transcripts and data extraction sheets will be backed up electronically and stored in a password-protected folder and/or locked away in a secure access-controlled location for up to 15 years.

Only the researcher or research supervisors are authorised to use and/or disclose anonymised information in connection with this research study. Any other person wishing to work with the anonymised information as part of the research process is required to sign a confidentiality agreement before being allowed to do so.

### Data analysis

Quantitative data from questionnaires and data extraction sheets will be captured into a statistical software known as SPSS V.27 and checked for duplicates or obvious discrepancies before analysis. Qualitative data from interview transcripts after in-depth interviews will be recorded, transcribed and analysed. [Table 1](#) below provides an overview of the data analysis methods selected for this study, which are appropriate for each data collection tool.

### Measurement of key indicators

[Table 2](#) below shows the items that will be measured for each key indicator through the research questionnaire to minimise the extent of reporting biases (measurement error).

### Covariates

There are a number of independent variables which are not of direct interest in this study which will be important to control as they may influence the outcome of the



**Table 1** Data analysis methods

Data collection tool	Data analysis method
Research questionnaire (research objectives (a), (b), (c) and (e))	<ul style="list-style-type: none"> <li>▶ Frequency tables shall be used to analyse single-response questions (thus, mostly demographics).</li> <li>▶ Custom tables shall be used to analyse multiple-response questions and Likert-type response questions.</li> <li>▶ Means and SDs shall also be used to analyse Likert-type response questions.</li> <li>▶ Summary statistics shall be used to analyse continuous variables in the study.</li> <li>▶ Exploratory factor analysis shall be used as a construct validity technique.</li> <li>▶ Reliability analysis shall be used to assess the internal consistency of the questionnaire.</li> <li>▶ Correlation analysis shall be used to measure the relationship of the (economic, political and legal, demographic, sociocultural and technological) factors in the study.</li> <li>▶ Logistic regression analysis shall be used to determine if economic, political and legal, demographic, sociocultural and technological factors have an impact on reporting injuries and illnesses.</li> </ul> <p><b>Independent variables</b> Economic, political and legal, demographic, sociocultural and technological factors</p> <p><b>Dependent variables</b> Under-reporting injuries; under-reporting illnesses</p>
In-depth interviews (research objective (d))	Inductive methods shall be used to analyse interview transcripts: <ol style="list-style-type: none"> <li>1. Thematic content analysis               <ul style="list-style-type: none"> <li>– Remove biases to establish overarching impressions in the data.</li> <li>– Identify common themes/patterns from the data set.</li> </ul> </li> <li>2. Narrative analysis               <ul style="list-style-type: none"> <li>– Make sense of interview respondents.</li> <li>– Highlight important aspects of responses.</li> <li>– Highlight critical points found in other areas of the research.</li> </ul> </li> </ol>
Data extraction sheet (research objectives (a), (b) and (e))	<ul style="list-style-type: none"> <li>▶ Summary statistics analyse continuous variables emanating from the data extraction sheets.</li> <li>▶ Frequency tables analyse the count of reported work injuries, illnesses, low-income and middle-income workers.</li> <li>▶ <math>X^2</math> tests of independence measure the association between reported work injuries and level of employees (low-income and middle-income workers).</li> <li>▶ <math>X^2</math> tests of independence measure the association between reported illnesses and level of employees (low-income and middle-income workers).</li> </ul>

data analysis. [Table 3](#) below shows the covariates to be controlled.

### Methodological limitations

Self-administered questionnaires and in-depth interviews may introduce response bias. To overcome these limitations, during the distribution of questionnaires, the researcher shall encourage participants to complete self-administered questionnaires at home so that their responses are not influenced by those of their workmates. In addition, during in-depth interviews, the researcher shall not ask leading questions or state the researcher's opinion so as not to influence the response of the interviewee.

