



Government of **Western Australia**  
Department of **Mines, Industry Regulation and Safety**

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# SAFETY PERFORMANCE

IN THE WESTERN AUSTRALIAN MINERAL INDUSTRY

# 2018 - 19

ACCIDENT AND INJURY STATISTICS



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Government of **Western Australia**  
Department of **Mines, Industry Regulation and Safety**

# **SAFETY PERFORMANCE**

IN THE WESTERN AUSTRALIAN MINERAL INDUSTRY

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#### Surface:

**113,784** employed

**2** fatal injuries

**391** lost time injuries

**722** restricted work injuries



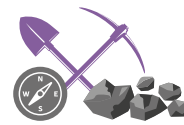
#### Underground:

**10,086** employed

No fatal injury

**34** lost time injuries

**113** restricted work injuries



#### Exploration:

**3,106** employed

No fatal injury

**21** lost time injuries

**27** restricted work injuries

## STATISTICAL SUMMARY

### MINING

- Two fatal mining accidents occurred during 2018-19, one each at a construction material quarry and an iron ore operation.
- There were 425 lost time injuries (LTIs) during 2018-19, 72 more than in the previous year (353 lost time injuries in 2017-18).
- LTIs resulted in a total of 10,359 rostered days lost and a further 11,776 rostered days of restricted work in 2018-19.
- There was an average workforce of 123,870 in 2018-19, an increase of approximately 11% from the previous year's average of 112,021.
- The overall LTI duration rate deteriorated by approximately 13% during 2018-19, rising from 21.5 to 24.4.
- The overall LTI frequency rate deteriorated by 10% during 2018-19, rising from 2.0 to 2.2.
- The overall injury index (days lost per million hours worked) deteriorated by approximately 25%, rising from 42.2 in 2017-18 to 52.7 in 2018-19.
- Serious LTIs in mining during 2018-19 totalled 365, 69 more than in 2018-19, with the overall serious LTIFR deteriorated 13% from 1.65 to 1.87.
- The iron ore sector LTIFR deteriorated by 21%, rising from 1.4 to 1.7 during 2018-19.
- The bauxite and alumina sector LTIFR deteriorated by 23% during 2018-19, rising from 5.6 to 6.9.
- The gold sector LTIFR improved by 21% during 2018-19, falling from 1.9 to 1.5.
- The nickel sector LTIFR deteriorated by 32%, during 2018-19, rising from 1.9 to 2.5.
- There were 835 restricted work injuries (RWIs) during 2018-19, a 2% improvement on the previous year (853 RWIs reported in 2017-18).
- RWIs resulted in a total of 27,151 rostered days of restricted work in 2018-19.
- The overall RWI frequency rate for 2018-19 remains the same from 2017-18 at 4.7.

### EXPLORATION

- There was no exploration fatality in 2018-19.
- There were 21 lost time injuries (LTIs) reported during 2018-19, 5 more than the previous year.
- LTIs resulted in a total of 664 rostered days lost and a further 247 rostered days of restricted work in 2018-19.
- There was an average workforce of 3,106 workers, an increase of 15% from the previous year's average.
- The overall LTIFR deteriorated by 16% in 2018-19, rising from 3.2 to 3.7. Rates for exploration such as LTIFR may vary significantly from year to year due to the low numbers of both the LTIs reported and hours worked.
- There were 27 restricted work injuries (RWIs) reported for exploration during 2018-19, resulting in an RWI frequency rate of 4.7, 2% lower than the 2017-18 rate of 4.8.
- RWIs resulted in a total of 648 rostered days of restricted work in 2018-19.



## INTRODUCTION

There were two fatal accidents in 2018-19, one each at an iron ore operation and a construction material quarry. Both incidents occurred on a surface operation.

A further 365 people in mining and 17 in exploration suffered from a serious lost time injury – an injury that disables a worker for two weeks or more. Overall, the mining injury frequency rate deteriorated by 10% during 2018-19.

These figures are a reminder that we still have too many people being put in harm's way while working in the State's mining industry.

As a regulator, the Department of Mines, Industry Regulation and Safety continues to look at ways to increase awareness of safety issues and seeks compliance across the sector. Improving the use of data to drive decision-making is an important focus for the Department. We collect a large amount of information, and it is essential we use these data to improve our and industry's understanding.

However, each and every person involved in the mining industry must

take their safety responsibilities seriously.

In 2018-19, the Department held its second Safety and Health Resources Sector Awards to recognise individuals, teams and companies that have developed a new initiative or an original solution to safety and health problems in the workplace. The Awards highlight and promote leadership and innovation to ensure continuous improvement to safety and health in the sector.

The mental health and wellbeing of workers within the WA mining industry will continue to be an area of focus for the Department. The Department has developed a mentally healthy workplaces hub with resources for both workers and management. Use this hub to develop your ideas about implementing the *Mentally healthy workplaces for fly-in fly-out (FIFO) workers in the resources and construction sectors – code of practice* in your workplace.

The Department also released the fifth instalment of the *Know Your Hazards* video series, focussing on the importance of safety and health representatives (SHReps) and

acknowledging the work they do to help improve workplace safety.

To help increase knowledge about the influence of human and organisational factors on safety in the resources industry, the Department is finalising a suite of guidance materials, which includes information about the top ten human factors for Western Australia's resources sector.

Whether you are an executive, manager, supervisor, worker, supplier or regulator, we must all make a commitment to improve safety in Western Australia's mining industry.

It is a commitment we need to make our highest priority because the costs of not doing so are far too high.

Sharing the lessons learned, whether it be through the information available on the Department's website or attendance at one of our industry forums, advances our collective safety and health knowledge.

**Christina Folley**  
**A/State Mining Engineer**

31 March 2020

Visit [www.dmirs.wa.gov.au](http://www.dmirs.wa.gov.au) for further information on the fatalities and serious injuries reports.



# DEFINITIONS

## DAYS LOST

Rostered days absent from work due to work injury

## DAYS OFF

Total calendar days, whether rostered or not, absent from work or on alternative duties, restricted duties or restricted hours due to work injury

## DURATION RATE (LTI)

Average number of workdays lost per lost time injury

## DURATION RATE (RWI)

Average number of restricted workdays per restricted work injury

## EXPLORATION

Exploration activities not under the control of a registered mine manager; usually associated with exploration leases

## FATAL INJURY INCIDENCE RATE

Number of fatal injuries per 1,000 employees for a 12 month period

## INCIDENCE RATE

Number of injuries per 1,000 employees for a 12 month period

## INJURY INDEX (LTI)

Number of workdays lost per million hours worked

## INJURY INDEX (RWI)

Number of restricted workdays per million hours worked

## LOST TIME INJURY (LTI)

Work injury that results in an absence from work for at least one full day or shift any time after the day or shift on which the injury occurred

## LOST TIME INJURY FREQUENCY RATE (LTIFR)

Number of lost time injuries per million hours worked

## METALLIFEROUS MINES

All mines other than coal mines are classed as metalliferous mines

## MINOR INJURY

Work injury that results in the injured person being disabled for a period of less than two weeks

## NOC

Not otherwise classified

## REPORTABLE INJURY

A work injury which results in the injured person being unable to fully perform his or her ordinary occupation (regular job) any time after the day or shift on which the injury occurred and includes both lost time and restricted work injuries

## RESTRICTED WORK INJURY (RWI)

Work injury (not LTI) that results in the injured person being unable to fully perform his or her ordinary occupation (regular job) any time after the day or shift on which the injury occurred. E.g. Where a person is on alternative or light duties or hours are restricted

## RESTRICTED WORK INJURY FREQUENCY RATE (RWIFR)

Number of restricted work injuries per million hours worked

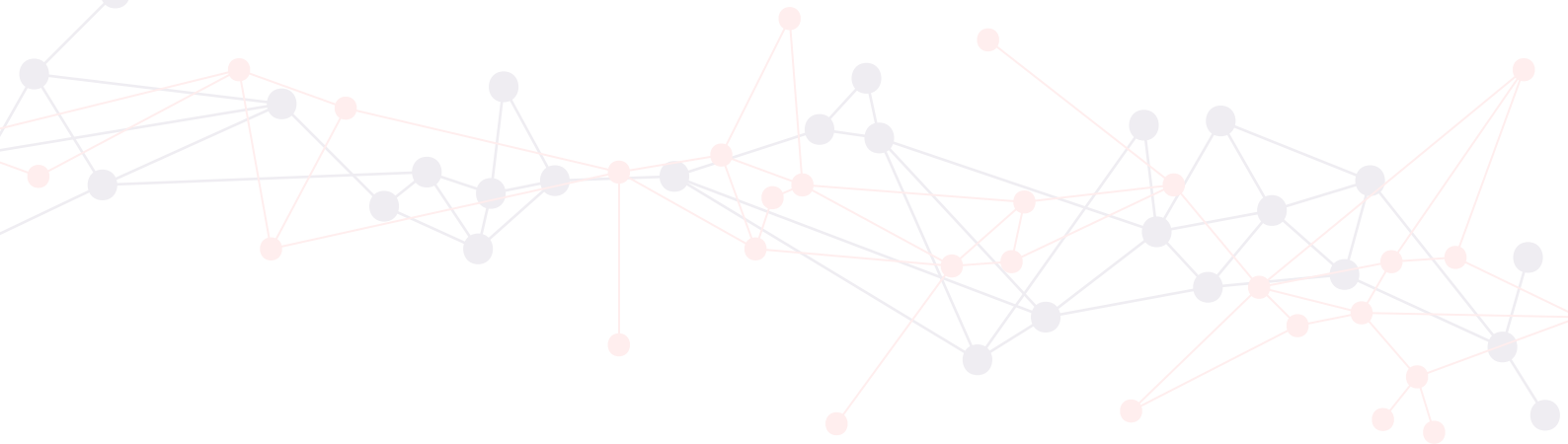
## SERIOUS INJURY

Work injury that results in the injured person being disabled for a period of two weeks or more

## SERIOUS INJURY FREQUENCY RATE

The number of serious injuries per million hours worked





## EXPLANATORY NOTES

### Introduction

The statistics published in this annual compilation mainly relate to accidents between 1 July 2018 and 30 June 2019 (2018-19) involving time lost from work of one day or more (lost time injuries) or incapable of working their usual job (restricted work injuries) on mines in Western Australia. The day on which the accident occurred is not counted as a day lost. The total number of working days lost through injury in 2018-19 has three components:

- i) Initial injuries — days lost in 2018-19 from injuries that occurred in 2018-19
- ii) Recurrent injuries — days lost in 2018-19 through recurrences of injuries that occurred in 2018-19 and previous years
- iii) Carry-over injuries — days lost in 2018-19 by persons continuously off work from injuries that occurred before 1 July 2018.

### Scope

Injuries to all company and contractor employees who worked at mining operations are included in these statistics. The definition of "mining operation" is stated in section 4 of the *Mines Safety and Inspection Act 1994* and includes mining company treatment plants, port facilities and railways.

Mineral exploration is included in the report, with statistics available in the statistical summary, Tables 1, 2, 4, 8 and 10, an LTI performance indicator summary, and Appendices K and L.

Restricted work injuries are covered in the statistical summary, the "Restricted work injuries" section and Appendices L, M and N.

Injuries that occurred in journey accidents not on mine sites (i.e. travelling to or from work) have not been included in calculations of incidence, frequency or duration rates.

Unless otherwise stated, all rates are based on LTI.

### Fatal accidents

Work days lost have not been allocated to fatal accidents, nor have fatalities been included in injury incidence, frequency or duration rate calculations except in Tables 8 and 9, which are in accordance with Australian Standard AS 1885.1:1990 *Workplace Injury and Disease Recording Standard*. This Standard treats fatalities as lost time injuries with a penalty of 220 work days lost for each.

### Collection of information

Accident and injury details are reported monthly to the Department by mine managers and exploration managers, as are the number of persons employed (including contractor employees) and the hours worked during the month.

This report has been made using data for 2018-19 received by the 6th of February 2020. It will not reflect any data received or changed after this date.

During the twelve months covered by this compilation, 503 mining operations and 345 exploration companies reported to the Safety Regulation System (SRS). Of these, 28 mines and 48 exploration companies reported zero hours worked for the year.

Some of the terms most commonly used to describe accident type in incident reports are listed in Appendix A.

### Charts

For clarity, most bar charts in this publication are restricted to 12 or fewer categories.

The term "other" is used for a grouping of accident categories that each contain a smaller proportion of injuries than the smallest individual category shown on the chart (typically less than 2%).

# FATAL ACCIDENTS

## Fatal accidents during 2018-19

### Mining

#### Daniel Leslie Patterson, 15 August 2018

Daniel Patterson, a 29 year old haul truck driver was fatally injured he lost control of a Komatsu 830E A/C haul truck and crashed into a windrow. The haul truck was descending an inclined ramp with a full load of ore.

The mine's standard for the safe operation of a loaded haul truck descending the ramp was for the speed not to exceed 20km/h. The descent speed of the Komatsu 830E A/C truck is controlled by dynamic braking controls when it is driven within the safe operating range, but will not slow a loaded truck on a 10% downward slope when the speed is above 25 km/h. If the truck exceeds this speed, the driver is required to engage the service brakes and perform an emergency stop.

#### Related safety alert

Mines Safety Significant Incident Report No. 267 Haul truck operator loses control descending ramp on haul road – fatal accident

#### Andrew Ivan Herd, 20 June 2019

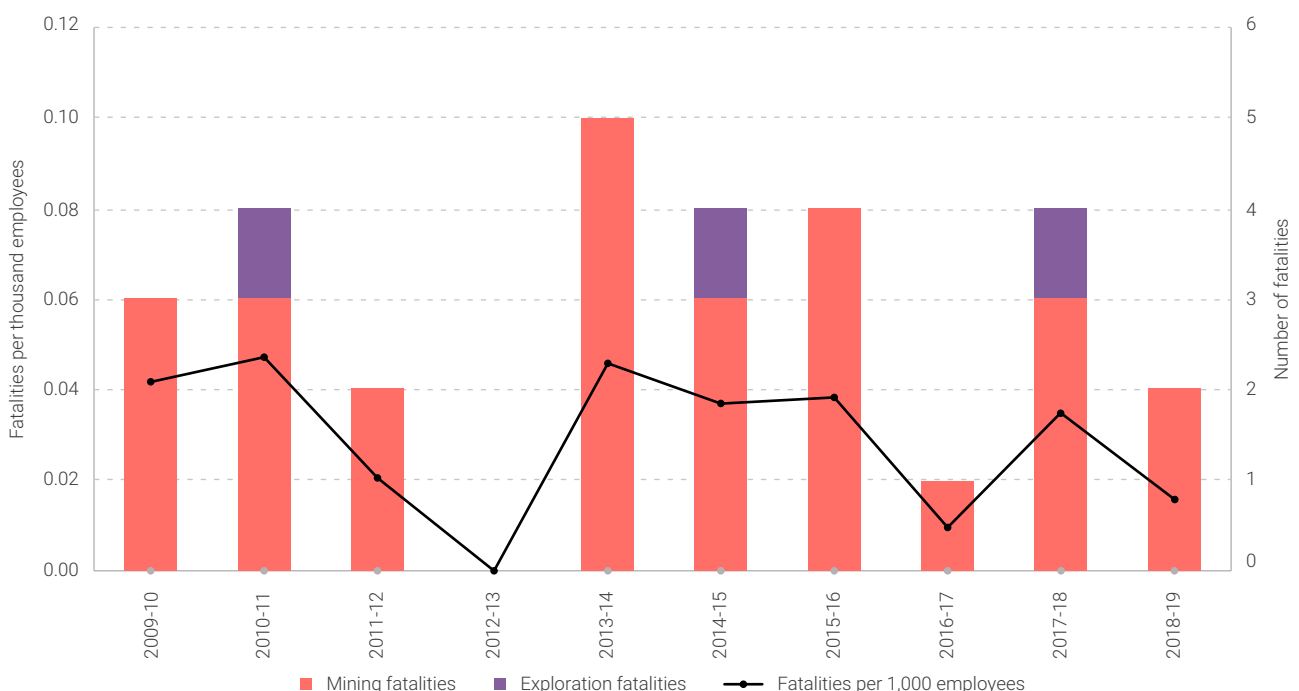
Andrew Herd, a 44 year old truck driver was fatally injured when the Caterpillar 775G dump truck he was driving out of the pit crossed a windrow and fell down the pit wall to the bench below.

The loaded truck had just reached the second narrow point in a section of the ramp that was reduced to a single lane. The truck's right side wheels rode up and over the windrow and the truck slid over the edge falling 15 metres to the bench below. There was no demarcation or signage indicating any reduction in road width, the size and shape of the windrow at the narrow point was not ideal, and material had built up on the inside edge of the windrow, limiting its effectiveness.

#### Related safety alert

Mines Safety Significant Incident Report No. 277 Haul truck over open pit wall edge – fatal accident

FIGURE 1 FATAL INJURY INCIDENCE RATE 2009-10 TO 2018-19



## Fatal injury incidence rate 2009-10 to 2018-19

There were two fatal accidents in the Western Australian mineral industry during 2018-19, both occurred on mining operations. This resulted in a fatal injury incidence rate (per thousand employees) for 2018-19 of 0.016.

While there had been a long term overall decrease in the number of fatalities per thousand employees, in recent years the average rate of improvement has slowed, with a fatal incidence rate in the last ten years varying between 0.05 and zero (see Figure 1).

The Department maintains the view that no fatal accident is acceptable, and that a fatal injury incidence rate of zero is achievable. The zero fatal incidence rate achieved for 2012-13 supports this view.

## Fatal injury incidence rate by mineral mined 2014-15 to 2018-19

Table 1 lists fatal injury incidence rates by mineral mined for the past five years, as well as the grouped information for all surface and underground mines. The underground fatal injury incidence rate over that period was 3.1 times higher than the fatal injury incidence rate for surface operations.

## Fatal accidents by type of accident 2014-15 to 2018-19

Table 2 indicates the type of accidents for the 15 fatalities in the mineral industry (mining and exploration) over the past five years, with three underground, ten at surface operations and two in exploration.

The three types of underground fatal accident which occurred during the past five years were rockfall (one fatality), caught by machine (one fatality) and exposure to environmental heat (one fatality).

Of the six types of surface fatal accident occurring in the past five years the most common were both fall from height (3 fatalities) and vehicle or mobile plant rollover (3 fatalities). This is followed by struck by object, caught by or between objects, caught by machine, and sting from insect (one fatality each).

The accident types for the two exploration fatalities were struck by object and exposure to environmental heat.

**TABLE 1** FATAL INJURY INCIDENCE RATE BY MINERAL MINED 2014-15 TO 2018-19

Category		Fatalities per thousand employees
Mineral	Construction materials	0.184
	Coal	0.183
	Base metals	0.081
	Heavy mineral sands	0.081
	Bauxite and alumina	0.056
	Gold	0.031
	Iron ore	0.007
Underground		0.071
Surface		0.023
Exploration		0.161

**TABLE 2** NUMBER OF FATALITIES BY TYPE OF ACCIDENT 2014-15 TO 2018-19

Category		Number of fatalities
Underground	Caught by machine	1
	Exposure to environmental heat	1
	Rockfall	1
Surface	Fall from height	3
	Vehicle or mobile plant rollover	3
	Caught by machine	1
	Caught by or between objects	1
	Sting from insect	1
	Struck by object	1
Exploration	Exposure to environmental heat	1
	Struck by object	1
Total		15

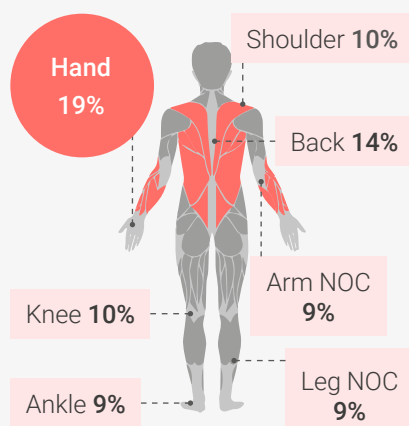
## SERIOUS INJURIES 2014-15 TO 2018-19

### Injuries by severity

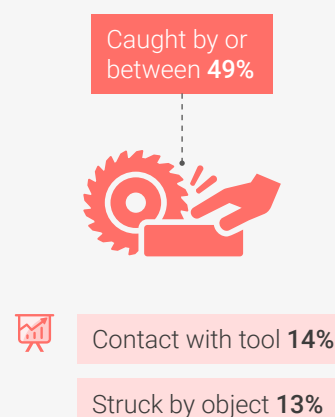


331 of the 398 LTIs were classified as serious

### Part of body (top 5)



### Hand injury (top 3)



## SERIOUS INJURIES

### Review of serious injuries during 2018-19

There were 365 serious lost time injuries reported in the WA mining industry during 2018-19 (296 in 2017-18). Of these, 349 were in metalliferous mines and 16 were in coal mines. There were a further 17 serious lost time injuries reported for exploration (9 in 2017-18).

#### Some examples of serious injuries in 2018-19

##### Fall while building scaffold

A worker fell approximately ten metres when building internal scaffolding in a vessel at a processing plant. Other workers raised the emergency and notified a supervisor. The emergency response team attended and transported the worker to a local hospital where he was treated for serious injuries. The incident scene was secured and the facility evacuated of non-essential workers.

##### Detached lanyard leads to fall

A worker fell approximately 3.5 metres to the level below of a tower when the panel he was standing on dislodged. The worker was replacing expanded mesh panels. At the time of the fall, he was relocating his position and had

detached his fall protection lanyard from an overhead static line. The worker was treated for a broken ankle.

##### Dislocated elbow from slip

Two workers were changing out pipe spools at a processing plant. One worker used a tag line attached to the pipe spool to manoeuvre the pipe into position. As he pulled on the tag line to align the pipe, the knot came undone and the worker slipped off the process water pipe he was standing on and hit the ground, dislocating his elbow in the process.

##### Contact with hot caustic solution

Two workers were investigating a top screen blockage in the elution column at a processing plant. The plant was stopped and depressurised and the system opened to the atmosphere. When all the bolts holding the screen in place were removed, hot caustic solution vented through the screen opening and hit both workers. One received burns to their eyes, neck, arm and groin and the other to their eyes and neck. The workers assisted each other with flushing their eyes and skin, before changing their clothes and attending the regional hospital. The operation has ceased using

the unit pending the outcome of an investigation and follow up with the manufacturer.

##### Cable hits worker's head


A worker was in a semi squatted position under a steel conveyor cable when the cable fell off the jack and struck the worker on the top of the head. The worker felt pain between the shoulder blades and lower back, and was winded and faint. He received a concussion from the strike.

##### Worker suffers chemical burns

A worker received chemical burns while pouring cement for a concrete pad at an underground mine when cement entered the top of his steel capped boots. He continued to work until he felt a burning sensation. He reported this to a colleague and was transported to the surface for medical treatment and admitted to a local hospital.

##### Arm caught by jaw crusher

A worker at a processing plant was standing on a walkway at the crusher bin watching the rock breaker being manoeuvred into position above the jaw crusher. They had their hand



on the side of the jaw crusher feed chute while the rock breaker was in operation. The rock breaker operator inadvertently operated the slew lever instead of the crowd lever and the breaker slewed sideways, catching the worker's arm between the bin side and rock breaker crowd arm. The worker was taken to the site paramedic then transferred to Perth by the Royal Flying Doctor Service.

### **Finger severed**

During exploration, a driller's offsider was guiding drill core tube towards the core rack. During this process, his hands moved down the tube and his finger became caught between the core tube and the step guard. About one centimetre of his finger was severed off.

### **Burns from quicklime**

A shrub was seen burning in the stockpile area at an open pit. It self-extinguished after a short period of time. A worker went over to investigate and sank up to his knees in quicklime. He received burns to both legs.

### **Struck by rocks when opening hatch**

A worker inspecting a blocked transfer chute on a crushing circuit at a processing plant was struck in the shoulder by several rocks when opening the inspection hatch. The worker required keyhole surgery.

