SAFETY PERFORMANCE

IN THE WESTERN AUSTRALIAN MINERAL INDUSTRY

ACCIDENT AND INJURY STATISTICS 2014-2015

Government of **Western Australia**
Department of **Mines and Petroleum**
Resources Safety

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STATISTICAL SUMMARY

MINING

- There were three fatal mining accidents during 2014-15. Of these, one occurred on the surface (in a bauxite mine) and two occurred underground (one in a gold mine and the other in a base metals mine).
- There were 413 LTIs during 2014-15, 43 less than the previous year (456 injuries in 2013-14). Table 5 and Appendix A show a breakdown of the number of injuries by commodity mined.
- Lost time injuries resulted in a total of 7,883 rostered days lost and a further 11,361 rostered days of restricted work in 2014-15.
- There was an average workforce of 105,964 in 2014-15, a decrease of approximately 1% from the previous year's average of 107,335.
- The overall LTI duration rate improved by approximately 22% during 2014-15, falling from 24.4 to 19.1.
- The overall LTIFR for 2014-15 improved by 5%, falling from 2.3 to 2.2.
- The overall injury index improved by approximately 26%, falling from 57 in 2013-14 to 42 in 2014-15.
- Serious LTIs in mining during 2014-15 totalled 351, 35 less than in 2013-14, with the overall serious LTIFR improving from 2.0 to 1.9.
- The iron ore sector LTIFR improved by 24% during 2014-15, falling from 1.7 to 1.3.
- The bauxite and alumina sector LTIFR remained unchanged during 2014-15, at 4.0.
- The gold sector LTIFR improved by 4% during 2014-15, falling from 2.6 to 2.5
- The nickel sector LTIFR deteriorated by 10% during 2014-15, rising from 3.0 to 3.3.
- There were 753 RWIs during 2014-15, 159 less than the previous year (912 RWIs reported in 2013-14).
- RWIs resulted in a total of 19,907 rostered days of restricted work in 2014-15.
- The overall RWI frequency rate for 2014-15 improved by 13%, falling from slightly less than 4.7 to 4.0.

EXPLORATION

- There was one exploration fatality in 2014-15.
- There were 10 LTIs reported during 2014-15, 4 more than the previous year.
- Lost time injuries resulted in a total of 148 rostered days lost and a further 337 rostered days of restricted work in 2014-15.
- There was an average workforce of 2,179 workers, a decrease of 5% from the previous year's average.
- The overall LTIFR deteriorated by 92% in 2014-15, rising from 1.3 to 2.5. 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 10 restricted work injuries reported for exploration during 2014-15, resulting in a RWI frequency rate of 2.5, a decrease of 61%.
- RWIs resulted in a total of 354 rostered days of restricted work in 2014-15.

INTRODUCTION

The costs of not building safety into the way a company does business are counted not just in dollars and cents, but in lives lost and changed forever.

In 2014-15, four people died while working at a mining operation in Western Australia. It is unacceptable for even one person to be killed while working, let alone four. We can and should do better. The highest priority on mining operations should be safe systems of work and applying appropriate risk management.

While the Department of Mines and Petroleum is committed to promoting and advocating workplace safety and health, as well as continuing its program of inspections and investigating incidents, the reality is the regulator cannot provide a 24/7 presence on the hundreds of operations in Western Australia. However, we do provide important, timely safety information.

Earlier this year, the Department released an analysis of serious injuries, which followed a similar analysis of fatalities. The key objective of these reports was to develop a better understanding of the injury risk profile of the State's mining industry. The aim is to work with industry to reduce the number and severity of injuries.

Both reports list three main hazards that if they were eliminated or adequately controlled, should see a reduction in the incidence of fatal and serious injuries:

- falling while working at height
- being in the line of fire for objects or suspended loads
- being struck or crushed by machines and heavy components.

Another risk identified in both reports involves low-frequency high-consequence events associated with mobile plant that typically result in either near-miss situations or serious injuries. Three of the top ten critical activities listed in the fatalities report involved:

- run-away vehicles
- vehicles over edges
- vehicle collisions.

Identifying and understanding hazards is paramount in the workplace. Applying appropriate risk management strategies and moving up the hierarchy of control is critical to improve safety outcomes. Job and task safety analyses should concentrate on critical tasks and activities where the risks are heightened.

Unfortunately, the industry appears not to be learning from past tragedies. To draw attention to what the data is telling us, the Department is using a variety of ways to communicate with the State's diverse mining operations. Three areas are being targeted:

- improving hazard awareness and control selection
- promoting the adoption of appropriate risk management strategies
- supporting effective leadership and positive cultural change.

