



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



SAFETY PERFORMANCE

IN THE WESTERN AUSTRALIAN MINERAL INDUSTRY

2017 - 18

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

ACCIDENT AND INJURY STATISTICS 2017-18

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STATISTICAL SUMMARY

MINING

- Three fatal mining accidents occurred during 2017-18, one each at a mineral sands operation, a coal operation and a construction material quarry.
- There were 353 lost time injuries (LTIs) during 2017-18, 36 less than in the previous year (389 lost time injuries in 2016-17).
- LTIs resulted in a total of 7,587 rostered days lost and a further 10,911 rostered days of restricted work in 2017-18.
- There was an average workforce of 112,021 in 2017-18, an increase of approximately 5% from the previous year's average of 106,590.
- The overall LTI duration rate deteriorated by approximately 4% during 2017-18, rising from 20.7 to 21.5.
- The overall LTI frequency rate improved by 15% during 2017-18, falling from 2.3 to 2.0.
- The overall injury index (days lost per million hours worked) improved by approximately 12%, falling from 47.4 in 2017-18 to 42.2 in 2017-18.
- Serious LTIs in mining during 2017-18 totalled 296, 17 less than in 2016-17, with the overall serious LTIFR improving 11% from 1.85 to 1.65.
- The iron ore sector LTIFR deteriorated by 33%, rising from 1.1 to 1.4 during 2017-18.
- The bauxite and alumina sector LTIFR improved by 30% during 2017-18, falling from 8.1 to 5.6.
- The gold sector LTIFR improved by 8% during 2017-18, falling from 2.1 to 1.9.
- The nickel sector LTIFR improved significantly, by 52%, during 2017-18, falling from 3.9 to 1.9.
- There were 853 restricted work injuries (RWIs) during 2017-18, a 19% deterioration on the previous year (718 RWIs reported in 2016-17)
- RWIs resulted in a total of 25,827 rostered days of restricted work in 2017-18
- The overall RWI frequency rate for 2017-18 deteriorated by 12% from 2016-17, rising from 4.2 to 4.7.

EXPLORATION

- There was one exploration fatality in 2017-18.
- There were 16 lost time injuries (LTIs) reported during 2017-18, 6 more than the previous year.
- LTIs resulted in a total of 205 rostered days lost and a further 451 rostered days of restricted work in 2017-18.
- There was an average workforce of 2,702 workers, an increase of 18% from the previous year's average.
- The overall LTIFR deteriorated by 33% in 2017-18, rising from 2.4 to 3.2. 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 24 restricted work injuries (RWIs) reported for exploration during 2017-18, resulting in an RWI frequency rate of 4.8, 42% higher than the 2016-17 rate of 3.4.
- RWIs resulted in a total of 282 rostered days of restricted work in 2017-18.



Surface:

103,072 employed

3 fatal injuries

325 lost time injuries

719 restricted work injuries



Underground:

8,949 employed

No fatal injuries

28 lost time injuries

132 restricted work injuries



Exploration:

2,702 employed

1 fatal injury

16 lost time injuries

24 restricted work injuries



INTRODUCTION

There were four fatalities in the 2017-18, one each at a mineral sands operation, a coal mining operation, a construction material quarry and an exploration operation.

A further 296 people in mining and 9 in exploration suffered from a serious lost time injury – an injury that disables a worker for two weeks or more. However, the overall mining injury frequency rate improved by 15% during 2017-18.

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 (DMIRS) continues to look at ways to increase awareness of safety issues 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, it is essential we use that data to improve our and industry's understanding.

This includes releasing two registers on the findings from DMIRS investigations into fatal mining accidents and serious injury and incidents in WA.

The *Hazard register for WA mining fatalities* and the *Hazard register for serious injury or other serious incident investigations in WA mining* include important details regarding the key hazards that contributed to those fatalities or incidents occurring, such

as occupations, work tasks, locations, and equipment or infrastructure involved. They also detail the root cause and any precautions or preventative measures that could have averted the incident.

While the registers are not intended to be the sole source of information for developing site-specific hazard registers, they can be a useful tool to check current risk registers and hazards. Sites may find something on the registers that have not been considered as a part of site's safety systems.

The Department has continued its commitment to target key focus areas identified in the *Towards 2020* regulatory strategy. *Towards 2020* is the Department's vision for a safe and healthy resources sector. Its purpose is to give stakeholders a clear understanding of the Department's focus on safety and health in the resources sector, going beyond the day-to-day inspectorate activities.

In 2017-18 there was an increased focus on how health and hygiene is managed within the WA mining industry. This includes the introduction of health and hygiene management plans (HHMPs), moving away from risk-based hygiene management plans (RBHMPs). To assist industry with this change, enhancements were made to the Safety Regulation System (SRS) to allow online submissions. Guidance has been developed to assist industry through this process. The Department is committed to working with industry to assist in

developing and implementing HHMPs across WA mining operations.

The mental health and wellbeing of workers within the WA mining industry will continue to be an area of focus for DMIRS. The Department is working with industry to develop guidance to address the potential hazards and risk factors in fly-in, fly-out (FIFO) workplaces. This includes the release of the *Mentally healthy workplaces for fly-in fly-out (FIFO) workers in the resources and construction sectors code of practice*. Development of additional resources, including webpages, videos and podcasts for both management and workers, is also underway to help raise the importance of developing mentally healthy workplaces.

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.

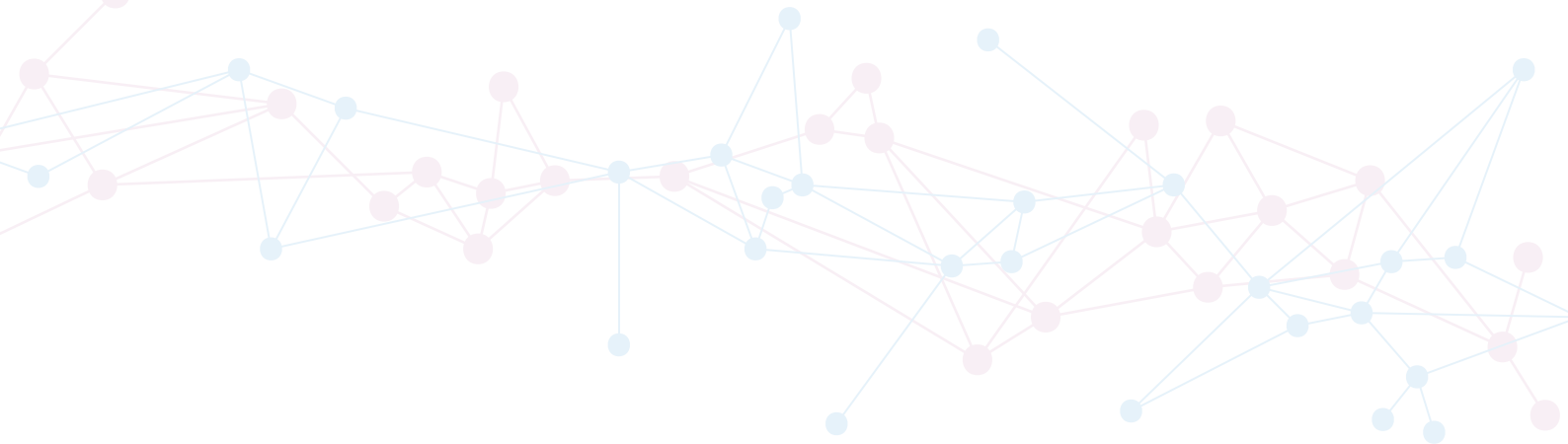
It is a commitment we need to make our highest priority because the costs of not doing so are far too high.

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.

Andrew Chaplyn
State Mining Engineer

31 March 2019

Visit www.dmirs.wa.gov.au for further information on the fatalities and serious injuries reports.



EXPLANATORY NOTES

Introduction

The statistics published in this annual compilation mainly relate to accidents between 1 July 2017 and 30 June 2018 (2017-18) 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 2017-18 has three components:

- i) Initial injuries — days lost in 2017-18 from injuries that occurred in 2017-18
- ii) Recurrent injuries — days lost in 2017-18 through recurrences of injuries that occurred in 2017-18 and previous years
- iii) Carry-over injuries — days lost in 2017-18 by persons continuously off work from injuries that occurred before 1 July 2017.

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 4, 8 and 10, an LTI performance indicator summary, and Appendices [M](#) and [N](#).

Restricted work injuries are covered in the statistical summary, the “Restricted work injuries” section and Appendices [N](#), [O](#) and [P](#).

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.

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 2017-18 received by the 18 January 2019. It will not reflect any data received or changed after this date.

During the twelve months covered by this compilation, 498 mining operations and 282 exploration companies reported to the Safety Regulation System (SRS). Of these, 25 mines and 41 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 2017-18

Mining

Richard Geoffery Luff, February 2018

Mr Luff, an 82 year old company director was found deceased at Onslow Quarry by WA police on Monday 19 February 2018. The police had been contacted by a family member to conduct a welfare check as Mr Luff had not called in to his office or family for a number of days. The mine was on care and maintenance.

There were no witnesses to the incident. The circumstantial evidence at the scene suggested that he had fallen from a service truck deck onto the ground. No cause of death has been formally determined at this time.

Glenn Morton, 13 March 2018

Glenn Morton, a 34 year old surveyor, was conducting field work at a mineral sand mining operation north of Perth on 27 February 2018 when he apparently suffered a severe allergic reaction following a bee sting.

Mr Morton was working alone and reported an emergency shortly after being stung and self-administered an EpiPen. He was found unconscious and unresponsive by co-workers responding to the emergency call. The site medic and St John's Ambulance were also called and first aid, including CPR and defibrillation, was administered. Mr Morton was airlifted to Royal Perth Hospital where he subsequently died.

Neville Bentley, 26 April 2018

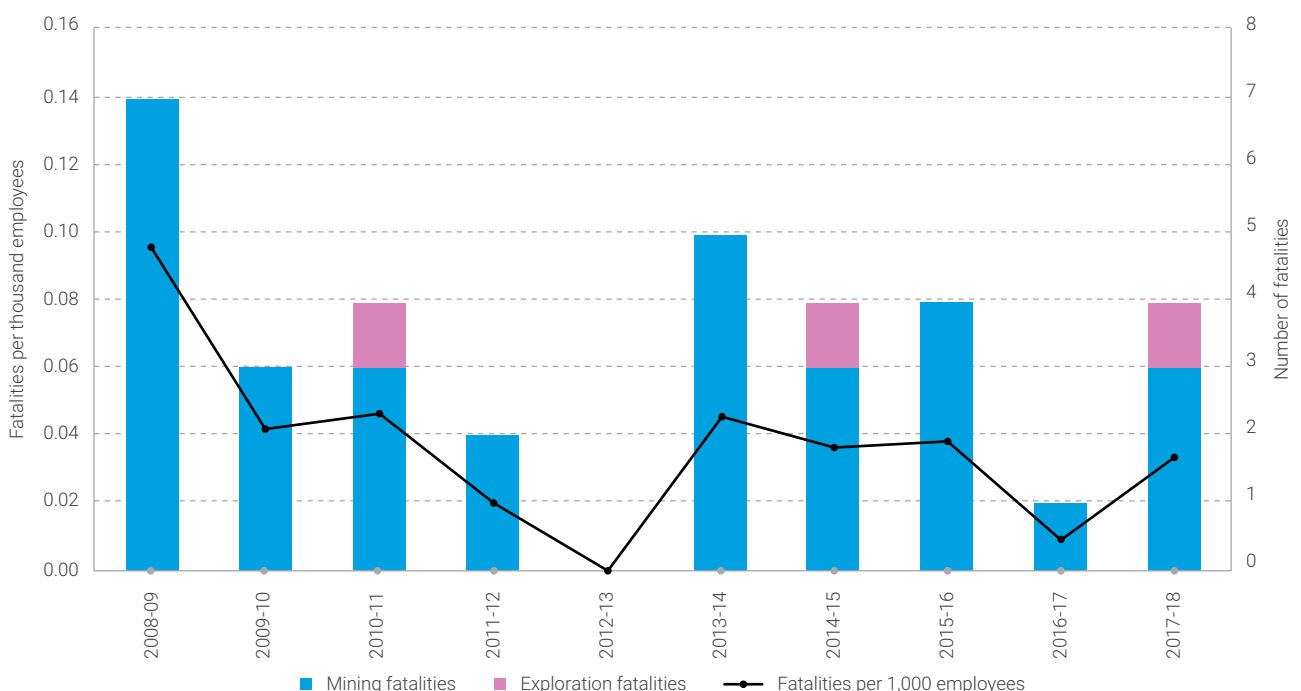
Neville Bentley, a 42 year old face shovel operator, died after being caught between the hydraulic access ladder and a hand rail when the ladder rotated. The face shovel had been loading a haul truck when it suddenly lost power. The pit face had collapsed, and overburden material had rilled against the side and rear of the shovel. This appears to have put tension on the pull-wire of the emergency shutdown switch, which is located next to the emergency access ladder pull-wire switch.

The deceased investigated the loss of engine power and it appears that he was attempting to reset the switch from the shovel walkway when the ladder activated.

Related safety alert

Significant Incident Report No. 261
Face shovel operator crushed between ladder and handrail – fatal accident

FIGURE 1 FATAL INJURY INCIDENCE RATE 2008-09 TO 2017-18



Exploration

Paul Fogarty, October 2017

Paul Fogarty, a 49 year old senior field technician, was conducting exploration reconnaissance activities on a remote tenement near Mt Windell when he collapsed, became unconscious and could not be resuscitated. Mr Fogarty had walked approximately 16 km both on that day and on the previous day, over rough terrain, in temperatures up to 37°C.

Mr Fogarty had complained of leg cramps at the end of the previous day, but reported he felt fine and well enough to conduct field work at the prestart on the day of the incident. The cause of death was determined to be the combined effects of dehydration and renal failure.

Related safety alert

[Significant Incident Report No. 257](#)
Field technician collapses during exploration activities – fatal accident

Fatal injury incidence rate 2008-09 to 2017-18

There were four fatal accidents in the Western Australian mineral industry during 2017-18. Three occurred on mining operations and one occurred on an exploration lease. This resulted in a fatal injury incidence rate (per thousand employees) for 2017-18 of 0.035.

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 0.10 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 2013-14 to 2017-18

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 3.6 times higher than the fatal injury incidence rate for surface operations.

Fatal accidents by type of accident 2013-14 to 2017-18

Table 2 indicates the type of accidents for the 18 fatalities in the mining industry (including exploration) over the past five years, with four underground, twelve at surface operations and two in exploration.

The three types of underground fatal accident which occurred during the past five years were rockfall

(two fatalities), caught by machine (one fatality) and exposure to environmental heat (one fatality).

Of the eight types of surface fatal accident occurring in the past five years the most common was struck by object (three fatalities), followed by caught by or between objects and fall from height (two fatalities each) then caught by machine, insect sting, struck by vehicle or mobile equipment and vehicle or mobile plant rollover (one fatality each). One fatality remains with the cause of death not yet determined.

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 2013-14 TO 2017-18

Category		Fatalities per thousand employees
Mineral	Coal	0.201
	Construction materials	0.109
	Heavy mineral sands	0.086
	Base metals	0.081
	Gold	0.059
	Bauxite and alumina	0.056
	Iron ore	0.011
Underground		0.102
Surface		0.028
Exploration		0.172

TABLE 2 NUMBER OF FATALITIES BY TYPE OF ACCIDENT 2013-14 TO 2017-18

Category		Number of fatalities
Underground	Rockfall	2
	Caught by machine	1
	Exposure to environmental heat	1
Surface	Struck by object	3
	Caught by or between objects	2
	Fall from height	2
	Caught by machine	1
	Sting from insect	1
	Struck by vehicle or mobile plant	1
	Vehicle or mobile plant rollover	1
	Not yet determined	1
Exploration	Struck by object	1
	Exposure to environmental heat	1
Total		18

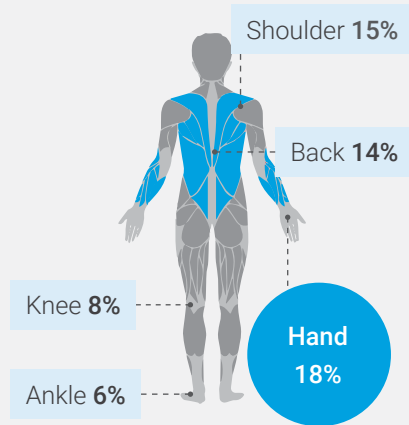
SERIOUS INJURIES 2013-14 TO 2017-18

Injuries by severity



294 of the 353 LTIs were classified as serious

Part of body (top 5)



Hand injury (top 4)

Caught by between 44%



Contact with tool 13%

Caught by machine 7%

Contact with sharp object 7%

SERIOUS INJURIES

Review of serious injuries during 2017-18

There were 296 serious lost time injuries reported in the WA mining industry during 2017-18 (318 in 2016-17). Of these, 284 were in metalliferous mines and 12 were in coal mines. There were a further 9 serious lost time injuries reported for exploration (10 in 2016-17).

Some examples of serious injuries in 2017-18

Worker and basket fall from integrated tool carrier

An operator was in the basket of an integrated tool carrier being used to lift a vent bag in the drive of an underground mine, when the basket came off and fell to the ground. The operator sustained an ankle injury. The scene was secured and the operator was taken to the regional hospital by the Royal Flying Doctor Service.

Struck by cage falling from forklift

A delivery truck driver was assisting a forklift operator to unload a truck at a store yard of a mine site. As the

forklift removed a cage of goods from the truck, the load shifted on the forks, falling off to the side and striking the truck driver, injuring his forehead.

Hit by passing truck

The driver of a truck stopped the vehicle in a parking bay on the left-hand side of the road at a site boom gate. The truck driver exited the cab while talking on the phone with headphones in, and made contact with the first trailer of a passing road train. The road train driver stopped to assist and sought help from gatehouse personnel. The truck driver was treated on site by the emergency response team before being transferred to hospital. He was diagnosed with a fractured toe and bruising of the upper arm.

Hand caught in auger

Two workers were unblocking a surface-based slurry cement line at an underground mine. During the operation, a fault light was noticed on the plant control panel. The machinery was stopped and the fault rectified. To test the system, the motorised auger

was restarted. Upon restart, one of the workers still had his arm reaching into the auger and sustained an injury to his hand. He was taken to the regional hospital for assessment and then flown to Perth for further treatment.

Fingertip amputated

A fitter was performing maintenance on an air compressor on the back of a service truck on the light vehicle workshop maintenance apron. To drop the engine mount, the fitter removed the side mount top nut at the rear of the compressor. He then used a pry bar to lift the engine slightly to gain visual access to the lower stud. The engine slipped and the fitter's finger was caught between the upper and lower engine mount brackets, amputating the tip of the finger. The fitter's second in command, who was also the emergency response team captain, dressed the wound and the fitter was flown to Perth where the tip of his finger was successfully re-attached.

Truck wheel falls on fitter's leg

A fitter was preparing to fit a wheel and tyre assembly to a road train at a surface workshop. The wheel was propped up against a shipping container. As the fitter manually righted the wheel to move it, he lost his footing and the wheel toppled over, falling onto his leg. The wheel was lifted off the fitter and first aid administered on the scene. The fitter was transported to the medical centre for assessment of an injured knee before being released on restricted duties.

Ore release knocks down worker

Due to extreme rain fall, four mill circuit bins released saturated material into the transfer chutes at a refinery, bogging them out and causing the inspection hatches to open in an uncontrolled manner. A process operator in the vicinity was knocked off their feet and into an adjacent structure. The process operator received a fractured scapula.

Hit in face by shifting spanner

Two heavy diesel fitters were fixing an oil leak on a loader at an open pit. One of the fitters used a 15" shifter to undo two leaking hoses. As he was undoing the second hose, it released under pressure. He lost his grip on the shifter and it hit his safety glasses, causing an eye injury. The fitter was taken to the site medic for first aid before being sent to the regional hospital, and then on to Perth to treat a corneal tear.

Pothole jars forklift driver's back

A forklift operator felt a sharp jarring pain in his lower back when the machine hit an unseen pothole at an open pit. The injury resulted in long-term restricted duties.

Finger trapped by lifting chain

During maintenance at an open pit, a fitter was moving a lift drive when his finger got caught between the lifting chain and the motor drive. The fitter received a crush injury requiring the tip of his finger to be amputated.

Arm caught in conveyor

A fixed plant operator was working in the sample station at a port facility when his hand and arm became entangled in the sample conveyor belt. The belt was running at the time, causing crush injuries to his arm and hand.

Spider bite inside glove

A mechanic was conducting maintenance at an open pit truck breakdown workshop when he felt a prick on the back of his hand. When the mechanic took his gloves off at the end of the job, he saw his hand was swollen. He was taken to the regional hospital and was diagnosed with a spider bite. The wound required the affected skin to be removed and four to six weeks to heal.

Valve blows out of gas cylinder

A driller was working in the mouth of a sea container on the drill laydown yard, preparing to use oxy/acetylene to cut out inserts. When he reached for the G-size oxygen cylinder to turn on the valve, the valve blew out from the cylinder, injuring his hand. The rapid release of oxygen caused rubber hoses hanging from the sea container's door to ignite. Two dry chemical powder extinguishers were used to put out the fire. The cause of the cylinder valve failure was unknown.

Ankle rolled on loose stone

At an open pit, a worker was walking along an area of shot when he stepped on a loose rock and rolled his ankle. While discomfort was mild and there was no swelling, ultrasound examination identified a ligament tear and inflammation of the achilles tendon.

Dropped tool leads to eye injury

Two workers were replacing a chisel component on a rock breaker when one of them dropped a hammer. While picking the hammer up off the floor, the worker's head made contact with the chisel, causing a laceration to the eye area. The worker was taken to the site medic for treatment before being transported to hospital. A doctor

recommended further scans and the worker was transferred to Perth to see a specialist. The scans revealed a foreign body behind the eye.

Fall stepping over trailer draw bar

A worker was stepping over the draw bar of a lighting tower at a mine site when his trousers became caught on the jockey wheel, causing him to fall. He attempted to grasp the back of a light vehicle before falling to the ground, landing on his right shoulder. The worker sustained a sprain injury to his shoulder.

Fingers crushed by reverse circulation drill hammer

A driller's offsider received a crush injury while breaking down a reverse circulation drill hammer assembly. While removing the sleeve from the breakout tool, the offsider's hand was caught between the RC hammer sleeve and the bottom clamp of the breakout tool assembly. The offsider sustained a crush injury to three fingers on the right hand.

Scraper operator suffers back pain

After operating a scraper for about three hours towards the end of his shift, the operator noticed a gradual onset of mid to lower back pain after his shift ended, caused by excess movement in the scraper's seat base.

Wrist sprain from repeated lifting

After a shift of strenuous manual handling involving repeated lifting, carrying and placing of heavy objects at a processing plant, a worker experienced a sprained wrist. He was treated at the onsite medical facility.

Steering ram amputates finger tip

A fitter was repairing a water cart in the heavy vehicle workshop of an open pit. As he was aligning the steering ram, the component dropped into place and amputated the tip of his finger. A co-worker raised the emergency and first aid was applied. The fitter was taken to the local hospital, then flown to Perth for treatment. An investigation was initiated.

SERIOUS INJURIES CONTINUED

Serious injury incidence rate by mineral mined 2013-14 to 2017-18

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 (4.0) was 29% higher than that for surface operations (3.1).

Of the major mining sectors, coal had the highest five-year average serious injury incidence rate (12.3), followed by bauxite-alumina at 8.2. The mining sector referred to as "Other", with a five-year average serious injury incidence rate of 4.9, contained 3% of the total number of employees spread over 21 small commodity groups.

Serious injury frequency rate 2013-14 to 2017-18

Figure 3 shows that over the five years since 2013-14 the total mining serious injury frequency rate has improved from 2.0 to 1.6.

The rate for surface metalliferous mining fell from 1.9 to 1.6 and the rate for underground metalliferous mining fell from 2.3 to 1.0.