### **Worker falls from dislodged plank**

At a processing plant, a worker was installing a seal on a filter in a filter deck. A plank in the metal scaffold he was standing on became dislodged, causing him to fall 4.5 metres to the ground. The worker was taken to the regional hospital for treatment to a fractured kneecap. An investigation was commenced.

### **Snake bite while conducting survey**

An environmental team was brought in to conduct a field survey along a mine site's drill lines through a nature reserve. Three team members were dropped off at individual lines, about

400 metres apart. They were to meet at an agreed point at 10.30 am and the other two team members back at the road at 12.00 noon. When the team realised one of the members had not arrived at the arranged time and she did not answer her radio, they walked along the line she was surveying and found her. She had been bitten by a snake and had used a GPS device to send a message to both police and ambulance for help. Several hours later, the ambulance picked up the injured team member and took her to the regional hospital where she was administered a broad anti-venom. She was then transferred to Perth for further treatment. A toxicology report determined that the snake was a king brown, which was rare to the region.

### **Hand trapped in drill parts**

At an underground mine, a driller working on a diamond drill rig attempted to manually feel a break in the core sample. When he handled the drill rods, the chuck moved up the rod and trapped his hand between the chuck jaws and the water swivel. The driller managed to free his hand by releasing and moving the chuck mechanism. First aid was given and a supervisor informed. After receiving initial attention at a regional nursing post, he was flown to hospital in Perth for further treatment, which included amputation of two fingers. An investigation has commenced. The safety cage on the drilling platform is being extended to restrict any potential hand access.

### **Ankles injured by ricochet rock**

A shift supervisor was setting up for blasting operations at an underground mine when a basketball-sized rock fell from the wall face to the floor and ricocheted into his ankles. The impact knocked over the supervisor and he dragged himself away to a safer position. He was treated by site medical staff and then transported to the regional hospital for further examination. The supervisor sustained fractures to both ankles. An investigation was commenced.

### **Knee twist in waste channel**

A worker in the stone processing area of an open pit was attempting to clear

the waste channel. The channel uses a chain-driven series of paddles to clear the waste. The worker stepped in the channel and slipped, causing the paddles to catch his foot and twist his knee.

### **Amputation from piston actuation**

At an open pit, a worker was performing maintenance on an excavator. During the operation, he noticed a lubrication fault alarm had activated. He exited the cab and attempted to change over grease pumps to rectify the fault. As he reached into the rubber boot, the piston actuated and cut the tip off his right index finger. The worker was taken to the regional hospital for assessment and then flown to Perth for further treatment. The scene was secured. An investigation was commenced.

### **Crush injury from unjammed drill**

At a drill site, workers were reaming, collaring and conditioning a new hole. During the procedure, one worker attempted to release a jammed drill bit while another positioning the breakout rod. The second worker inadvertently left his hand on the breakout handle, and was injured when the bit became unjammed, causing the drill head, rod and breakout to suddenly drop. His left middle finger was crushed between the breakout handle and the table bush.

### **Back injury from lifting**

A worker was fabricating machinery guards at an open pit. When he lifted a completed guard he felt pain in his lower back and right leg. A supervisor was informed. The worker was taken to the site medical facility for assessment. An investigation was commenced.

### **Built-up material falls on worker**

At an open pit, a worker was clearing oxide material from underneath an excavator when some of the material fell onto his lower body. An emergency was called, the area secured and a supervisor informed. The injured worker sustained multiple leg fractures and was taken to the regional hospital for treatment. An investigation was commenced.



# SERIOUS INJURIES CONTINUED

## Serious injury incidence rate by mineral mined 2014-15 to 2018-19

Figure 2 is a chart of incidence rates for serious injuries for the past five years. The top of the chart shows the serious injury incidence rates for surface and underground operations. The lower part shows serious injury incidence rates by mineral mined.

The serious injury incidence rate for underground mining (3.6) was 24% higher than that for surface operations (2.9).

Of the major mining sectors, coal had the highest five-year average serious injury incidence rate (11.3), followed by bauxite-alumina at 8.2. The mining sector referred to as "Other", with a five-year average serious injury incidence rate of 5.0, contained 3% of the total number of employees spread over 20 small commodity groups.

## Serious injury frequency rate 2014-15 to 2018-19

Figure 3 shows that over the five years since 2014-15 the total mining serious injury frequency rate has remained largely unchanged, returning to a value of 1.9.

The rate for surface metalliferous mining remained unchanged from 1.8 to 1.8, and the rate for underground metalliferous mining improved from 2.1 to 1.7.

The serious injury frequency rate for coal deteriorated from 6.8 to 11.2.

FIGURE 2 SERIOUS INJURY INCIDENCE RATE 2014-15 TO 2018-19

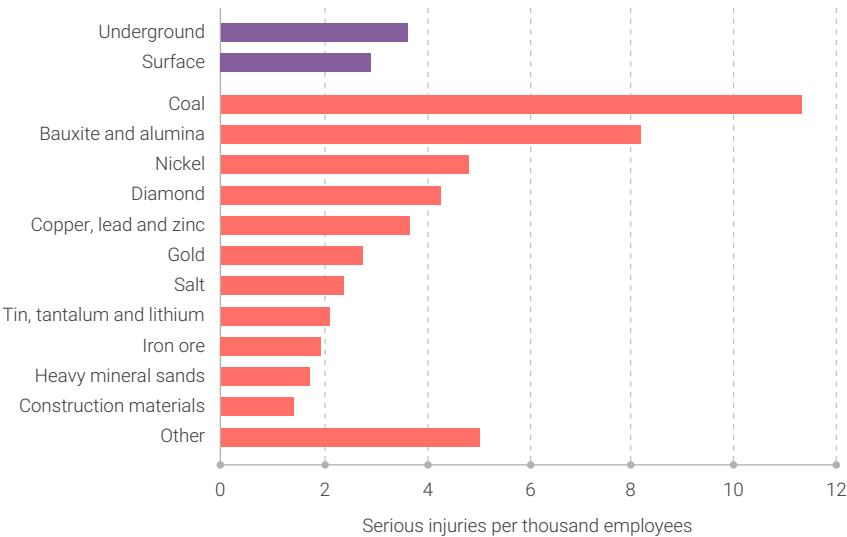
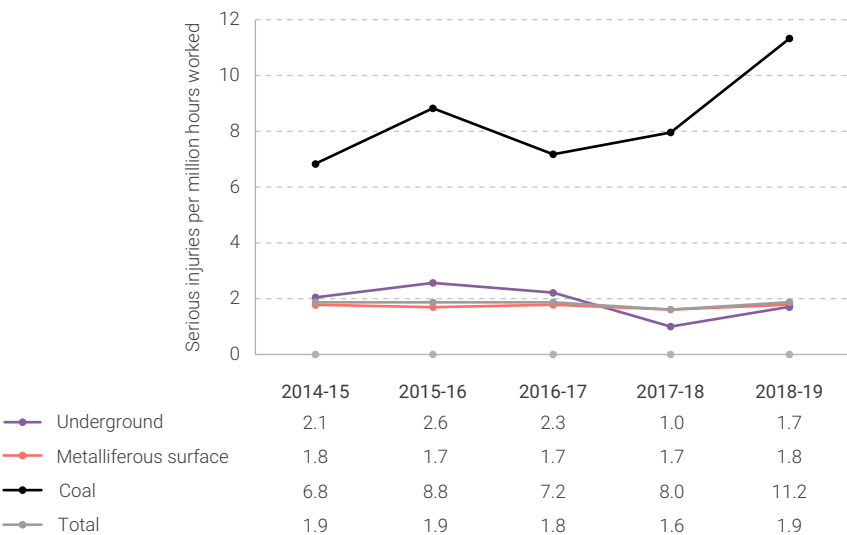
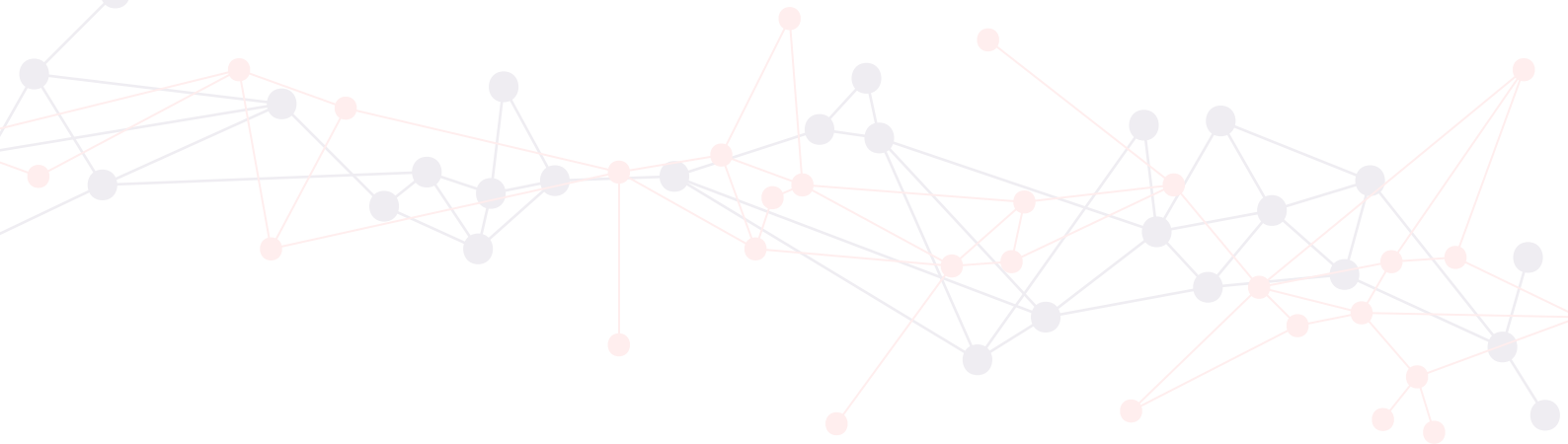


FIGURE 3 SERIOUS INJURY FREQUENCY RATES 2014-15 TO 2018-19







## Serious injury percentage breakdown for 2018-19

Appendices **C** and **D** provide a percentage breakdown of the number of serious injuries by part of body, nature of injury, location of accident, and type of accident for underground and surface operations, respectively.

### Injuries by part of body

- **Underground:** Nine injuries to hands made up the largest proportion of serious injuries at 26%, followed by injuries to ankles with 6 injuries (18%) and 4 injuries to leg NOC (Not otherwise classified) contributing 12%. In total, 47% of serious injuries were to arms (including shoulders) and 35% were to legs.
- **Surface:** Injuries to hands accounted for the largest proportion of serious injuries with 61 (18% of total), followed by back injuries with 42 (13%), injuries to knee and arm NOC both next at 12% (41 and 40 injuries respectively). In total, 39% of serious injuries were to arms (including shoulders), 30% were to legs and 19% were to trunks.

### Injuries by nature

- **Underground:** Sprain or strain represented the highest proportion by nature of injury with 13 injuries (38% of total), followed by fracture with 8 injuries (24%), then laceration next with 4 injuries (12%).
- **Surface:** Sprain or strain represented the highest proportion by nature of injury with 174 injuries (53% of total). Fracture was the next highest with 60 injuries (18%), followed by laceration with 20 injuries (6%) and burns with 16 injuries (5%).

### Injuries by location

- **Underground:** The largest proportion of serious injuries underground was in production and development areas with 18 injuries (53% of total), followed by underground access and haulage ways with 8 injuries (24%) then underground storage with 3 injuries (9%).
- **Surface:** The largest proportion of serious injuries on the surface occurred in treatment plants with 117 injuries (35% of total), followed by open pits with 68 injuries (21%), general surface areas with 58 injuries (18%) and workshop with 52 injuries (16%).

### Injuries by type of accident

- **Underground:** The most common accident type associated with serious injuries underground was over-exertion or strenuous movements with 7 injuries (21% of total), followed by struck by objects with 6 injuries (18%), then stepping with 5 injuries (15%) and slip or trip with 4 injuries (12%).
- **Surface:** The most common accident type associated with serious injuries on the surface was over-exertion or strenuous movements with 89 injuries (27% of total), followed by stepping with 43 injuries (13%), caught by or between objects with 40 injuries (12%) then slip or trip with 34 injuries (10%).



## LOST TIME INJURIES

### Review of lost time injuries during 2018-19

In 2018-19, 19,839 days were lost through occupational injuries on mines in Western Australia. This figure is made up of the number of days lost from injuries occurring in 2018-19 (10,359), recurrences of injuries sustained before 2018-19 and in 2018-19 (718), and LTIs and recurrences carried over into

2018-19 from accidents before July 2018 (8,762). A breakdown of work days lost in coal and metalliferous mining is given in Table 3.

During 2018-19, there were 425 LTIs in the State's mineral industry. Of those, 409 were in metalliferous mines, 16 in coal mines and 21 in exploration. A breakdown of these data with performance indicators is given in Tables 4 and 5.

In addition to the initial injuries, there were 23 recurrences of previous injuries, resulting in 718 work days lost in 2018-19. A breakdown of recurrent injuries by financial year of initial injury is given in Table 6. One hundred and two people, who were still off work from injuries received before July 2018, lost 8,762 work days in 2018-19. A breakdown of these carryover injuries is given in Table 7.

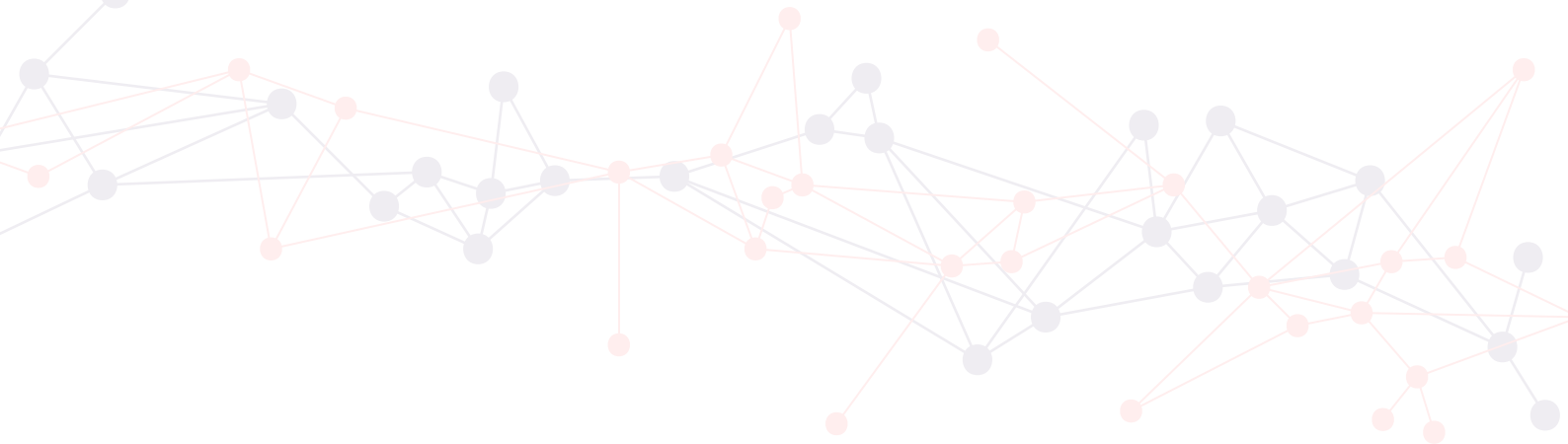
**TABLE 3** DAYS LOST THROUGH INJURY DURING 2018-19

Mines	Days lost			
	Initial injuries	Recurrent injuries	Carry-over injuries	Total
Metalliferous	9,800	565	8,541	18,906
Coal	559	153	221	933
<b>Total mining</b>	<b>10,359</b>	<b>718</b>	<b>8,762</b>	<b>19,839</b>

**TABLE 4** INITIAL LOST TIME INJURIES DURING 2018-19

Sector	No. of employees	No. of LTIs	Incidence rate	Frequency rate	Duration rate	Injury index	Days lost
Metalliferous surface	112,644	375	3.3	2.1	24.3	52	9,126
Metalliferous underground	10,086	34	3.4	1.7	19.8	34	674
Metalliferous total	122,730	409	3.3	2.1	24.0	50	9,800
Coal total	1,139	16	14.0	11.2	34.9	393	559
<b>Total mining</b>	<b>123,870</b>	<b>425</b>	<b>3.4</b>	<b>2.2</b>	<b>24.4</b>	<b>53</b>	<b>10,359</b>
Exploration	3,106	21	6.8	3.7	31.6	116	664





**TABLE 5** LOST TIME INJURIES BY MINERAL MINED DURING 2018-19

Mineral mined	No. of employees	No. of LTIs	Incidence rate	Frequency rate	Duration rate	Injury index	Days lost
Iron ore	60,089	149	2.5	1.7	26.3	44	3,924
Gold	31,368	75	2.4	1.5	38.0	56	2,852
Bauxite and alumina	7,360	96	13.0	6.9	9.2	64	886
Nickel	6,064	31	5.1	2.5	30.6	76	950
Construction materials	2,726	3	1.1	2.0	61.3	121	184
Base metals	2,627	9	3.4	2.0	21.2	42	191
Tin, Tantalum and lithium	3,606	8	2.2	0.8	7.8	6	62
Mineral sands	3,084	7	2.3	1.7	4.6	8	32
Coal	1,139	16	14.0	11.2	34.9	393	559
Salt	1,039	4	3.8	3.3	2.5	8	10
Diamond	902	1	1.1	0.6	3.0	2	3
Other	3,864	26	6.7	5.8	27.2	157	706
<b>Total mining</b>	<b>123,870</b>	<b>425</b>	<b>3.4</b>	<b>2.2</b>	<b>24.4</b>	<b>53</b>	<b>10,359</b>

Note: Duration in Tables 4 and 5 does not take into consideration time lost after 30 June 2019 by persons still off work at the end of the fiscal year, time lost from recurrent injuries, or time lost by persons with carry-over injuries from before July 2018.

**TABLE 6** RECURRENT LOST TIME INJURIES DURING 2018-19

Year	Metalliferous mining		Coal mining		Total mining	
	No. of injuries	Days lost	No. of injuries	Days lost	No. of injuries	Days lost
2018-19	3	148	1	14	4	162
2017-18	9	310	3	107	12	417
2016-17	3	73	1	32	4	105
2012-13	1	7	0		1	7
2008-09	1	22	0		1	22
1997-98	1	5	0		1	5
<b>Total</b>	<b>18</b>	<b>565</b>	<b>5</b>	<b>153</b>	<b>23</b>	<b>718</b>

Note: Apart from the information shown in Tables 3, 6 and 7, analysis of recurrent and carry-over injuries has not been presented in this publication.



## LOST TIME INJURIES CONTINUED

**TABLE 7** CARRY-OVER LOST TIME INJURIES DURING 2018-19

Year	Metalliferous mines		Coal mines		Total mining	
	No. of injuries	Days lost	No. of injuries	Days lost	No. of injuries	Days lost
2017-18	80	6,375	6	194	86	6,569
2016-17	14	1,927	1	27	15	1,954
2015-16	1	239	0		1	239
<b>Total</b>	<b>95</b>	<b>8,541</b>	<b>7</b>	<b>221</b>	<b>102</b>	<b>8,762</b>

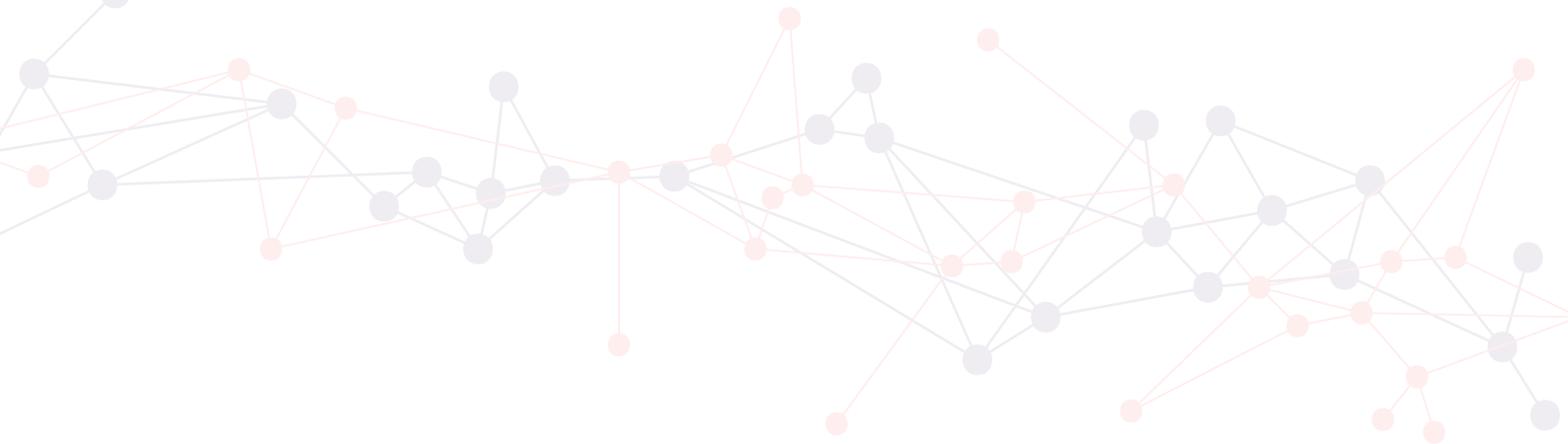
### Review of lost time injuries during 2018-19 in accordance with Australian Standard AS 1885.1:1990

The *National Standard for Workplace Injury and Disease Recording* is designed to be used by individual workplaces. Tables 8 and 9 provide statistical information in accordance with AS 1885.1:1990.

There are two major differences between reporting for AS 1885.1:1990 and the Department's SRS database.

The Australian Standard treats fatalities as LTIs with a penalty of 220 workdays lost for each, whereas fatalities are reported separately from other injury data in the SRS database.

The incidence rate reported in accordance with the Australian Standard definition is injuries per hundred employees, rather than injuries per thousand employees.



**TABLE 8** INITIAL LOST TIME INJURIES DURING 2018-19 (AS 1885.1:1990)

Sector	No. of employees	No. of LTIs	Injuries per hundred	Frequency rate	Duration rate	Days lost
Metalliferous surface	112,644	377	0.33	2.2	25.4	9,566
Metalliferous underground	10,086	34	0.34	1.7	19.8	674
Metalliferous total	122,730	411	0.33	2.1	24.9	10,240
Coal total	1,139	16	1.40	11.2	34.9	559
<b>Total mining</b>	<b>123,870</b>	<b>427</b>	<b>0.34</b>	<b>2.2</b>	<b>25.3</b>	<b>10,799</b>
Exploration	3,106	21	0.68	3.7	31.6	664

*Note: Duration in Tables 8 and 9 does not take into consideration time lost after 30 June 2019 by persons still off work at the end of the fiscal year, time lost from recurrent injuries, or time lost by persons with carry-over injuries from before July 2018.*

**TABLE 9** LOST TIME INJURIES BY MINERAL MINED DURING 2018-19 (AS 1885.1:1990)

Mineral mined	No. of employees	No. of LTIs	Injuries per hundred	Frequency rate	Duration rate	Days lost
Iron ore	60,089	150	0.25	1.7	27.6	4,144
Gold	31,368	75	0.24	1.5	38.0	2,852
Bauxite and alumina	7,360	96	1.30	6.9	9.2	886
Nickel	6,064	31	0.51	2.5	30.6	950
Construction materials	2,726	4	0.15	2.6	101.0	404
Base metals	2,627	9	0.34	2.0	21.2	191
Tin, tantalum and lithium	3,606	8	0.22	0.8	7.8	62
Mineral sands	3,084	7	0.23	1.7	4.6	32
Coal	1,139	16	1.40	11.2	34.9	559
Salt	1,039	4	0.38	3.3	2.5	10
Diamond	902	1	0.11	0.6	3.0	3
Other	3,864	26	0.67	5.8	27.2	706
<b>Total mining</b>	<b>123,870</b>	<b>427</b>	<b>0.34</b>	<b>2.2</b>	<b>25.3</b>	<b>10,799</b>



# AUSTRALIAN WORK HEALTH AND SAFETY STRATEGY 2012–2022

The Australian Work Health and Safety Strategy 2012–2022 was launched by Safe Work Australia in October 2012. There are three specific targets to be achieved by 2022.