Activities this year have included roadshows, a forum for registered managers, safety alerts, site presentations and toolbox presentations.

We have also presented targeted forums on structural integrity, exploration safety and responsibilities, radiation management plans and risk-based hygiene management.

The focus of this year's Mines Safety Roadshow was height – falling from height, working at height, rock falls, fall of ground – and recurrent incidents, and what can be done about them.

We also released two new hazard videos on the consequences of falling from height to coincide with the roadshows. One of the videos looks at the physics involved in falling. The other presents the human side of the equation, including the personal story of Natalie Bell, who lost her father Rene Ponce in a mining accident the day before his 60th birthday.

We are also committed to releasing the learnings from investigations as quickly as we can through Significant Incident Reports and Mines Safety Bulletins.

The Department launched its new website in November. The content has been completely revamped so people can more easily access the information they need to know and the resources they can use to raise awareness of issues.

As a regulator, we try to raise awareness and seek compliance. However, the only way we can all make a difference and improve safety by ensuring each and every person involved in the mining industry takes their safety responsibilities seriously – whether they are an executive, manager, supervisor, worker or regulator.

Andrew Chaplyn
State Mining Engineer

10 December 2015

Visit **www.dmp.wa.gov.au/Safety/Reports-16199.aspx** for further information on the fatalities and serious injuries reports.

DEFINITIONS

DAYS LOST
Rostered days absent from work due to work injury

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

DURATION RATE
Average number of workdays lost per injury

EXPLORATION
Exploration activities not under the control of a Registered Mine Manager; usually associated with exploration leases

FATAL INJURY INCIDENCE RATE
Number of fatal injuries per 1,000 employees for a 12 month period

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

INJURY INDEX
Number of workdays lost per million hours worked

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

LOST TIME INJURY FREQUENCY RATE (LTIFR)
Number of lost time injuries per million hours worked

METALLIFEROUS MINES
All mines other than coal mines are classed as metalliferous mines

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

NOC
Not otherwise classified

RESTRICTED WORK INJURY (RWI)
Work injury (not LTI) that results in the injured person being unable to fully perform his or her ordinary occupation (regular job) any time after the day or shift on which the injury occurred, regardless of whether or not the person is rostered to work, and where alternative or light duties are performed or hours are restricted

RESTRICTED WORK INJURY FREQUENCY RATE (RWIFR)
Number of restricted work injuries per million hours worked

SERIOUS INJURY FREQUENCY RATE
The number of serious injuries per million hours worked

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

ABBREVIATIONS

C/BY BETWEEN	caught by or between moving or stationary objects or both
C/BY MACHINE	caught by or between operating machine
CHEM/FUMES	chemicals or fumes
COMP	compressed
C/W	contact with
DETON	detonation
ENV	environment
EXP	exposure
FR	frequency rate
HI PRESS FLUID	high pressure fluid
JOLT/JAR	jolting or jarring
LTI	lost time injury
LTIFR	lost time injury frequency rate
NOC	not otherwise classified
ON/OFF	on or off
OVER/STREN MOV	over-exertion or strenuous movements
PRESS	pressure
RWI	restricted work injury
S/AGAINST	struck against
S/BY	struck by
SLIP/TRIP	slip or trip
U/G	underground
U/G ACCESS/ HAUL	underground access, travelling or haulage ways
U/G PROD/DEV	underground production or development areas
VEH/MOB	vehicle or mobile equipment

EXPLANATORY NOTES

Introduction

The statistics published in this annual compilation mainly relate to accidents between 1 July 2014 and 30 June 2015 (2014-15) involving time lost from work of one day or more (lost time 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 2014-15 has three components:

i) Initial injuries — days lost in 2014-15 from injuries that occurred in 2014-15

ii) Recurrent injuries — days lost in 2014-15 through recurrences of injuries that occurred in 2014-15 and previous years

iii) Carry-over injuries — days lost in 2014-15 by persons continuously off work from injuries that occurred before 1 July 2014.

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 not covered by this report, apart from the statistical summary, Tables 4, 8 and 10, and Appendix N.

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

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 Resources Safety 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 2014-15 received by 20 October 2015. It will not reflect any data received or changed after this date.

During the twelve months covered in this compilation, an average of 407 mines or groups of mines and 244 exploration companies reported to the SRS.

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

Charts

For clarity, most bar charts in this publication are restricted to 15 or fewer categories.

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

FATAL ACCIDENTS

Fatal accidents during 2014-15

Colin Whitton, 29 September 2014

Colin Whitton, an electrician, was fatally injured while carrying out breakdown maintenance on a lift at an alumina refinery. Mr Whitton was working at the ground level and was caught between the lift car and the lift shaft when the lift car moved upwards.