The serious injury frequency rate for coal rose from 7.7 to 8.0.

FIGURE 2 SERIOUS INJURY INCIDENCE RATE 2013-14 TO 2017-18

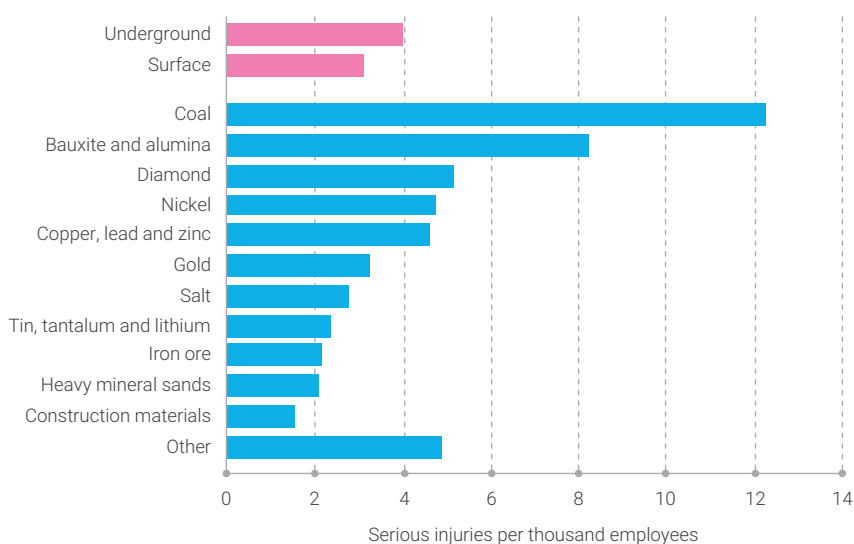
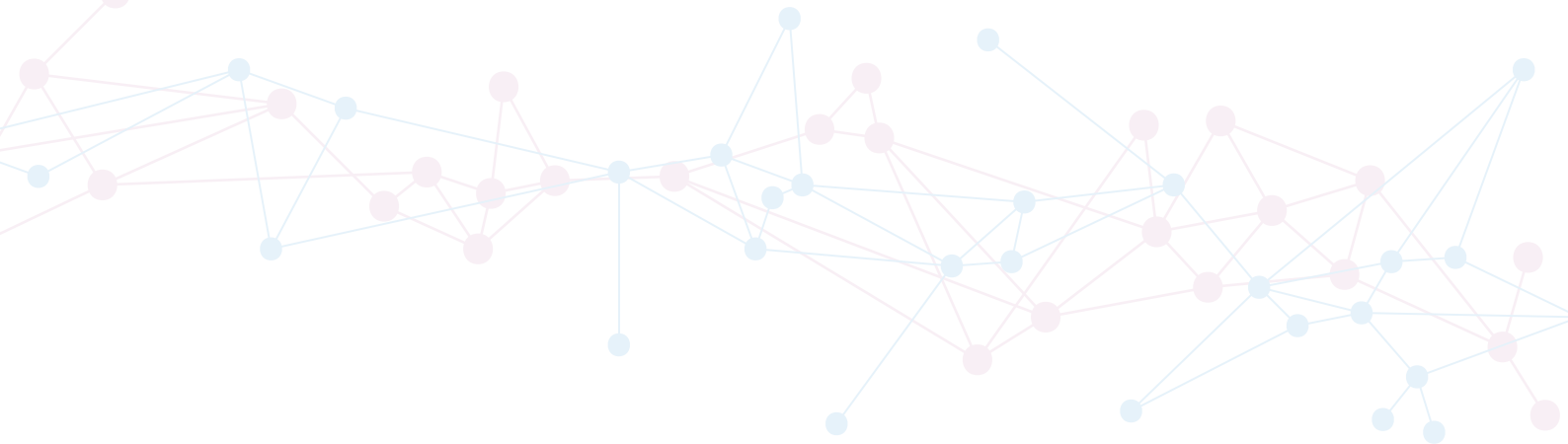


FIGURE 3 SERIOUS INJURY FREQUENCY RATES 2013-14 TO 2017-18





Serious injury percentage breakdown for 2017-18

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:** Injuries to backs and knees each made up the largest proportion of serious injuries at 17%, followed by injuries to arm NOC (Not otherwise classified), hand, leg NOC and shoulder, each at 11%. In total, 33% of serious injuries were to legs, 28% were to arms (including shoulders) and 17% were to backs.
- **Surface:** Injuries to hands accounted for the largest proportion of serious injuries at 19%, followed by shoulder injuries at 15%, back injuries at 13% and knee injuries at 8%. In total, 29% of serious injuries were to arms (including shoulders), 24% were to legs and 20% were to hands.

Injuries by nature

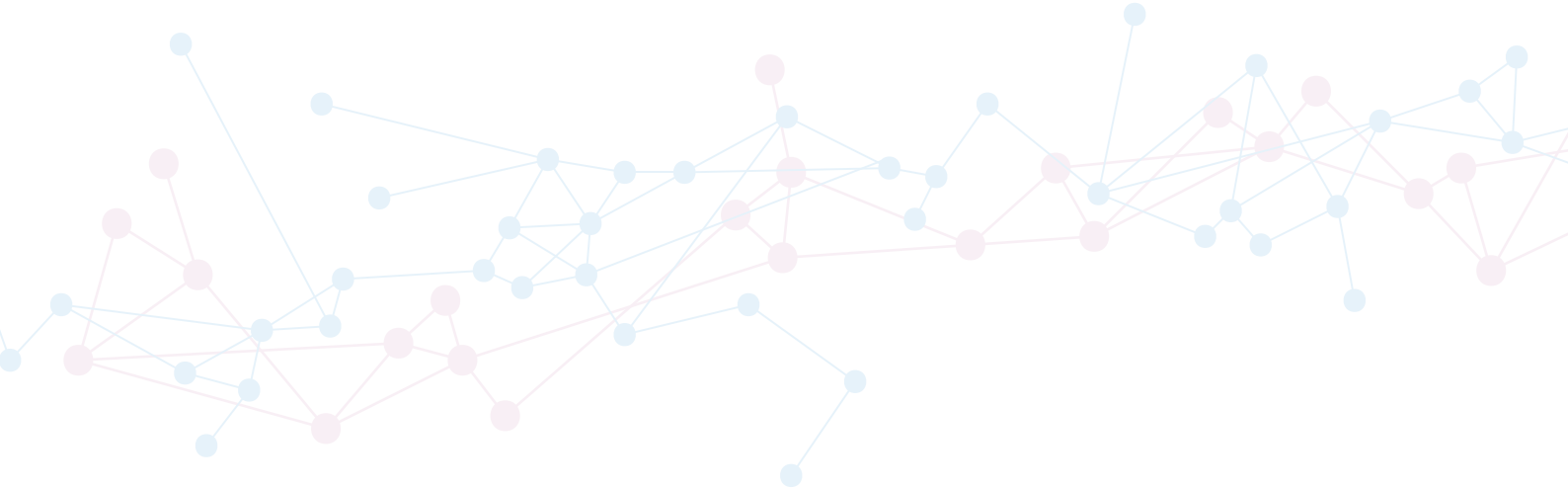
- **Underground:** Sprain or strain represented the highest proportion by nature of injury (44%), followed by fracture (17%) and laceration (11%).
- **Surface:** Sprain or strain represented the highest proportion by nature of injury (48%). Fracture was the next highest (17%), followed by laceration at 8% and crushing at 5%.

Injuries by location

- **Underground:** The largest proportion of serious injuries underground was in production and development areas (72%), followed by underground access and haulage ways (22%) then underground storage (6%).
- **Surface:** The largest proportion of serious injuries on the surface occurred in treatment plants (38%), followed by open pits at 23%, then general surface areas and workshops, each at 13%.

Injuries by type of accident

- **Underground:** The most common accident type associated with serious injuries underground was over-exertion or strenuous movements at 28%, followed by stepping at 17% then falls getting on or off vehicles or mobile equipment and rockfalls, both at 11%.
- **Surface:** The most common accident type associated with serious injuries on the surface was over-exertion or strenuous movements (28%), followed by stepping (12%) and caught by or between objects (10%).



LOST TIME INJURIES

Review of lost time injuries during 2017-18

In 2017-18, 14,242 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 2017-18 (7,587), recurrences of injuries sustained before 2017-18 and in 2017-18 (443), and LTIs and recurrences carried over into

2017-18 from accidents before July 2017 (6,212). A breakdown of work days lost in coal and metalliferous mining is given in Table 3.

During 2017-18, there were 353 LTIs in the State's mining industry. Of those, 341 were in metalliferous mines, 12 in coal mines and 16 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 19 recurrences of previous injuries, resulting in 443 work days lost in 2017-18. A breakdown of recurrent injuries by calendar year of initial injury is given in Table 6.

Ninety-six people, who were still off work from injuries received before July 2017, lost 6,212 work days in 2017-18. A breakdown of these carry-over injuries is given in Table 7.

TABLE 3 DAYS LOST THROUGH INJURY DURING 2017-18

Mines	Days lost			
	Initial injuries	Recurrent injuries	Carry-over injuries	Total
Metalliferous	7,187	414	5,818	13,419
Coal	400	29	394	823
Total mining	7,587	443	6,212	14,242

TABLE 4 INITIAL LOST TIME INJURIES DURING 2017-18

Sector	No. of employees	No. of LTIs	Incidence rate	Frequency rate	Duration rate	Injury index	Days lost
Metalliferous surface	101,919	313	3.1	1.9	21.5	42	6,728
Metalliferous underground	8,949	28	3.1	1.9	16.4	26	459
Metalliferous total	110,868	341	3.1	1.9	21.1	40	7,187
Coal total	1,153	12	10.4	8.0	33.3	265	400
Total mining	112,021	353	3.2	2.0	21.5	42	7,587
Exploration	2,702	16	5.9	3.2	12.8	41	205

TABLE 5 LOST TIME INJURIES BY MINERAL MINED DURING 2017-18

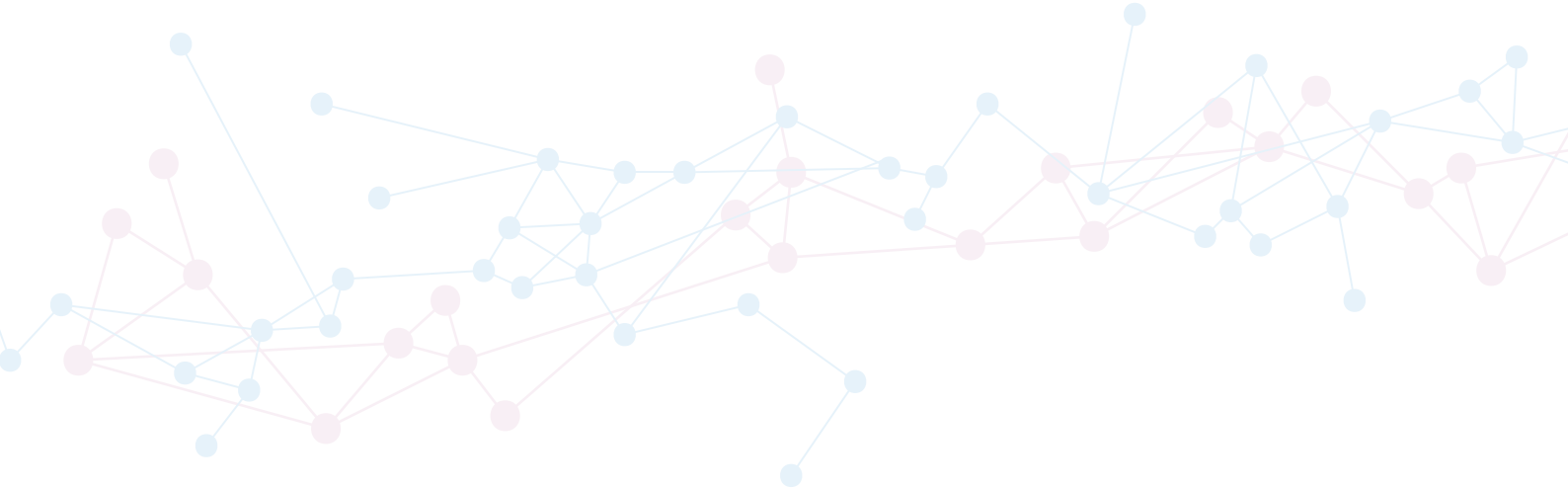
Mineral mined	No. of employees	No. of LTIs	Incidence rate	Frequency rate	Duration rate	Injury index	Days lost
Iron ore	53,712	119	2.2	1.4	24.2	34	2,885
Gold	29,273	91	3.1	1.9	20.0	38	1,822
Bauxite and alumina	6,850	74	10.8	5.7	15.2	87	1,125
Nickel	5,474	21	3.8	1.9	29.6	56	621
Construction materials	2,622	2	0.8	1.3	50.0	65	100
Base metals	2,548	5	2.0	1.2	35.2	41	176
Tin, tantalum and lithium	2,471	4	1.6	0.6	28.8	17	115
Mineral sands	2,311	6	2.6	2.0	5.7	11	34
Coal	1,153	12	10.4	8.0	33.3	265	400
Salt	978	3	3.1	2.6	13.7	36	41
Diamonds	824	2	2.4	1.3	2.0	3	4
Other	3,805	14	3.7	3.3	18.9	62	264
Total mining	112,021	353	3.2	2.0	21.5	42	7,587

Note: Duration in Tables 4 and 5 does not take into consideration time lost after 30 June 2018 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 2017.

TABLE 6 RECURRENT LOST TIME INJURIES DURING 2017-18

Year	Metalliferous mining		Coal mining		Total mining	
	No. of injuries	Days lost	No. of injuries	Days lost	No. of injuries	Days lost
2017-18	7	219	1	29	8	248
2016-17	6	190	0		6	190
2012-13	1	1	0		1	1
1997-98	1	4	0		1	4
Total	15	414	1	29	16	443

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 2017-18

Year	Metalliferous mines		Coal mines		Total mining	
	No. of injuries	Days lost	No. of injuries	Days lost	No. of injuries	Days lost
2016-17	80	5,030	2	194	82	5,224
2015-16	12	967	3	200	15	1,167
2013-14	1	60	0		1	60
Total	93	6,057	5	394	98	6,451

Review of lost time injuries during 2017-18 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.

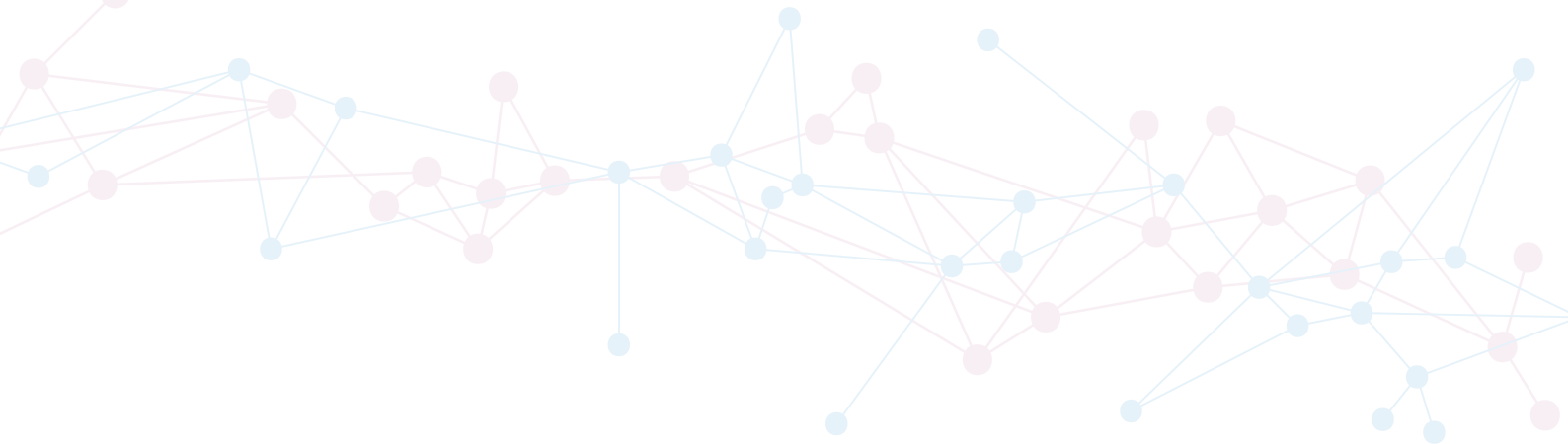


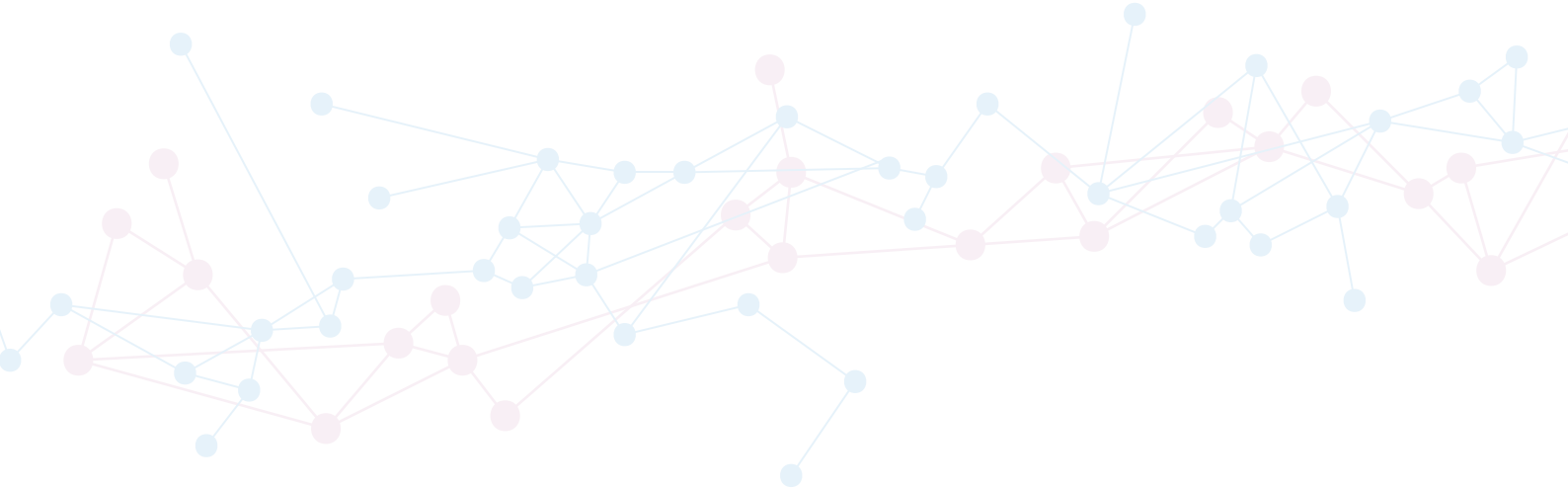
TABLE 8 INITIAL LOST TIME INJURIES DURING 2017-18 (AS 1885.1:1990)

Sector	No. of employees	No. of LTIs	Injuries per hundred	Frequency rate	Duration rate	Days lost
Metalliferous surface	101,919	315	0.31	2.0	22.8	7,168
Metalliferous underground	8,949	28	0.31	1.6	16.4	459
Metalliferous total	110,868	343	0.31	1.9	22.2	7627
Coal total	1,153	13	1.13	8.6	47.7	620
Total mining	112,021	356	0.32	2.0	23.2	8,247
Exploration	2,702	17	0.63	3.4	25.0	425

Note: Duration in Tables 8 and 9 does not take into consideration time lost after 30 June 2018 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 2017.

TABLE 9 LOST TIME INJURIES BY MINERAL MINED DURING 2017-18 (AS 1885.1:1990)

Mineral mined	No. of employees	No. of LTIs	Injuries per hundred	Frequency rate	Duration rate	Days lost
Iron ore	53,712	119	0.22	1.4	24.2	2,885
Gold	29,273	91	0.31	1.9	20.0	1,822
Bauxite and alumina	6,850	74	1.08	5.7	15.2	1,125
Nickel	5,474	21	0.38	1.9	29.6	621
Construction materials	2,622	3	0.11	2.0	106.7	320
Base metals	2,548	5	0.20	1.2	35.2	176
Tin, tantalum and lithium	2,471	4	0.16	0.6	28.8	115
Mineral sands	2,311	7	0.30	2.3	36.3	254
Coal	1,153	13	1.13	8.6	47.7	620
Salt	978	3	0.31	2.6	13.7	41
Diamonds	824	2	0.24	1.3	2.0	4
Other	3,805	14	0.37	3.3	18.9	264
Total mining	112,021	356	0.32	2.0	23.2	8,247



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

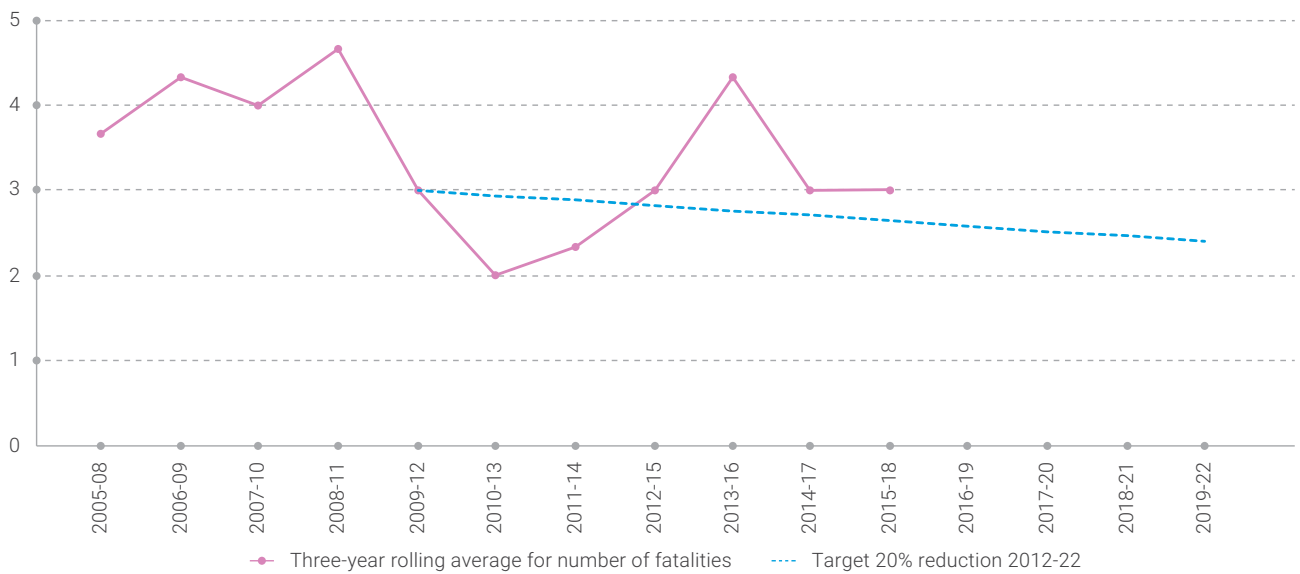


FIGURE 5 MINING AND EXPLORATION INJURIES OF DURATION ONE WEEK OR MORE PER 1,000 EMPLOYEES (INCIDENCE RATE)