- 20 percent or greater reduction in the number of worker fatalities due to injury
- 30 percent or greater reduction in the incidence rate of workers' compensation claims where the worker has been off work for one or more working weeks
- 30 percent or greater reduction in the incidence rate of workers' compensation claims for musculoskeletal disorders where the worker has been off work for one or more working weeks.



Further information on the Australian Work Health and Safety Strategy 2012–2022 is available on Safe Work Australia's website.

[Australian Work Health and Safety Strategy 2012–2022](#)

[Measuring progress towards targets](#)

## Western Australia's safety performance

Because the number of fatalities can vary considerably from year to year, Safe Work Australia is measuring progress towards the national target for worker fatalities using a three year rolling average. This guards against an unusually low number of fatalities in 2022 meeting the target by chance rather than by sustained improvement.

Figure 4 shows the Western Australian fatality data for mining and exploration as a three-year rolling average for the number of fatalities, as well as a line representing a 20% improvement over 11 years.

Safe Work Australia's targets for injuries, including musculoskeletal disorders, relate to compensation claims. Serious claims are defined as those where the worker has been off work for one or more working weeks. This differs from the definition used for reporting serious mining and exploration injuries to the Department. However, for consistency, injury reports for mining and exploration fitting the Safe Work Australia definition have been extracted and the same targets applied to injury incidence rates.

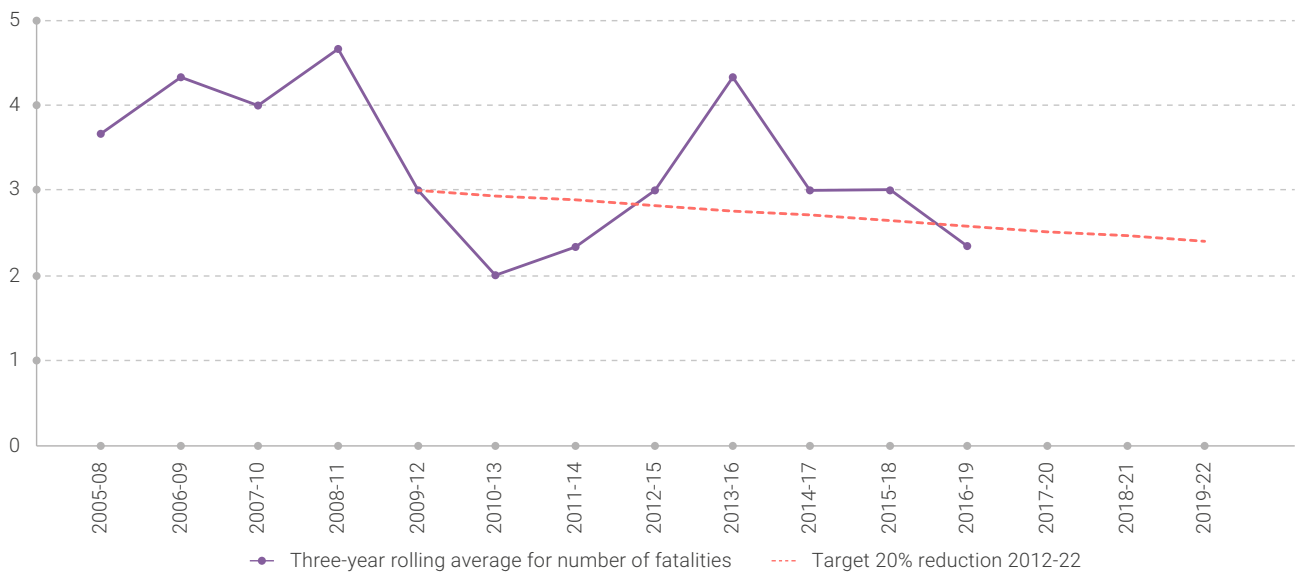
Figure 5 shows the Western Australian data for reportable injuries per 1,000 employees where the injured person did not return to their regular occupation within 7 days, as well as a line representing a 30% reduction over 11 years.

Figure 6 shows the Western Australian statistics for musculoskeletal reportable injuries per 1,000 employees where the injured person did not return to their regular occupation within 7 days, also with a line representing a 30% reduction over 11 years.

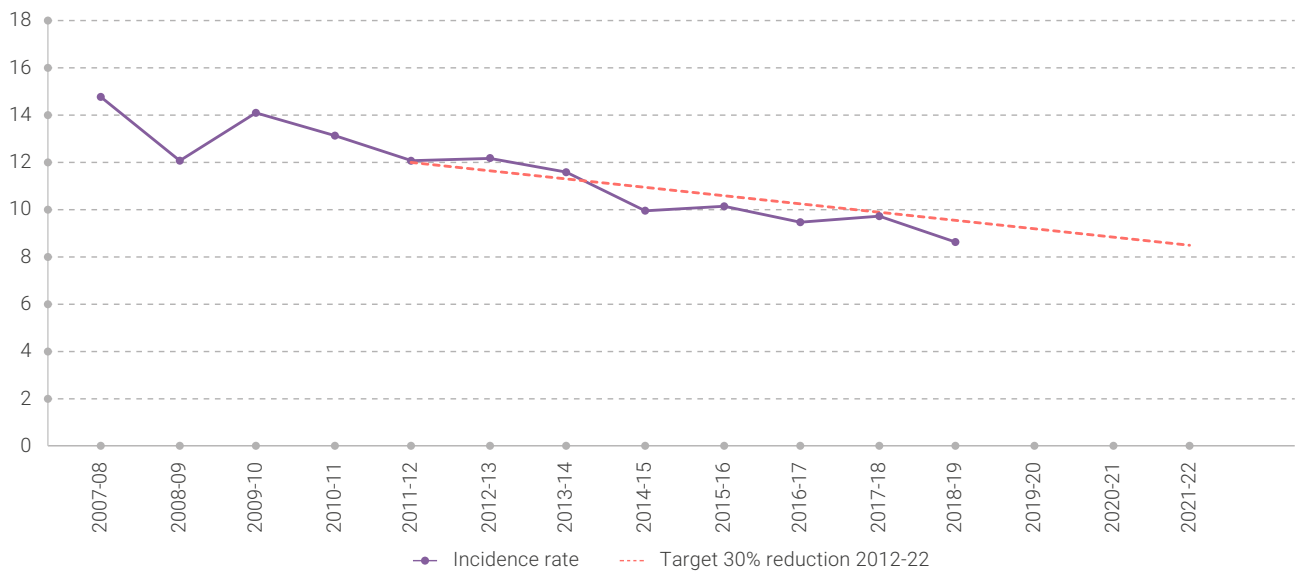
The injury reporting requirements for petroleum facilities do not allow a similar data treatment.

*Note: Safe Work Australia presents the national data in calendar years, with the targets applying from 2012 to 2022. The safety performance data for mining and exploration in Western Australia is reported for financial years and hence the Safe Work Australia targets are applied from 2011–12 to 2021–22.*

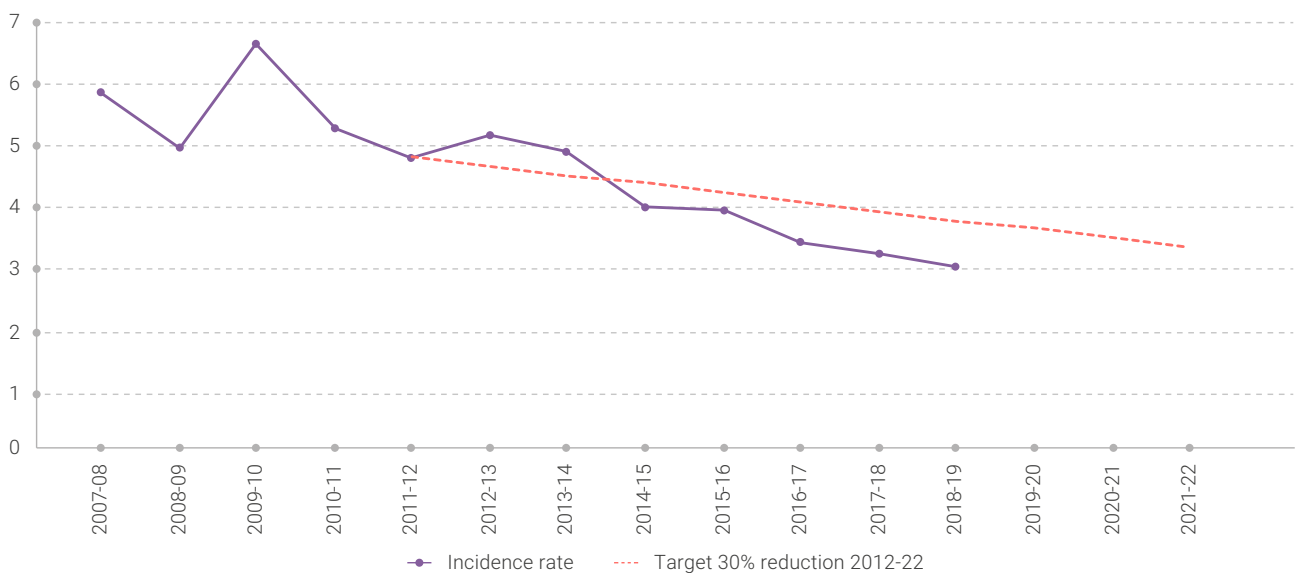
**FIGURE 4** NUMBER OF MINING AND EXPLORATION FATALITIES THREE-YEAR ROLLING AVERAGE



**FIGURE 5** MINING AND EXPLORATION INJURIES OF DURATION ONE WEEK OR MORE PER 1,000 EMPLOYEES (INCIDENCE RATE)



**FIGURE 6** MUSCULOSKELETAL INCIDENCE RATE (DURATION ONE WEEK OR MORE)





## LOST TIME INJURIES BY COMMODITIES

### Metalliferous performance indicators

The performance indicators for the metalliferous mining sector show increasing rates of injuries occurring in 2018-19. Figures 7 to 10 depict the performance indicators of incidence, frequency, duration rates and injury index (see [page 2](#) for definitions).

Performance indicator trends for metalliferous mining in 2018-19 are summarised below.

- The overall incidence rate deteriorated by 6%, rising from 3.1 to 3.3. The surface incidence rate deteriorated by 6% (from 3.1 to 3.3), while the underground incidence rate deteriorated by 10% (from 3.1 to 3.4).
- The overall frequency rate deteriorated by 11%, rising from 1.9 to 2.1. The surface frequency rate deteriorated by 5%, rising from 2.0 to 2.1, while the underground frequency rate deteriorated by 6% (from 1.6 to 1.7).
- The overall duration rate deteriorated by 8%, rising from 22.2 to 24.0. The surface duration rate deteriorated by 9%, rising from 22.3 to 24.3. The underground duration rate deteriorated by 21% (rising from 16.4 to 19.8).
- The rise in both the frequency rate and duration rate resulted in the overall injury index deteriorating by 19%, from 42 to 50. The surface injury index deteriorated by 18% (from 44 to 52), while the underground injury index deteriorated by 31% (from 26 to 34).

### Metalliferous injury percentage breakdown for 2018-19

Appendices **E** and **F** provide a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident, and type of accident for underground and surface operations, respectively. There was a total number of 409 lost time injuries reported in 2018-19 (34 underground injuries, 374 surface injuries).

#### Injuries by part of body

- **Underground:** Hands were the most frequently injured part of body with 9 injuries (26% of total), followed by ankles with 6 injuries (18%), and leg not otherwise classified (NOC) with 4 injuries (12%). Overall, injuries to arms (including shoulders) made up 47% of injuries, with leg injuries representing a further 35%.
- **Surface:** Hands were the most frequently injured part of body, with 72 injuries (19% of total), followed by knees and backs, at approximately 11% each (42 and 40 injuries respectively). Overall, arm injuries (including shoulder) made up 37% of the total, with leg injuries accounting for a further 28% and trunk injuries next at 18%.

#### Injuries by nature

- **Underground:** Sprain or strain was the highest ranking nature of injury for underground injuries with 13 injuries (38% of total), followed by fracture with 8 injuries (24%), laceration next with 4 injuries (12%).

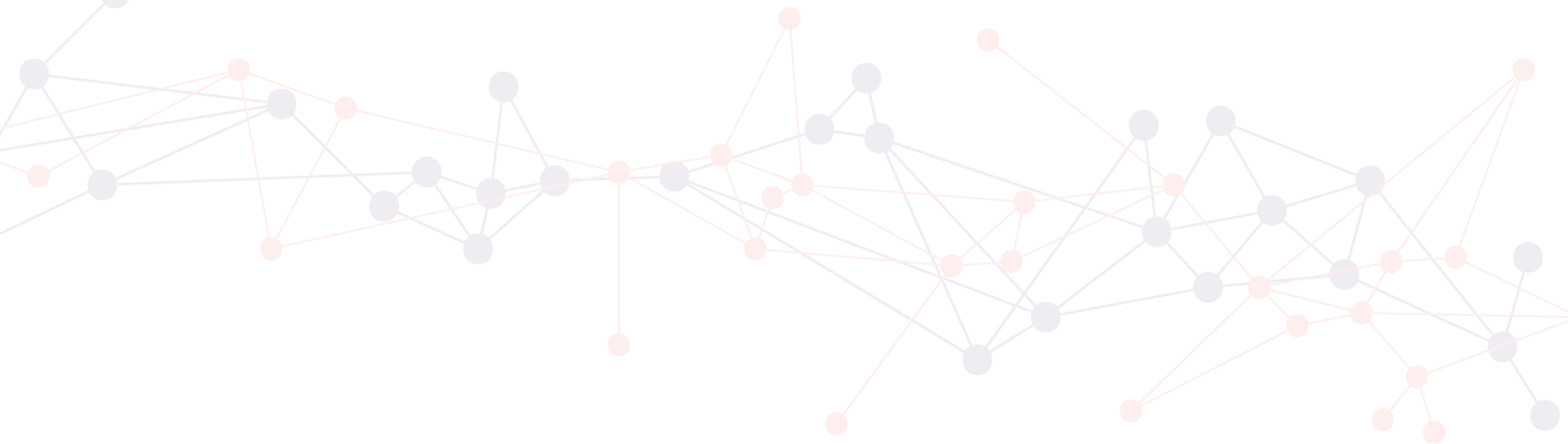
- **Surface:** Sprain or strain was the highest ranking nature of injury for surface injuries with 175 injuries (47% of total), followed by fracture with 60 injuries (16%) and laceration next with 28 injuries (7%).

#### Injuries by location

- **Underground:** The largest proportion of underground injuries occurred in production and development areas with 18 injuries (53% of total), followed by underground access and haulage with 8 injuries (24%), and storage areas next with 3 injuries (9%).
- **Surface:** The largest proportion of surface injuries occurred in treatment plants with 138 injuries (37% of total), followed by open pits with 71 injuries (19%), and general surface areas next with 64 injuries (17%).

#### Injuries by type of accident

- **Underground:** Over-exertion or strenuous movements was the most common accident type for underground injuries with 7 injuries (21% of total), then struck by objects with 6 injuries (18%), and stepping next with 5 injuries (15%).
- **Surface:** The most common accident type for surface injuries was over-exertion or strenuous movements with 87 injuries (23% of total), followed by stepping with 45 injuries (12%), and then caught by or between objects with 42 injuries (11%).



## Metalliferous LTI performance indicators 2014-15 to 2018-19

FIGURE 7 INCIDENCE RATE

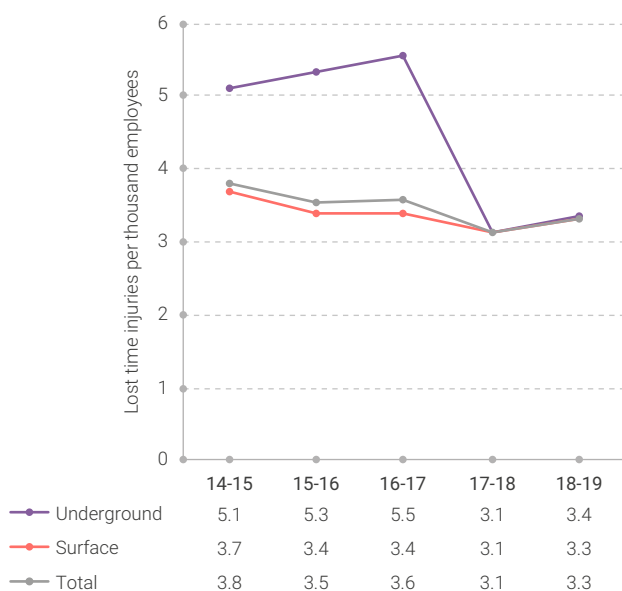


FIGURE 8 FREQUENCY RATE

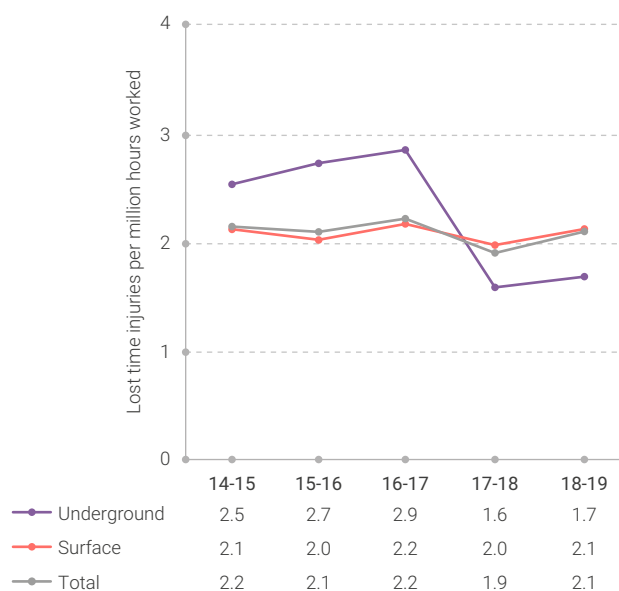


FIGURE 9 DURATION RATE

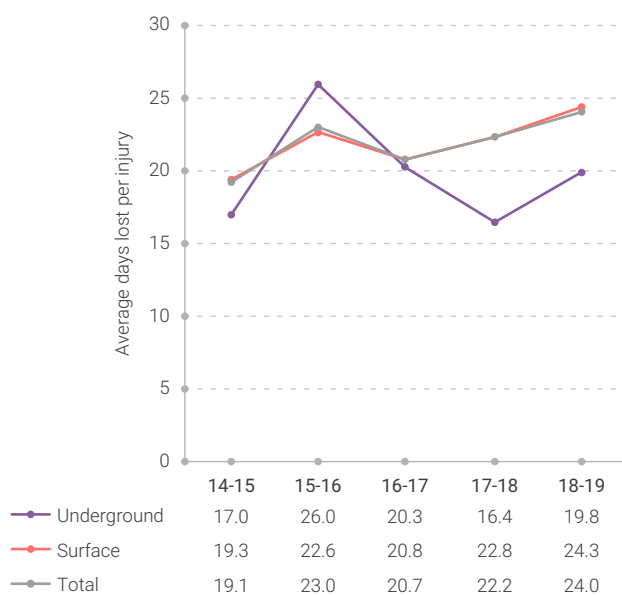
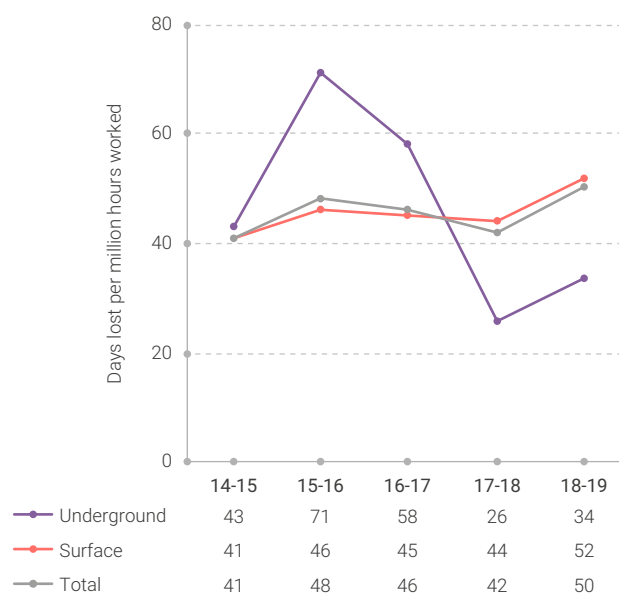


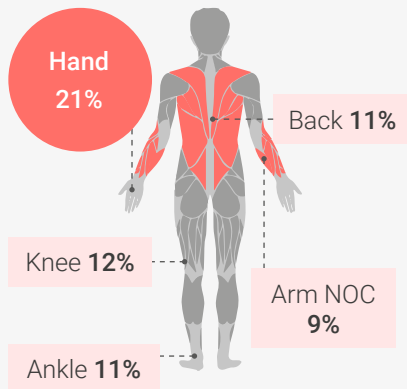
FIGURE 10 INJURY INDEX



## IRON ORE INJURIES 2018-19



49% of the 126,976 average mining workforce were in **iron ore**



LTIFR for iron ore was **1.7**, compared to 2.2 for all mining

## LOST TIME INJURIES BY COMMODITIES CONTINUED

### Iron ore performance indicators

The performance indicators for the iron ore sector showed an overall deterioration during 2018-19. Figures 11 to 14 depict the performance indicators of incidence, frequency and duration rates, and injury index.

Performance indicator trends for the iron ore sector in 2018-19 are summarised below.

- The incidence rate deteriorated by 14%, rising from 2.2 to 2.5.
- The frequency rate deteriorated by 21%, rising from 1.4 to 1.7.
- The duration rate deteriorated by 8%, rising from 24.4 to 26.3.
- The rise in both the frequency and duration rates resulted in a deterioration of 23% in the injury index (from 35 to 43).

### Iron ore injury percentage breakdown for 2018-19

Appendix H provides a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident, and type of accident. There was a total number of 149 lost time injuries reported in 2018-19.

#### Injuries by part of body

- Thirty-one hand injuries, at 21%, accounted for the largest proportion of injuries, followed by 18 knee injuries (12%), then injuries to ankle and back with 17 (11%) each.
- Overall, injuries to arms (including shoulders) made up of 38% of the total (57 injuries), with legs representing 35% of the total (52 injuries), and trunk injuries at 18% (27 injuries).

### Injuries by nature

- Sprain or strain was the highest ranking nature of injury with 75 injuries (50% of total).
- Fracture was the second highest ranking nature of injury with 27 injuries (18%), followed by laceration with 11 injuries (7%).