There were no direct eye witnesses, and so it is not possible to determine exactly what Mr Whitton was doing at the time of the accident. He was last seen alive by a work colleague when he entered the lift at the top floor and rode it down to the ground floor.

Related safety alert

Mine Safety Significant Incident Report No. 210 Electrician crushed between lift car and lift shaft structure – fatal accident

Philip Kitching, 20 January 2015

Philip Kitching, a fitter, was fatally injured when working on a guard fitted beneath the engine of a bulldozer. The machine was parked for maintenance in an exploration area on a mining lease.

Mr Kitching was lying on his back on the ground underneath the bulldozer removing bolts from the engine guard. Mud had collected on the engine guard and a decision had been made to remove the guard to allow the mud to be cleaned off. The right side of the guard was supported with a chain block, but the left side of the engine guard fell down onto his chest. It was found that the hinge plate was broken and did not secure the left hand side of the engine guard to the chassis.

Related safety alert

Mine Safety Significant Incident Report No. 213 Maintenance worker pinned by bulldozer belly plate – fatal accident

Adam Hardaker, 11 May 2015

Adam Hardaker, a load-haul-dump (LHD or bogger) operator, was working at a stope draw point in the underground operations at a copper mine. He received fatal injuries when he was struck by a rock weighing about 700 kg that rolled from an open stope.

Mr Hardaker had parked the LHD in the stope access drive and was on foot in front of the loader bucket. There was a substantial gap between the brow and the rill at the stope draw point. The rill extended well into the draw point.

The rock appears to have rolled down the rill and struck the operator, who was using a hose to water down the rill.

Related safety alerts

Mine Safety Significant Incident Report No. 221 Operator struck by rolling rock at stope draw point – fatal accident

Joshua Martin, 15 May 2015

Joshua Martin, an underground worker, was using an elevated work platform (EWP) to load explosive emulsion into pre-drilled holes. He was fatally injured when the charge-up basket he was in moved upwards, crushing him against the roof of the cross-cut.

It appears he was leaning over the front of the basket when he accidentally activated the control stick for raising and lowering the basket. An offsider was working in front of the basket to help guide the charge-up hose into the blast holes. After the accident, the control stick was found to be bent forward (i.e. in “raise basket” position).

Related safety alerts

Mine Safety Significant Incident Report No. 217 Underground worker crushed between charge-up basket and roof – fatal accident

FATAL ACCIDENTS CONTINUED

Fatal injury incidence rate 1995-96 to 2014-15

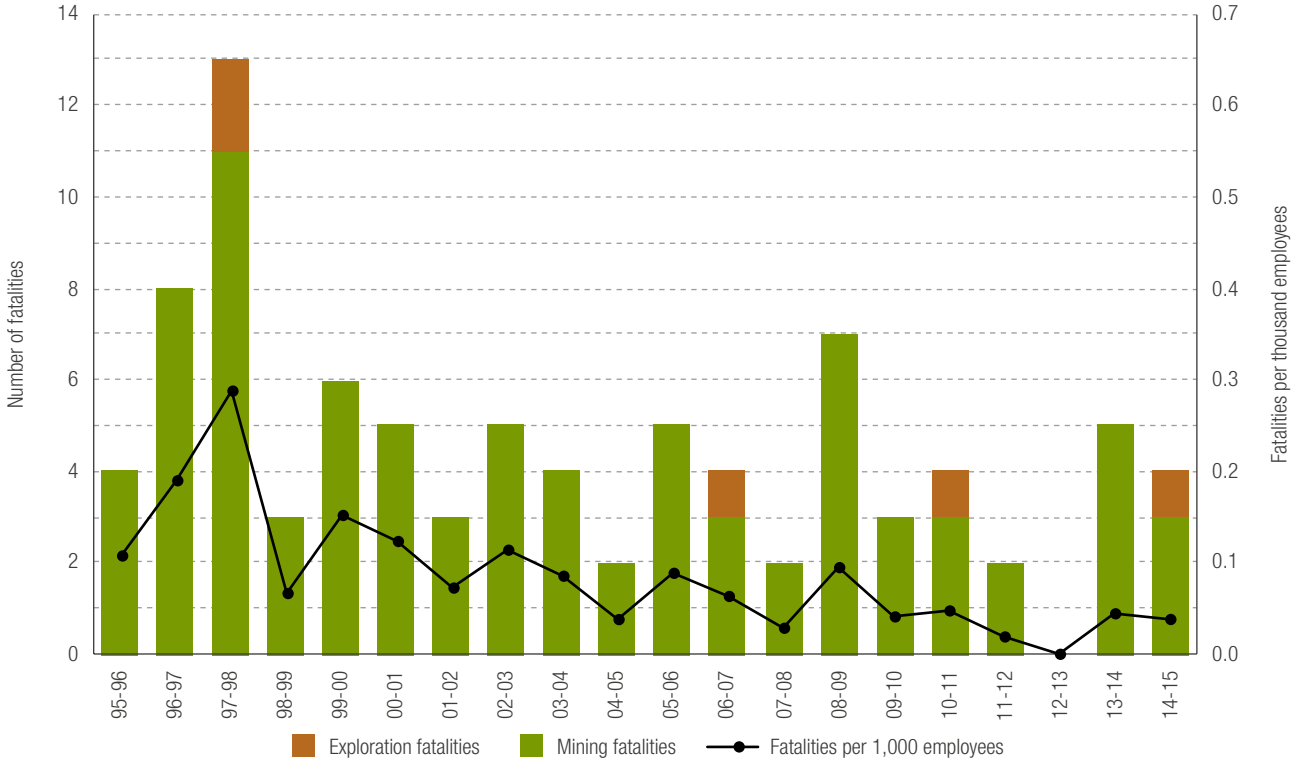
There were four fatal accidents in the Western Australian mineral industry during 2014-15. Of these three were on mining operations and one associated with an exploration operation. This resulted in a combined fatal injury incidence rate for 2014-15 of 0.037.