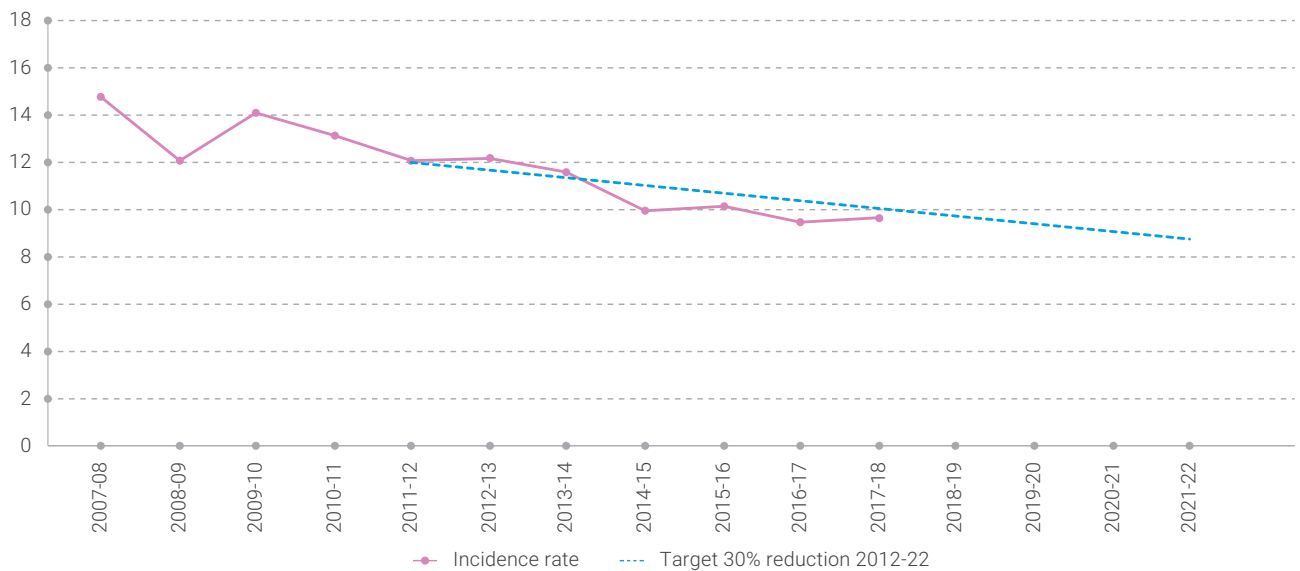
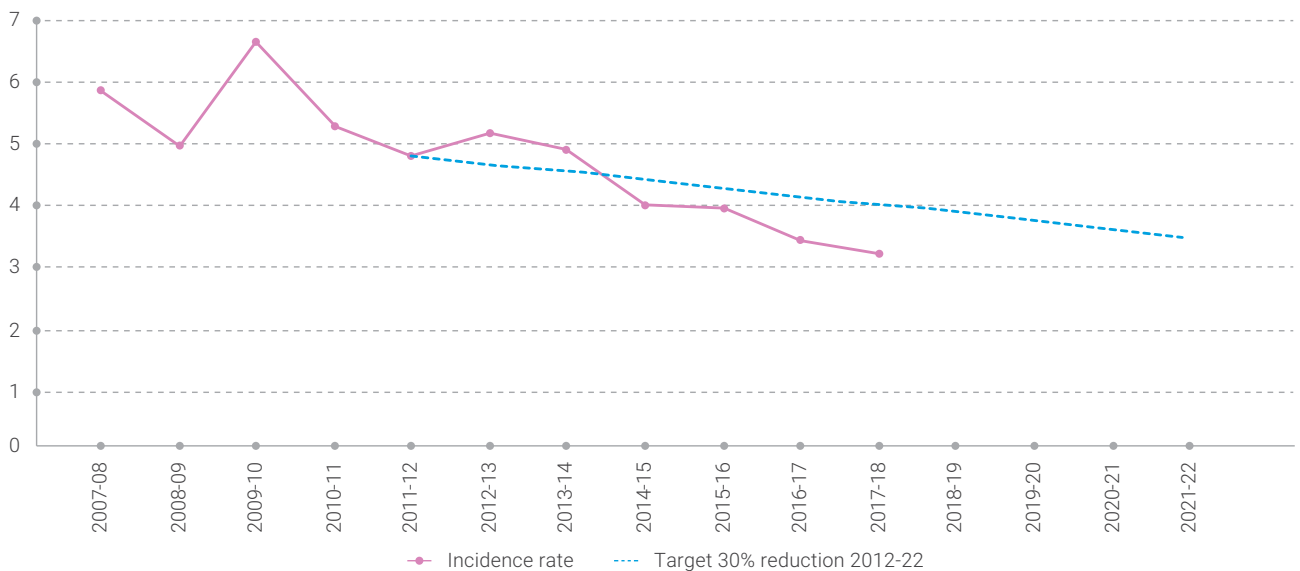
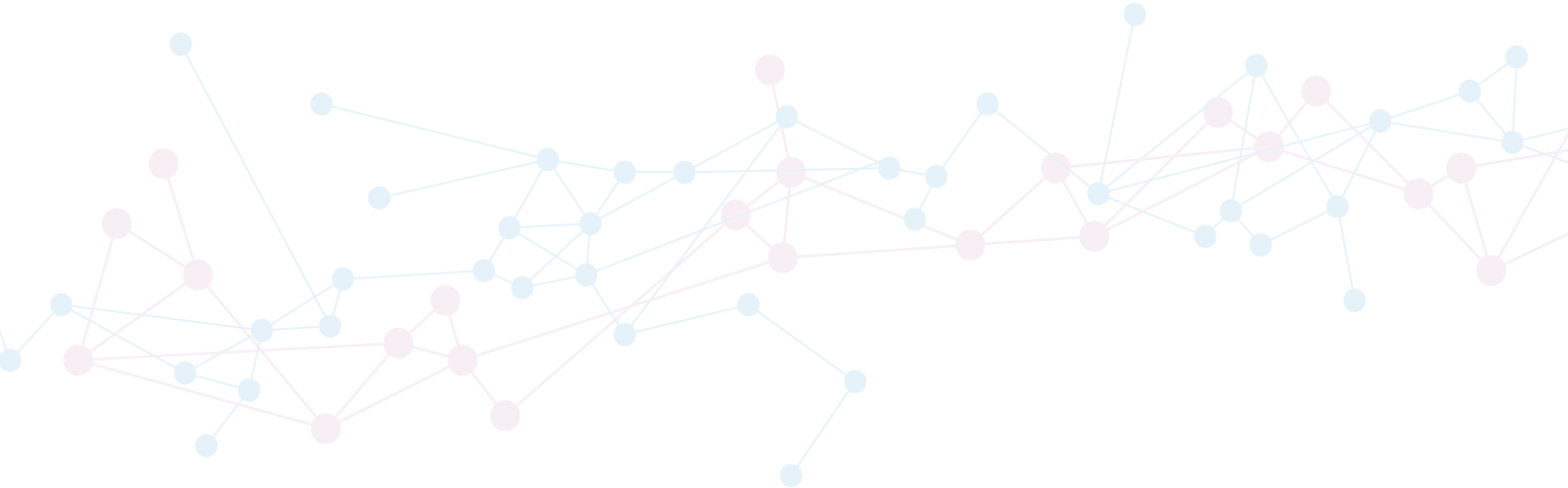


FIGURE 6 MUSCULOSKELETAL INCIDENCE RATE (DURATION ONE WEEK OR MORE)





LOST TIME INJURIES BY COMMODITIES

Metalliferous performance indicators

The performance indicators for the metalliferous mining sector show decreasing rates of injuries occurring in 2017-18, although with a higher average days lost per injury. 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 2017-18 are summarised below.

- The overall incidence rate improved by 14%, falling from 3.6 to 3.1. The surface incidence rate improved by 9% (from 3.4 to 3.1), while the underground incidence rate improved by 44% (from 5.5 to 3.1).
- The overall frequency rate improved by 14%, falling from 2.2 to 1.9. The surface frequency rate improved by 14%, falling from 2.2 to 1.9, while the underground frequency rate improved by 45% (from 2.9 to 1.6).
- The overall duration rate deteriorated by 7%, rising from 20.7 to 22.2. The surface duration rate deteriorated by 10%, rising from 20.8 to 22.8. The underground duration rate improved by 19 % (falling from 20.3 to 16.4).
- The fall in the frequency rate combined with a rise in the duration rate resulted in the overall injury index improving by 9%, from 46 to 42. The surface injury index improved by 2% (from 45 to 44), while the underground injury index improved by 55% (from 58 to 26).

Metalliferous injury percentage breakdown for 2017-18

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.

Injuries by part of body

- **Underground:** Injuries to head and neck, each at 14%, were the most frequently occurring underground injuries, followed by back, hand, knee and shoulder injuries (each at 11%). Overall, injuries to arms (including shoulders) made up 25% of injuries, with leg injuries representing a further 21%.
- **Surface:** Hands were the most frequently injured part of body, at 18%, followed by shoulders and backs, at approximately 13% each. Overall, arm injuries (including shoulder) made up 23% of the total, with leg injuries accounting for a further 21% and hand injuries next at 18%.

Injuries by nature

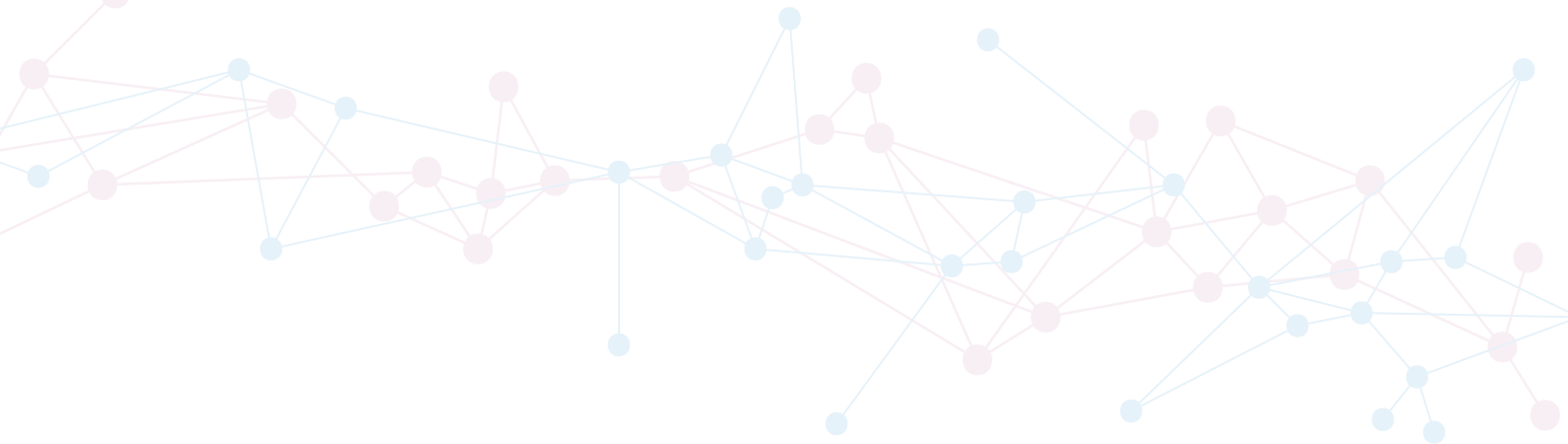
- **Underground:** Sprain or strain was the highest ranking nature of injury for underground injuries at 43%, followed by laceration, at 14% then concussion and fracture each accounting for 11%.
- **Surface:** Sprain or strain was the highest ranking nature of injury for surface injuries at 45%, followed by fracture at 15% and laceration at 8%.

Injuries by location

- **Underground:** The largest proportion of underground injuries occurred in production and development areas (71%), followed by underground access and haulage at 25% and ancillary locations at 4%.
- **Surface:** The largest proportion of surface injuries occurred in treatment plants at 41%, followed by open pits at 23% then workshops at 13%.

Injuries by type of accident

- **Underground:** Over-exertion or strenuous movements was the most common accident type for underground injuries at 21%, followed by rockfall at 14% then contact with tool and stepping (each 11%).
- **Surface:** The most common accident type for surface injuries was over-exertion or strenuous movements at 26%, followed by stepping, at 11%, and caught by or between objects at 10%.



Metalliferous LTI performance indicators 2013-14 to 2017-18

FIGURE 7 INCIDENCE RATE

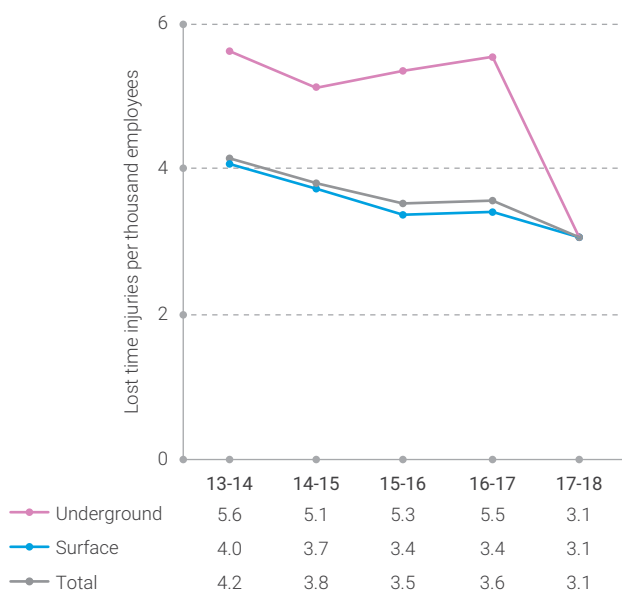


FIGURE 8 FREQUENCY RATE

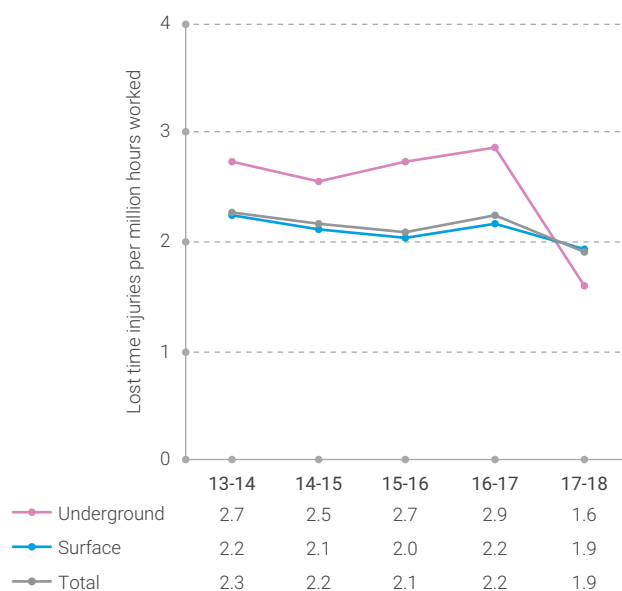


FIGURE 9 DURATION RATE

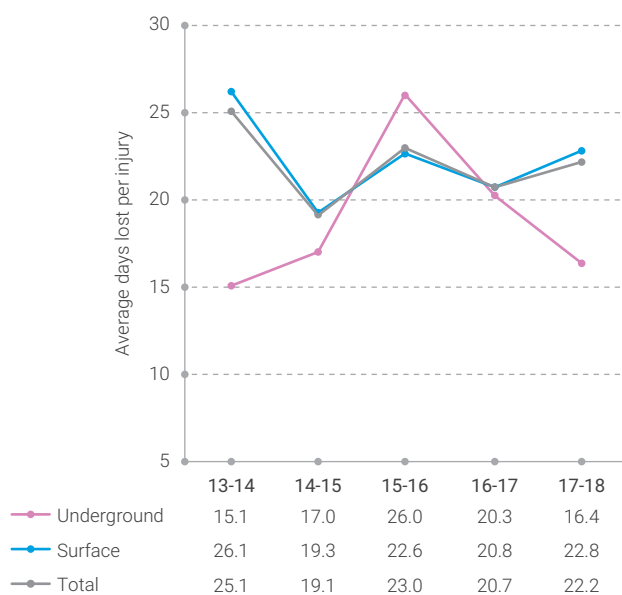
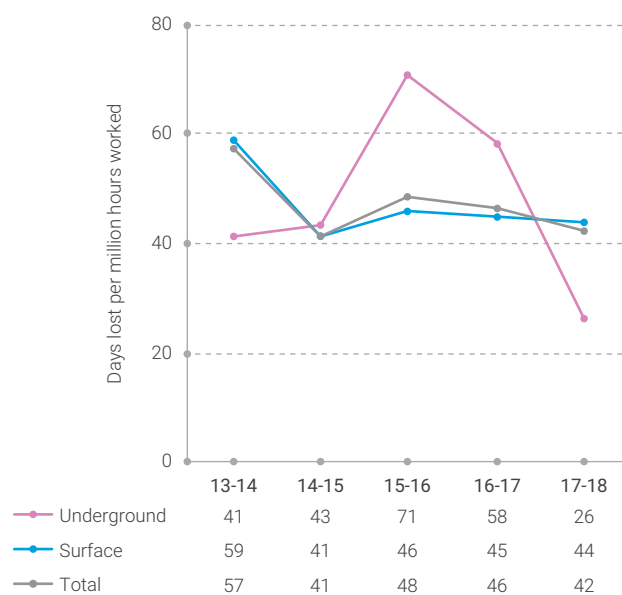


FIGURE 10 INJURY INDEX

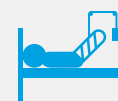
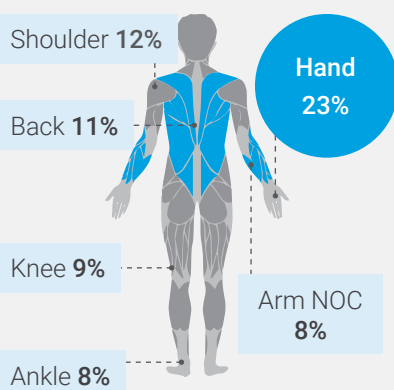




IRON ORE INJURIES 2017-18



48% of the 112,021
average mining workforce were
in **iron ore**



LTIFR for iron ore was **1.4**,
compared to 2.0 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 2017-18. 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 2017-18 are summarised below.

- The incidence rate deteriorated by 29%, rising from 1.7 to 2.2.
- The frequency rate deteriorated by 27%, rising from 1.1 to 1.4.
- The duration rate improved slightly by 1%, falling from 24.6 to 24.2.
- The rise in the frequency rate was much greater than the fall in the duration rate, resulting in an deterioration of 35% in the injury index (from 26 to 35).

Iron ore injury percentage breakdown for 2017-18

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.

Injuries by part of body

- Hand injuries, at 23%, accounted for the largest proportion of injuries, followed by shoulder injuries at 12% and back injuries, at 11%.
- Injuries to legs overall made up 25% of the total, with injuries to hands the next most common at 23%.

Injuries by nature

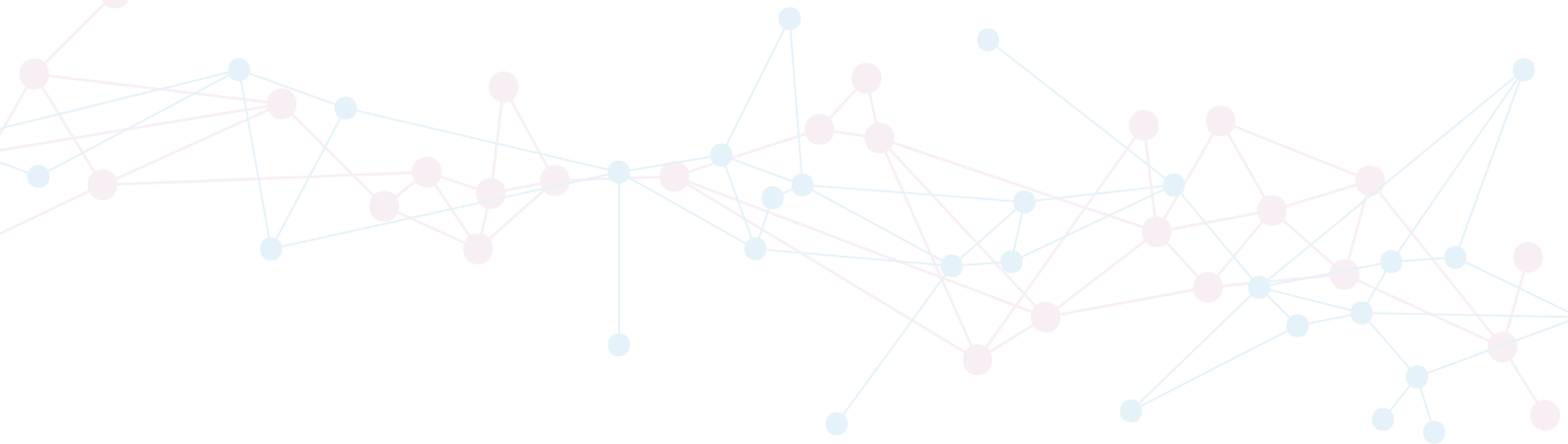
- Sprain or strain was the highest ranking nature of injury at 43%.
- Fracture was the second highest ranking nature of injury at 17%, followed by laceration at 8%.

Injuries by location

- The largest proportion of injuries occurred in treatment plants, which accounted for 27%. The second largest proportion occurred in open pits at 22%, followed by workshops at 18%.

Injuries by type of accident

- Over-exertion or strenuous movement was the most common type of accident resulting in injury, at 26%.
- Caught by or between objects, at 14%, was the next most common type of accident, followed by stepping at 10%, then struck by object and slip or trip, both at 8%.



Iron ore LTI performance indicators 2013-14 to 2017-18

FIGURE 11 INCIDENCE RATE

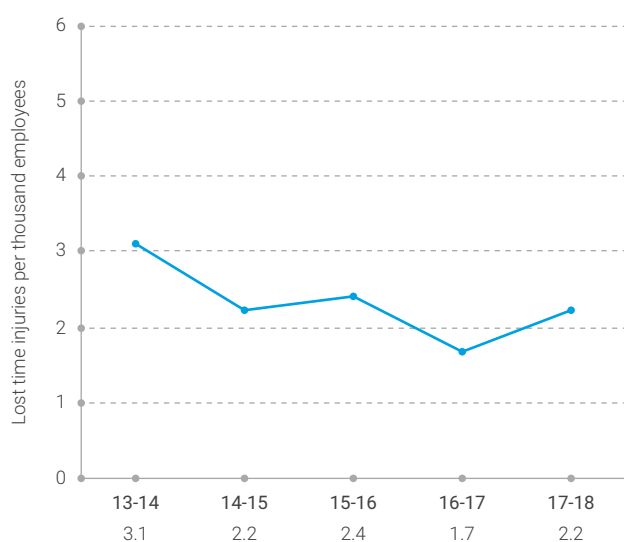


FIGURE 12 FREQUENCY RATE

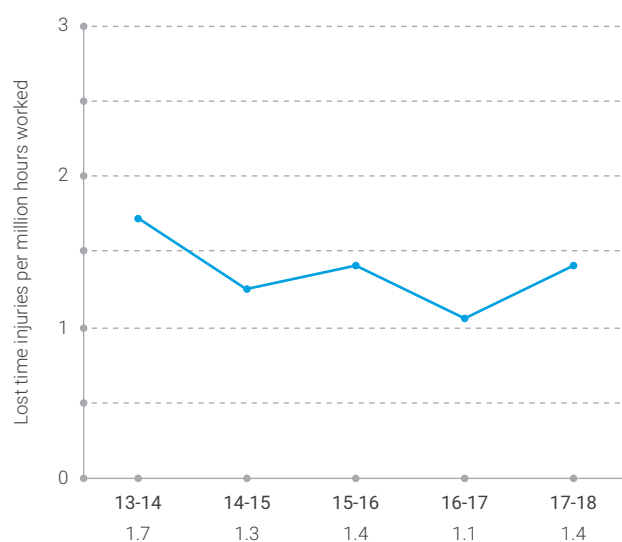


FIGURE 13 DURATION RATE

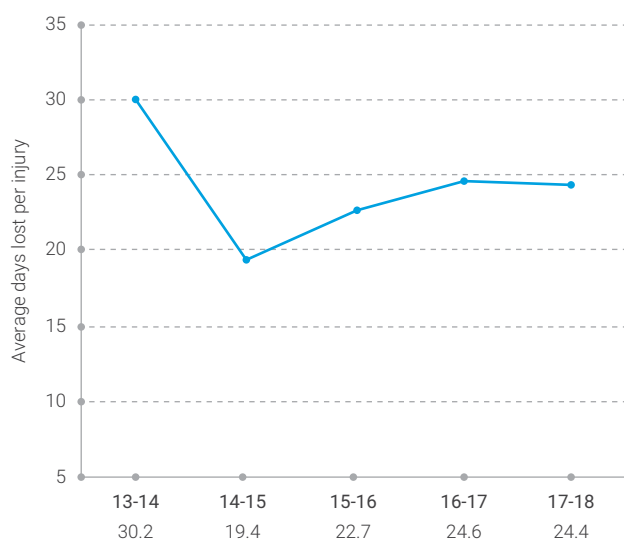
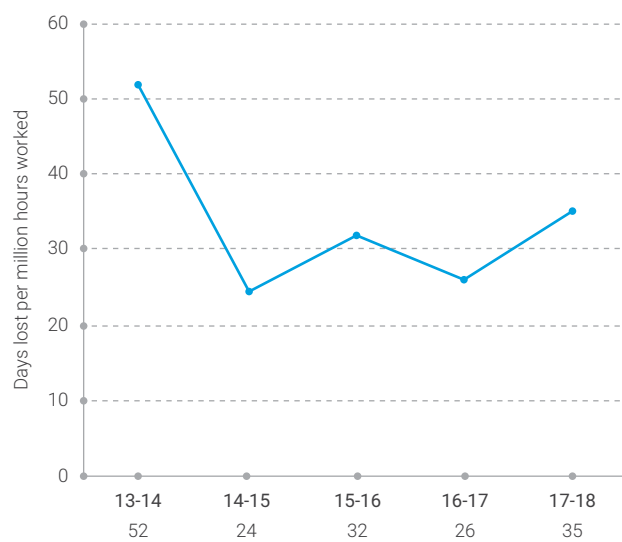


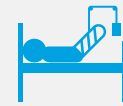
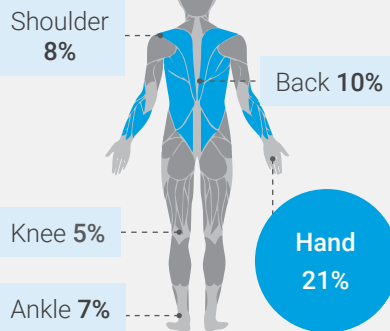
FIGURE 14 INJURY INDEX



GOLD INJURIES 2017-18



26% of the 112,021 average mining workforce were in **gold operations**



LTIFR for gold was **1.9**, compared to 2.0 for all mining

LOST TIME INJURIES BY COMMODITIES CONTINUED

Gold performance indicators

The performance indicators for the gold sector were generally improved during 2017-18. 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 2017-18 are summarised below.