### ETHICS AND DISSEMINATION

The study received approval (HDC-01-101-2021) from the University of Johannesburg Faculty of Health Sciences HDC in 2021 as well as ethical clearance (REC-1377-2022) from the University of Johannesburg Faculty of Health Sciences REC in 2022 (online supplemental appendix 4).

Prior to commencing this study, we obtained written permission from the nine companies to allow their employees to participate in the study. Research participants (low-income and middle-income workers) shall be given an information letter for the study and thereafter sign the consent form. All compensation fund administration companies provided written permission to authorise the release of data on data extraction sheets. Subject matter experts who agreed to participate and be recorded during in-depth interviews also provided their permission beforehand.

No personal details of research participants shall be captured on the questionnaire to protect the identity and anonymity of research participants. Data extraction sheets do not contain fields to extract names or national identity numbers of claimants that were injured, ill or died at work. Questionnaires from research participants shall be coded for easy identification and traceability. There are no circumstances under which confidentiality may be breached for the duration of the study and post-publication of the research results.

**Table 2** Key indicators measured

Key indicator	Items of measurement
Workplace health and safety	History of injuries/occupational illnesses
	Frequency of injuries/occupational illnesses
	Type of injuries/occupational illnesses
Social factors	Difference in language or communication impact on reporting
	Impact of difference in nationality with supervisor on reporting
	Impact of difference in sex/gender with supervisor on reporting
	Impact of difference in race with supervisor on reporting
	Impact of difference in ethnicity with supervisor on reporting
	Impact of harassment or intimidation by supervisor on reporting
Demographic factors	Impact of high unemployment rate on reporting
	Impact of employee age on reporting
	Impact of employee sex/gender on reporting
	Impact of employee race on reporting
	Impact of employee nationality on reporting
Economic factors	Fear of job termination or layoff for reporting
	Salary pay cut for reporting
	Reduced work hours when injured/ill
	Demotion from current post for reporting
	Denied promotions or benefits for reporting
Technological factors	Fear of job being automated after reporting
	Lack of understanding how technology improves job safety
	Fear of retraining and upskilling if job incorporates technology to improve safety
	Lack of understanding electronic platform for reporting
	Poor communication infrastructure for reporting
Political factors	Compensation uncertainty after injury or illness
	Fear of blame for injury or illness
	Multiple medical tests after injury or illness
	Conflict between labour union and employer for injury or illness

Continued

**Table 2** Continued

Key indicator	Items of measurement
Reporting injuries or illnesses	Awareness that injuries or illnesses must be reported
	Encouragement by employer to report injuries or illnesses
	Existence of individual to report injuries or illnesses
	Training provided on how to report injuries or illnesses
	Willingness to report injuries or illnesses
	Communication channels for reporting injuries or illnesses
	Ease of reporting injuries or illnesses

Research participants do not need to take any time off work to participate in the study. Participants shall be informed that they have the right to withdraw from participating at any stage within the research without prejudice. The research will be conducted in a manner that does not pose any harm to research participants.

Research findings shall be published in academic journals and presented at academic conferences. Copies of the doctoral thesis shall be available at the University of Johannesburg. Feedback from the findings of this study shall be shared with research participants. The findings from this study will also be shared with the Department of Employment and Labour and employers across the

**Table 3** Covariates to be controlled

Covariate	Description of factor
Years on the job	People tend to be injured more in jobs they are either new at or too experienced that they become complacent
Reporting channels	People tend to report when there are safety representatives/processes in place
Nature of workplace injury or illness	People tend to report only serious injuries or illnesses
Bias	Research participants may be inherently biased on their perception of health and safety in their organisation based on past experiences in industry or at their employer
Size of employer	People tend to think large-scale companies have good health and safety processes in place compared with smaller organisations
Perception of safety experts	Safety experts who shall be interviewed may have their own perceptions on what influences health and safety reporting

mining, manufacturing and construction sectors at industry conferences, Continuous Professional Development (CPD) workshops and other health and safety-related events.

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