While there has been an overall decrease in the number of fatalities per thousand employees over the last 20 years (see Figure 1), the rate of improvement has slowed in recent years, with a fatal incidence rate of between zero and 0.1 over the last decade.

Resources Safety maintains the view that no fatal accident is acceptable, and a fatal injury incidence rate of zero is achievable.

The zero fatal incidence rate achieved for 2012-13 supports this view.

FIGURE 1 FATAL INJURY INCIDENCE RATE 1995-96 TO 2014-15



FATAL ACCIDENTS CONTINUED

Fatal injury incidence rate by mineral mined 2010-11 to 2014-15

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

Fatal injuries by type of accident 2010-11 to 2014-15

Table 2 indicates the type of accidents for the 15 fatalities in the mining industry (including exploration) over the past five years, with four underground, nine 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 fall from height (one fatality).

Of the five types of surface fatal accident occurring in the past five years the most common was struck by object (four fatalities), followed by struck by vehicle or mobile equipment (two fatalities) and then caught by or between objects, exposure to environmental heat, and fall from height (one fatality each).

The two exploration fatality types were exposure to environmental heat and struck by object.

TABLE 1 FATAL INJURY INCIDENCE RATE BY MINERAL MINED 2010-11 TO 2014-15

Category		Fatalities per thousand employees
Mineral	Base metals	0.08
	Gold	0.05
	Iron ore	0.02
	Bauxite and alumina	0.02
Underground		0.09
Surface		0.02
Exploration		0.14

TABLE 2 NUMBER OF FATALITIES BY TYPE OF ACCIDENT 2010-11 TO 2014-15

Category		Number of fatalities
Underground	Rockfall	2
	C/by machine	1
	Fall from height	1
Surface	S/by object	4
	S/by veh/mob	2
	C/by between	1
	Exposure to env heat	1
	Fall from height	1
Exploration	Exposure to env heat	1
	S/by object	1
Total		**15**

SERIOUS INJURIES

Review of serious injuries during 2014-15

There were 351 serious lost time injuries reported in the mining industry during 2014-15 (386 in 2013-14). Of these, 340 were in metalliferous mines and 11 were in coal mines.

Typical serious lost time injuries are described below:

A process operator sustained burn injuries from liquid ammonia when a purge hose ruptured during a routine purging activity in the anhydrous ammonia storage.

The operator of a loader sweeping the toe of a stockpile was ejected from his seat and struck his head on the roof of the cab, sustaining a fracture to his neck, when he drove over a rock which had apparently rolled down between the loader's front and rear side wheels.

A processing plant operator injured his shoulder when he missed a step while going up stairs and grabbed the handrail to avoid falling.

A conveyor belt technician, undertaking a roller change-out using a 'come-along' winch and spreader bar, was struck in the jaw by one of the attaching hooks when it released while lifting the return side of the conveyer belt. The technician sustained a fractured jaw, requiring surgery to plate the fracture.

The operator of an excavator climbing steps up to the machine lost his footing and fell backwards while still holding onto the hand rail, resulting in a dislocation of his right shoulder .

A truck driver, taking a break to stretch and walk while one of the truck's wheels was being worked on, fell and rolled her ankle, resulting in a fracture. She had inadvertently stepped into a rut left by a bulldozer in an area being rehabilitated.