- The overall incidence rate improved by 6%, falling from 3.3 to 3.1. The surface incidence rate deteriorated by 3%, rising from 3.3 to 3.4, while the underground incidence rate improved by 28% (from 3.2 to 2.3).
- The overall frequency rate improved by 5%, falling from 2.0 to 1.9. The surface frequency rate remained unchanged at 2.2, while the underground frequency rate improved by 29%, falling from 1.7 to 1.2.
- The overall duration rate improved by 19%, falling from 23.7 to 19.2. The surface duration rate improved by 24%, falling from 25.6 to 19.4, however the underground duration rate deteriorated by 7% (from 17.3 to 18.5).
- The overall improvement in both the frequency rate and the duration rate resulted in a 23% improvement in the injury index, falling from 48 to 37. The surface injury index improved by 25%

(falling from 56 to 42) and the underground injury index improved by 27% (from 30 to 22).

Gold injury percentage breakdown for 2017-18

Appendices G and H 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, respectively.

Injuries by part of body

- **Underground:** Head injuries made up 23% of underground injuries. Injuries to arms, hands, legs not otherwise classified (NOC) and necks accounted for the next largest proportions of underground injuries at 15% each. Overall, injuries to legs (including knees and ankles) made up 25% of injuries, and arms 19%.
- **Surface:** Hand injuries, making up 23% of the total, were the most common surface gold mining injuries, followed by arm injuries (NOC) at 13%, back injuries at 11% and shoulder injuries at 8%. Overall, injuries to arms (including shoulders) accounted for 21% and legs (ankles, knees and other parts of the leg) made up 19% of the total.

Injuries by nature

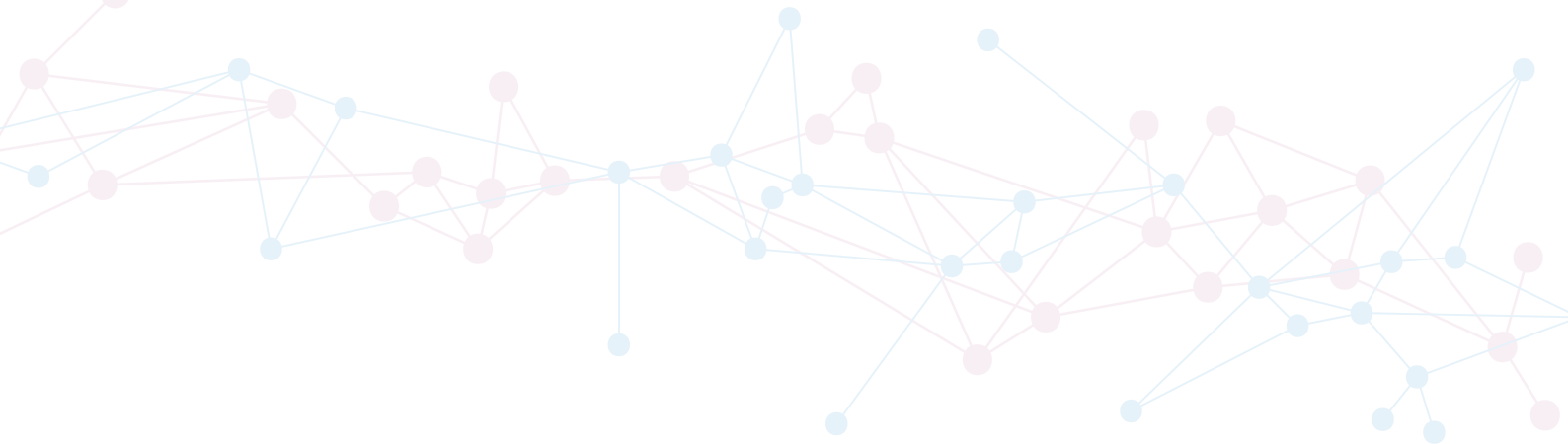
- **Underground:** Sprain or strain was the highest ranking nature of injury for underground injuries at 25%, followed by concussion and fracture, both at 19% of injuries.
- **Surface:** Sprain or strain was the highest ranking nature of injury for surface injuries at 39%, followed by fracture (20%) and laceration (7%).

Injuries by location

- **Underground:** The largest proportion of underground injuries occurred in production and development (63%), followed by access and haulage ways at 37%.
- **Surface:** The largest proportion of surface injuries occurred in open pits (37%), followed by treatment plants, at 29% and general surface areas, at 13%.

Injuries by type of accident

- **Underground:** Contact with tool and rockfall were the most common accident types for underground injuries, at 19% each, followed by falls getting on or off vehicles or mobile equipment and struck by objects, each at 12%.
- **Surface:** The most common accident type for surface injuries was stepping, at 17%, followed by over-exertion or strenuous movements at 16%, then caught by or between objects at 11%.



Gold LTI performance indicators 2013-14 to 2017-18

FIGURE 15 INCIDENCE RATE

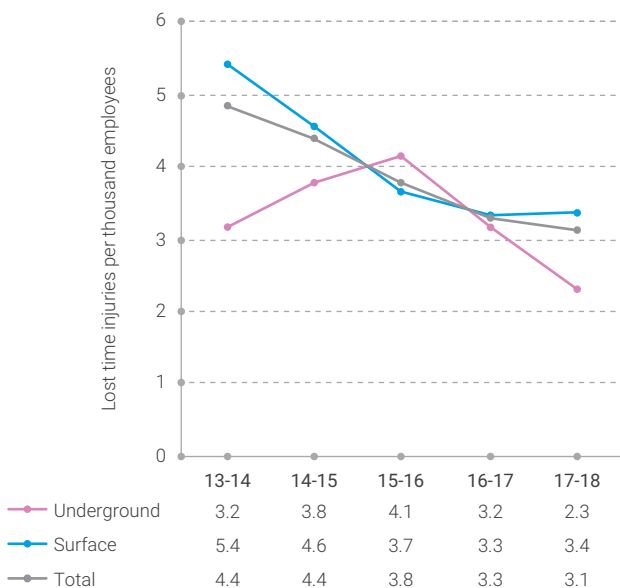


FIGURE 16 FREQUENCY RATE

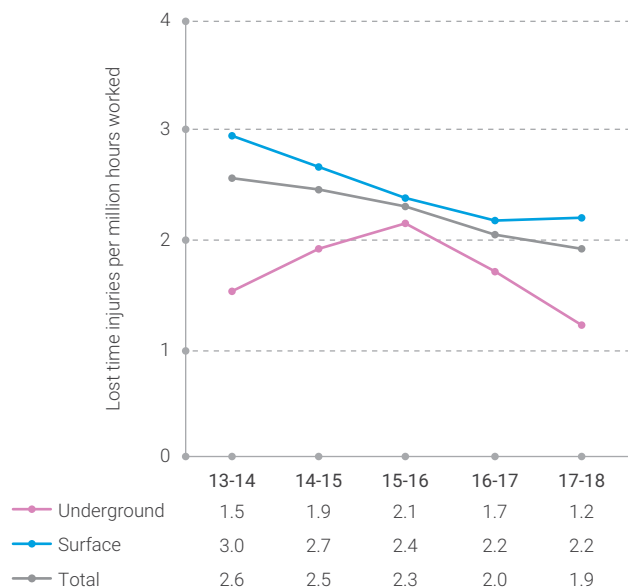


FIGURE 17 DURATION RATE

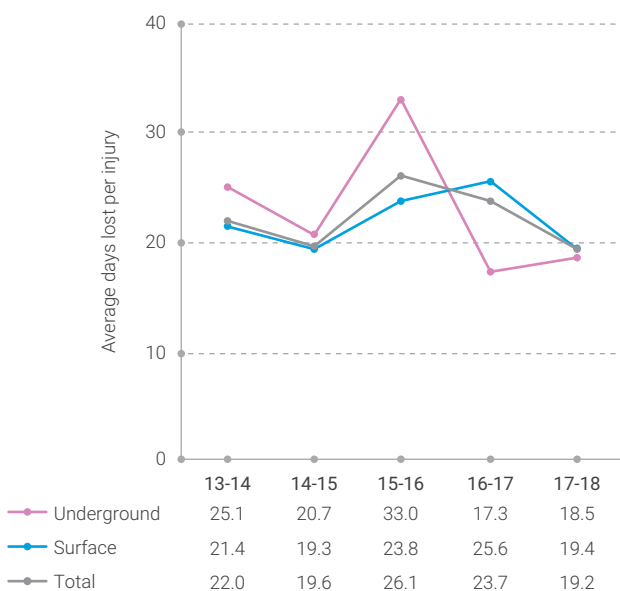
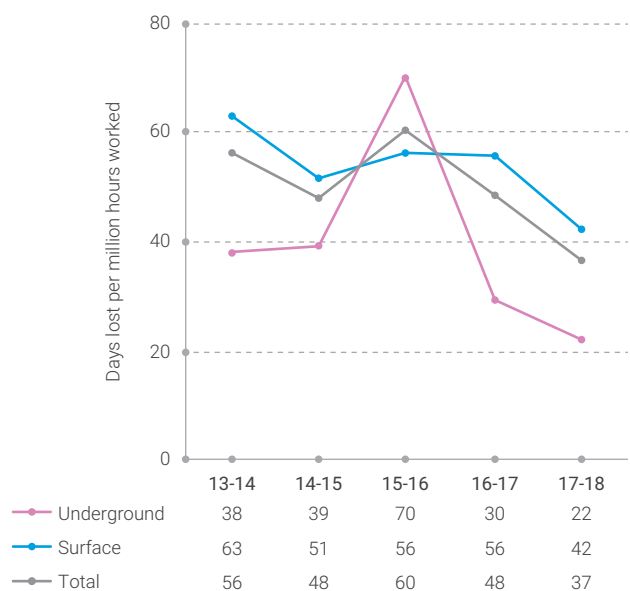


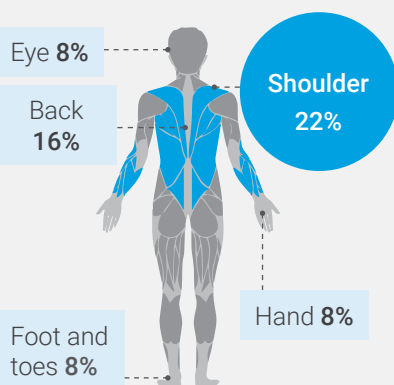
FIGURE 18 INJURY INDEX



BAUXITE AND ALUMINA INJURIES 2017-18



6% of the 112,021
average mining workforce were
in **bauxite and alumina**



LTIFR for bauxite and alumina
was **5.7**, compared to 2.0
for all mining

LOST TIME INJURIES BY COMMODITIES CONTINUED

Bauxite and alumina performance indicators

The performance indicators for the bauxite and alumina sector mostly improved during 2017-18 after a significant deterioration in the previous year, although the days lost per injury increased. 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 2017-18 are summarised below.

- The incidence rate improved, by 28%, falling from 14.9 to 10.8.
- The frequency rate improved, by 30%, falling from 8.1 to 5.7.
- The duration rate deteriorated by 6%, rising from 14.4 to 15.2.
- The improvement of the frequency rate was greater than the deterioration in the duration rate, resulting in the injury index improving by 25%, falling from 116 to 87.

Bauxite and alumina injury percentage breakdown for 2017-18

Appendix J provides a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident, and type of accident.

Injuries by part of body

- Shoulder injuries accounted for the largest proportion of injuries at 22%.
- Injuries to backs were the next highest proportion of injuries, at 16%, followed by eye injuries and foot and toe injuries, both at 8%.
- Combined, all injuries to arms (including shoulder) contributed 28% of injuries. All leg injuries (including knees and ankles) made up 18% of the total.

Injuries by nature

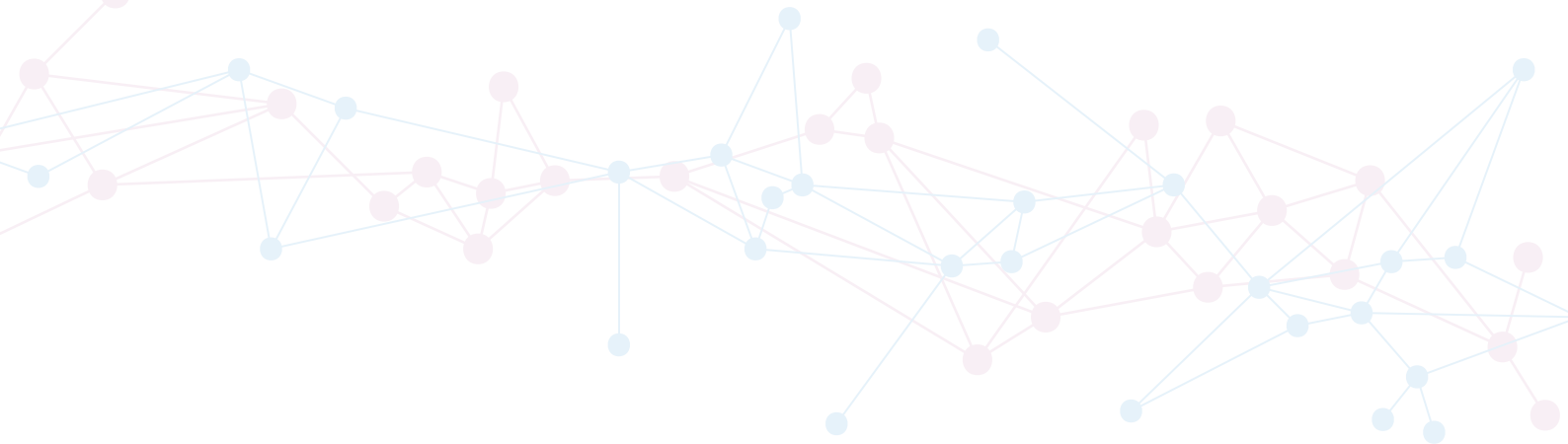
- Sprain or strain was the highest ranking nature of injury at 57%.
- Effects of chemicals or fumes was the second highest ranking nature of injury at 16%, followed by laceration, at 9%.

Injuries by location

- The largest proportion of injuries occurred in treatment plants, accounting for 76% of the total.
- The next largest proportion of injuries occurred in open pits (14%) and workshops (9%).

Injuries by type of accident

- Over-exertion or strenuous movements was the most common type of accident resulting in injury (39%).
- Contact with chemical or fume at 16% contributed the next highest proportion of injury, followed by fall from height at 11%.



Bauxite and alumina LTI performance indicators 2013-14 to 2017-18

FIGURE 19 INCIDENCE RATE

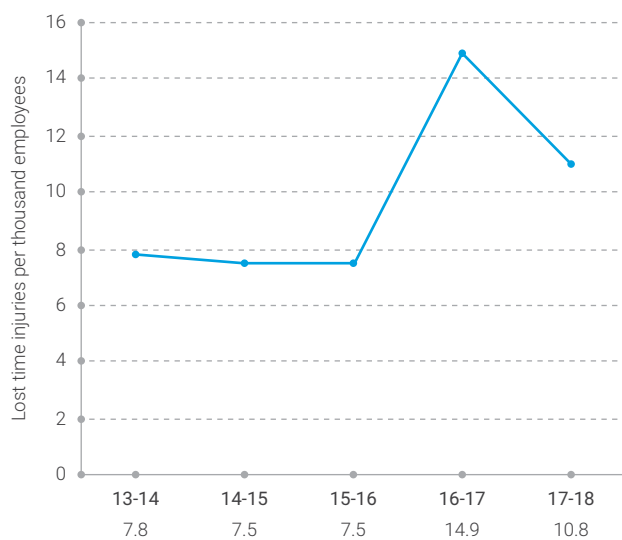


FIGURE 20 FREQUENCY RATE

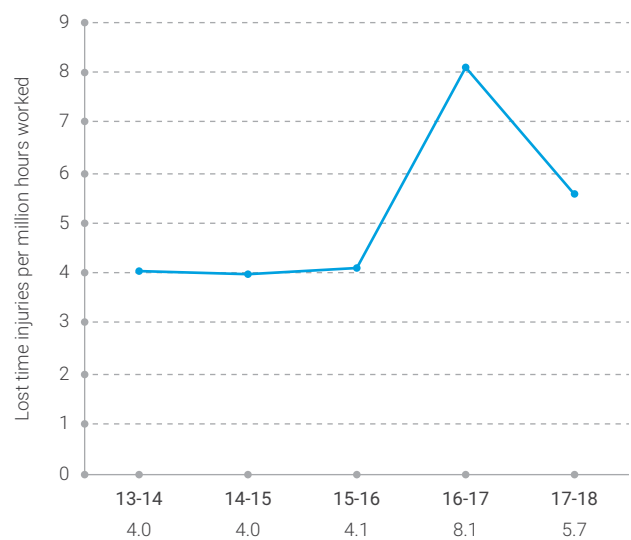


FIGURE 21 DURATION RATE

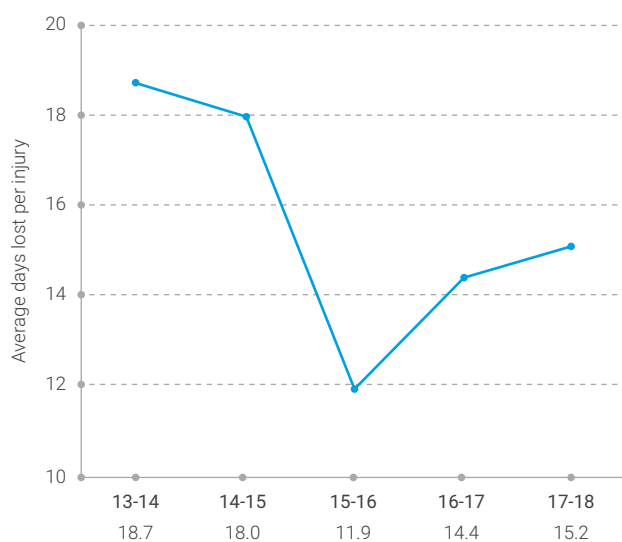
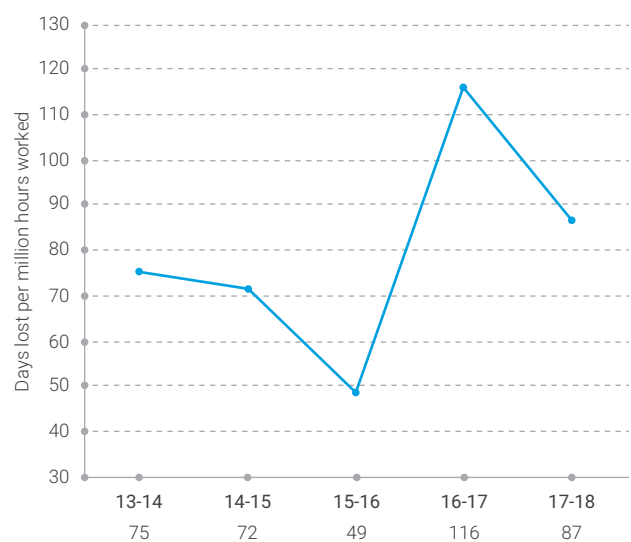


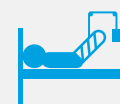
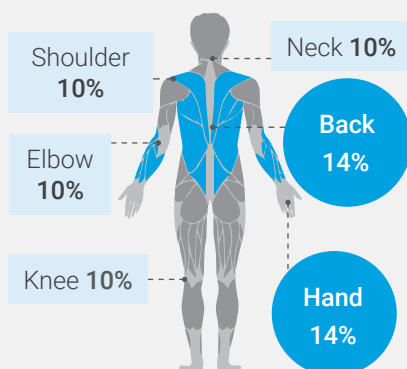
FIGURE 22 INJURY INDEX



NICKEL INJURIES 2017-18



5% of the 112,021 average mining workforce were in **nickel operations**



LTIFR for nickel was **1.9**, compared to 2.0 for all mining

LOST TIME INJURIES BY COMMODITIES CONTINUED

Nickel performance indicators

The performance indicators for the nickel sector were mixed for 2017-18. 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 2017-18 are summarised below.

- The overall incidence rate improved by 51%, falling from 7.8 to 3.8. The surface incidence rate improved by 55%, (from 5.8 to 2.6), while the underground incidence rate improved by 49%, (from 21.1 to 10.7).
- The overall frequency rate improved by 51%, falling from 3.9 to 1.9. The surface frequency rate improved by 57% (from 3.0 to 1.3), while the underground frequency rate improved by 51% (from 8.9 to 4.4).
- The overall duration rate deteriorated by 164% after the strong improvement of 2016-17, rising from 11.2 to 29.6. The surface duration rate deteriorated significantly, by 303% (from 10.2 to 41.1), while the underground duration rate deteriorated by 10% (from 12.9 to 14.2).
- The rise in the duration rate offset the fall in the frequency rate, resulting in a deterioration of 27% in the injury index, rising from 44 to 56. The surface injury index rose

by 74% (from 31 to 54), however the underground injury index improved by 45% (falling from 115 to 63).

Nickel injury percentage breakdown for 2017-18

Appendices K and L 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, respectively.

Injuries by part of body

- Underground:** Back, knee and neck injuries together accounted for six of the nine underground injuries reported, with two injuries or 22% of the total each. One injury each was reported for elbow, hand and shoulder.
- Surface:** Leg injuries, at 25%, accounted for the largest proportion of the twelve surface injuries, followed by two hand injuries (17%). Arm injuries (including one elbow and one shoulder injury) in total accounted for 25% of injuries.