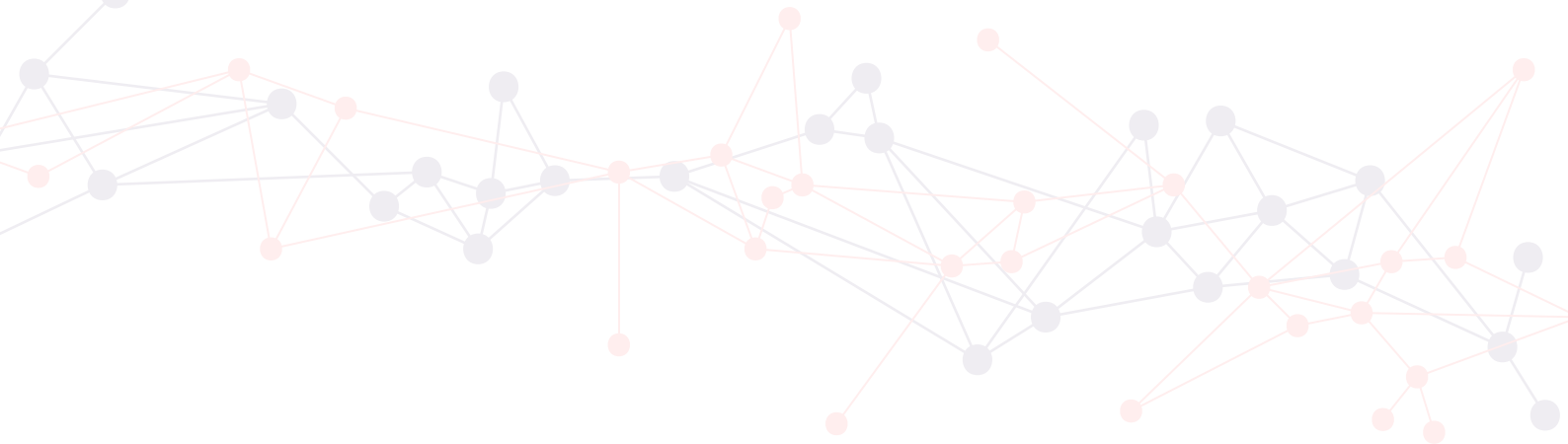
### Injuries by location

- The largest proportion of injuries occurred in treatment plants, which accounted for 24% (36 injuries).
- The second largest proportion occurred in open pits at 22% (33 injuries), followed by workshops at 19% (29 injuries), and general surface areas at 18% (27 injuries).

### Injuries by type of accident

- Over-exertion or strenuous movement was the most common type of accident resulting in injury, with 34 injuries (23%).
- Stepping, with 22 injuries (15%), was the next most common type of accident, followed by caught by or between objects with 19 injuries (13%), then struck by object with 18 injuries (12%), and slip or trip with 13 injuries (9%).





## Iron ore LTI performance indicators 2014-15 to 2018-19

FIGURE 11 INCIDENCE RATE

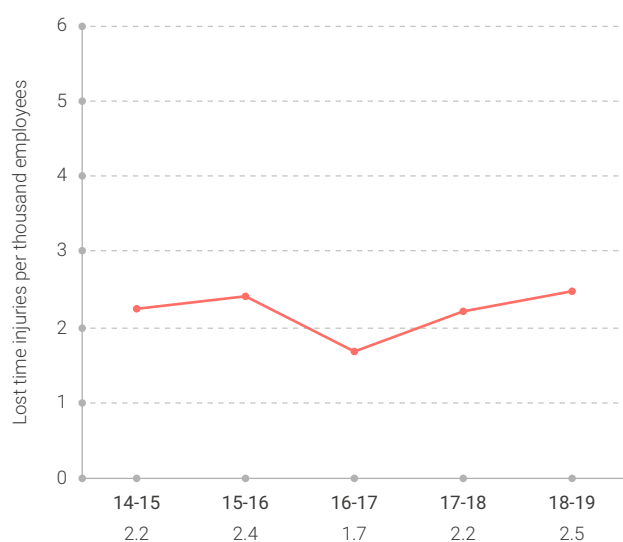


FIGURE 12 FREQUENCY RATE

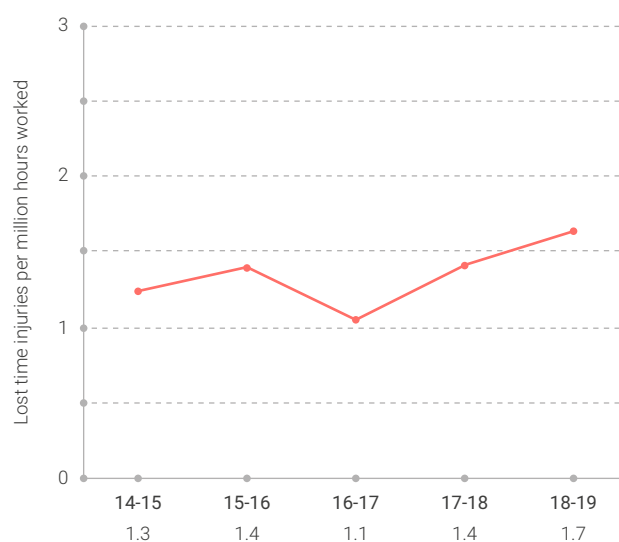


FIGURE 13 DURATION RATE

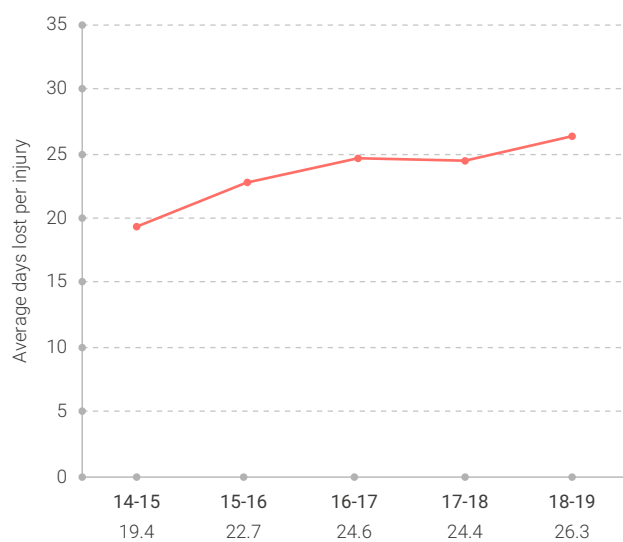
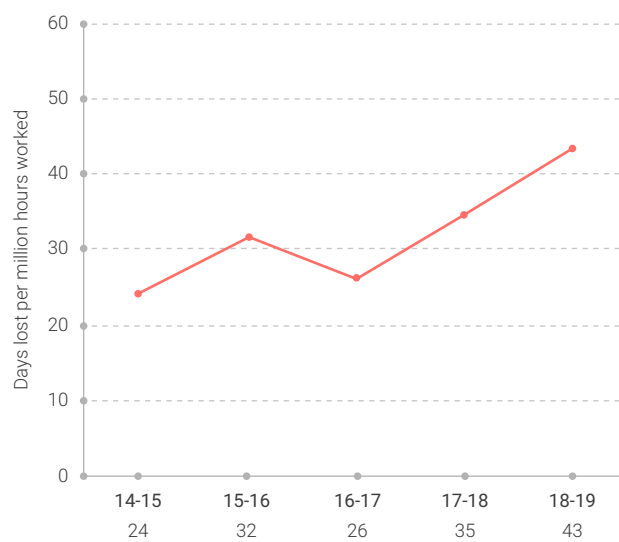


FIGURE 14 INJURY INDEX



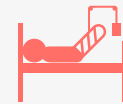
## GOLD INJURIES 2018-19



**25% of the 126,976**  
average mining workforce were  
in **gold**

Multiple **9%**

Arm NOC  
**9%**



LTIFR for gold was **1.5**,  
compared to 2.2 for all mining

Knee **9%**

Ankle **11%**

Hand  
**23%**

## LOST TIME INJURIES BY COMMODITIES CONTINUED

### Gold performance indicators

The performance indicators for the gold sector generally improved during 2018-19, although there was an increase with the number of days lost to injuries. Figures 15 to 18 depict the performance indicators of incidence, frequency and duration rates, and injury index.

Performance indicator trends for the gold sector in 2018-19 are summarised below.

- The overall incidence rate improved by 23%, falling from 3.1 to 2.4. The surface incidence rate improved significantly by 29%, falling from 3.4 to 2.4, while the underground incidence rate deteriorated slightly by 4% (from 2.3 to 2.4).
- The overall frequency rate improved by 21%, falling from 1.9 to 1.5. The surface frequency rate improved by 32%, falling from 2.2 to 1.5, while the underground frequency rate deteriorated by 8%, rising from 1.2 to 1.3.
- The overall duration rate deteriorated greatly by 98%, rising from 19.2 to 38.0. The surface duration rate also deteriorated significantly, by 121%, rising from 19.4 to 42.9, and the underground duration rate deteriorated by 28% (from 18.5 to 23.6).

- The rise in the duration rate offset the fall in the frequency rate, resulting in a deterioration of 51% in the injury index, rising from 37 to 56. The surface injury index deteriorated by 57% (rising from 42 to 67) and the underground injury index deteriorated by 33% (from 22 to 30).

### Gold injury percentage breakdown for 2018-19

Appendices **G** provide a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident and type of accident for the underground and surface sectors. There was a total number of 75 lost time injuries reported in 2018-19 (19 underground injuries, 56 surface injuries).

#### Injuries by part of body

- Hand injuries were the most commonly injured part of body at 23% (13 surface injuries, 4 underground injuries), followed by ankle injuries at 11% (4 surface, 4 underground).
- Arm not otherwise classified (NOC), knee, and multiple injuries, were next, each at 9%.
- Overall, arm injuries (including shoulders) made up 39% of the total (23 surface injuries, 6 underground injuries), and leg injuries accounted for a further 28% (12 surface, 9 underground).

#### Injuries by nature

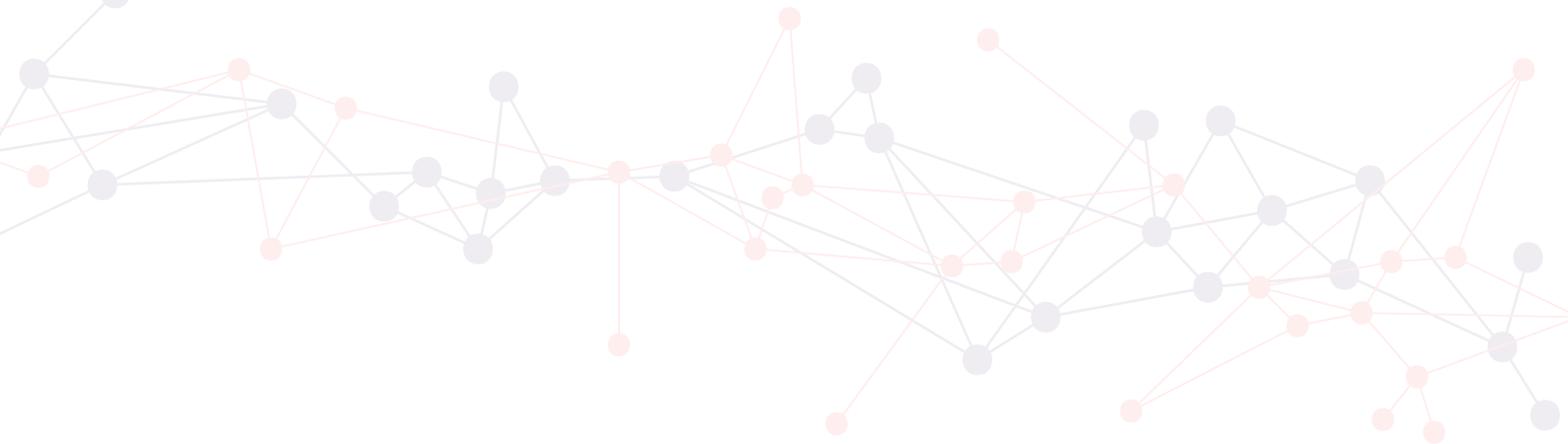
- Sprain or strain was the highest ranking nature of injury for both surface and underground injuries at 40% (24 surface injuries, 6 underground injuries)
- This was followed by fracture, at 20% (10 surface, 5 underground), then laceration next at 8% (2 surface, 4 underground).

#### Injuries by location

- The largest proportion of injuries occurred in general surface areas, which accounted for 21% (16 injuries).
- Treatment plant, and underground production and development areas, both accounted for 17% (13 injuries each), followed by workshops at 12% (9 injuries).

#### Injuries by type of accident

- Stepping injuries was the most common type of accident resulting in injury, at 16% (10 surface injuries, 2 underground injuries).
- Over-exertion or strenuous movements (8 surface injuries, 3 underground injuries) and struck by objects (7 surface, 4 underground), was the next most common type of accident, both at 15%.



## Gold LTI performance indicators 2014-15 to 2018-19

FIGURE 15 INCIDENCE RATE

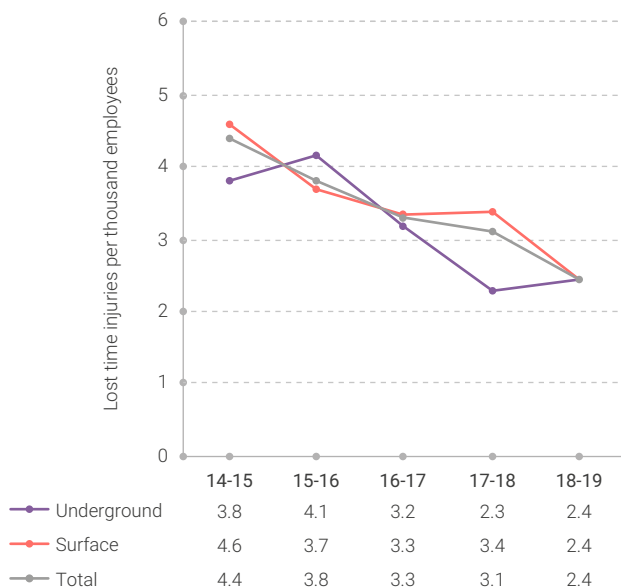


FIGURE 16 FREQUENCY RATE

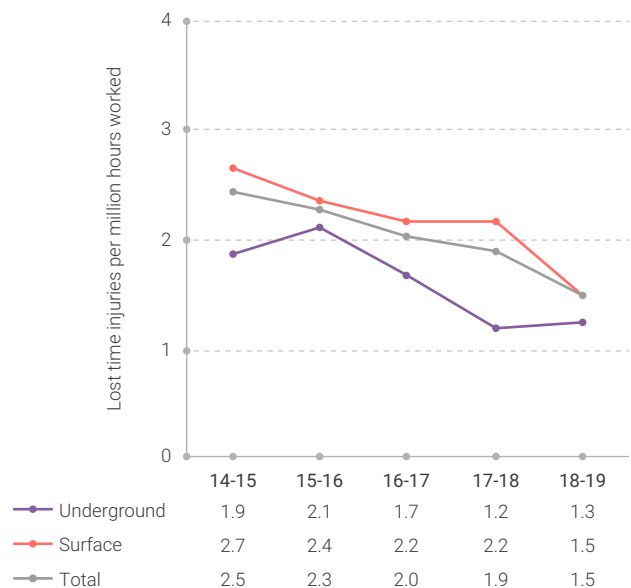


FIGURE 17 DURATION RATE

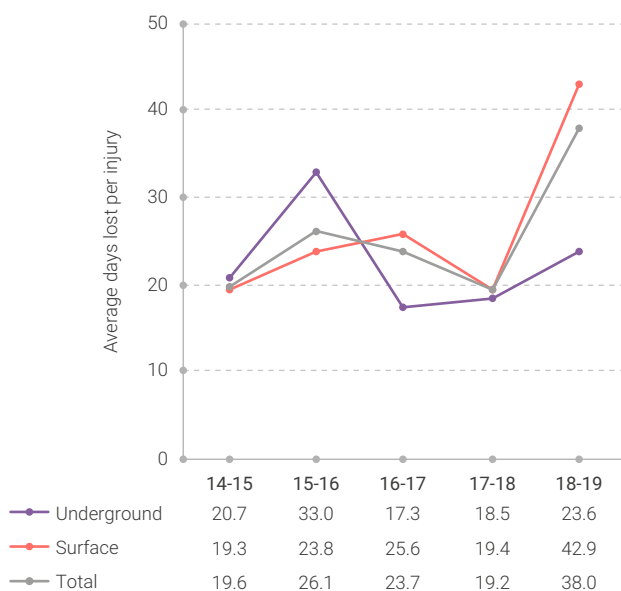
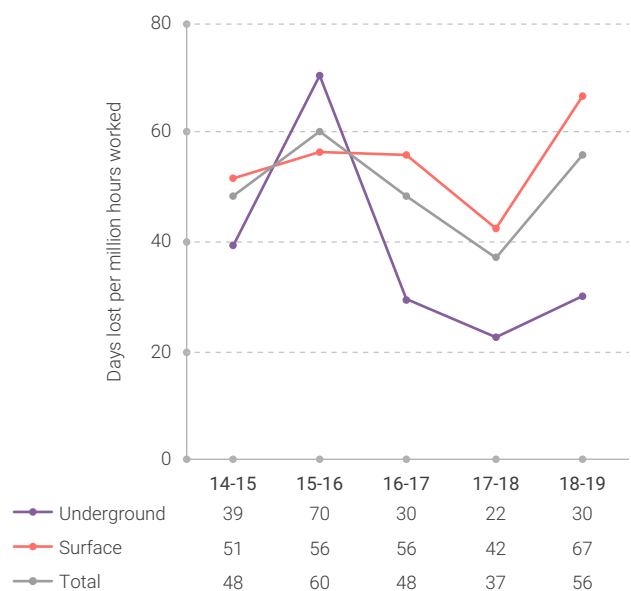


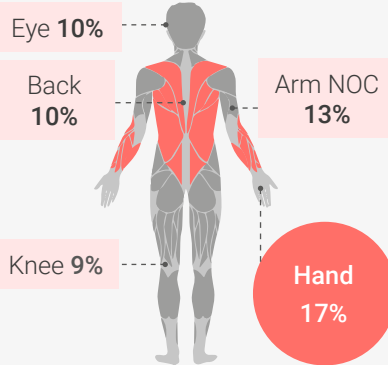
FIGURE 18 INJURY INDEX



## BAUXITE AND ALUMINA INJURIES 2018-19



6% of the 126,976 average mining workforce were in **bauxite and alumina**



LTIFR for bauxite and alumina was **6.9**, compared to 2.2 for all mining

## LOST TIME INJURIES BY COMMODITIES CONTINUED

### Bauxite and alumina performance indicators

The performance indicators for the bauxite and alumina sector were mixed for 2018-19. Figures 19 to 22 depict the performance indicators of incidence, frequency and duration rates, and injury index.

Performance indicator trends for the bauxite and alumina sector in 2018-19 are summarised below.

- The incidence rate deteriorated, by 20%, rising from 10.8 to 13.0.
- The frequency rate deteriorated, by 21%, rising from 5.7 to 6.9.
- The duration rate improved by 39%, falling from 15.2 to 9.2.
- The improvement of the duration rate was greater than the deterioration in frequency rate, resulting in the injury index improving by 26%, falling from 87 to 64.

### Bauxite and alumina injury percentage breakdown for 2018-19

Appendix I provides a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident, and type of accident. There was a total of 96 lost time injuries reported in 2018-19.

#### Injuries by part of body

- Hand injuries accounted for the largest proportion of injuries with 16 injuries (17% of total).
- Injuries to arms not otherwise classified (NOC) were the next highest proportion of injuries, with 12 injuries (13%), followed by back and eye injuries, both with 10 injuries (10%) each.
- Combined, injuries to arms (including shoulder) contributed 38% of total injuries, with trunk injuries made up 19%, and all leg injuries (including knees and ankles) made up 16%.

#### Injuries by nature

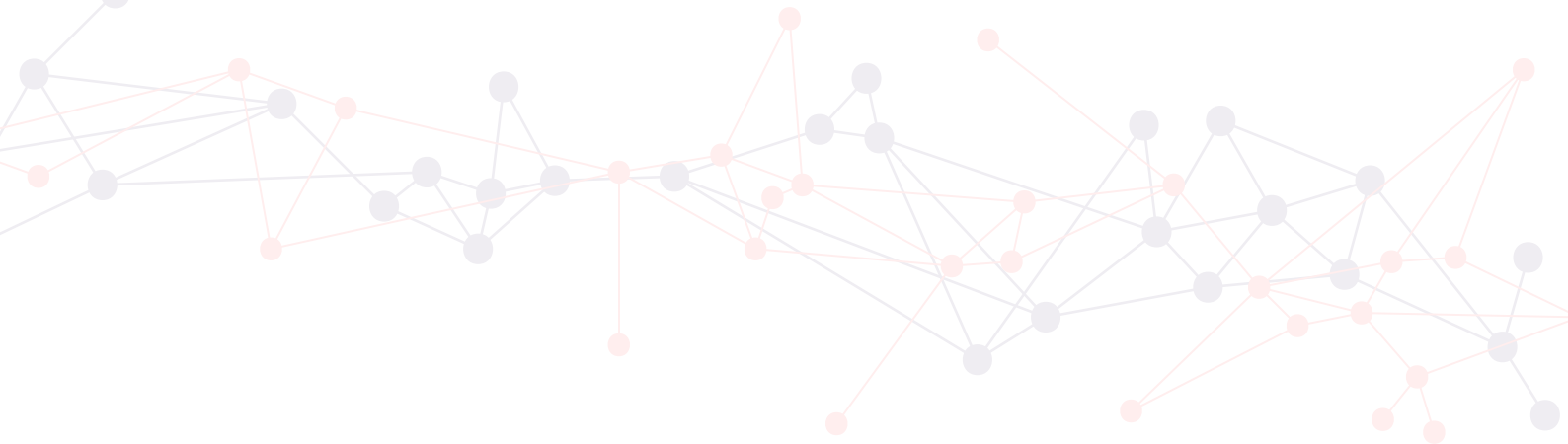
- Sprain or strain was the highest ranking nature of injury with 44 injuries (46% of total).
- This is followed by bruise or contusion, burns, and effects of chemicals or fumes, each with 9 (9%) injuries.

#### Injuries by location

- The largest proportion of injuries occurred in treatment plants with 58 injuries (60% of total).
- The next largest proportion of injuries occurred in open pits with 12 injuries (13%) and general surface areas with 11 injuries (11%).

#### Injuries by type of accident

- Over-exertion or strenuous movements was the most common type of accident resulting in injury with 26 injuries (27% of total).
- Slip or trip contributed to the next highest proportion of injury with 12 injuries (13%), followed by caught by or between objects and chemical absorption with 10 injuries (10%) each.