A fitter experienced pain which did not subside in both wrists after a period of continuous rattle gun usage working on piping and valves during an outage at a processing plant . After medical examinations conducted over an extended period it was determined to be a carpal tunnel condition.

An operator descending stairs to the processing plant tertiary mill level stumbled and fell, striking his knee on the grid mesh floor, when he missed the last step. The fall resulted in a fracture to his knee cap, contusions and swelling.

Maintenance contractors had been sandblasting the inside walls of a CIL tank using a scissor lift to access the higher areas of the tank. As a contractor was raising the scissor lift, operating the controls with his right hand, his left hand thumb became jammed between the scissor lift hand rail and the tank agitator blade, causing a part of his left thumb to be severed just below his knuckle.

A driller sustained a significant crushing injury to the hand while attempting to resolve a problem with the transfer of a rod from the drill rig's carousel to the drill centre. The rod handler had faulted in mid-sequence and the driller had laid down the drill mast on top of the drill rig to assess a potential faulty proximity sensor at the top of the mast. When he reached with his right hand in between the rod arm rotation motor and the drill rod to access the proximity sensor the sensor activated, resulting in the rod transfer arm completing its sequence, pinning his hand between the drill rod and rod arm rotation motor. The driller shouted to the offsider for help and then gave instructions to engage the rod handler lever to release his hand.

An employee slipped while walking down a newly constructed embankment of a 'turkey's nest' water pond as he was returning from checking the water level and looking for any trapped fauna. This resulted in a hyper-extension injury to his right knee and caused him to fall to the ground. The injured person's left foot had slipped and when he put his right foot down it sank into the soft ground of the embankment.

A truck driver received a complete fracture of the tibia and fibula when he was knocked from the truck and his foot caught between rolls of 110 mm poly pipe while unloading a delivery truck. The truck was loaded with a strapped bundle of five rolls of 110 mm poly pipe and it was decided to unstrap the rolls of pipe whilst on the truck and remove them in smaller parcels. When the driver, who was standing among the rolls on the truck, released the last strap the rolls shifted. The truck driver and one of the rolls fell from one side of the truck, and the remaining four rolls fell from the other side.

A drill jumbo operator suffered abrasions and bruising to his back, and a small laceration to his forehead, when he was struck on the hard hat and back by a slab of rock weighing approximately 100 kg which fell from the face while he was marking lines preparatory to drilling the development face. He was given first aid at the site of the incident before being transported to the surface and then to hospital for further treatment.

A truck driver sustained a fracture to his lower spine when he fell to the ground while unstrapping a load on the truck.

A technician, attempting to re-enter a light truck which had travelled unoccupied for approximately 28 m in a laydown yard, slipped and twisted his right knee. The vehicle came to rest against a windrow.

SERIOUS INJURIES CONTINUED

A light vehicle with two occupants, which entered a single-lane controlled area during night shift operations to conduct a brief inspection, collided with a loaded haul truck travelling down the ramp. The light vehicle became entangled with the haul truck's emergency ladder and was pushed backwards about 40 metres down the recently watered ramp. The haul truck stopped when radio contact was established by the occupants of the light vehicle, alerting the truck operator to the incident. Although no physical injuries were sustained during the collision, stress from the incident affected those involved.

An operator of a drill rig, walking towards the rig in darkness, stepped into a drill hole approximately 1 m from the rig stairs. The operator's left leg fell into the hole and his right knee struck the ground. The fall resulted in a sore right shoulder, later found to be due to a torn tendon.

A truck driver, standing on the ladder of a loader at a quarry to gather paper work from the operator, received crush injuries including fractures to his legs and hip when his loaded road train (consisting of a prime mover, lead trailer and dog trailer) rolled forwards, trapping him against the steps. The site registered manager, who was operating a second loader, was alerted by two-way radio. He directed another truck driver to go the muster point to call for ambulance and police to attend and on reaching the scene of the incident entered the truck and reversed it away from the loader, freeing the injured driver.

A pit technician, attempting to re-enter an unoccupied light vehicle after it began rolling down the pit ramp, received fractures to two neck vertebrae when she was struck on the head and neck by the headboard of the vehicle as it mounted a windrow and overturned towards her. The technician had been transporting approximately 500 kg of drill samples up the ramp to the laboratory when two bags fell from the open back of the vehicle onto the ramp road surface. She had turned around at the top of the ramp and driven back down to retrieve them, having received radio notification of their loss and alerting other ramp users of her presence. It was while she was out of the vehicle collecting the sample bags that the technician noticed the vehicle moving down the ramp and ran after it, intending to open the door. After travelling approximately 38 m the vehicle impacted the windrow and rolled towards the driver's side, striking and knocking the technician to the ground.