Injuries by nature

- Underground:** Sprain or strain was the highest ranking nature of injury for underground injuries at 78%, followed by one amputation injury and one dislocation (or

approximately 11% of the total each).

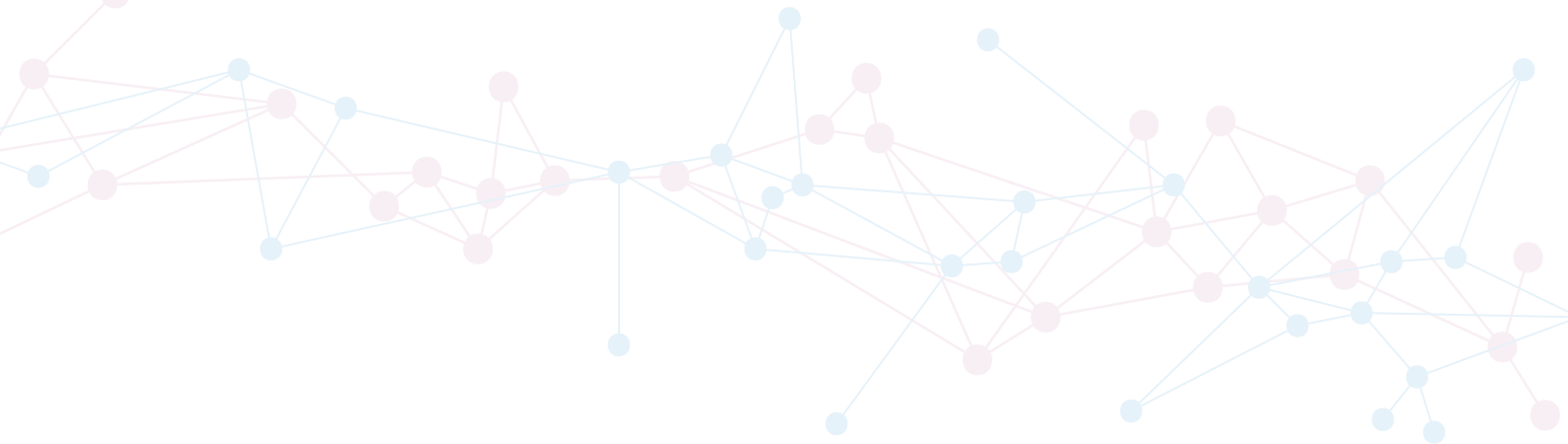
- Surface:** Fracture and Sprain or strain were the equal highest ranking natures of injury for surface at 25%, followed by burns at 17%.

Injuries by location

- Underground:** The largest proportion of underground injuries occurred in production and development areas (78%), followed by ancillary locations and underground access haulage ways with 1 injury (11%) each.
- Surface:** The largest proportion of surface injuries occurred in treatment plants (42%), followed by open pit and general surface areas, each contributing 17%.

Injuries by type of accident

- Underground:** Over-exertion or strenuous movements was the most common accident type for underground injuries at approximately 44% (4 injuries), followed by stepping at 22% (2 injuries) then caught by or between objects, struck against object and vehicle or mobile equipment jolting or jarring, each a single injury or 11% of the total.
- Surface:** The most common accident type for surface injuries was over-exertion or strenuous movements at 25%, followed by fall from height at 17%.



Nickel LTI performance indicators 2013-14 to 2017-18

FIGURE 23 INCIDENCE RATE

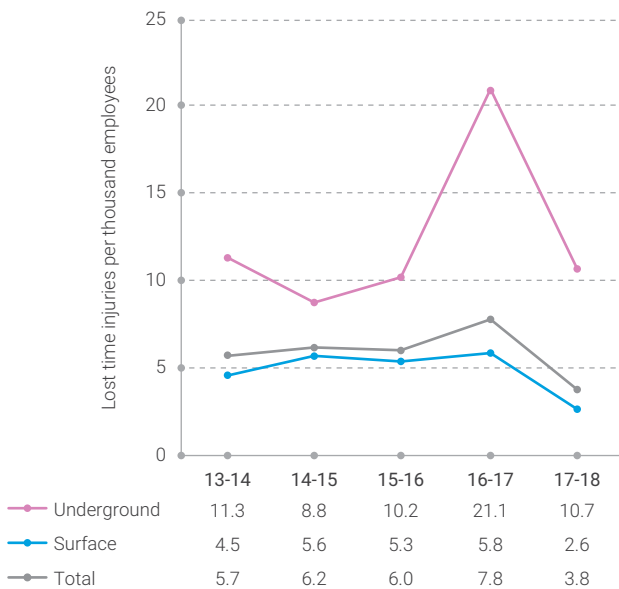


FIGURE 24 FREQUENCY RATE

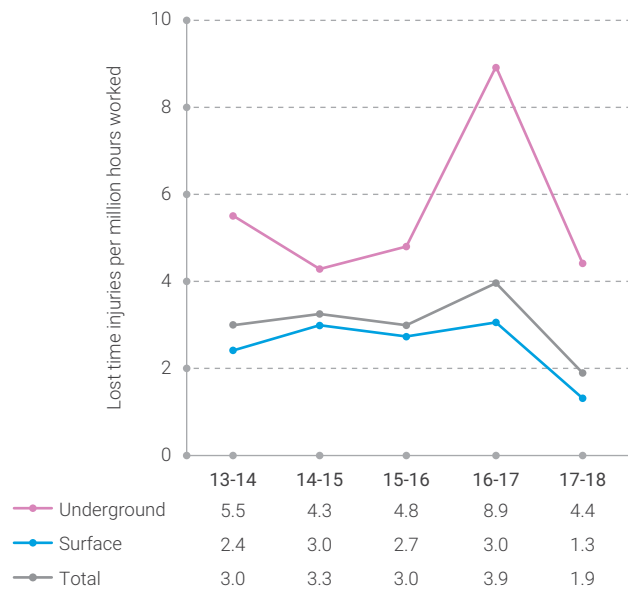


FIGURE 25 DURATION RATE

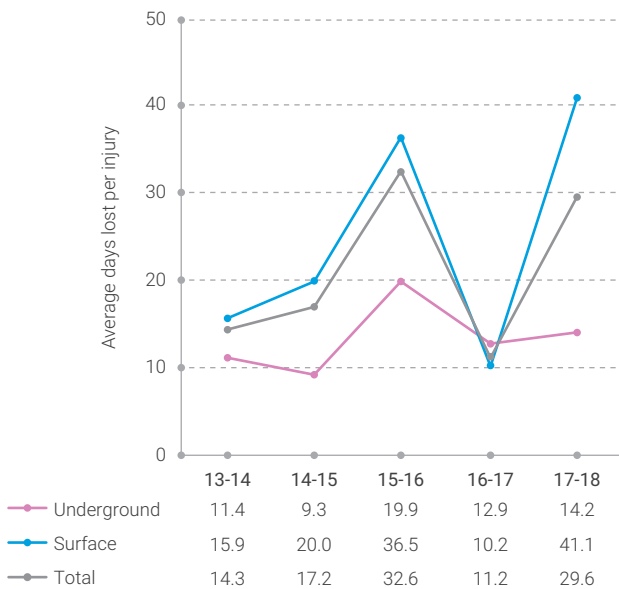
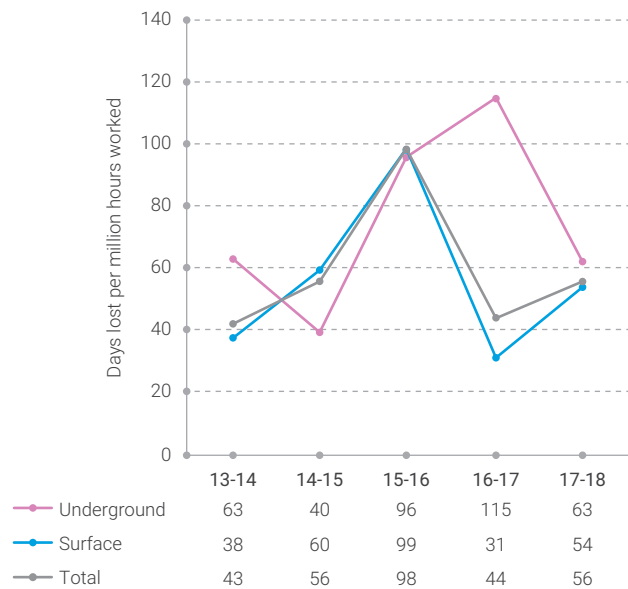


FIGURE 26 INJURY INDEX





EXPLORATION INJURIES 2017-18



Exploration employed an average of **2,702** workers, that is about 2% of the total mining workforce

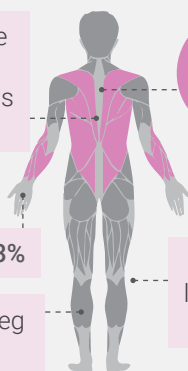
Multiple trunk locations
13%

Back
19%

Hand **13%**

Lower leg
13%

General locations
19%



LTIFR for exploration was **3.2**, compared to 2.0 for all mining

EXPLORATION LOST TIME INJURIES

The performance indicators for the mineral exploration sector showed an overall deterioration for 2017-18, although with a slight reduction in the number of days lost per injury. 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 2017-18 are summarised below

- The incidence rate deteriorated by 34%, rising from 4.4 to 5.9.
- The frequency rate deteriorated 33%, rising from 2.4 to 3.2.
- The duration rate improved by 7%, falling from 13.8 to 12.8.
- The fall in duration rate combined with the rise in the frequency rate resulted in a deterioration of 24% in the injury index, rising from 33 to 41.

Exploration injury percentage breakdown for 2017-18

Appendix M 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.

Injuries by part of body

- Injuries to backs and general body locations, each represented 19% of the 16 exploration injuries reported.

Injuries by nature

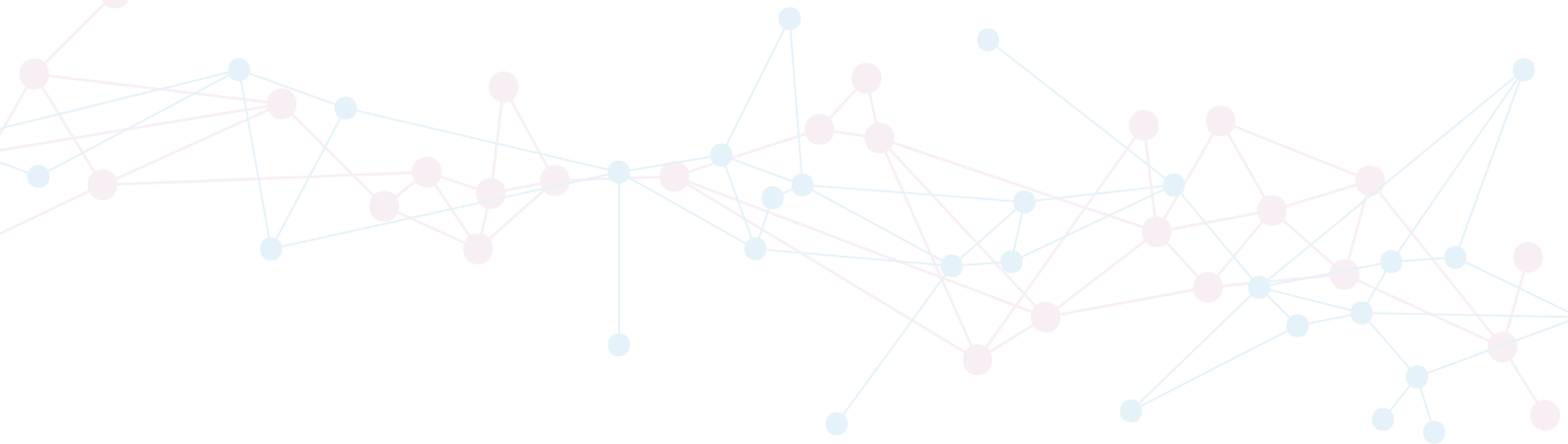
- Sprain or strain was the highest ranking nature of injury for surface injuries with five injuries representing 31% of the total. Effects of exposure to heat and fractures were the next most frequent natures of injury, at 19% each.

Injuries by location

- The largest proportion of surface injuries occurred in exploration areas (94%), with 6% (one injury) reported as occurring on a drill pattern area.

Injuries by type of accident

- The most common accident types for injuries were exposure to heat and over-exertion or strenuous movements, each at 19%, followed by caught by or between objects, struck by object, and slip or trip, each 13%.



Exploration LTI performance indicators 2013-14 to 2017-18

FIGURE 27 INCIDENCE RATE

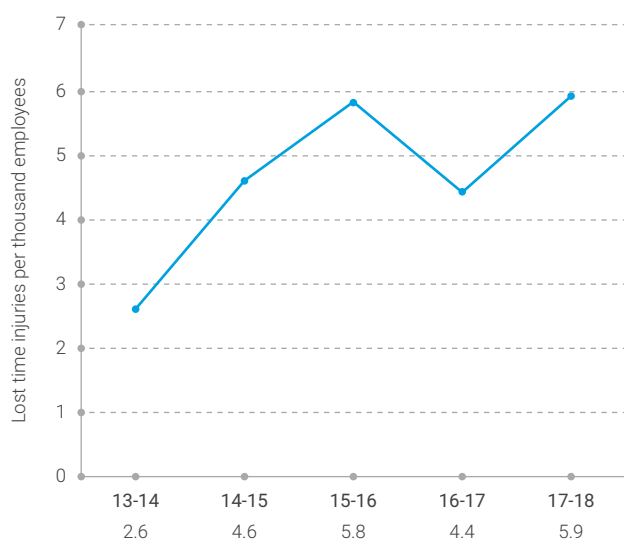


FIGURE 28 FREQUENCY RATE

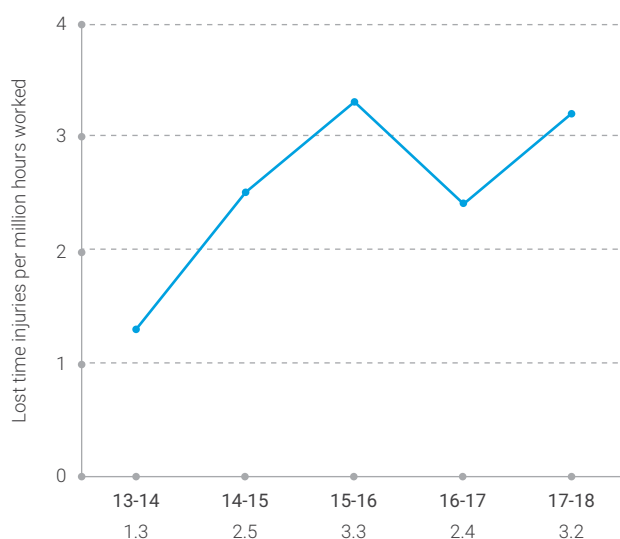


FIGURE 29 DURATION RATE

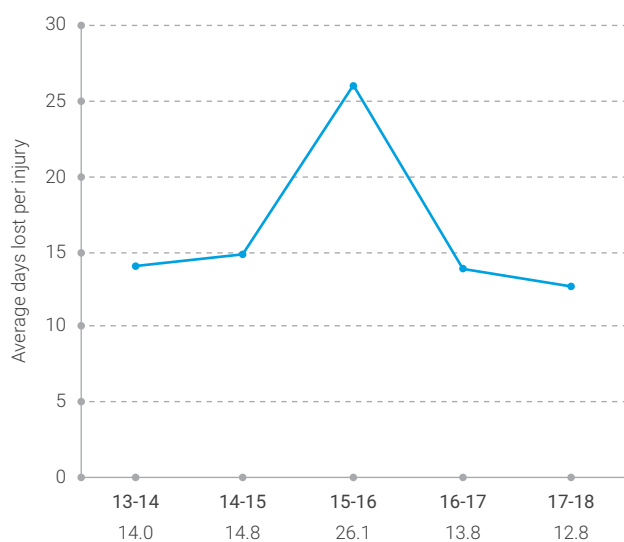
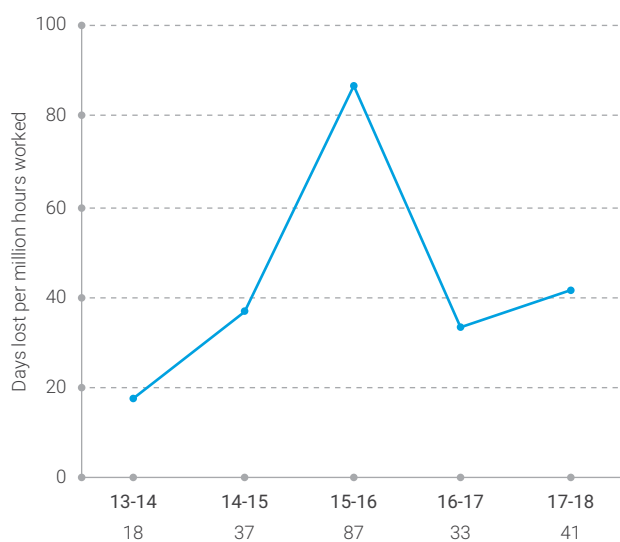


FIGURE 30 INJURY INDEX



RESTRICTED WORK INJURIES

Review of restricted work injuries during 2017-18

In addition to the 353 mining LTIs in 2017-18, there were 851 restricted work injuries (RWIs) reported (847 in metalliferous mines and 4 in coal mines), bringing the total number of mining reportable injuries to 1,204. There were also 16 exploration LTIs and 24 exploration RWIs reported, resulting in 40 reportable injuries. A breakdown of these data with performance indicators is shown in Tables 10 and 11.

Of the 875 restricted work injuries in total, 647 mining and 11 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 his or her normal occupation or job, but is not able to perform the full range of work duties*
- *remains in his or her normal occupation or job, but on restricted hours.*

TABLE 10 RESTRICTED WORK INJURIES 2017-18

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	101,919	715	7.0	4.5	1,028	10.1	6.4
Metalliferous underground	8,949	132	14.7	7.5	160	17.9	9.1
Metalliferous total	110,868	847	7.6	4.8	1,188	10.7	6.7
Coal total	1,153	4	3.5	2.7	16	13.9	10.6
Total mining	112,021	851	7.6	4.7	1,204	10.7	6.7
Exploration	2,702	24	8.9	4.8	40	14.8	8.1

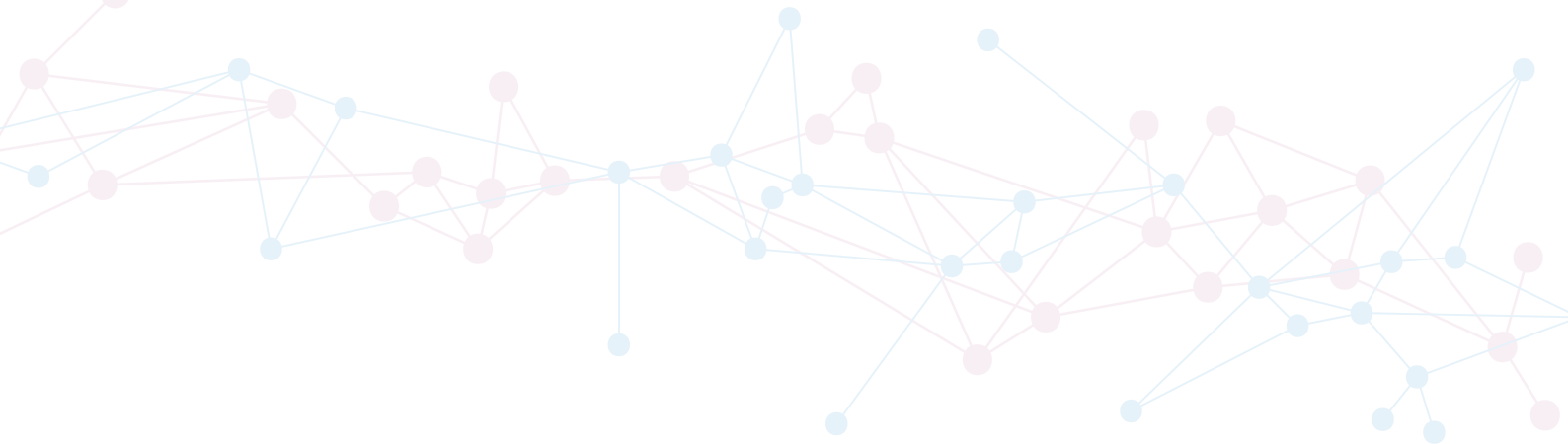


TABLE 11 RESTRICTED WORK INJURIES BY MINERAL MINED 2017-18

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	53,712	279	5.2	3.3	398	7.4	4.7
Gold	29,273	285	9.7	6.0	376	12.8	7.9
Bauxite and alumina	6,850	134	19.6	10.3	208	30.4	16.0
Nickel	5,474	64	11.7	5.7	85	15.5	7.6
Construction materials	2,622	2	0.8	1.3	4	1.5	2.6
Base metals	2,548	28	11.0	6.5	33	13.0	7.7
Tin, tantalum and lithium	2,471	9	3.6	1.4	13	5.3	2.0
Mineral sands	2,311	8	3.5	2.7	14	6.1	4.7
Coal	1,153	4	3.5	2.7	16	13.9	10.6
Salt	978	1	1.0	0.9	4	4.1	3.5
Diamonds	824	16	19.4	10.1	18	21.8	11.4
Other	3,805	21	5.5	5.0	35	9.2	8.3
Total mining	112,021	851	7.6	4.7	1,204	10.7	6.7

RESTRICTED WORK INJURIES CONTINUED

Restricted work injury performance indicators

The restricted work injury performance indicators for the mining sector showed a small overall deterioration during 2017-18. Exploration showed a similar deterioration, although there was a reduction in the average days lost per injury. 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 deteriorated by 13%, rising from 6.7 to 7.6. The surface incidence rate deteriorated by 15% (from 6.1 to 7.0), and the underground incidence rate deteriorated by 4% (from 14.2 to 14.8). The incidence rate for exploration deteriorated by 46%, rising from 6.1 to 8.9.
- The overall frequency rate deteriorated by 12%, rising from 4.2 to 4.7. The surface frequency rate deteriorated by 13%, rising from 3.9 to 4.4, while the underground frequency rate deteriorated by 3%, rising from 7.3 to 7.5. The frequency rate for exploration deteriorated by 41%, rising from 3.4 to 4.8.
- The average number of rostered days of restricted work per RWI (comparable to the LTI Duration rate) deteriorated by 16%, rising from 26.4 to 30.5. Surface restricted work days per RWI deteriorated by 18% (from 26.6 to 31.5), while restricted work days per underground RWI improved by about 1% (from 25.2 to 24.9). Average restricted work days per RWI for exploration improved by 24%, falling from 15.5 to 11.8.
- The rise in both the frequency rate and the restricted work days worked per restricted work injury resulted in a deterioration of 29% (from 112 to 144) 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 deteriorated by 35% (from 104 to 140). The restricted work days per million hours worked underground deteriorated slightly, by less than 1% (from 185 to 186). Exploration restricted work days per million hours worked deteriorated by 8%, rising from 53 to 57.

Restricted work injury percentage breakdown for 2017-18

Appendices N, O and P 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

Injuries by part of body

- **Underground:** Hand injuries, at 23% of the total, were the most frequently occurring, followed by shoulder injuries at 14%, then arm (not including shoulder) and back injuries (each 12% of the total).
- **Surface:** Hand injuries accounted for the largest proportion of surface restricted work injuries at 29%, followed by back injuries at 16%, and shoulder and knee injuries (each at 8%).
- **Exploration:** Hand injuries accounted for 21% of RWIs, followed by back and eye injuries, each at 17%.

Injuries by nature

- **Underground:** Sprain or strain was the highest ranking nature of injury for underground restricted work injuries at 51%, followed by laceration at 13% and fracture at 10%.