## Bauxite and alumina LTI performance indicators 2014-15 to 2018-19

FIGURE 19 INCIDENCE RATE

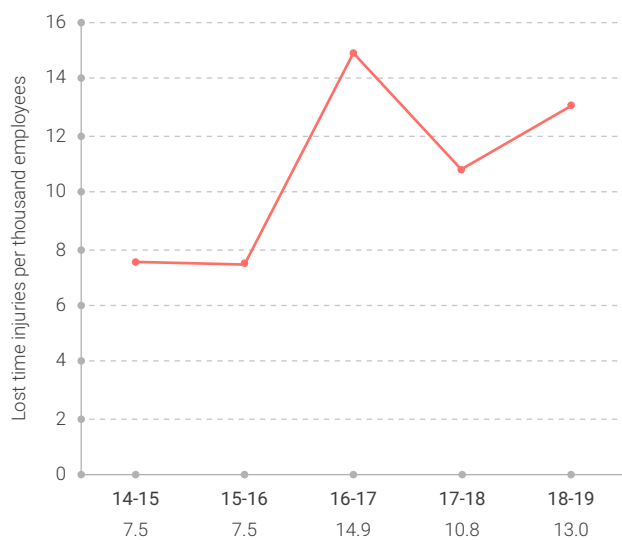


FIGURE 20 FREQUENCY RATE

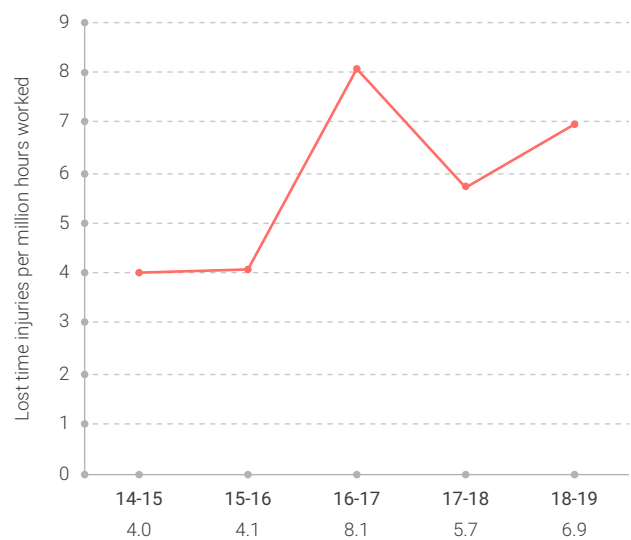


FIGURE 21 DURATION RATE

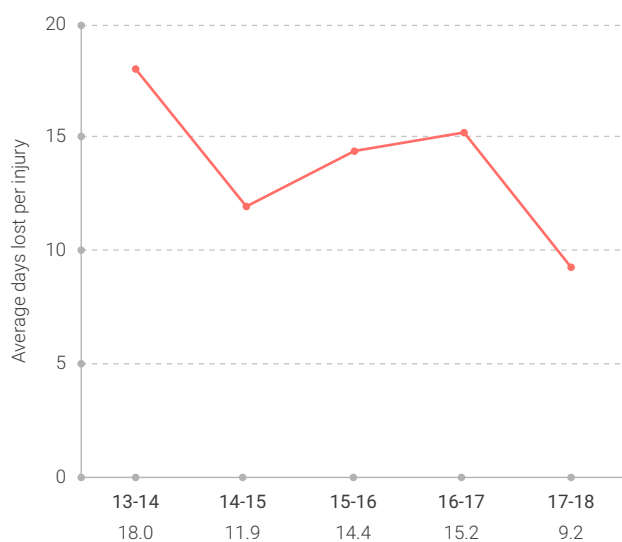
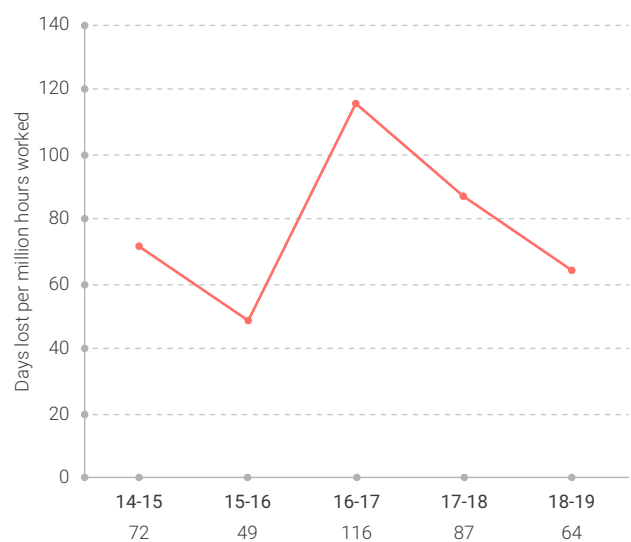


FIGURE 22 INJURY INDEX



## NICKEL INJURIES 2018-19



**5% of the 126,976**  
average mining workforce were  
in **nickel**

Multiple **10%**

Arm NOC  
**10%**

Hand  
**13%**

Back  
**13%**

Ankle  
**13%**

Knee **10%**



LTIFR for nickel was **2.5**,  
compared to 2.2 for all mining

## LOST TIME INJURIES BY COMMODITIES CONTINUED

### Nickel performance indicators

The performance indicators for the nickel sector showed an overall deterioration for 2018-19. Figures 23 to 26 depict the performance indicators of incidence, frequency and duration rates, and injury index.

Performance indicator trends for the nickel sector in 2018-19 are summarised below.

- The overall incidence rate deteriorated by 34%, rising from 3.8 to 5.1. The surface incidence rate deteriorated by 65%, (from 2.6 to 4.3), while the underground incidence rate improved by 9%, (from 10.7 to 9.7).
- The overall frequency rate deteriorated by 32%, rising from 1.9 to 2.5. The surface frequency rate deteriorated by 69% (from 1.3 to 2.2), while the underground frequency rate improved by 9% (from 4.4 to 4.0).
- The overall duration rate deteriorated slightly by 3%, rising from 29.6 to 30.6. The surface duration rate improved, by 7% (from 41.1 to 38.2), while the underground duration rate improved by 14% (from 14.2 to 12.2).

- The rise in the duration rate and frequency rate result in a deterioration of 36% in the injury index, rising from 56 to 76. The surface injury index rose by 52% (from 54 to 82), although the underground injury index improved by 22% (falling from 63 to 49).

### Nickel injury percentage breakdown for 2018-19

Appendices J provides a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident, and type of accident for the underground and surface sectors. There was a total of 31 lost time injuries reported in 2018-19 (9 underground injuries, 22 surface injuries).

#### Injuries by part of body

- Injuries to ankle (3 surface injuries, 1 underground injury), back (2 surface, 2 underground), and hand (2 surface, 2 underground), each accounted for 13% of injuries.
- Arms not otherwise classified (NOC) (2 surface injuries, 1 underground injury), injuries to knees (3 surface), and legs NOC (3 surface), each accounted for 10% of injuries.

#### Injuries by nature

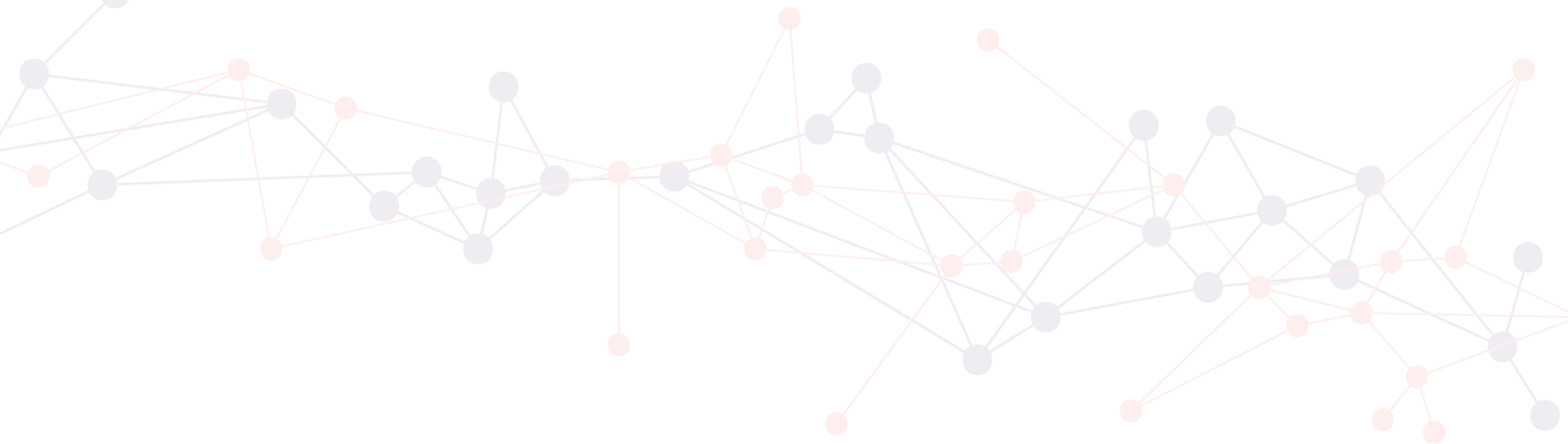
- Fractures (10 surface injuries, 2 underground injuries), and sprain or strain (6 surface, 6 underground), were the highest ranking nature of injury at 39% each.
- This is followed by bruise or contusion at 6% (1 surface injury, 1 underground injury)

#### Injuries by location

- The largest proportion of injuries occurred in treatment plants with 10 injuries (32% of total), followed by underground production and development areas with 5 injuries (16%).
- Administration not otherwise classified (NOC), open pit, surface general areas, and workshops, each accounted for 3 injuries (10% each).

#### Injuries by type of accident

- Over-exertion or strenuous movements was the most common accident type at 29% (5 surface injuries, 4 underground injuries).
- This was followed by fall from height (4 surface injuries), struck by object (3 surface, 1 underground), and slip or trip (4 surface), each accounting for 13% of injuries.



# Nickel LTI performance indicators 2014-15 to 2018-19

FIGURE 23 INCIDENCE RATE

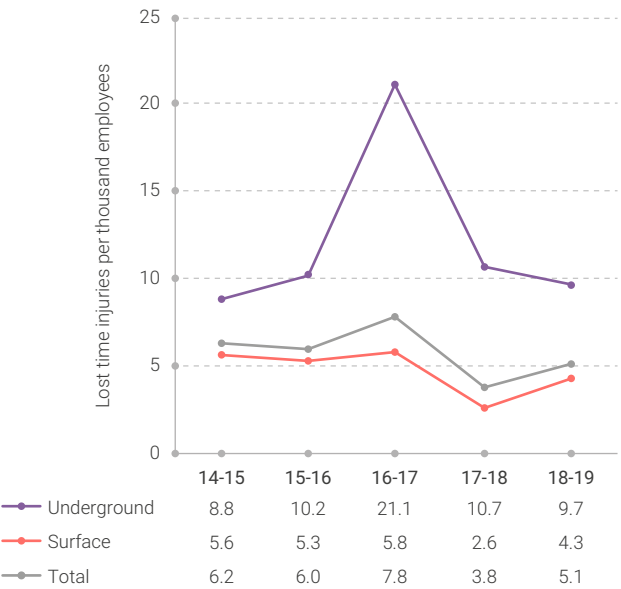


FIGURE 24 FREQUENCY RATE



FIGURE 25 DURATION RATE

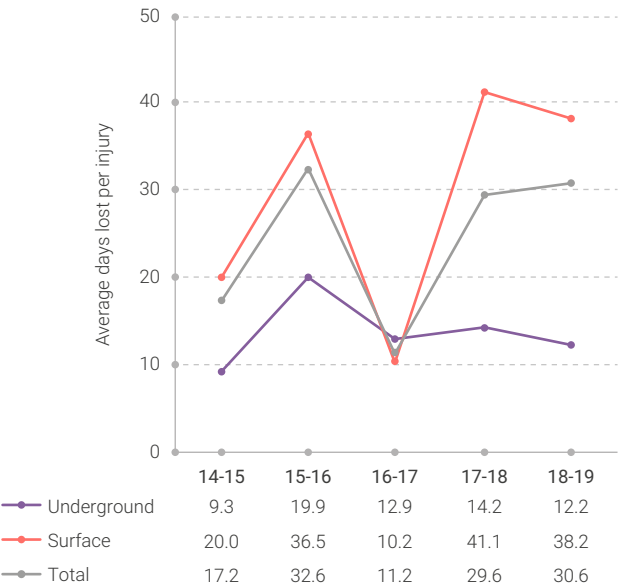


FIGURE 26 INJURY INDEX

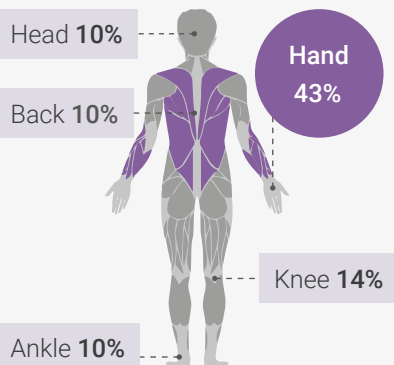




## EXPLORATION INJURIES 2018-19



**Exploration** employed an average of **3,106** workers, that is about 2% of the total mining workforce



LTIFR for exploration was **3.7**, compared to 2.2 for all mining

## EXPLORATION LOST TIME INJURIES

The performance indicators for the mineral exploration sector showed an overall deterioration for 2018-19. Figures 27 to 30 depict the performance indicators of incidence, frequency and duration rates, and injury index.

Performance indicator trends for the exploration sector in 2018-19 are summarised below

- The incidence rate deteriorated by 15%, rising from 5.9 to 6.8.
- The frequency rate deteriorated by 16%, rising from 3.2 to 3.7.
- The duration rate deteriorated sharply by 147%, rising from 12.8 to 31.6.
- The rise of both duration rate and frequency rate resulted in a deterioration of 181% in the injury index, rising from 41 to 116.

### Exploration injury percentage breakdown for 2018-19

Appendix K provides a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident, and type of accident for exploration. There was a total of 21 lost time injuries reported in 2018-19.

#### Injuries by part of body

- Hand injuries were the most common, representing 43% of the 21 exploration injuries reported.
- Knee injuries were the next most common, with 3 injuries representing 14% of the total.

#### Injuries by nature

- Sprain or strain was the highest ranking nature of injury for surface injuries with 6 injuries representing 29% of the total.
- Crush injuries were the next most frequent nature of injury, at 4 injuries (19% of the total).

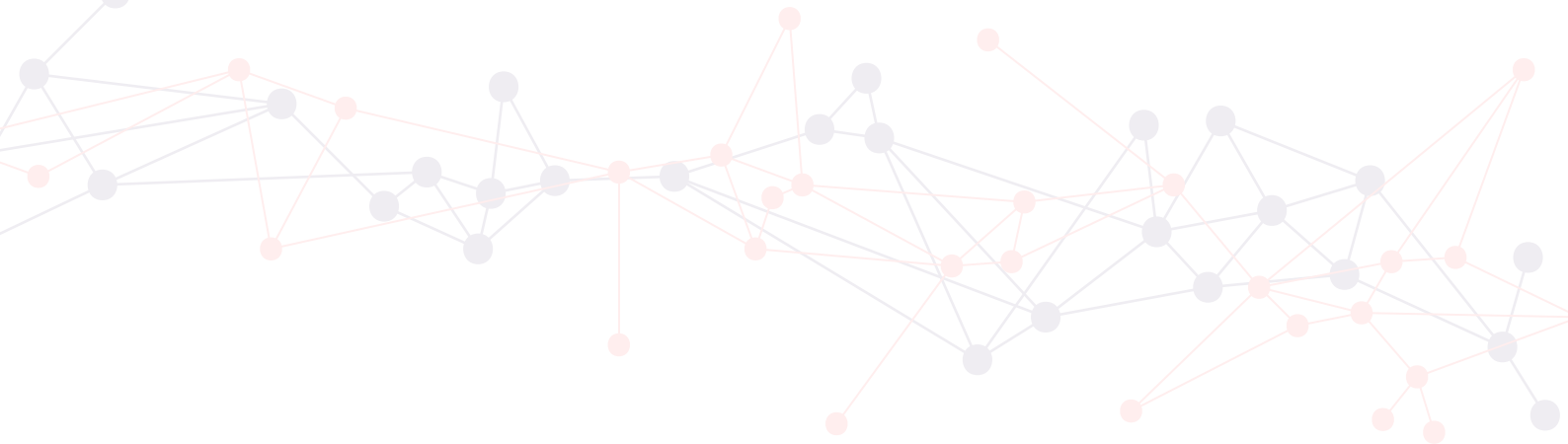
#### Injuries by location

- All injuries were in exploration areas (100%).

#### Injuries by type of accident

- The most common accident type for injuries was caught by or between objects, with 6 injuries (29% of total).
- This was followed by over-exertion or strenuous movements, and stepping, each with 3 (14%) injuries.





Exploration LTI performance indicators 2014-15 to 2018-19

FIGURE 27 INCIDENCE RATE

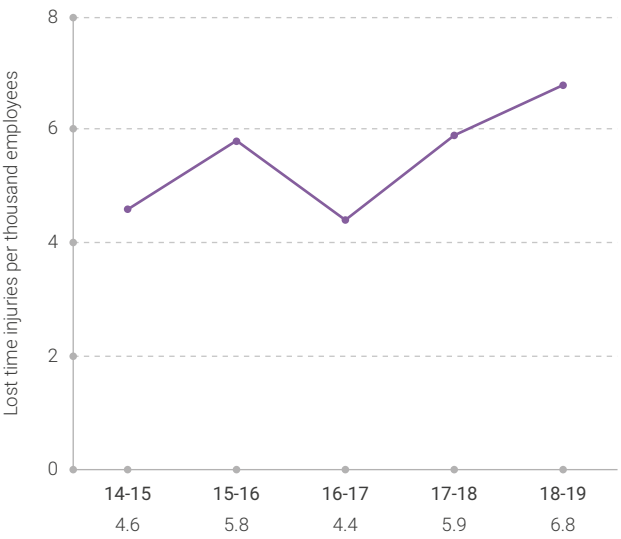


FIGURE 28 FREQUENCY RATE

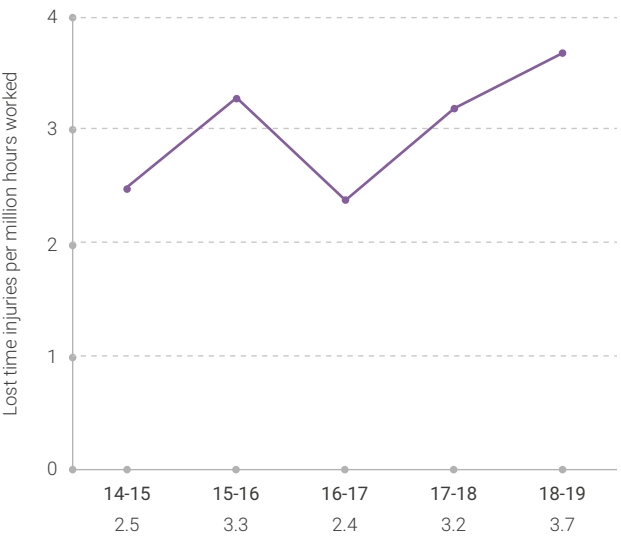


FIGURE 29 DURATION RATE

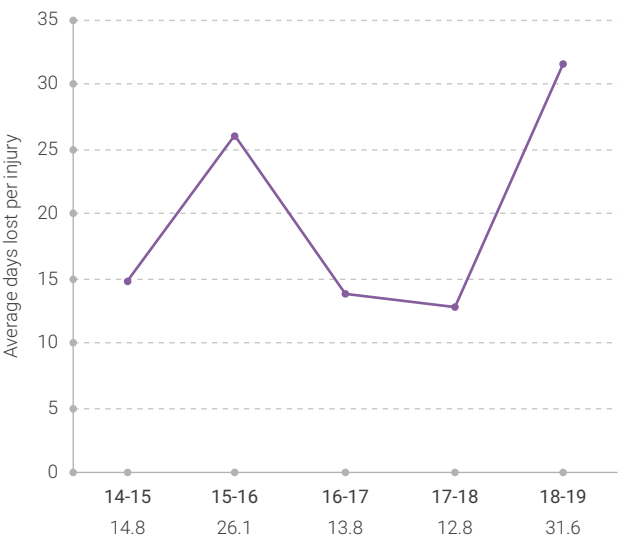
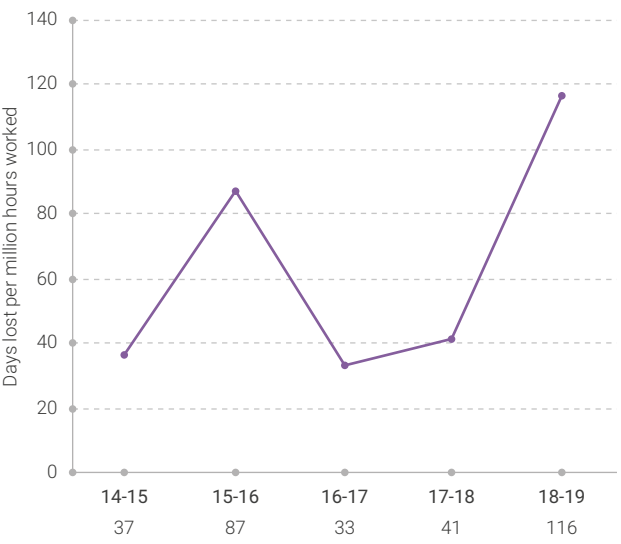


FIGURE 30 INJURY INDEX





## RESTRICTED WORK INJURIES

### Review of restricted work injuries during 2018-19

In addition to the 425 mining LTIs in 2018-19, there were 835 restricted work injuries (RWIs) reported (830 in metalliferous mines and 5 in coal mines), bringing the total number of mining reportable injuries to 1,260. There were also 21 exploration LTIs and 27 exploration RWIs reported, resulting in 48 reportable injuries. A breakdown of these data with performance indicators is shown in Tables 10 and 11.

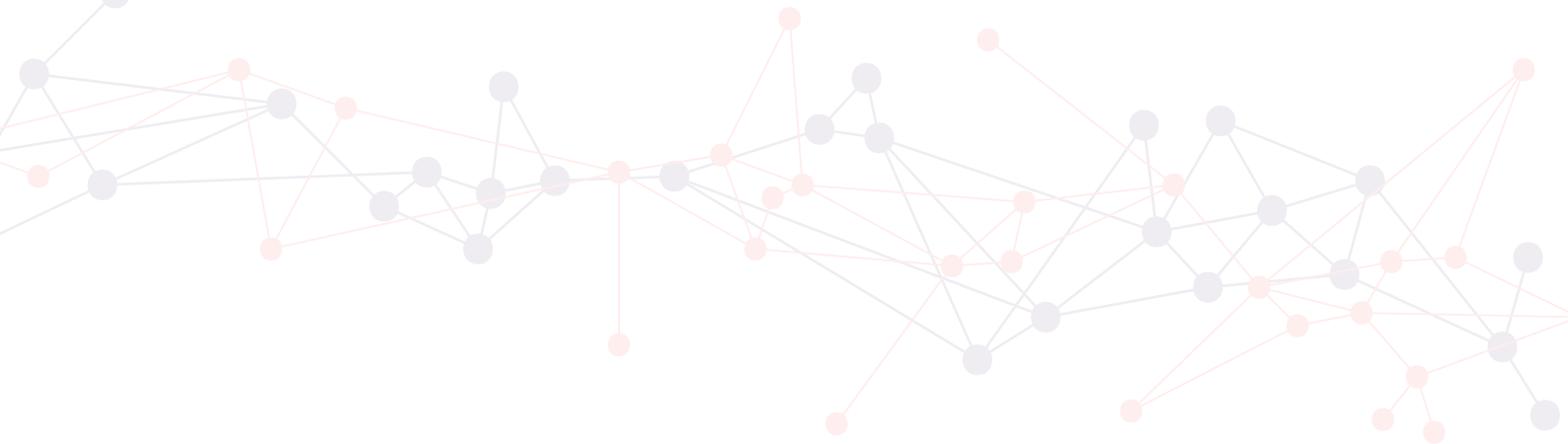
Of the 862 restricted work injuries in total, 516 mining and 15 exploration injuries resulted in the injured person not returning to their regular duties for two weeks or more.

*Note: Restricted work injury includes circumstances where the injured person:*

- *is placed in a different occupation or job, whether on full or restricted work hours*
- *remains in their normal occupation or job, but is not able to perform the full range of work duties*
- *remains in their normal occupation or job, but on restricted hours.*

**TABLE 10** RESTRICTED WORK INJURIES 2018-19

Sector	No. of employees	Restricted work injuries			Reportable injuries (RWIs and LTIs)		
		No. of injuries	Incidence rate	Frequency rate	No. of injuries	Incidence rate	Frequency rate
Metalliferous surface	112,644	717	6.4	4.1	1,092	9.7	6.2
Metalliferous underground	10,086	113	11.2	5.6	147	14.6	7.3
Metalliferous total	122,730	830	6.8	4.3	1,239	10.1	6.4
Coal total	1,139	5	4.4	3.5	21	18.4	14.8
<b>Total mining</b>	<b>123,870</b>	<b>835</b>	<b>6.7</b>	<b>4.2</b>	<b>1,260</b>	<b>10.1</b>	<b>6.4</b>
Exploration	3,106	27	8.7	4.7	48	15.5	8.4



**TABLE 11** RESTRICTED WORK INJURIES BY MINERAL MINED 2018-19

Mineral mined	No. of employees	Restricted work injuries			Reportable injuries (RWIs and LTIs)		
		No. of injuries	Incidence rate	Frequency rate	No. of injuries	Incidence rate	Frequency rate
Iron ore	60,089	294	4.9	3.3	443	7.4	5.0
Gold	31,368	212	6.8	4.1	287	9	5.6
Bauxite and alumina	7,360	143	19.4	10.3	239	32.4	17.2
Nickel	6,064	68	11.2	5.5	99	16.3	8.0
Construction materials	2,726	1	0.4	0.7	4	1.5	2.7
Base metals	2,627	33	12.6	7.3	42	16	9.3
Tin, tantalum and lithium	3,606	31	8.6	3.2	39	10.8	4.0
Mineral sands	3,084	22	7.1	5.4	29	9.4	7.1
Coal	1,139	5	4.4	3.5	21	18.4	14.7
Salt	1,039	4	3.8	3.3	8	7.6	6.6
Diamond	902	10	11.1	6	11	12.2	6.6
Other	3,864	12	3.1	2.7	38	9.8	8.5
<b>Total mining</b>	<b>123,870</b>	<b>835</b>	<b>6.7</b>	<b>4.2</b>	<b>1260</b>	<b>10.1</b>	<b>6.4</b>

# RESTRICTED WORK INJURIES CONTINUED

## Restricted work injury performance indicators

The restricted work injury performance indicators for the mining sector showed a general improvement during 2018-19, although there was an increase with the number of days lost to injuries.