A service crew operator sustained fractures to three metatarsal bones and a possible fracture to a fourth in his left foot when a work basket was lowered onto it. Two service crew operators had been working underground, undertaking cable activities using an Integrated Tool Carrier (IT) work basket. While the basket was being lowered and crowded to a level position the service crew operator working at ground level stepped forward and his left foot became caught between the floor of the drive and the work basket. Work was stopped immediately and the IT basket raised. The operator was transferred to the surface medical facility and treated, before being transferred to hospital for further assessment and treatment.

Serious injury incidence rate by mineral mined 2010-11 to 2014-15

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 chart shows that the serious injury incidence rate for underground mining (5.4) was 50% higher than that for surface operations (3.6).

Of the major mining sectors, coal had the highest five-year average serious injury incidence rate (16.7) , followed by Silica-silica sand at 7.8, whereas manganese ore had the lowest (at 2.1), followed closely by iron ore (at 2.5). The mining sector referred to as "Other", with a five-year average serious injury incidence rate of 6.3, contained 3% of the total number of employees spread over 18 commodity groups.

Serious injury frequency rate 2010-11 to 2014-15

Figure 3 shows that the serious injury frequency rate improved for both underground and surface metalliferous operations (by 9% and 5% respectively). Coal operations improved by approximately 12% during 2014-15. This resulted in a 5% improvement overall.

FIGURE 2 SERIOUS INJURY INCIDENCE RATE 2010-11 TO 2014-15

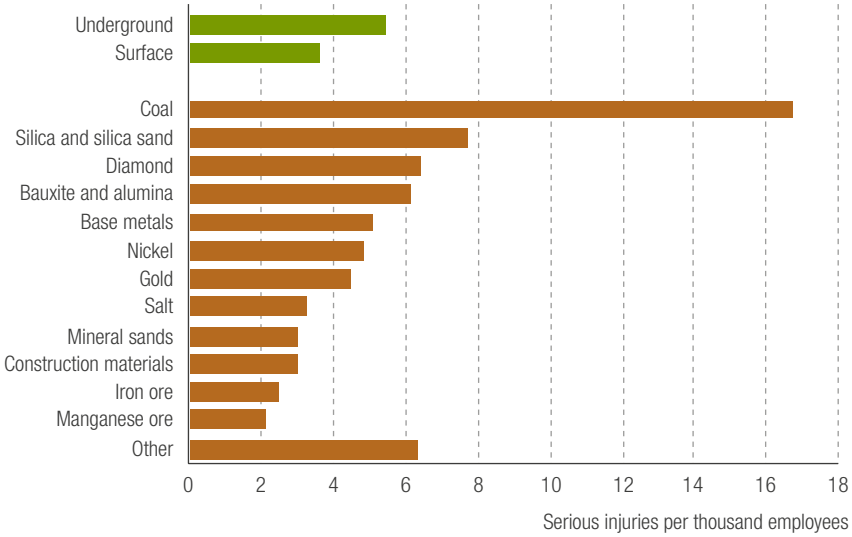
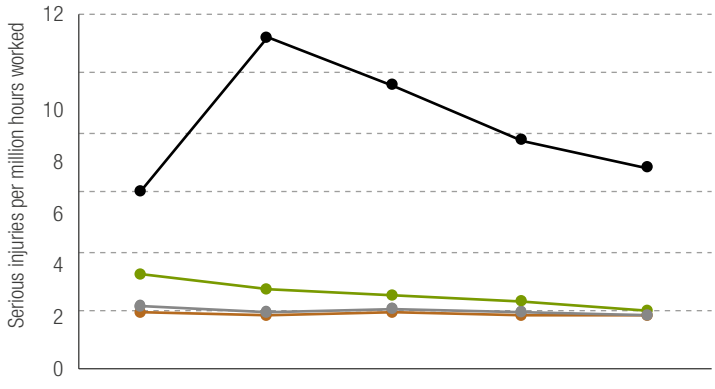


FIGURE 3 SERIOUS INJURY FREQUENCY RATES 2010-11 TO 2014-15



	10-11	11-12	12-13	13-14	14-15
Underground	3.2	2.7	2.5	2.3	2.1
Metalliferous surface	1.9	1.8	1.9	1.9	1.8
Coal	6.1	11.2	9.6	7.7	6.8
Total	2.1	2.0	2.0	2.0	1.9

Serious injury percentage breakdown for 2014-15

Appendices B and C 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.