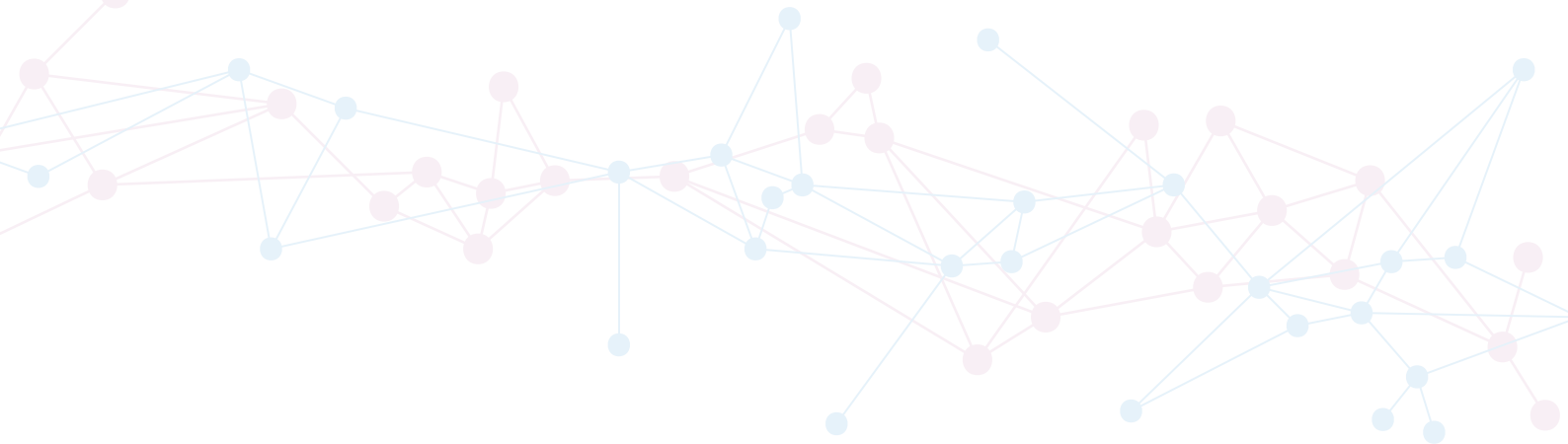
- **Surface:** Sprain or strain was the highest ranking nature of injury for surface restricted work injuries at 51%, followed by laceration and fracture, both at approximately 11%.
- **Exploration:** Sprain or strain, at 29%, was the highest ranking nature of injury, followed by laceration at 25%. The next most common was fracture, at 13%.

Injuries by location

- **Underground:** The largest proportion of underground injuries occurred in production and development areas (59%), followed by access and haulage ways (29%).
- **Surface:** The largest proportion of surface injuries occurred in treatment plants (33%) followed by open pits (22%), and workshops (19%).
- **Exploration:** 23 RWIs, or 96% of the total, were in general exploration areas. A further 4% was made up of a single injury, reported as being on a drill pattern area.

Injuries by type

- **Underground:** Over-exertion or strenuous movement (27%) was the most common accident type for underground injuries, followed by stepping (17%), caught by or between objects (11%), then slip or trip (9%).
- **Surface:** The most common accident type for surface injuries was over-exertion or strenuous movements at 30%, followed by caught by or between objects at 14%, then stepping at 12%.
- **Exploration:** Over exertion or strenuous movement at 29% was the most common type of accident, followed by struck by object at 21% and stepping at 13%.



Restricted work injury performance indicators 2013-14 to 2017-18

FIGURE 31 INCIDENCE RATE

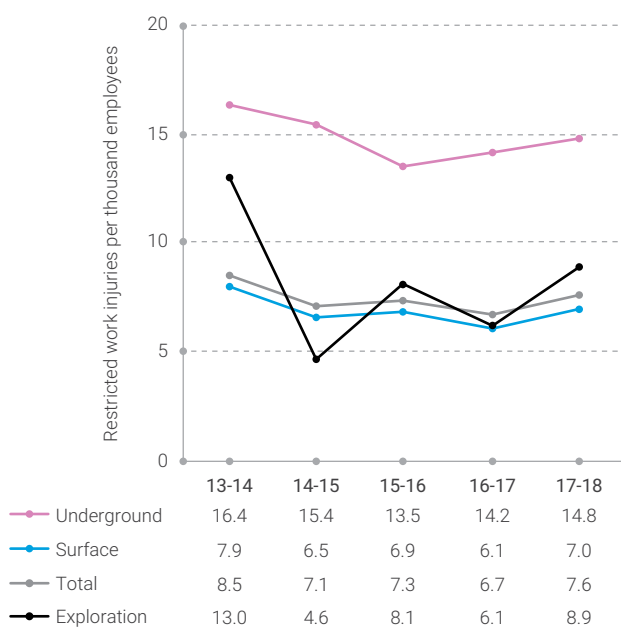


FIGURE 32 FREQUENCY RATE

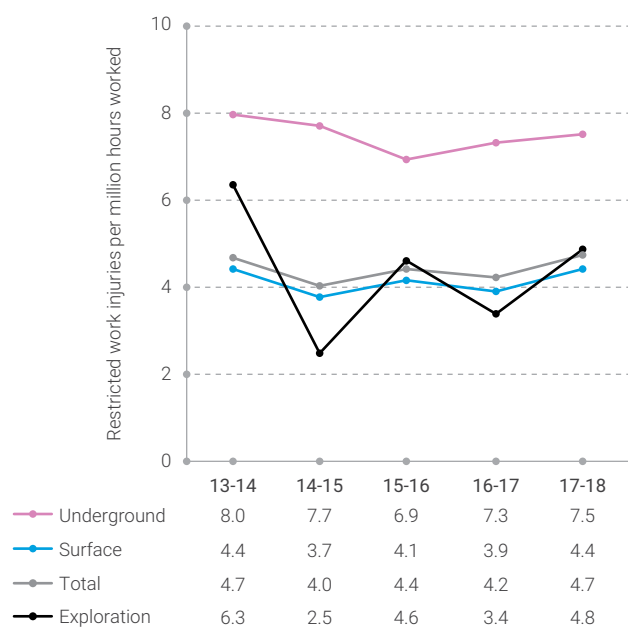


FIGURE 33 DURATION RATE

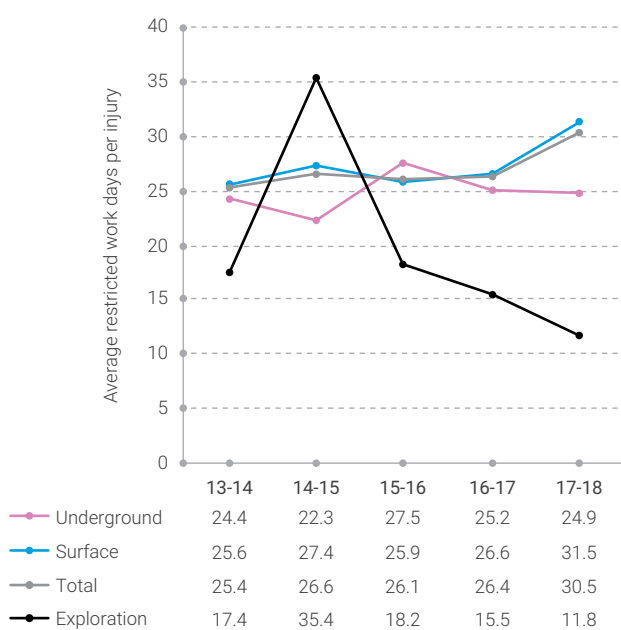
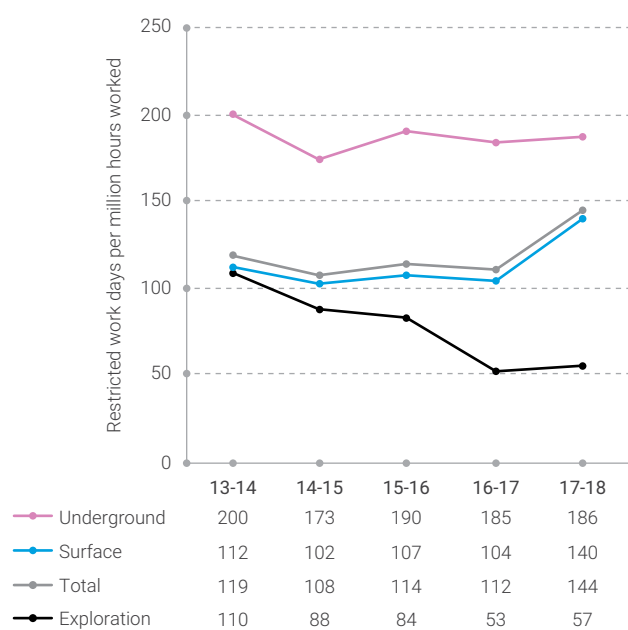


FIGURE 34 INJURY INDEX







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 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

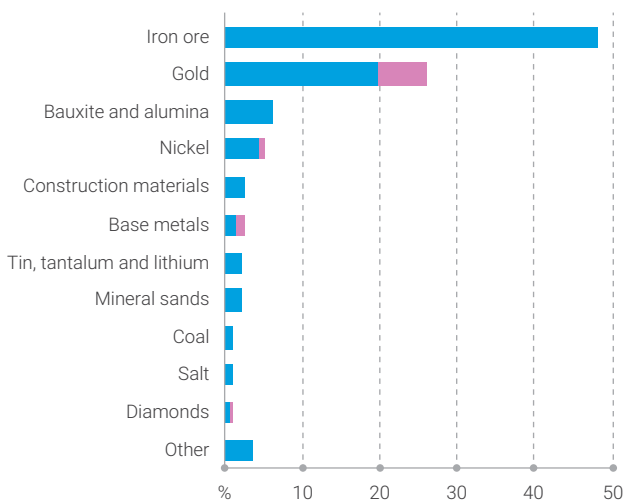
APPENDIX B

WESTERN AUSTRALIAN MINES 2017-18

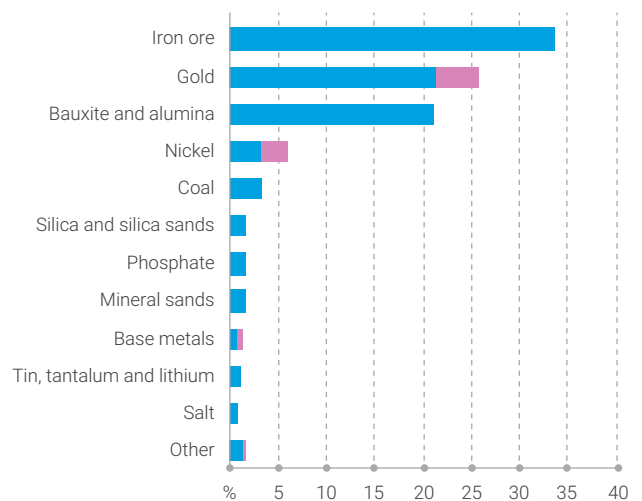
353 lost time injuries

■ Surface ■ Underground

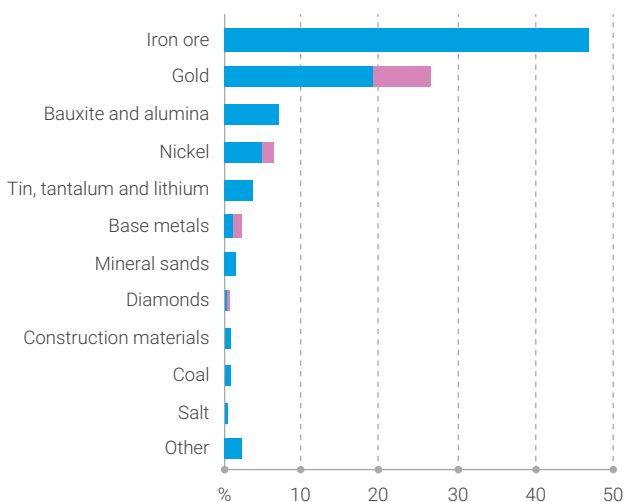
PERCENTAGE OF EMPLOYEES



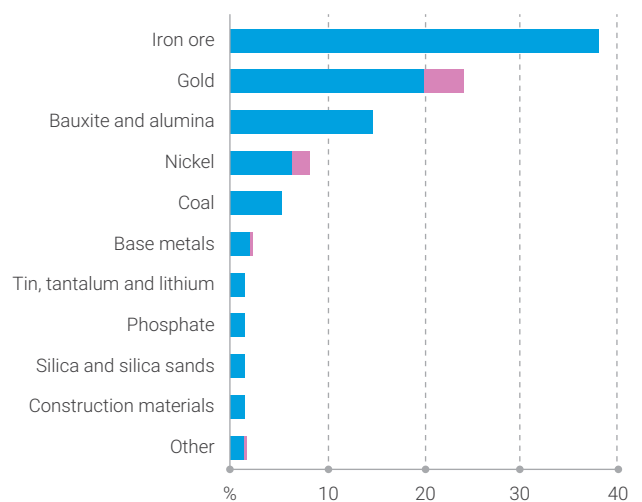
PERCENTAGE OF INJURIES



PERCENTAGE OF HOURS WORKED



PERCENTAGE OF WORK DAYS LOST

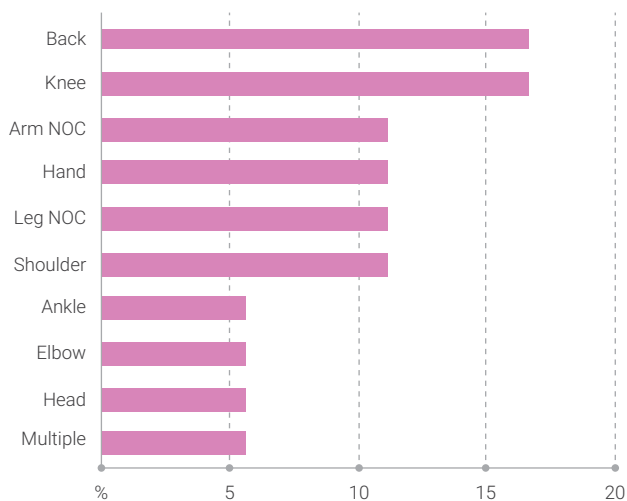


APPENDIX C

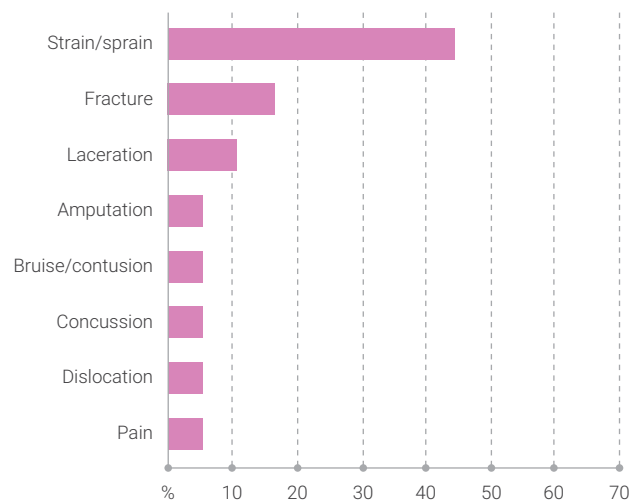
SERIOUS INJURIES UNDERGROUND 2017-18

18 lost time injuries

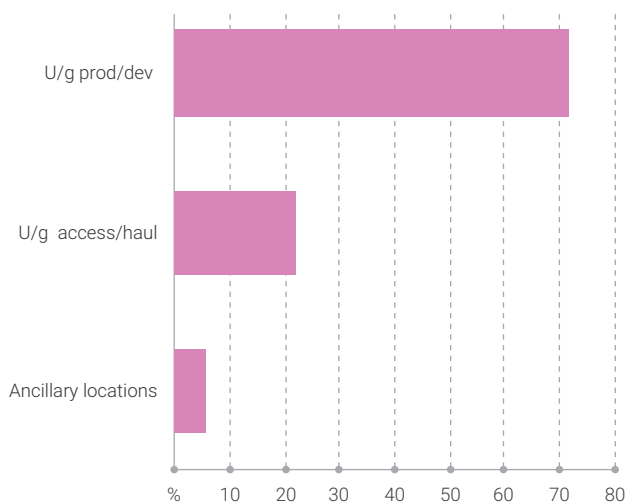
PART OF BODY



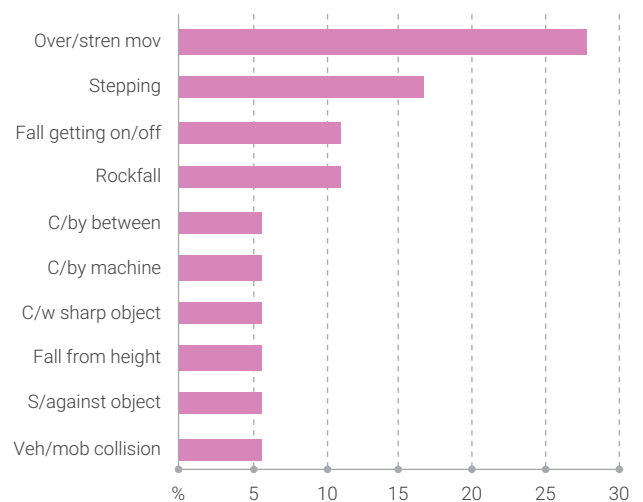
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

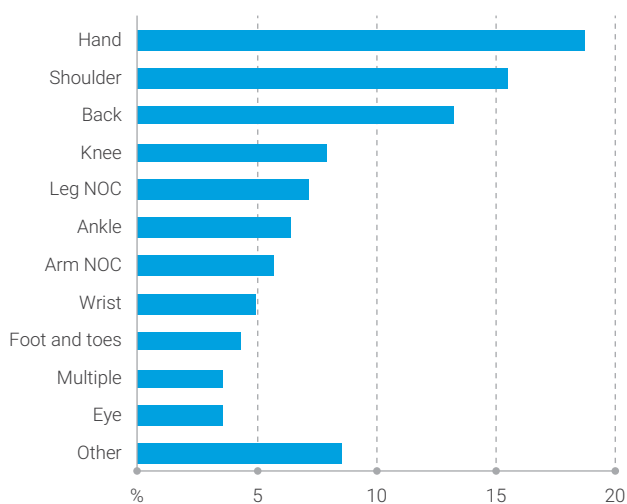


APPENDIX D

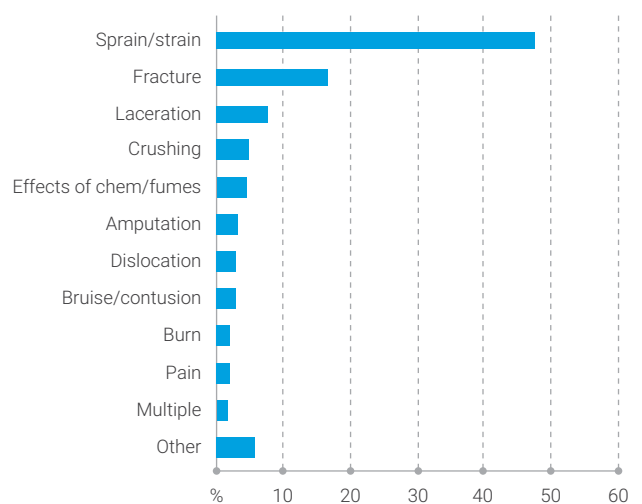
SERIOUS INJURIES SURFACE 2017-18

278 lost time injuries

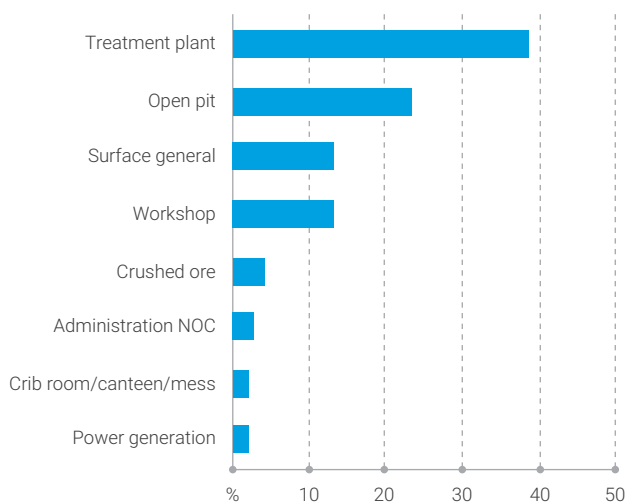
PART OF BODY



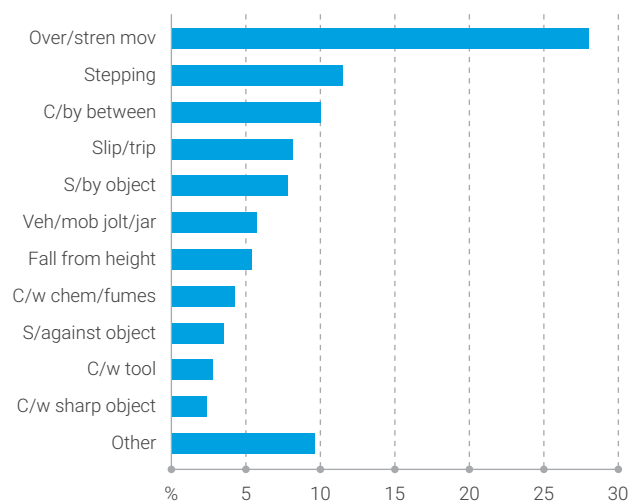
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

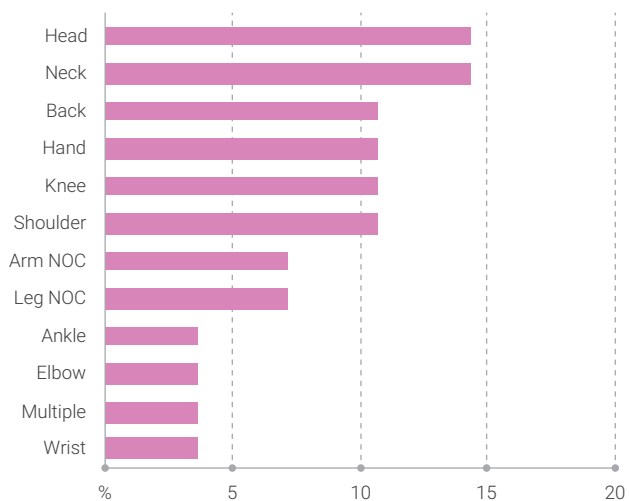


APPENDIX E

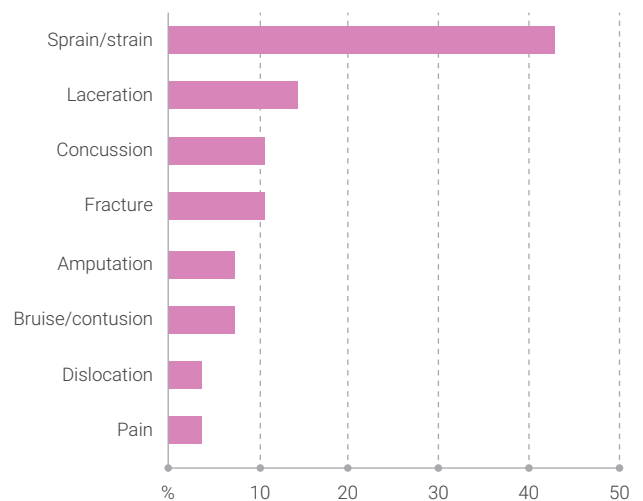
METALLIFEROUS UNDERGROUND INJURIES 2017-18