Exploration have some slight improvements but it does not offset the overall deterioration. Figures 31 to 34 depict the performance indicators of incidence rate, frequency rate, days off per injury and days off per million hours worked.

- The overall incidence rate for mining improved by 12%, falling from 7.6 to 6.7. The surface incidence rate improved by 10% (from 7.0 to 6.3), and the underground incidence rate improved by 24% (from 14.8 to 11.2). The incidence rate for exploration improved slightly, by 2%, falling from 8.9 to 8.7.
- The overall frequency rate improved by 11%, falling from 4.7 to 4.2. The surface frequency rate improved by 7%, falling from 4.4 to 4.1, while the underground frequency rate improved by 25%, falling from 7.5 to 5.6. The frequency rate for exploration improved slightly by 2%, falling from 4.8 to 4.7.
- The average number of rostered days of restricted work per RWI (comparable to the LTI Duration rate) deteriorated by 7%, rising from 30.5 to 32.5. Surface restricted work days per RWI deteriorated by 2% (from 31.5 to 32.1), while restricted work days per underground RWI deteriorated by about 41% (from 24.9 to 35.1). Average restricted work days per RWI for exploration deteriorated by 103%, rising from 11.8 to 24.0.
- The fall in the frequency rate offset the rise in the restricted work days worked per restricted work injury resulting a slight improvement of 4% (from 144 to 138) in the overall restricted work days worked per million hours (comparable to the LTI Injury Index) for mining. The surface restricted work days per million hours worked improved

by 6% (from 140 to 131). The restricted work days per million hours worked underground deteriorated, by 6% (from 186 to 197). Exploration restricted work days per million hours worked deteriorated by 98%, rising from 57 to 113.

## Restricted work injury percentage breakdown for 2018-19

Appendices **L**, **M** and **N** provide a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident and type of accident for the underground and surface sectors. There was a total of 835 mining related restricted injuries (113 underground, 722 surface) and 27 exploration injuries reported in 2018-19.

### Injuries by part of body

- **Underground:** Hands were the most frequently injured part of body with 24 injuries (21% of total), followed by shoulder injuries with 15 injuries (13%), then ankle with 14 injuries (12%) and arm not otherwise classified (NOC) with 13 injuries (12%).
- **Surface:** Hand injuries (208) accounted for the largest proportion of surface restricted work injuries at 29%, followed by back with 105 injuries (15%), shoulder with 95 injuries (13%) and knee with 70 injuries (10%).
- **Exploration:** Hand injuries accounted for 26% (7 injuries) of RWIs, followed by back and leg NOC injuries, each at 15% (4 injuries).

### Injuries by nature

- **Underground:** Sprain or strain was the highest ranking nature of injury for underground restricted work injuries with 54 injuries (48% of total), followed by laceration with 17 injuries (15%), then fracture with 16 injuries (14%).
- **Surface:** Sprain or strain was the highest ranking nature of injury for surface restricted work injuries

with 391 injuries (54% of total), followed by laceration with 87 injuries (12%), then fracture with 75 injuries (10%).

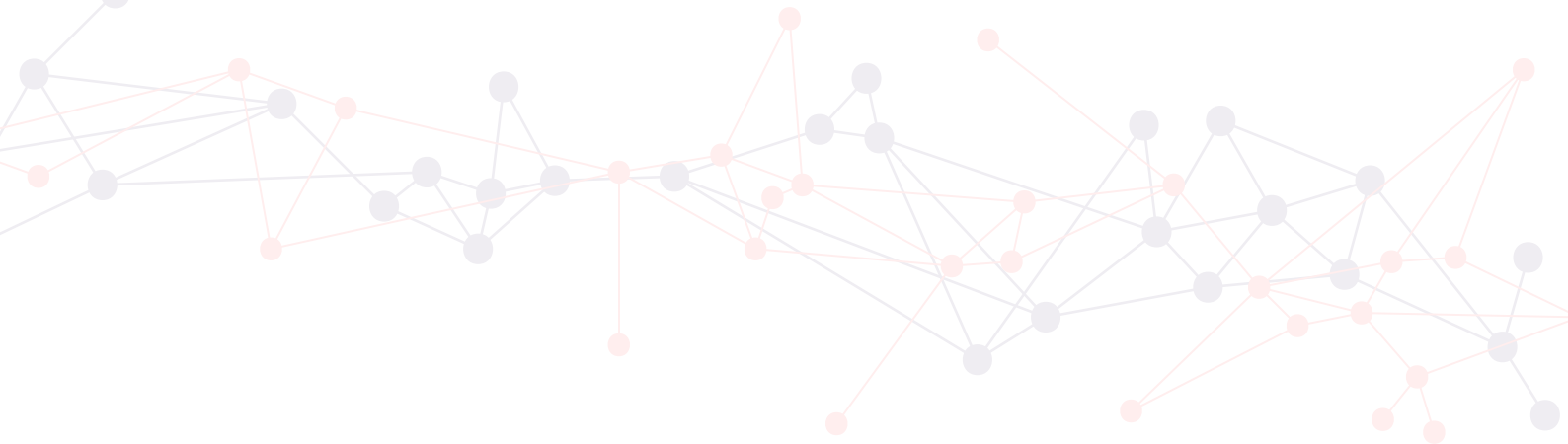
- **Exploration:** Sprain or strain, with 12 injuries (44% of total), was the highest ranking nature of injury, followed by fracture with 7 injuries (26%). The next most common was laceration, with 3 injuries (11%).

### Injuries by location

- **Underground:** The largest proportion of underground injuries occurred in production and development areas with 70 injuries (62% of total), followed by access and haulage ways with 27 injuries (24%).
- **Surface:** The largest proportion of surface injuries occurred in treatment plants with 243 injuries (34% of total) followed by open pits with 160 injuries (22%), and workshops next with 115 injuries (16%).
- **Exploration:** 26 RWIs, or 96% of the total, were in general exploration areas. A further 4% was made up of a single injury, reported in administration not otherwise classified (NOC).

### Injuries by type

- **Underground:** Over-exertion or strenuous movement with 30 injuries (27% of total) was the most common accident type for underground injuries, followed by stepping with 20 injuries (18%), slip or trip with 11 injuries (10%), and struck by object with 10 injuries (9%).
- **Surface:** The most common accident type for surface injuries was over-exertion or strenuous movements with 229 injuries (32% of total), followed by caught by or between objects with 89 injuries, and stepping with 87 injuries, each at 12%.
- **Exploration:** Over exertion or strenuous movement at 19% (5 injuries) was the most common type of accident, followed by stepping at 15% (4 injuries).



## Restricted work injury performance indicators 2014-15 to 2018-19

FIGURE 31 INCIDENCE RATE

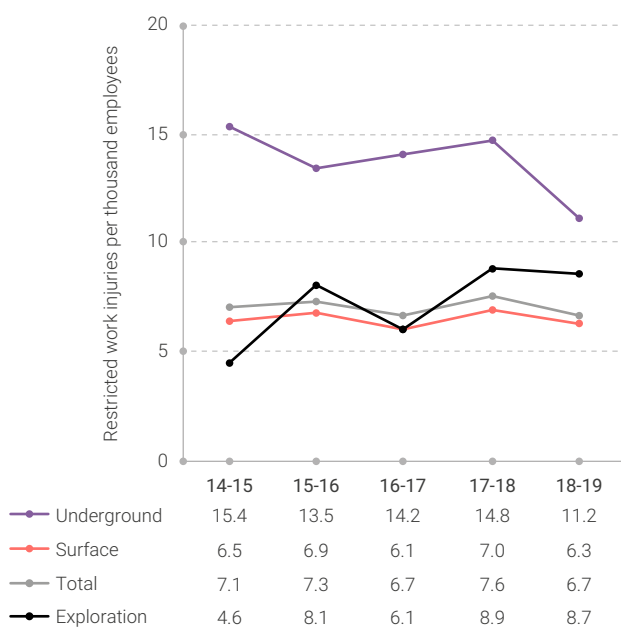


FIGURE 32 FREQUENCY RATE

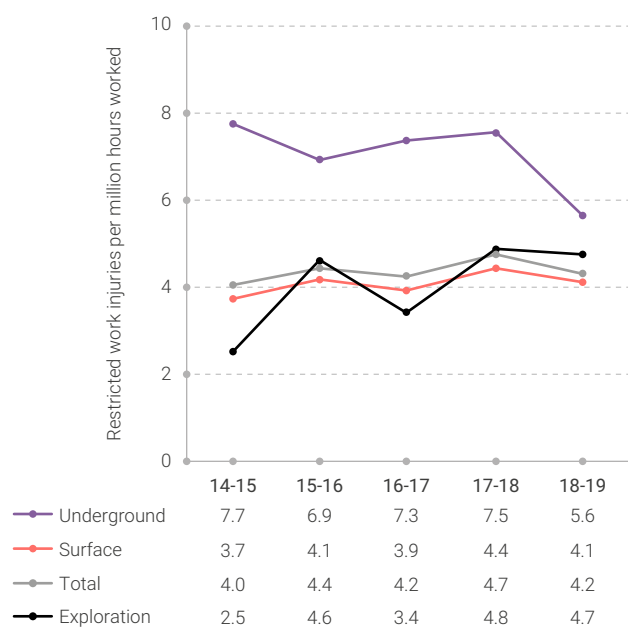


FIGURE 33 DURATION RATE

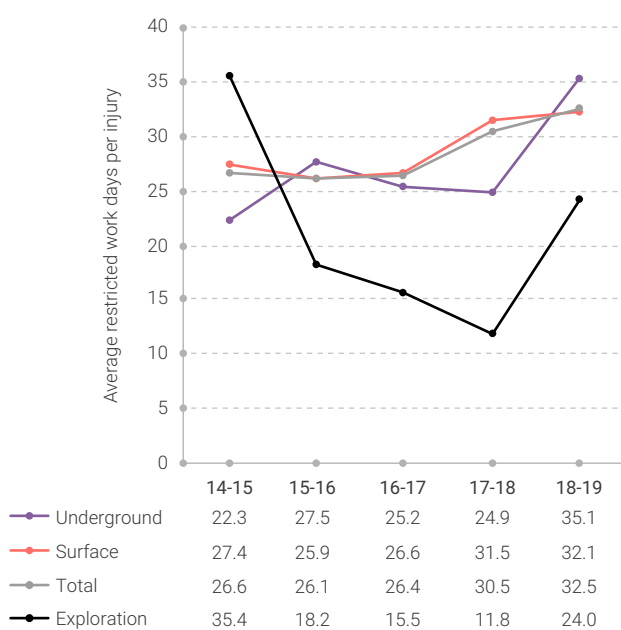
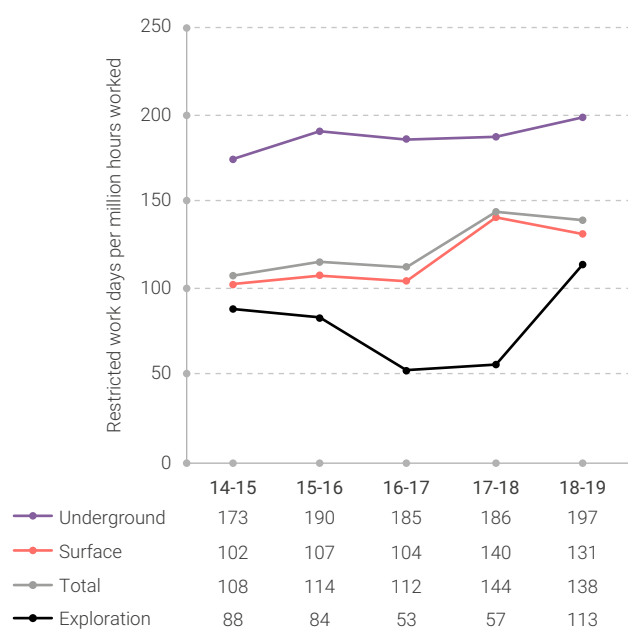


FIGURE 34 INJURY INDEX







# APPENDICES

## ABBREVIATIONS USED IN APPENDICES

**Chem/fumes** – chemicals or fumes

**Exp to** - exposure to

**NOC** – not otherwise classified

**Sprain/strain** – strain or sprain injuries

**U/g** – underground

**U/g access/haul** – underground access, travelling or haulage ways

**U/g crush** – underground crushing areas

**U/g prod/dev** – underground production or development areas

**U/g ore/waste dmpg** – underground ore or waste dumping areas

# APPENDIX A

## DESCRIPTIONS OF COMMONLY USED TERMS FOR THE TYPE OF ACCIDENT

**Bite insect/animal** – bites or stings from insects, spiders, snakes and other animals

**C/by between** – caught by or between still or moving objects (e.g. finger caught between two pipes while attempting to move one of them) but does not include getting caught between parts of an operating machine

**C/by machine** – caught between parts of an operating machine

**C/w chem/fumes** – inhalation, absorption or ingestion of chemicals or fumes; includes smoke, blast fumes, acids, caustic substances and industrial solvents

**C/w electric current** – contact with electric current; includes electric shock, electrocution, burning from electric current and static electricity discharge

**C/w foreign body** – contact with foreign body; includes entry into the skin, eyes, nose, ears, mouth or other part of the body by an object, but does not include sharp objects such as metal splinters

**C/w friction/rubbing** – blistering or abrasion due to rubbing by footwear, clothing or personal equipment

**C/w hi press fluid** – contact with high pressure fluid, including hydraulic fluid

**C/w hot substance** – contact with hot solid, liquid, gas or steam, molten metal or naked flame; usually results in burns

**C/w sharp object** – contact with sharp object (e.g. metal splinter) but does not include objects such as sharp tools or operating machines

**C/w tool** – contact with a handheld manual or power tool

**Exp to dust** – exposure to environmental dust

**Exp to heat** – exposure to environmental heat; usually results in injuries related to heat stress

**Exp to mental stress** – stress-related conditions; includes post-traumatic stress and effects of workplace harassment

**Explosion comp air** – compressed air explosions, including pressure vessel and tyre explosions

**Explosion NOC** – gas ignition

**Fall from height** – fall from height equal to or greater than 0.5 metres; includes falls from vehicles or mobile equipment but does not include falls while getting on or off the vehicle or mobile equipment

**Fall getting on/off** – falls getting on or off vehicles or mobile equipment but does not include falls stepping on uneven ground while disembarking from a vehicle or mobile equipment

**Jumping** – jumping by a person; includes jumping to a higher or lower level or from a moving object

**Over/stren mov** – over-exertion or strenuous movements; usually associated with lifting, carrying, pulling, pushing and moving objects; also includes strenuous movements, repetitive movements with no specific event, and working in a confined area or while in an awkward posture

**Rockfall** – falls of rock usually from the face, walls and backs of underground excavations or from the face and walls of surface excavations

**S/against object** – struck against stationary or moving objects (e.g. hitting head on low structure while walking)

**S/by object** – struck by falling, flying, sliding or moving objects but does not include rockfalls or being struck by persons, vehicles or mobile equipment

**S/by veh/mob** – struck by a vehicle or mobile equipment

**Slip/trip** – other falls not from height or while getting on or off vehicles or mobile equipment; includes falls on stairs, falls on slippery or uneven ground, falls over loose or fixed objects and falls while handling equipment

**Stepping** – stepping on object, loose rock, uneven surface or to a higher or lower level; includes stepping on uneven ground while disembarking from a vehicle or mobile equipment; usually results in a sprain or strain to the ankle or knee

**Veh/mob collision** – vehicle or mobile equipment collision; includes colliding with stationary objects or walls

**Veh/mob jolt/jar** – vehicle or mobile equipment jolting or jarring (e.g. jolting or jarring while driving over an uneven surface, sitting in a truck being loaded with large material, bogging a face, ripping with a bulldozer)

**Veh/mob rollover** – vehicle or mobile equipment rollovers; includes partial rollovers



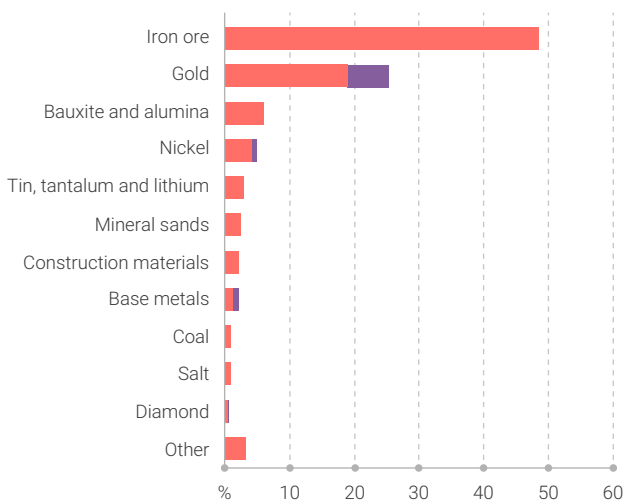
# APPENDIX B

## WESTERN AUSTRALIAN MINES 2018-19

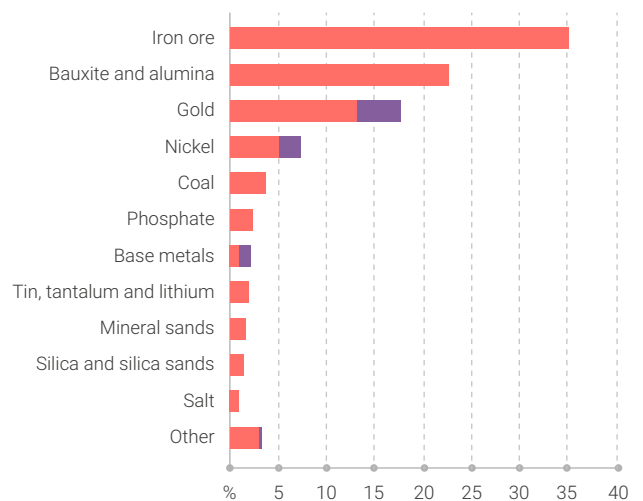
425 lost time injuries

■ Surface ■ Underground

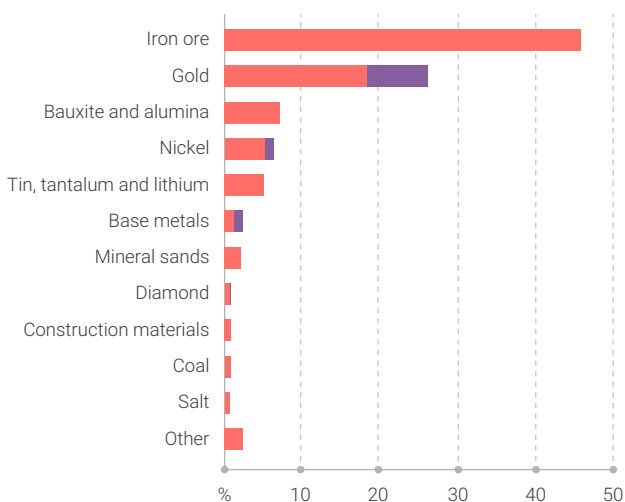
PERCENTAGE OF EMPLOYEES



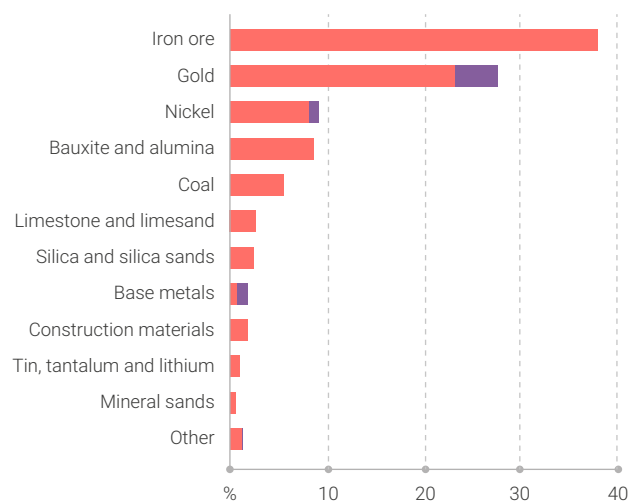
PERCENTAGE OF INJURIES



PERCENTAGE OF HOURS WORKED



PERCENTAGE OF WORK DAYS LOST

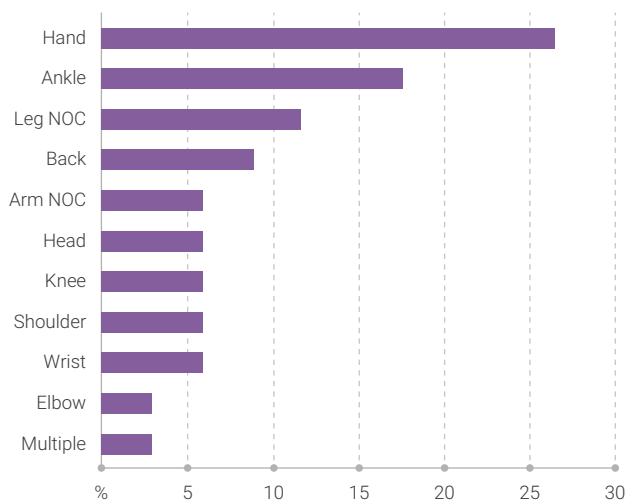


# APPENDIX C

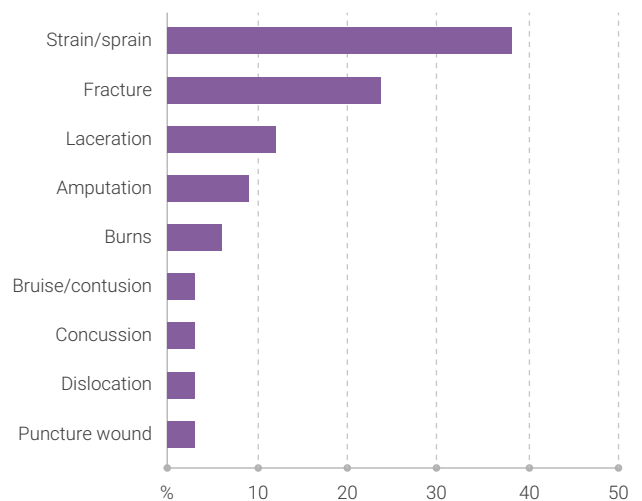
## SERIOUS INJURIES UNDERGROUND 2018-19

34 lost time injuries

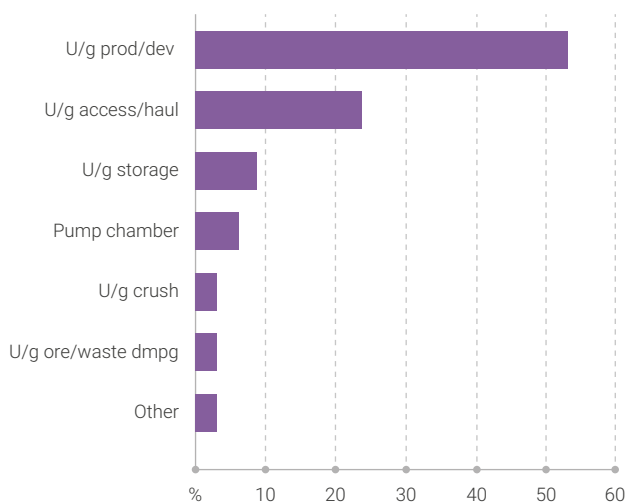
PART OF BODY



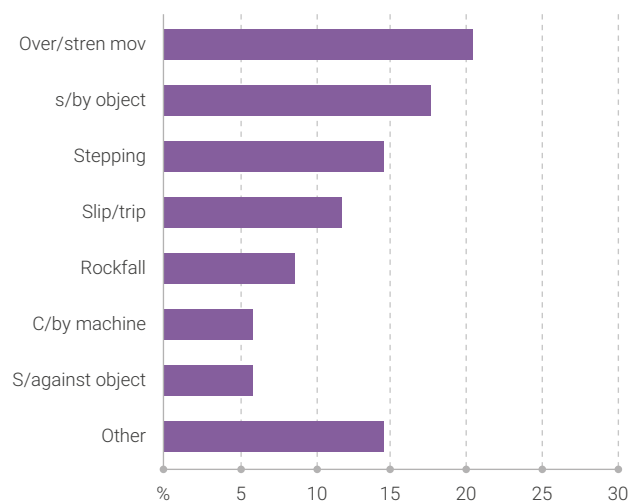
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