Underground

- Injuries to backs and legs each accounted for the largest proportion of serious injuries at 21%, followed by arm injuries at 17%, hand injuries at 14%, then foot and toes, head and multiple injuries, each at approximately 7%. Of the serious leg injuries, 67% were to knees and 33% to ankles. Injuries to shoulders made up 60% of serious arm injuries.
- Consistent with the high proportion of knee, ankle, shoulder and back injuries, sprain or strain represented the highest proportion by nature of injury (52%), followed by fracture and laceration, each at 17%.
- The largest proportion of serious injuries underground was in production and development areas (48%), followed by underground access and haulage ways (24%) and pump chambers (14%).
- The most common accident type associated with serious injuries underground was over-exertion or strenuous movements at 34%, followed by contact with tool, struck by object and slip or trip (each at 10%).

Surface

- Injuries to legs accounted for the largest proportion of serious injuries at 27%, followed by arm injuries at 24%, hand injuries at 17% and back injuries at 16%. Of the serious arm injuries, 57% were to shoulders, followed by injuries to elbows and wrists, each at 13%. Injuries to knees and to ankles accounted for 46% and 36% of serious leg injuries respectively.
- Consistent with the high proportion of knee, ankle, back and shoulder injuries, sprain or strain represented the highest proportion by nature of injury (53%). Fracture was the next highest (16%), followed by crushing and laceration at 6.5% and 6.2% respectively.
- The largest proportion of serious injuries on the surface occurred in treatment plants (33%), followed by open pits at 26% then workshops at 16%.
- The most common accident type associated with serious injuries on the surface was over-exertion or strenuous movements (27%), followed by stepping (16%) and slip or trip (13%).

LOST TIME INJURIES

Review of lost time injuries during 2014-15

In 2014-15, 19,691 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 2014-15 (7,883), recurrences of injuries sustained before 2014-15 and in 2014-15 (835), and LTIs and recurrences carried over into 2014-15 from accidents before July 2014 (10,973). A breakdown of work days lost in coal and metalliferous mining is given in Table 3.

During 2014-15, there were 413 LTIs in the State's mining industry. Of those, 399 were in metalliferous mines and 14 in coal mines. A breakdown of these data with performance indicators is given in Tables 4 and 5.

In addition to the initial injuries, there were 34 recurrences of previous injuries, resulting in 835 work days lost during 2014-15. A breakdown of recurrent injuries by calendar year of initial injury is given in Table 6.

One hundred and forty-four people who were still off work from injuries received before July 2014 lost 10,973 work days in 2014-15. A breakdown of these carry-over injuries is given in Table 7.

TABLE 3 DAYS LOST THROUGH INJURY DURING 2014-15

Mines	Initial injuries	Recurrent injuries	Carry-over injuries	Total
	Days lost			
Metalliferous	7,620	759	10,751	19,130
Coal	263	76	222	561
Total mining	**7,883**	**835**	**10,973**	**19,691**

TABLE 4 INITIAL LOST TIME INJURIES DURING 2014-15

Sector	No. of employees	No. of LTIs	Incidence	Frequency	Duration	Injury index	Days lost
Metalliferous surface	97,941	363	3.7	2.1	19.3	41	7,009
Metalliferous underground	7,065	36	5.1	2.5	17.0	43	611
Metalliferous total	**105,006**	**399**	**3.8**	**2.2**	**19.1**	**41**	**7,620**
Coal total	**958**	**14**	**14.6**	**8.7**	**18.8**	**163**	**263**
Total mining	**105,964**	**413**	**3.9**	**2.2**	**19.1**	**42.3**	**7,883**
Exploration	**2,179**	**10**	**4.6**	**2.5**	**14.8**	**36.82**	**148**

TABLE 5 INJURIES BY MINERAL MINED DURING 2014-15

Mineral mined	No. of employees	No. of LTIs	Incidence	Frequency	Duration	Injury index	Days lost
Iron ore	59,918	134	2.2	1.3	19.4	24.3	2596
Gold	19,194	84	4.4	2.5	19.6	48.1	1649
Bauxite and alumina	7,481	56	7.5	4.0	18.0	71.7	1006
Nickel	6,099	38	6.2	3.3	17.2	55.9	653
Base metals	2,531	10	4.0	2.2	9.4	21.0	94
Mineral sands	2,241	13	5.8	4.8	6.2	29.9	81
Construction materials	1,452	5	3.4	2.9	3.0	8.6	15
Diamonds	1,398	10	7.2	3.9	33.0	128.7	330
Coal	958	14	14.6	8.7	18.8	163.2	263
Salt	957	5	5.2	3.8	38.2	145.2	191
Manganese ore	517	0	0.0	0.0	0.0	0.0	0
Tin, tantalum and lithium	499	1	2.0	1.2	2.0	2.5	2
Other	2,719	43	15.8	12.8	23.3	298.0	1003
Total mining	**105,964**	**413**	**3.9**	**2.2**	**19.1**	**42.3**	**7,883**

Note: Duration in Tables 4 and 5 does not take into consideration time lost after 30 June 2015 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 2014.