28 lost time injuries

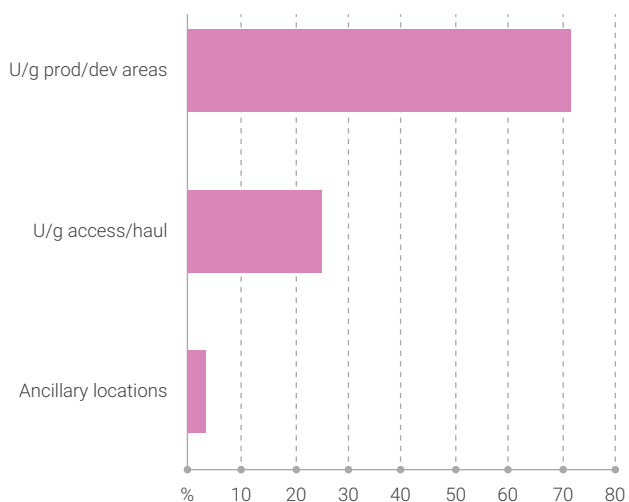
PART OF BODY



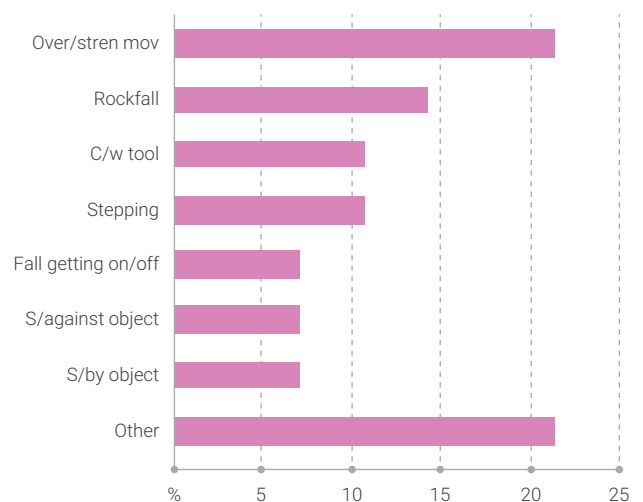
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

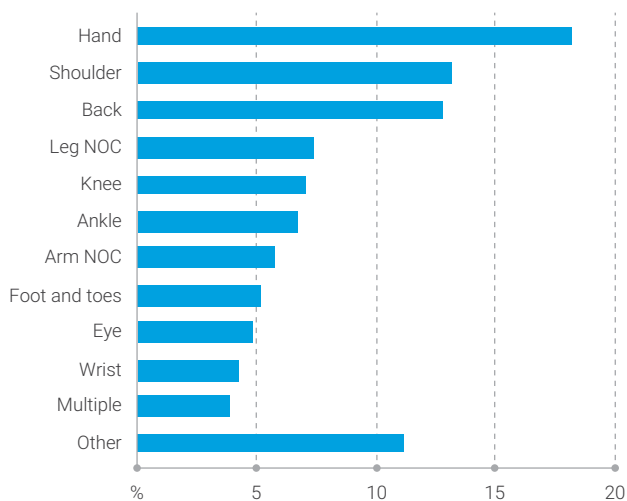


APPENDIX F

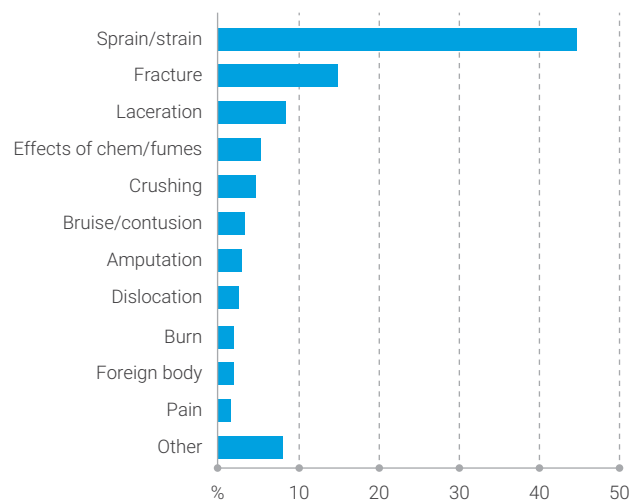
METALLIFEROUS SURFACE INJURIES 2017-18

313 lost time injuries

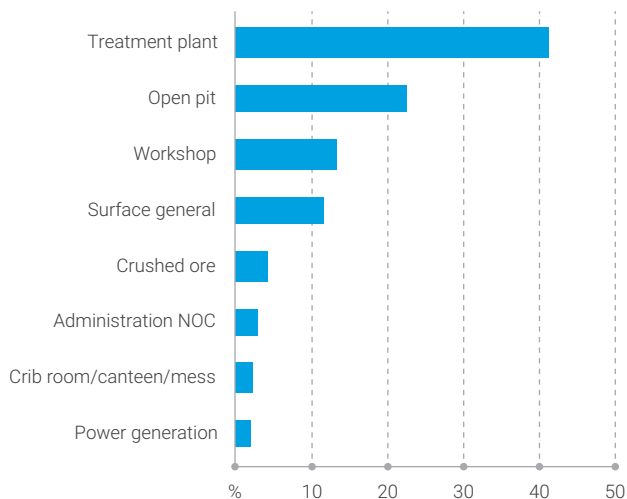
PART OF BODY



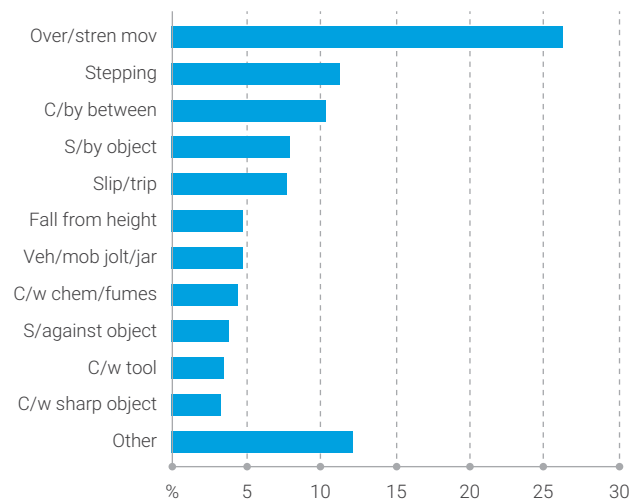
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

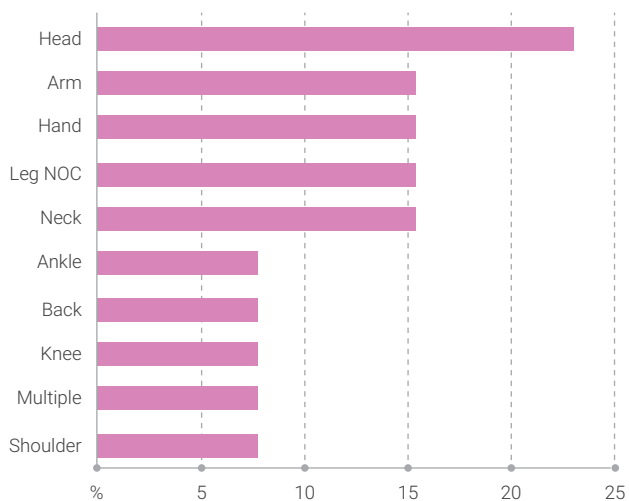


APPENDIX G

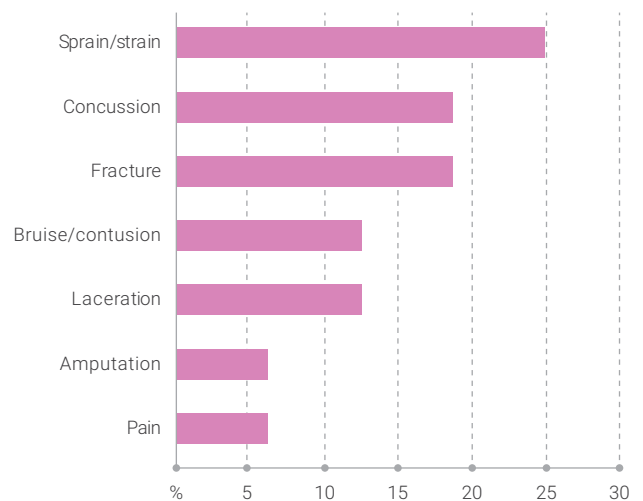
GOLD UNDERGROUND INJURIES 2017-18

16 lost time injuries

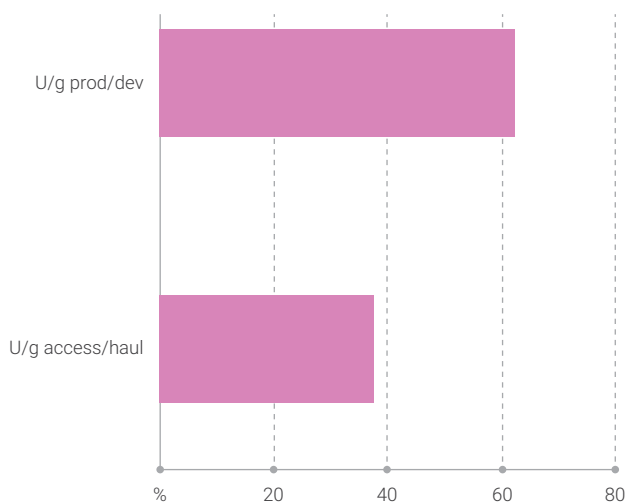
PART OF BODY



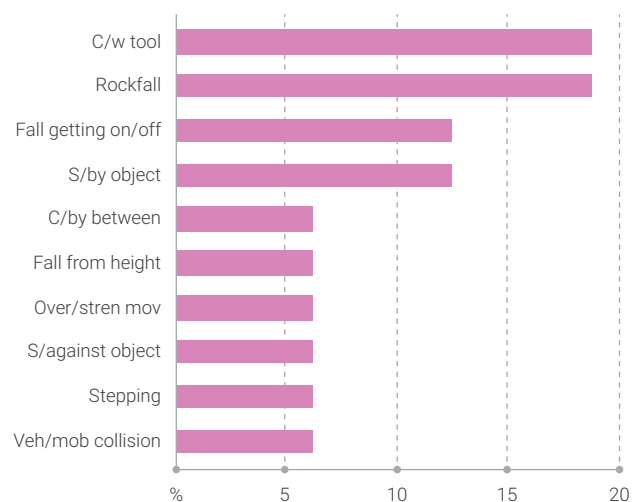
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

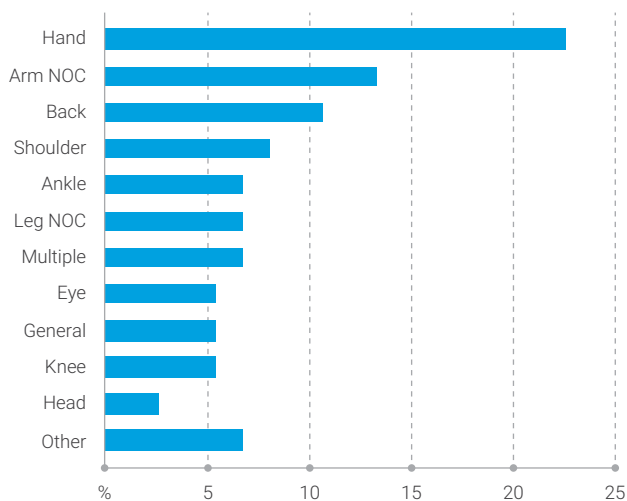


APPENDIX H

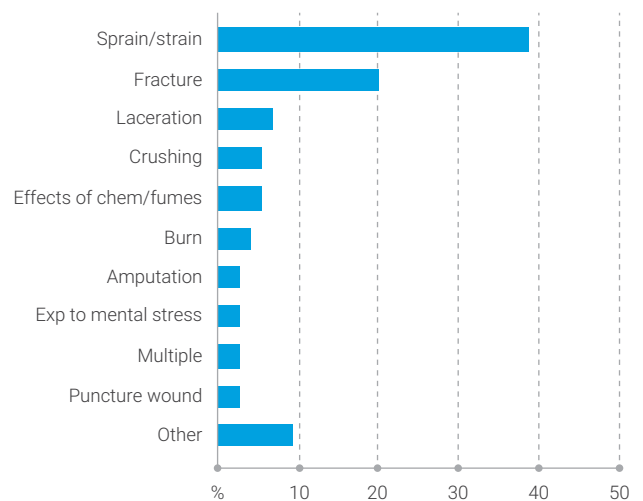
GOLD SURFACE INJURIES 2017-18

75 lost time injuries

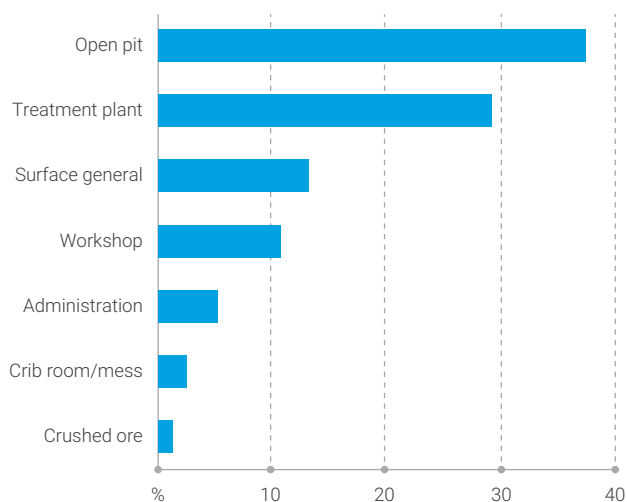
PART OF BODY



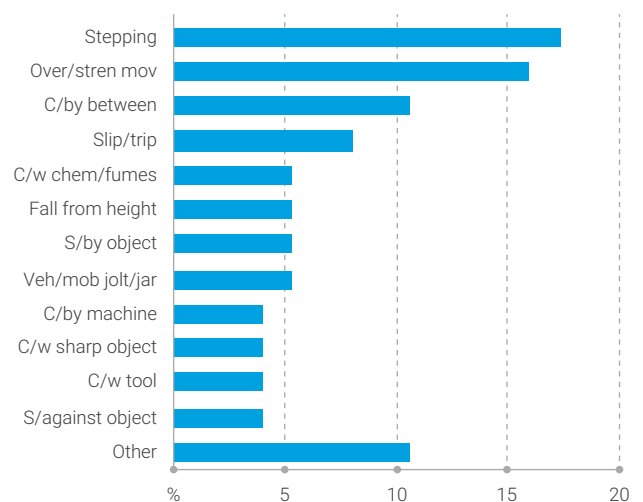
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

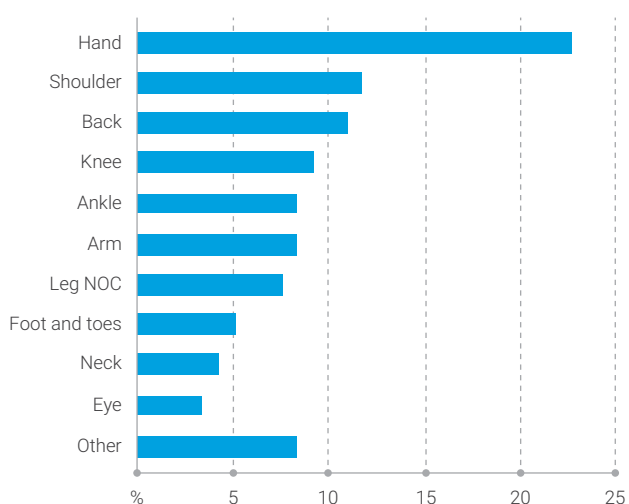


APPENDIX I

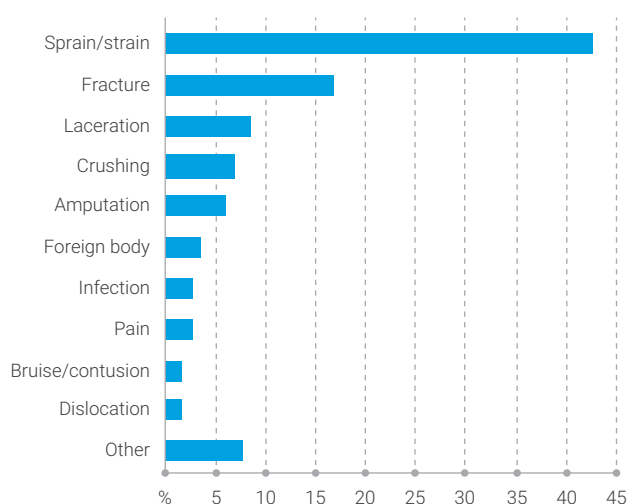
IRON ORE INJURIES 2017-18

119 lost time injuries

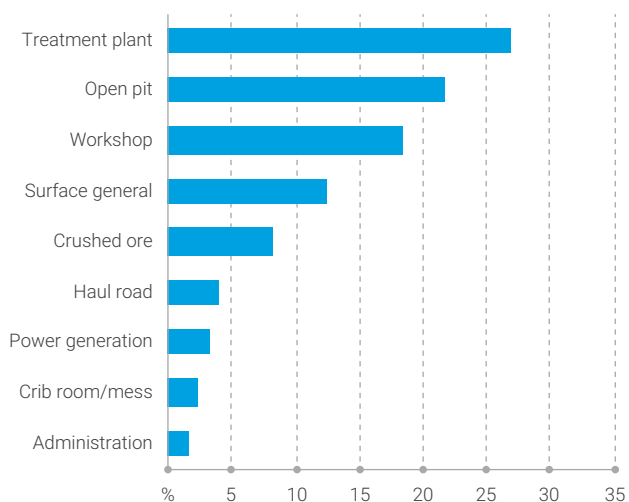
PART OF BODY



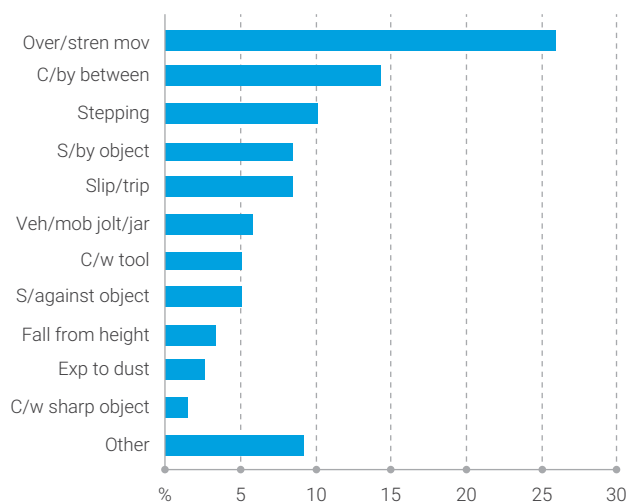
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

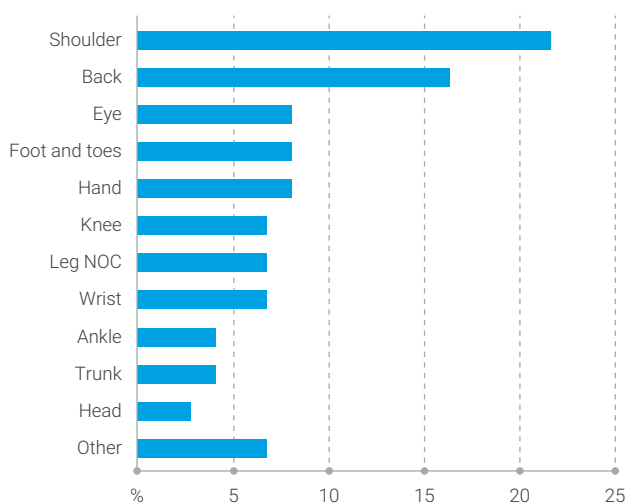


APPENDIX J

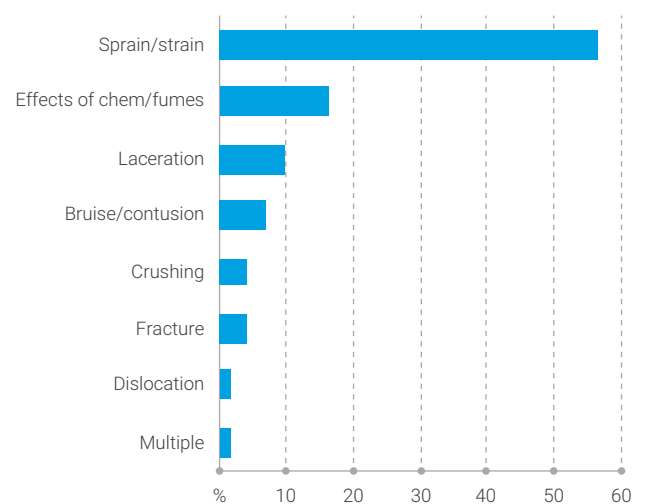
BAUXITE AND ALUMINA INJURIES 2017-18

74 lost time injuries

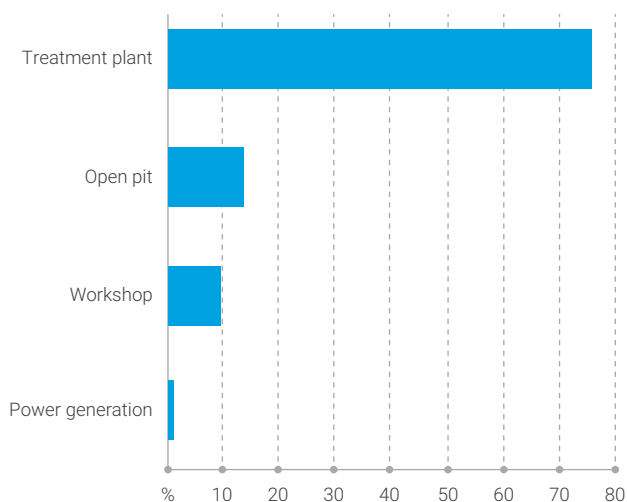
PART OF BODY



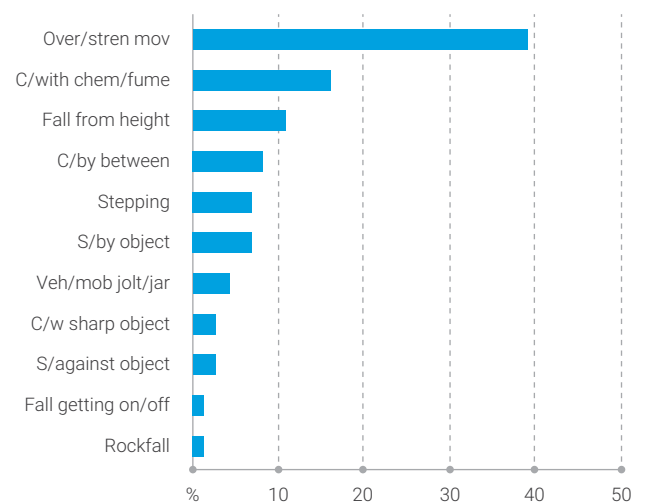
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