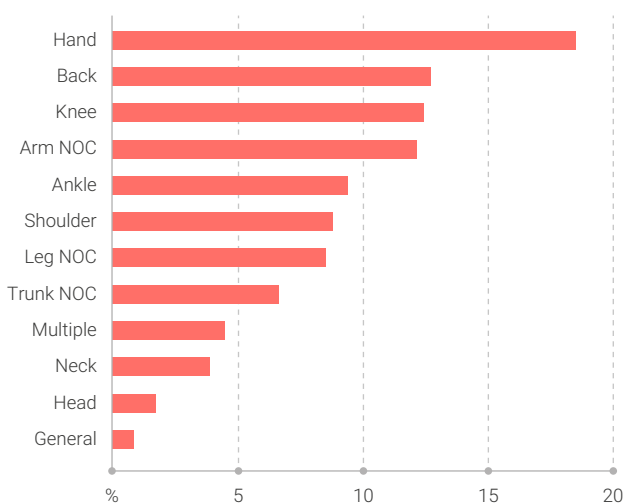


# APPENDIX D

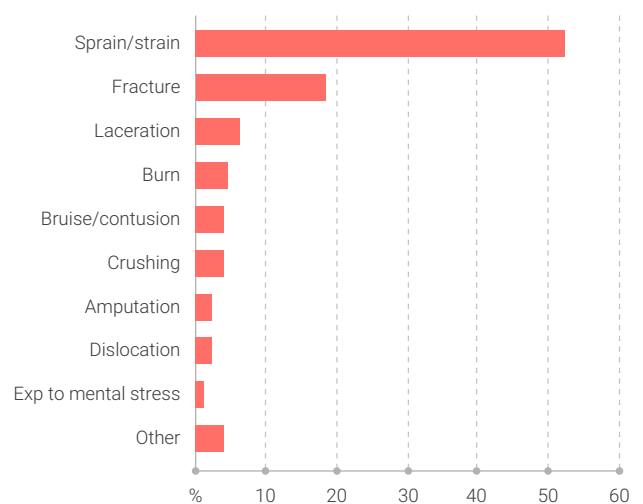
## SERIOUS INJURIES SURFACE 2018-19

331 lost time injuries

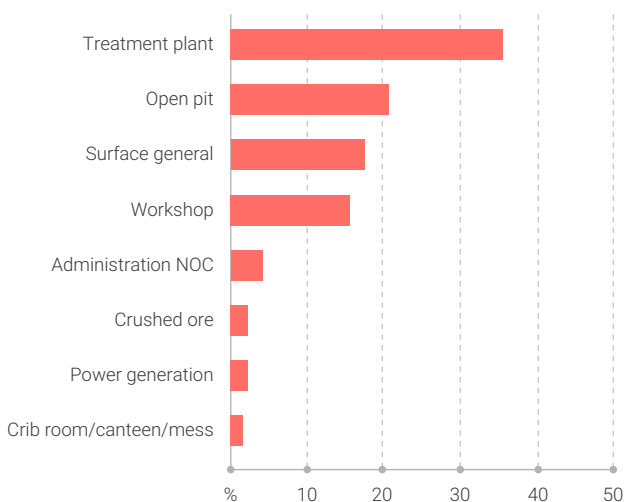
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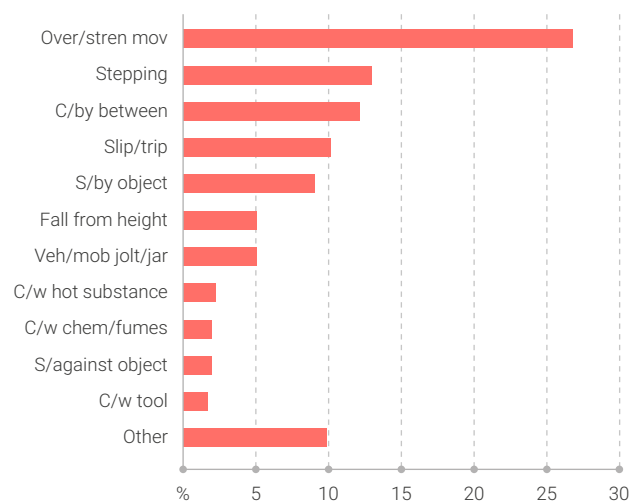
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

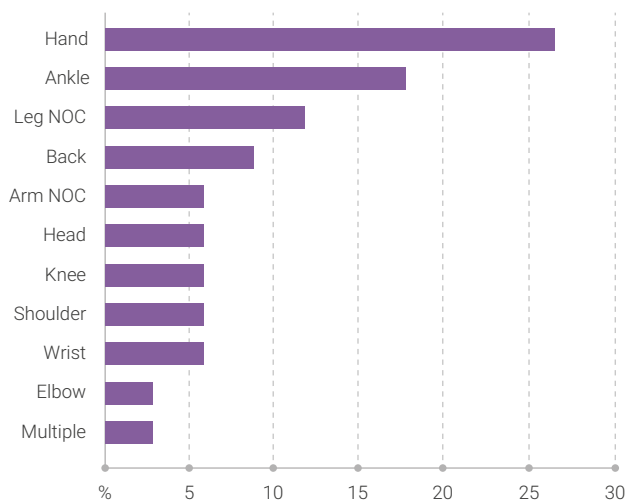


# APPENDIX E

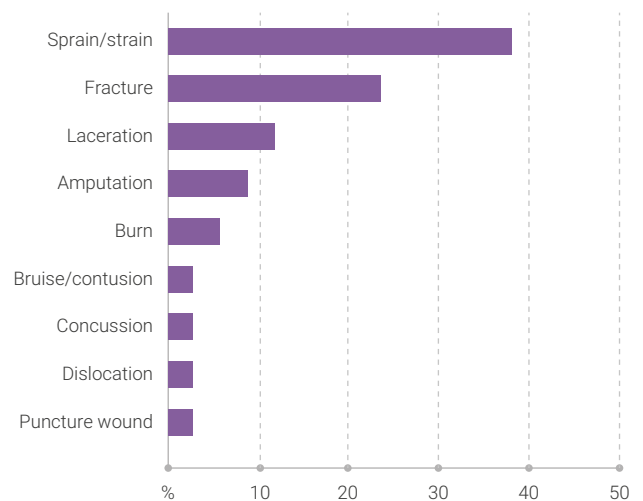
## METALLIFEROUS UNDERGROUND INJURIES 2018-19

34 lost time injuries

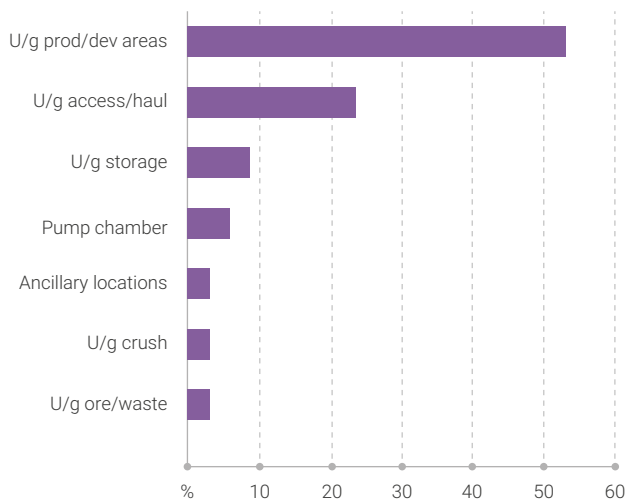
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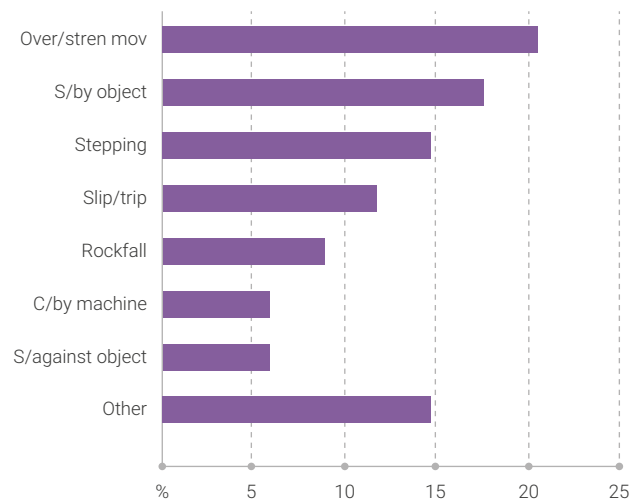
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

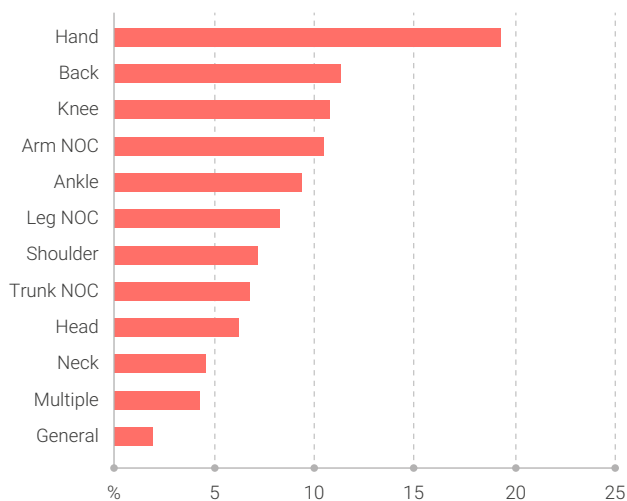


# APPENDIX F

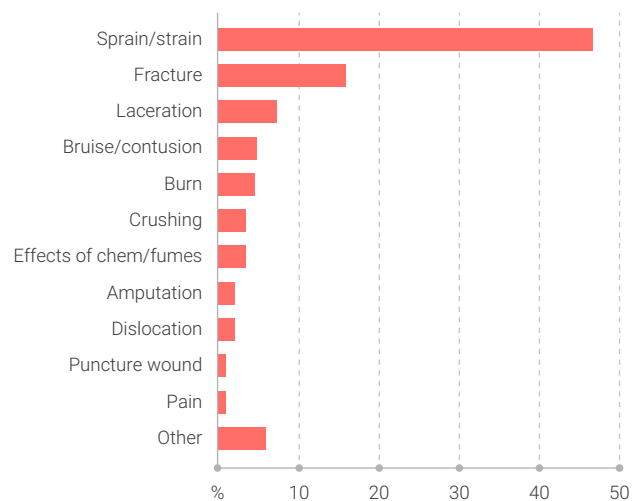
## METALLIFEROUS SURFACE INJURIES 2018-19

374 lost time injuries

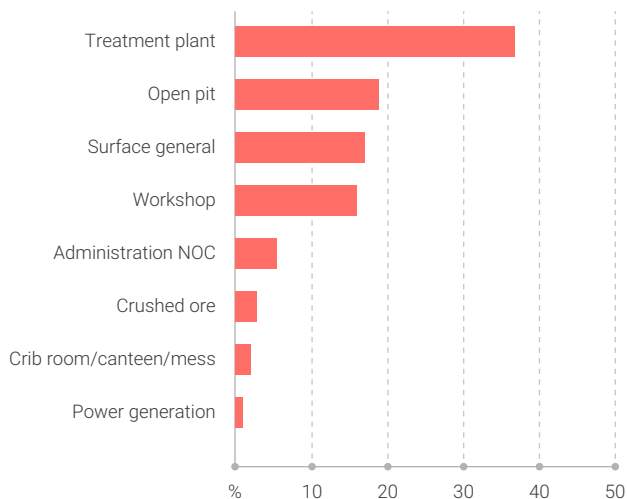
PART OF BODY



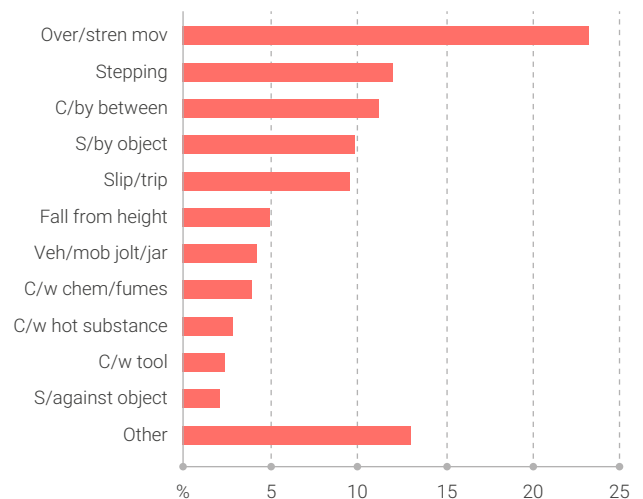
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT



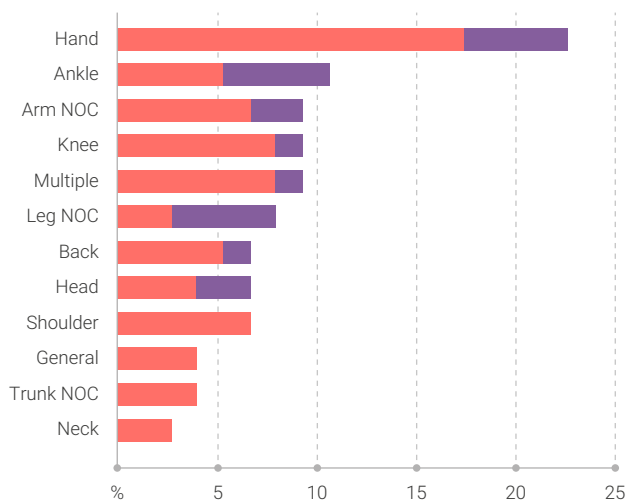
# APPENDIX G

## GOLD INJURIES 2018-19

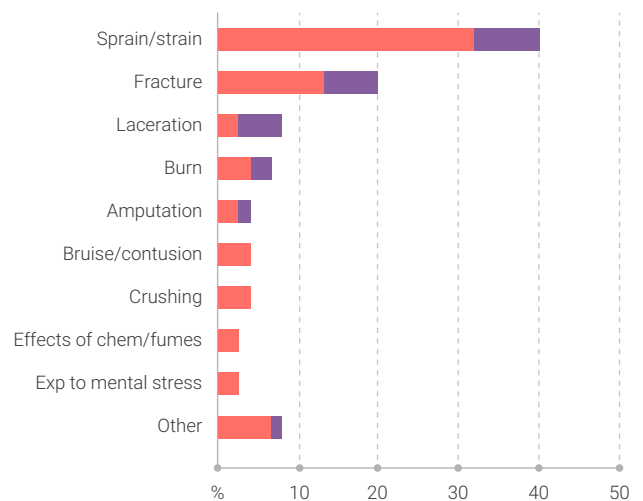
75 lost time injuries

■ Surface ■ Underground

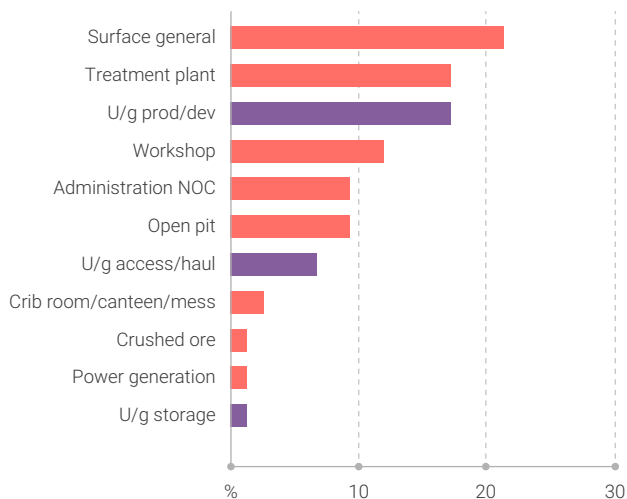
PART OF BODY



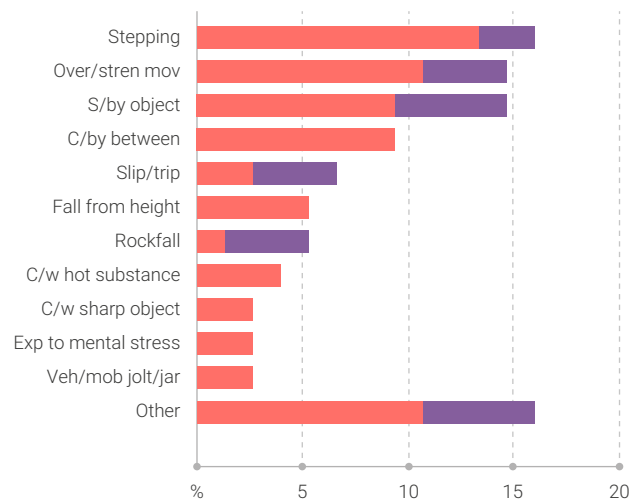
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

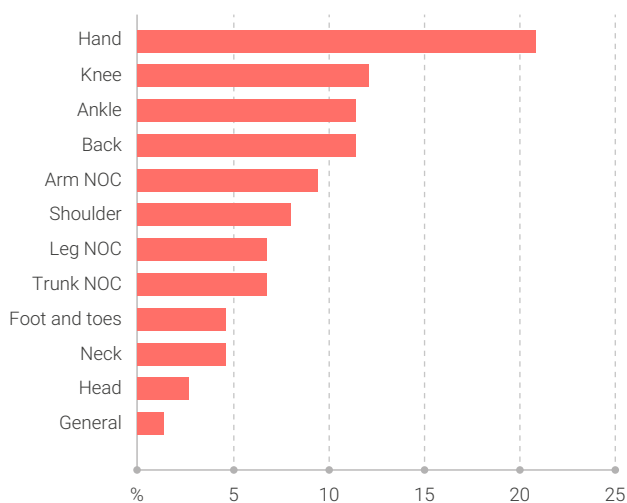


# APPENDIX H

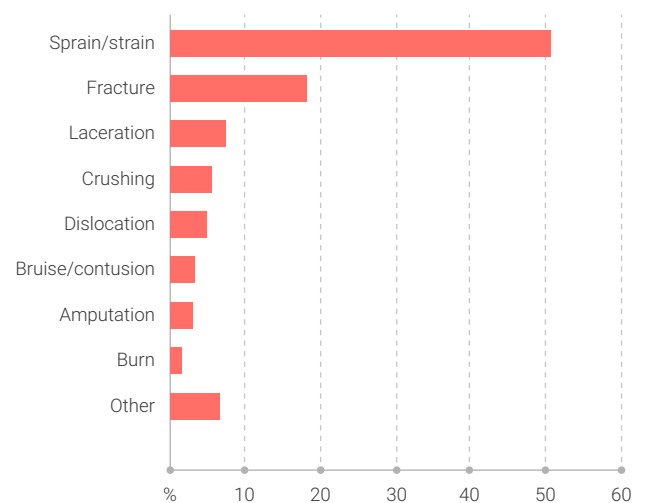
## IRON ORE INJURIES 2018-19

149 lost time injuries

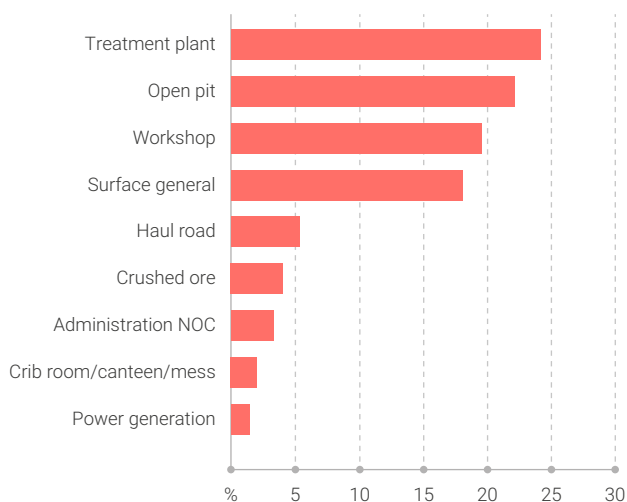
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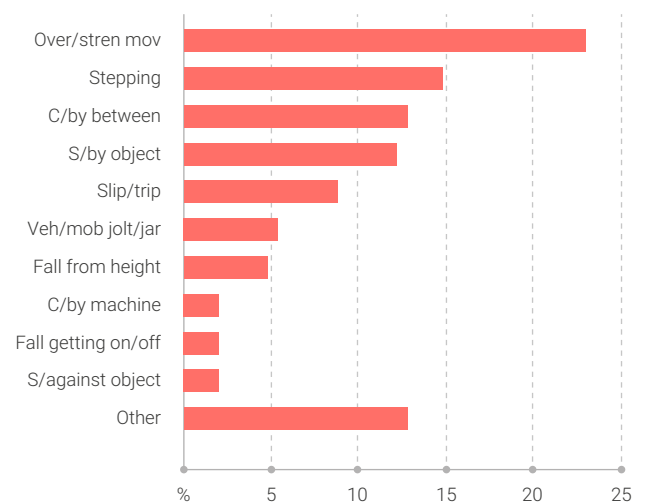
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