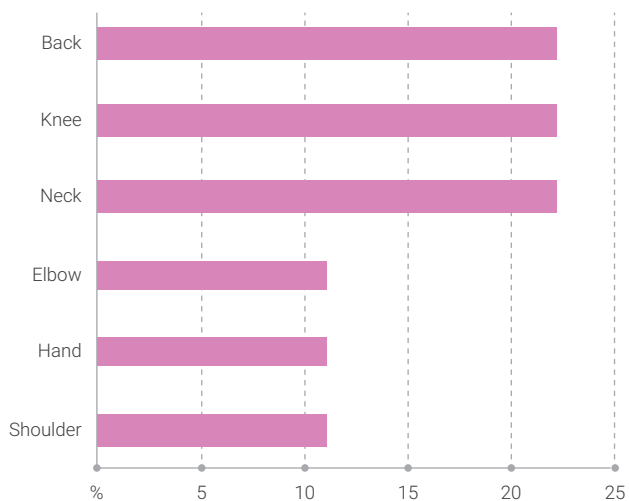


APPENDIX K

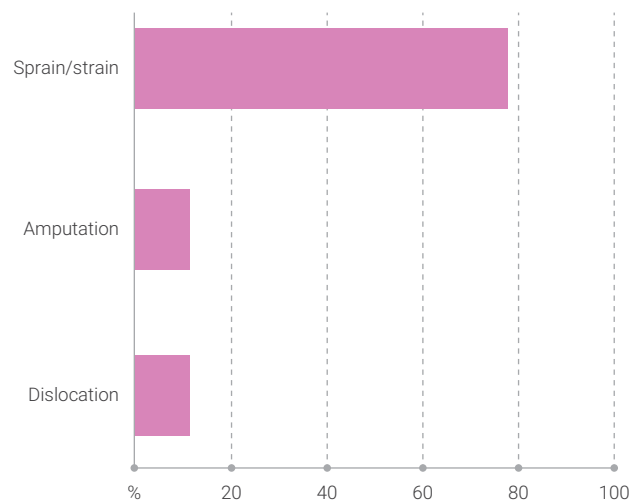
NICKEL UNDERGROUND INJURIES 2017-18

9 lost time injuries

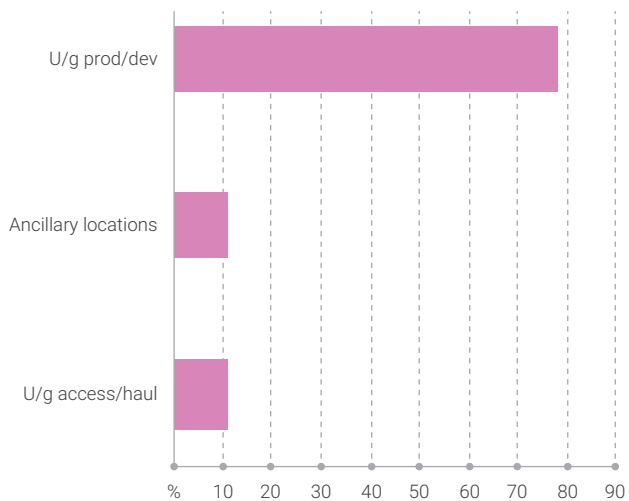
PART OF BODY



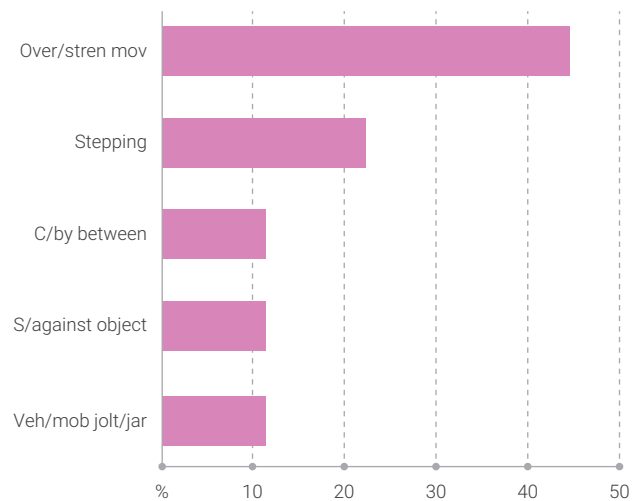
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

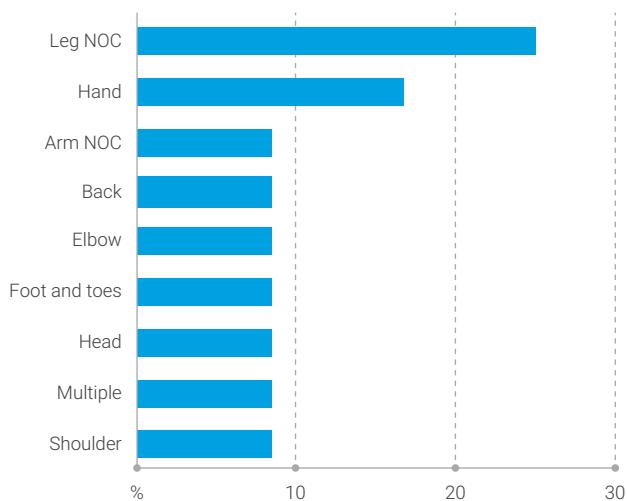


APPENDIX L

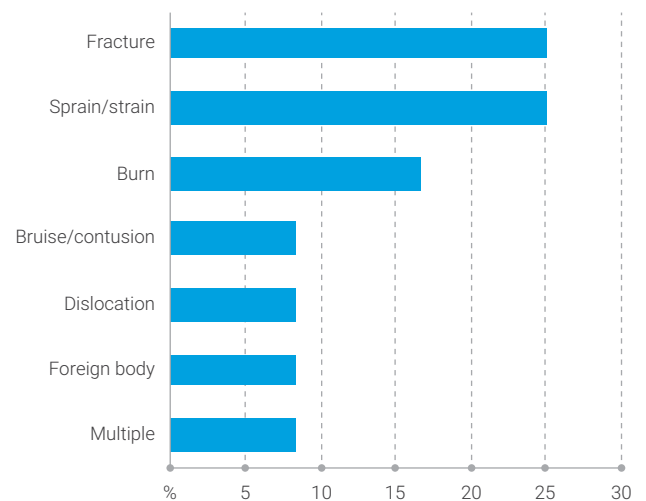
NICKEL SURFACE INJURIES 2017-18

12 lost time injuries

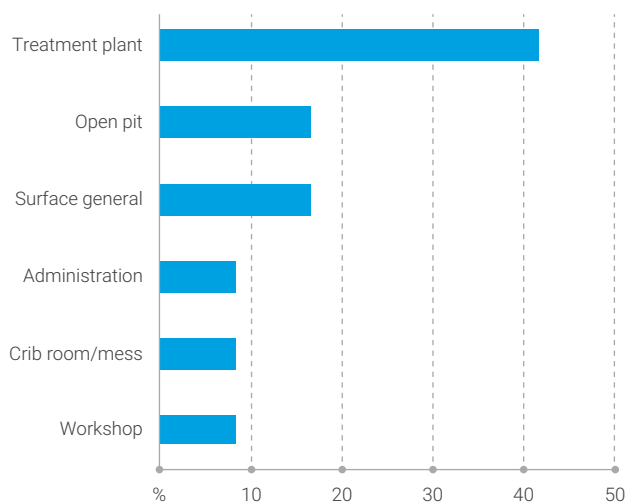
PART OF BODY



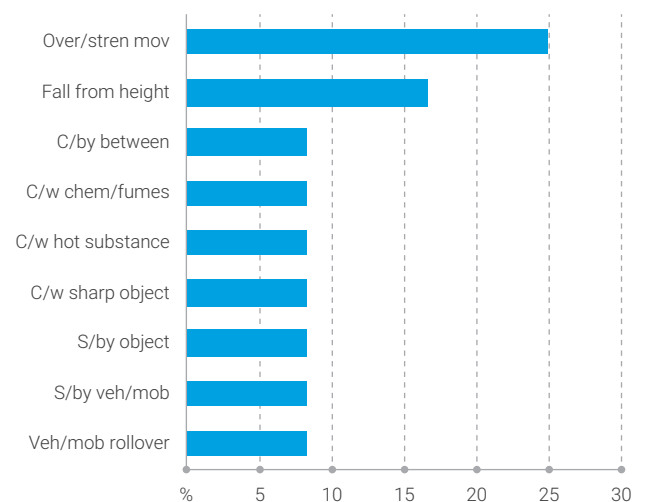
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

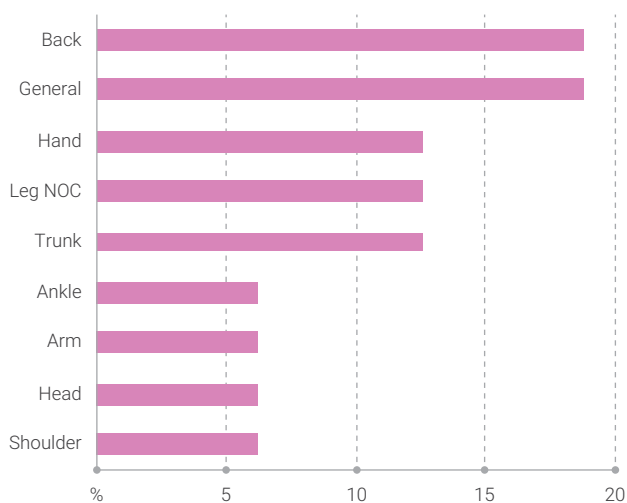


APPENDIX M

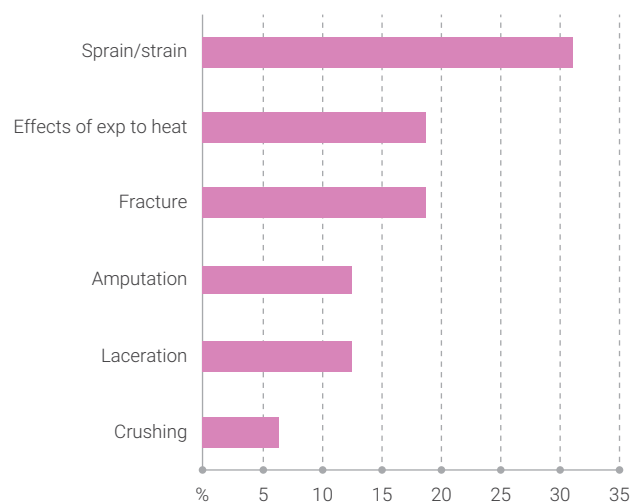
EXPLORATION INJURIES 2017-18

16 lost time injuries

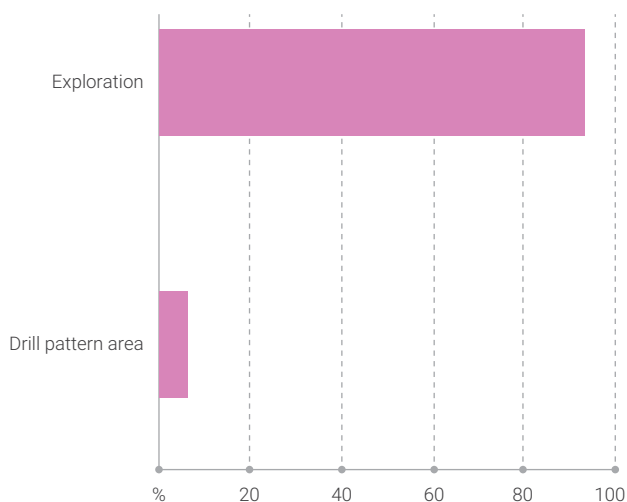
PART OF BODY



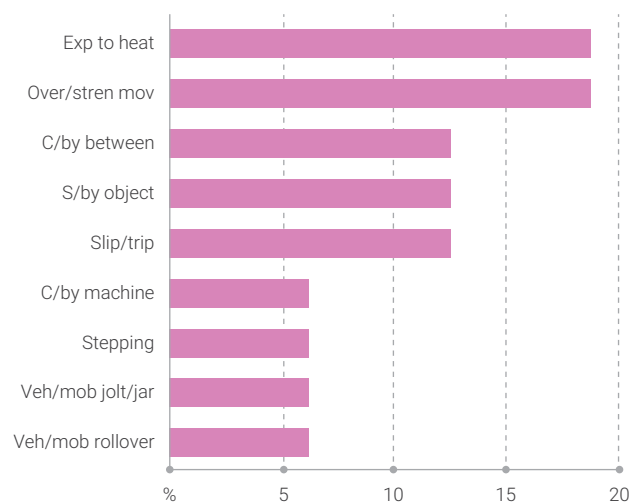
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

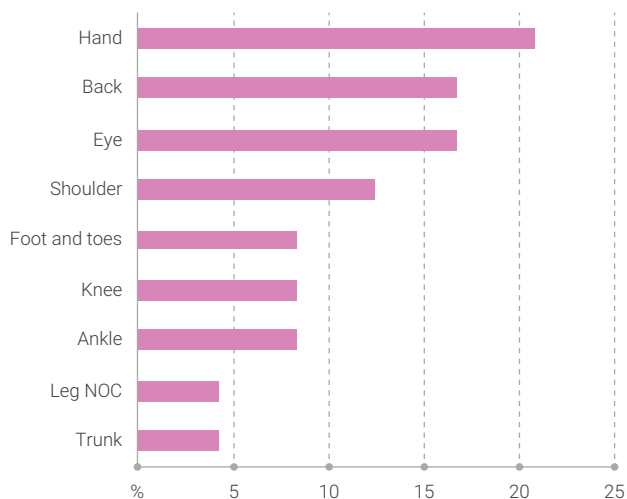


APPENDIX N

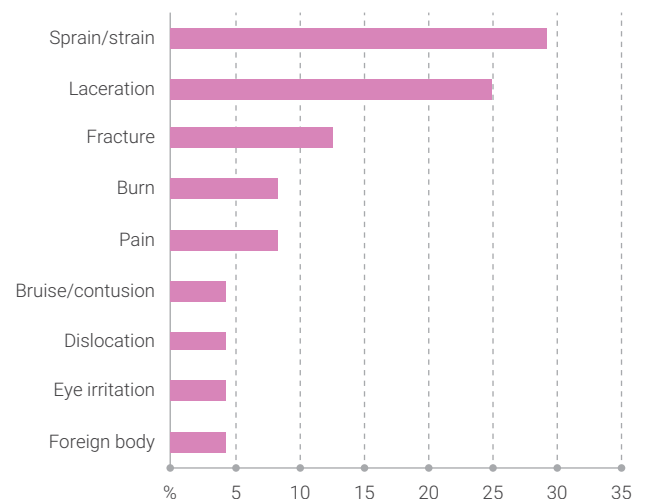
EXPLORATION RESTRICTED WORK INJURIES 2017-18

24 restricted work injuries

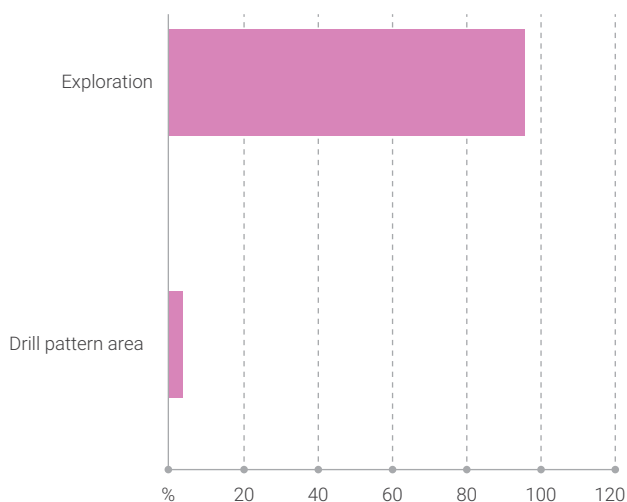
PART OF BODY



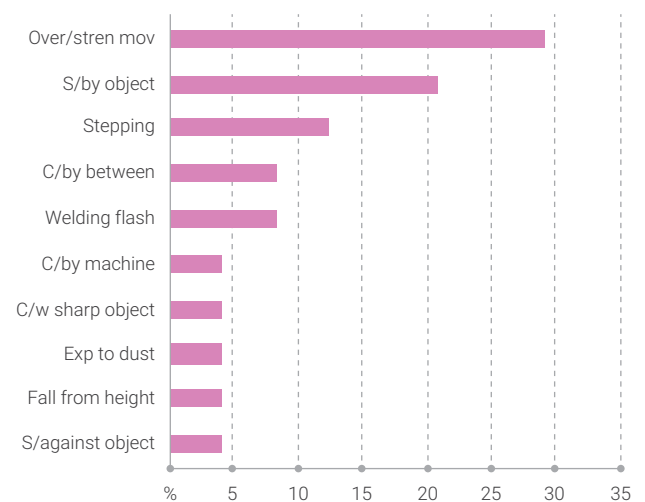
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

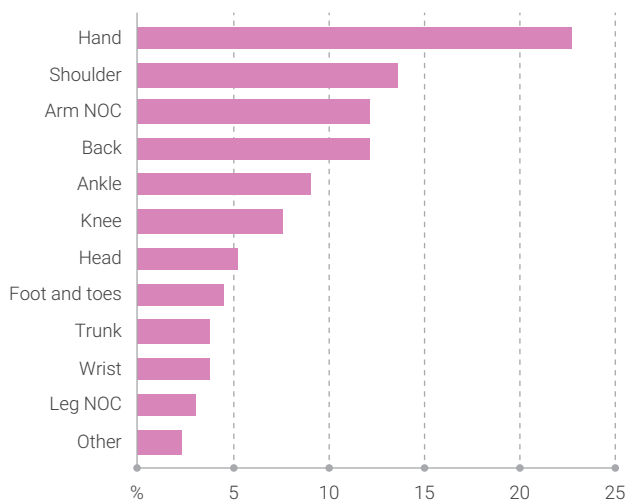


APPENDIX 0

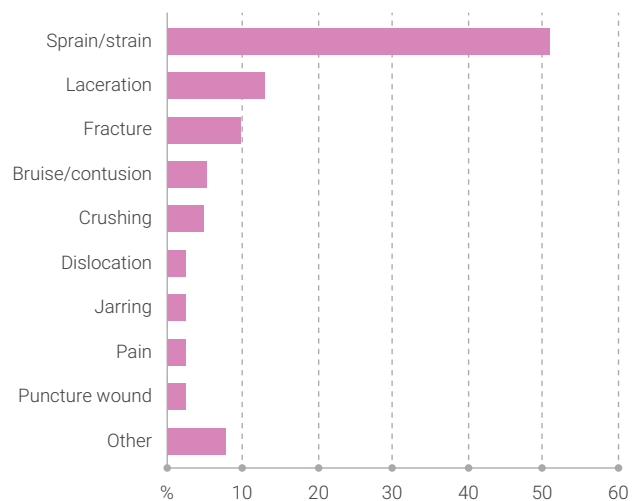
RESTRICTED WORK INJURIES UNDERGROUND 2017-18

132 restricted work injuries

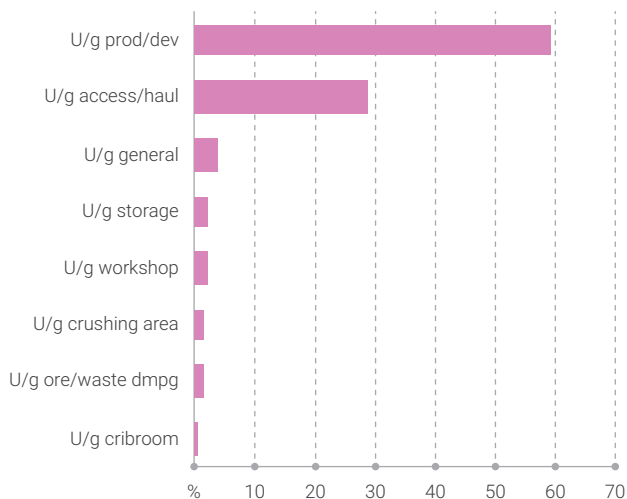
PART OF BODY



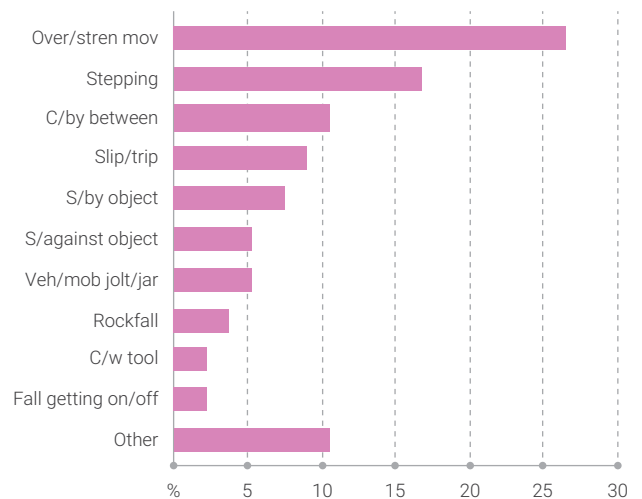
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

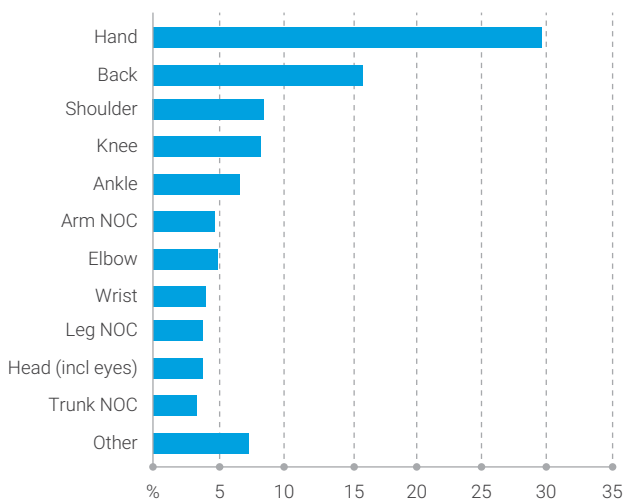


APPENDIX P

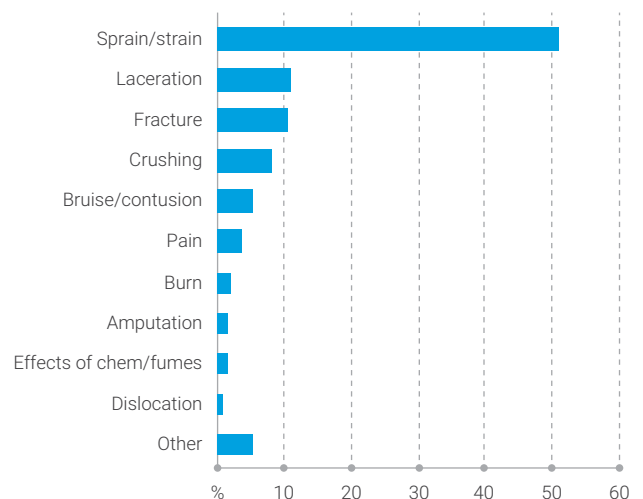
RESTRICTED WORK INJURIES SURFACE 2017-18

719 restricted work injuries

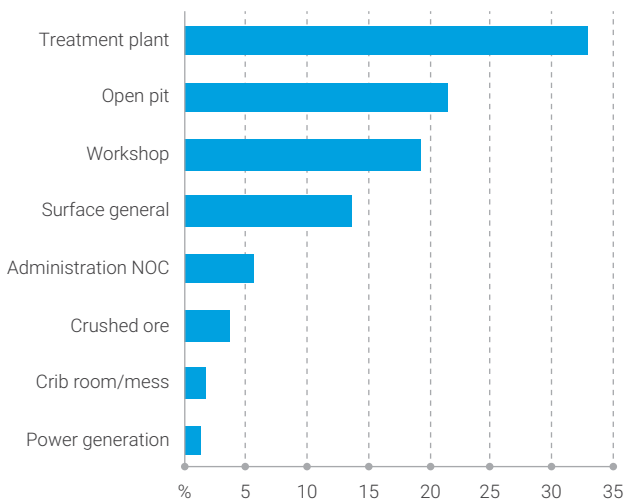
PART OF BODY



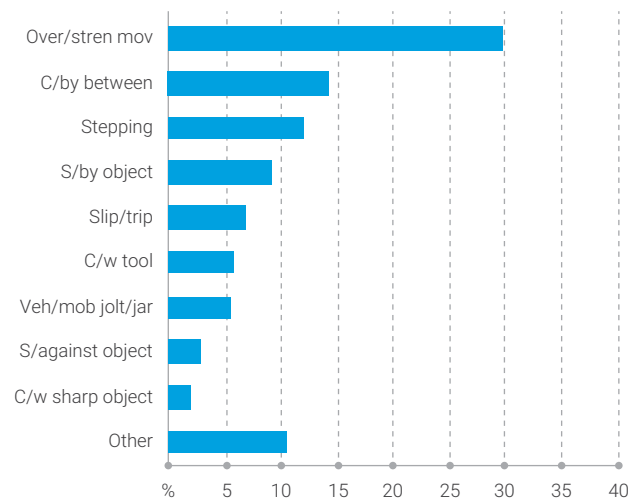
NATURE OF INJURY



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: + 61 8 9358 8001

NRS: 13 36 77

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