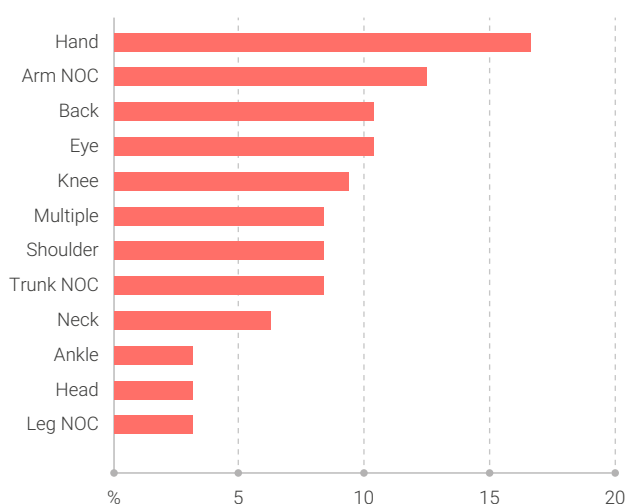


# APPENDIX I

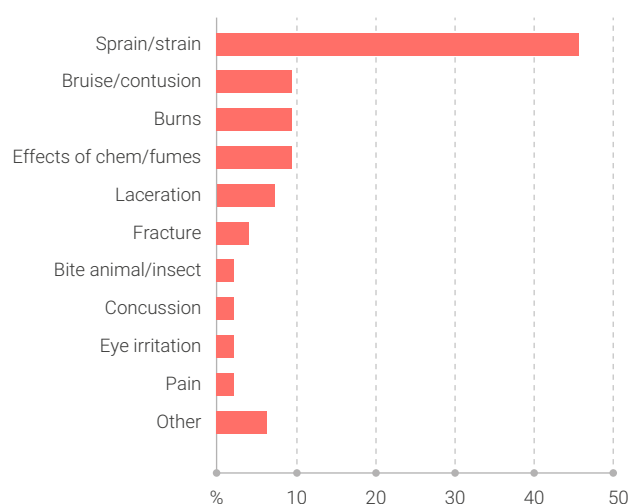
## BAUXITE AND ALUMINA INJURIES 2018-19

96 lost time injuries

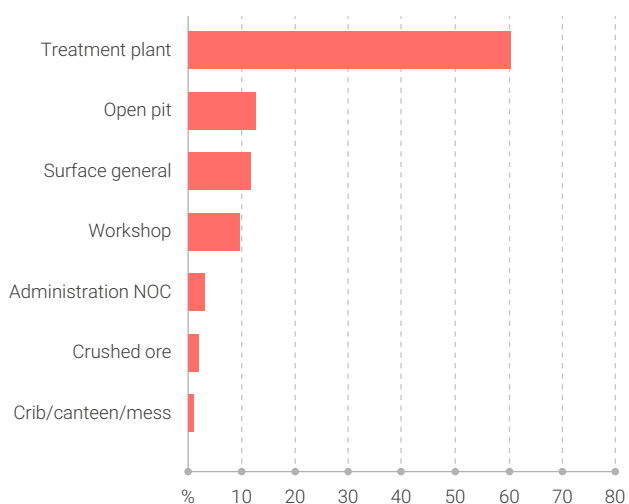
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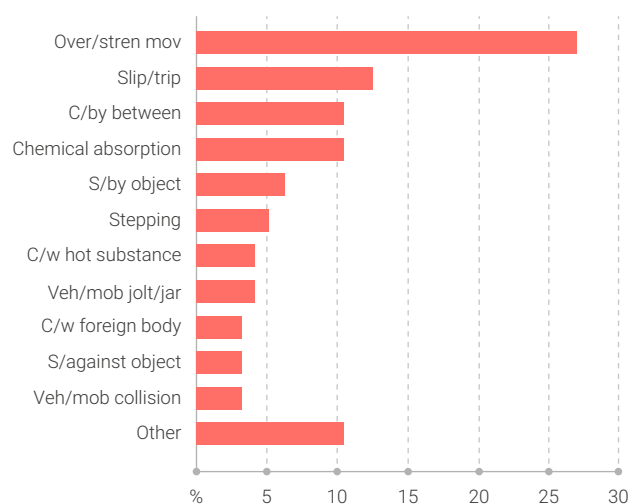
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT





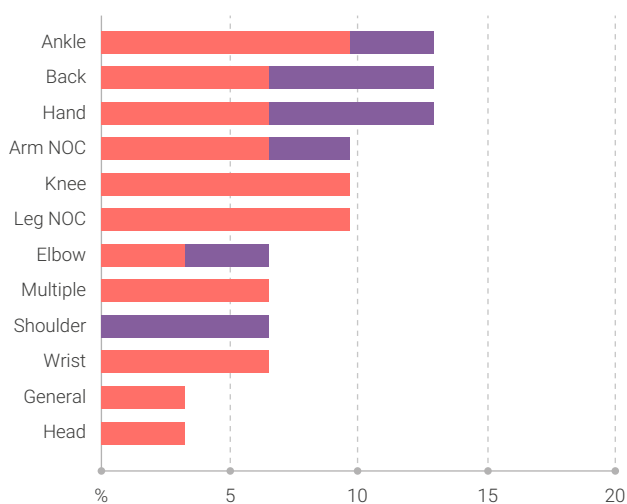
# APPENDIX J

## NICKEL INJURIES 2018-19

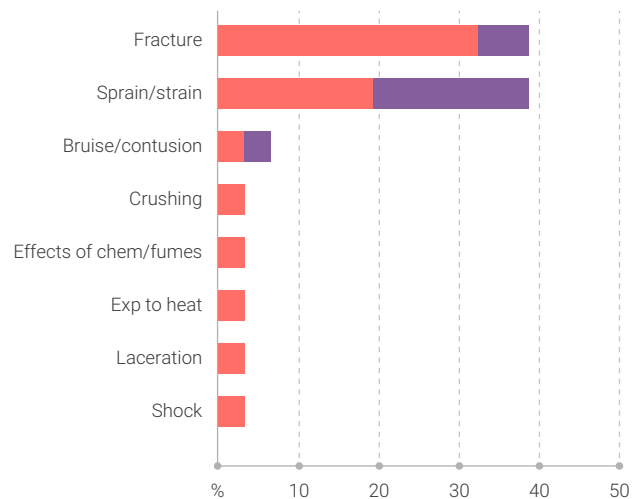
31 lost time injuries

Surface Underground

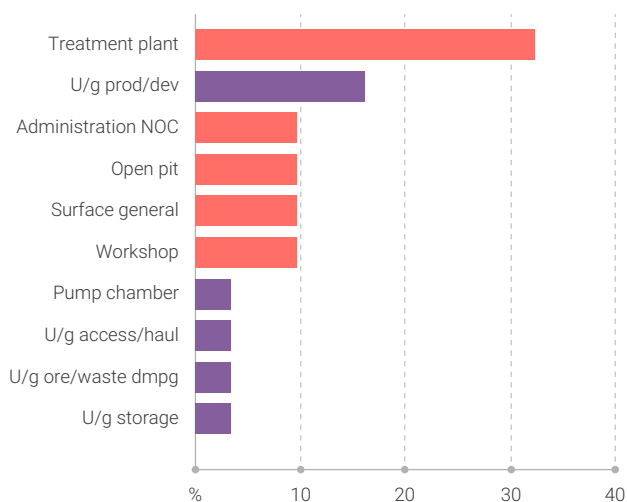
PART OF BODY



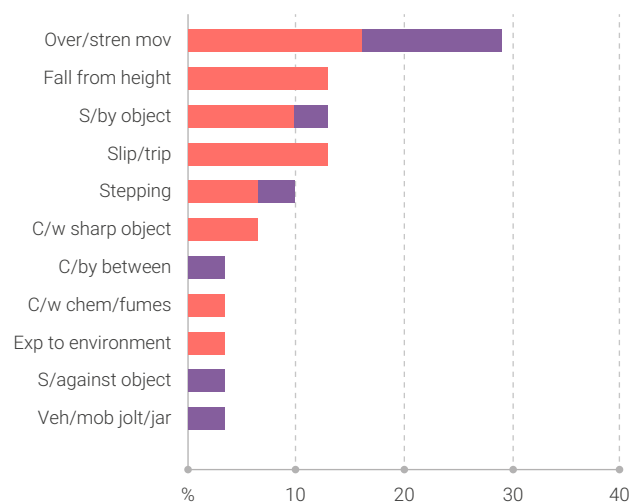
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

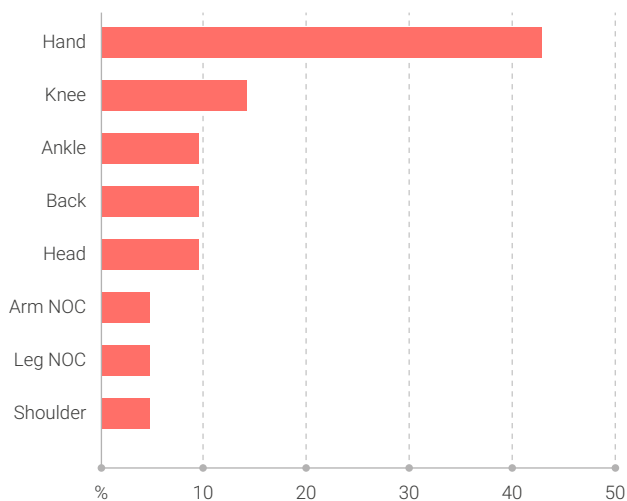


# APPENDIX K

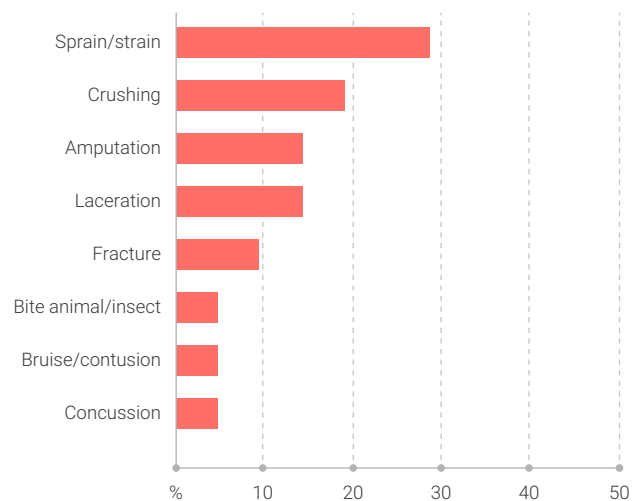
## EXPLORATION INJURIES 2018-19

21 lost time injuries

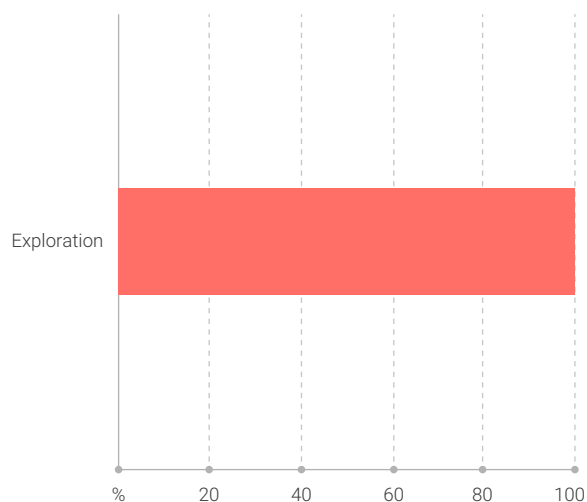
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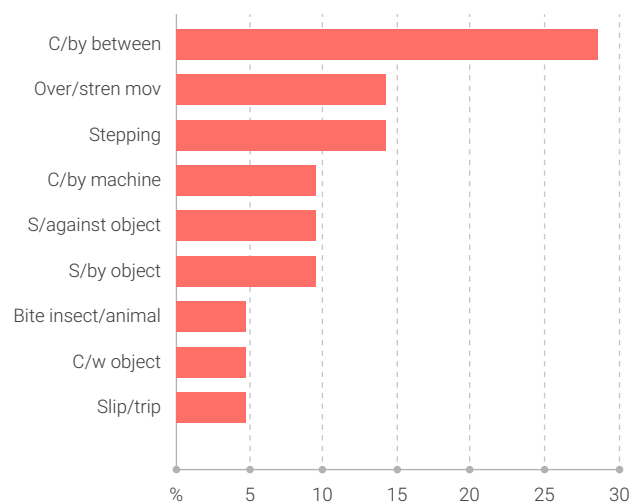
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

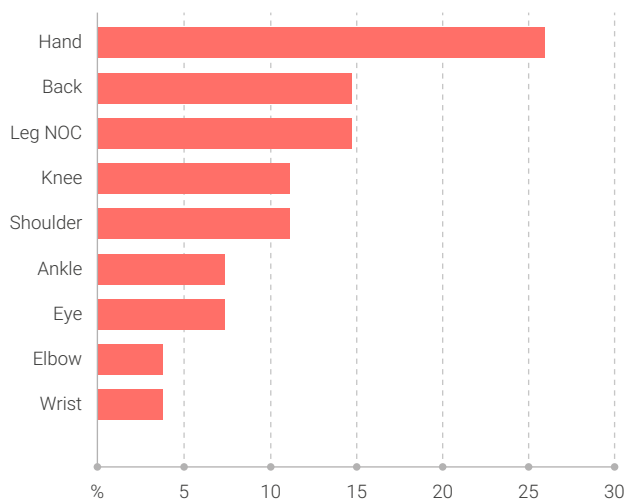


# APPENDIX L

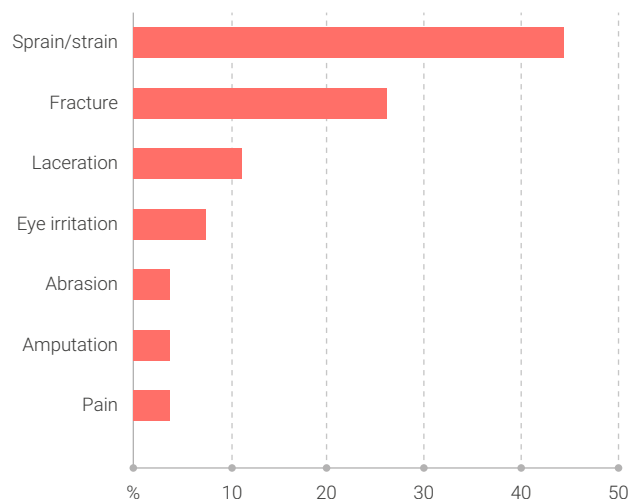
## EXPLORATION RESTRICTED WORK INJURIES 2018-19

27 restricted work injuries

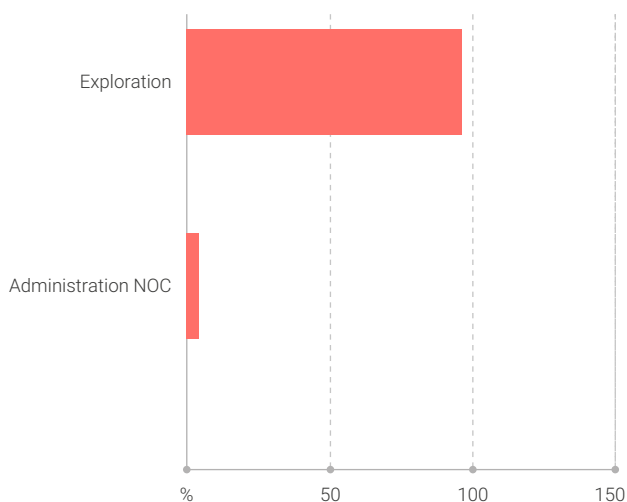
PART OF BODY



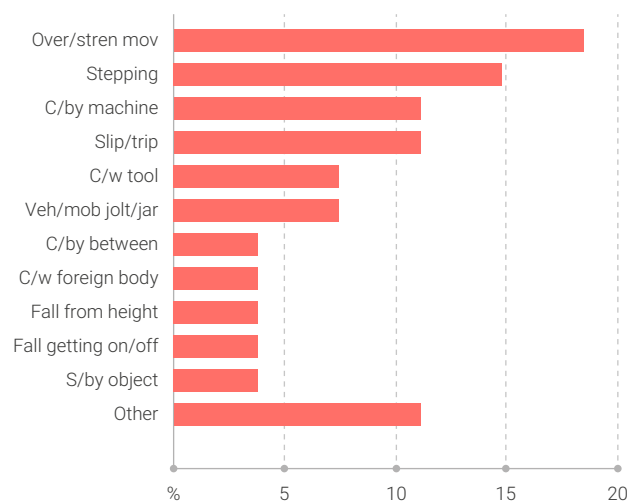
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

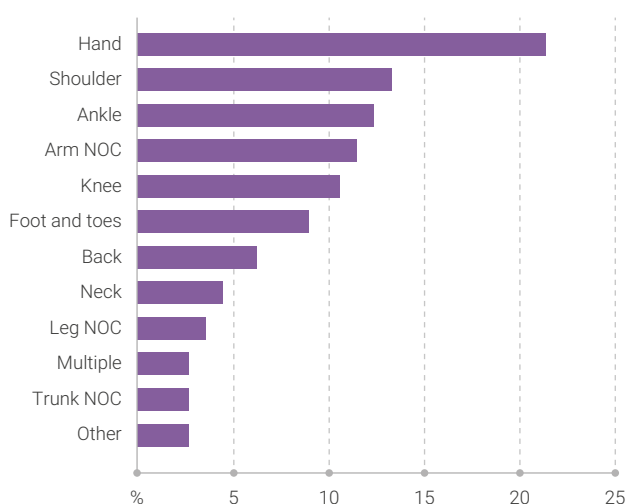


# APPENDIX M

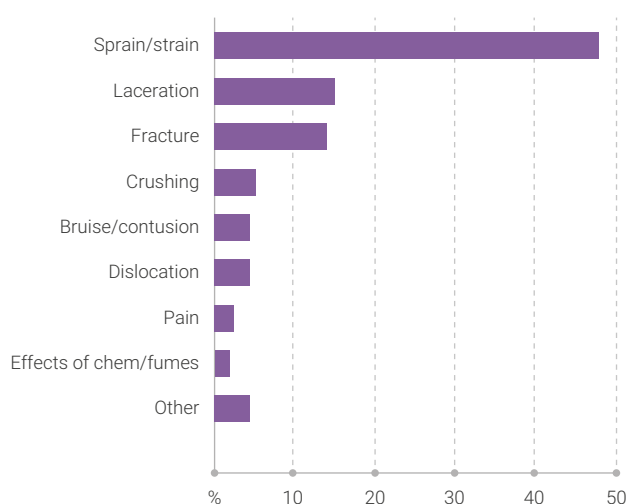
## RESTRICTED WORK INJURIES UNDERGROUND 2018-19

113 restricted work injuries

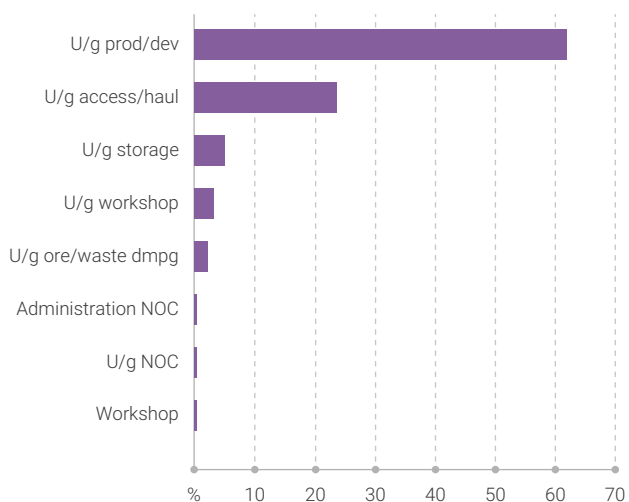
PART OF BODY



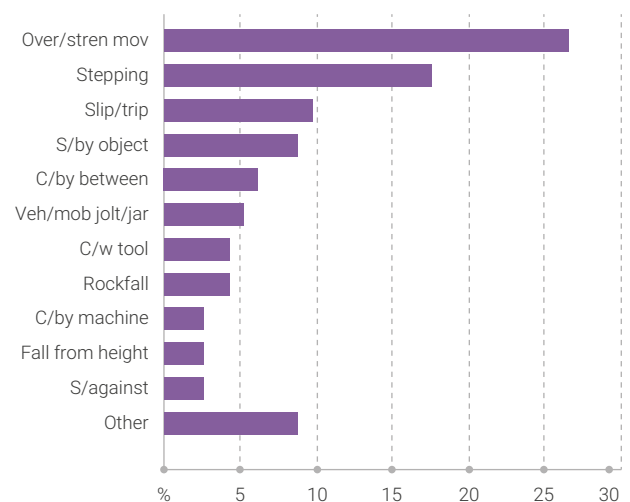
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

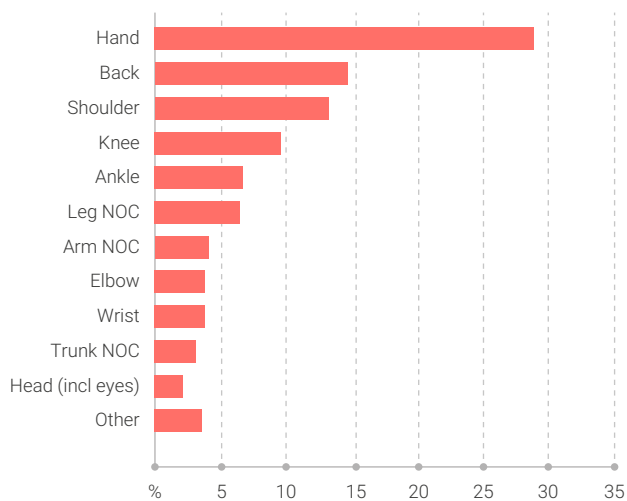


# APPENDIX N

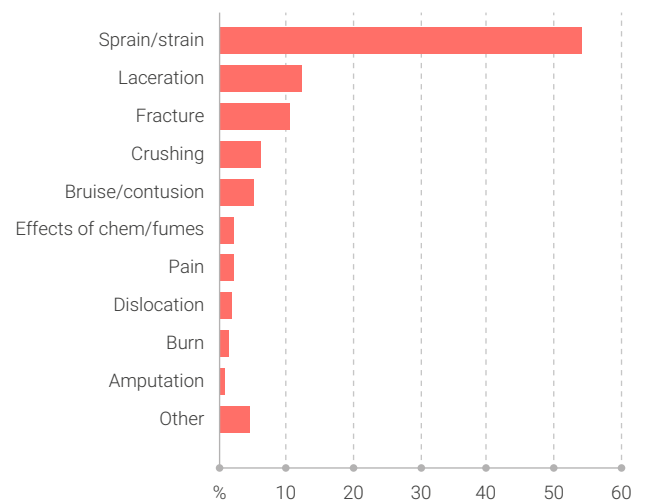
## RESTRICTED WORK INJURIES SURFACE 2018-19

722 restricted work injuries

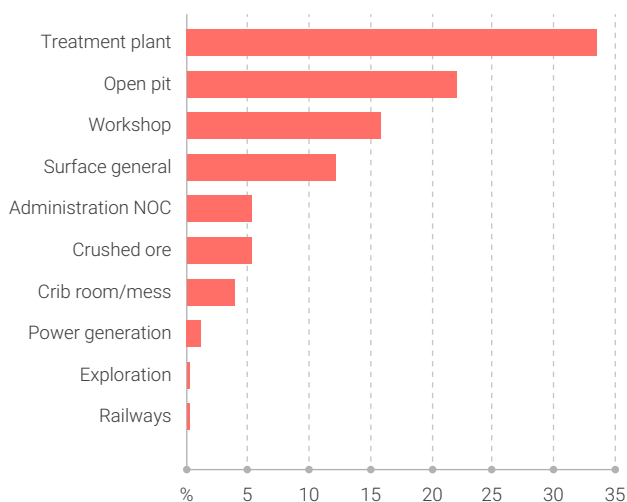
PART OF BODY



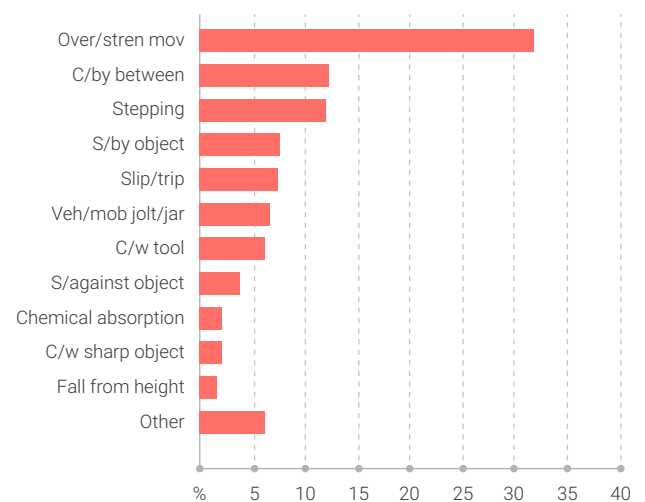
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT









Government of Western Australia  
Department of Mines, Industry Regulation and Safety

Department of Mines, Industry Regulation and Safety  
100 Plain Street  
EAST PERTH WA 6004

Telephone: 1800 SAFEMINE (1800 723 364)

NRS: 13 36 77

Email: [MinesSafety@dmirs.wa.gov.au](mailto:MinesSafety@dmirs.wa.gov.au)

Website: [www.dmirs.wa.gov.au](http://www.dmirs.wa.gov.au)