TABLE 6 RECURRENT INJURIES DURING 2014-15

Calendar year	Metalliferous mines		Coal mines		Total mining	
	No. of injuries	Days lost	No. of injuries	Days lost	No. of injuries	Days lost
2015*	3	94			3	94
2014	20	400	2	76	22	476
2013	4	63			4	63
2006	2	101			2	101
2004	1	32			1	32
2002	1	20			1	20
1998	1	49			1	49
Total	**32**	**759**	**2**	**76**	**34**	**835**

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.

** Covers period from 1 January to 30 June 2015*

LOST TIME INJURIES CONTINUED

TABLE 7 CARRY-OVER INJURIES DURING 2014-15

Calendar year	Metalliferous mines		Coal mines		Total mining	
	No. of injuries	Days lost	No. of injuries	Days lost	No. of injuries	Days lost
2014*	84	4,349	1	183	85	4,532
2013	41	4,113	2	39	43	4,152
2012	12	1,736			12	1,736
2011	3	410			3	410
2005	1	143			1	143
Total	**141**	**10,751**	**3**	**222**	**144**	**10,973**

** Covers period from 1 January to 30 June 2014*

Review of lost time injuries during 2014-15 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 Resources Safety'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 2014-15 (AS 1885.1:1990)

Sector	No. of employees	No. of LTIs	Injuries per hundred	Frequency rate	Duration rate	Days lost
Metalliferous surface	97,941	364	0.37	2.1	19.9	7,229
Metalliferous underground	7,065	38	0.54	2.7	27.7	1,051
Metalliferous total	**105,006**	**402**	**0.38**	**2.2**	**20.6**	**8,280**
Coal	**958**	**14**	**1.46**	**8.7**	**18.8**	**263**
Total mining	**105,964**	**416**	**0.39**	**2.2**	**20.5**	**8,543**
Exploration	**2,179**	**11**	**0.50**	**2.7**	**33.5**	**368**

Note: Duration in Tables 8 and 9 does not take into consideration time lost after 30 June 2015 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 2014.

TABLE 9 INJURIES BY MINERAL MINED DURING 2014-15 (AS 1885.1:1990)

Mineral mined	No. of employees	No. of LTIs	Injuries per hundred	Frequency rate	Duration rate	Days lost
Iron ore	59,918	134	0.22	1.3	19.4	2,596
Gold	19,194	85	0.44	2.5	22.0	1,869
Bauxite and alumina	7,481	57	0.76	4.1	21.5	1,226
Nickel	6,099	38	0.62	3.3	17.2	653
Base metals	2,531	11	0.43	2.5	28.5	314
Mineral sands	2,241	13	0.58	4.8	6.2	81
Construction materials	1,452	5	0.34	2.9	3.0	15
Diamonds	1,398	10	0.72	3.9	33.0	330
Coal	958	14	1.46	8.7	18.8	263
Salt	957	5	0.52	3.8	38.2	191
Manganese ore	517	0	0.00	0.0	0.0	0
Tin, tantalum and lithium	499	1	0.20	1.2	2.0	2
Sand - silica sand	346	13	3.76	27.1	9.2	119
Other	2,373	30	1.26	10.4	29.5	884
Total mining	**105,964**	**416**	**0.39**	**2.2**	**20.5**	**8,543**

WORKERS' COMPENSATION

Premium rates for the Western Australian mineral industry

The workers' compensation recommended premium rates determined by the Premium Rates Committee are published in a dedicated Western Australian Government Gazette, and are effective from 30 June in the year of issue.

Figure 4 indicates trends in workers' compensation costs for selected mineral groups for the ten-year period 2006-2007 to 2015-16.

Over this ten year period, the coal mining compensation rate increased, by 13%, to 2.31% of payroll. The compensation rate for surface gold operations decreased, by 39%, to 1.26% of payroll, and that for iron ore operations increased, by 37%, to 0.86% of payroll. The rate for underground gold operations decreased, by 12%, to 3.10% of payroll.

Figure 5 shows premium rates recommended in 2014-15 for the following year for a variety of mineral groups and other industries. Although premium rates in isolation are not necessarily reliable indicators of risk, they do represent a cost to industry and, in part, reflect past safety performance.

The average premium rate recommended in 2014-15 for the Western Australian mining industry for 2015-16 was 1.69% of payroll, an 11% decrease on the rate recommended in 2013-14 for 2014-15 (1.90% of payroll).

In 2014-15, apart from underground gold mining and coal, premium rates recommended for mining industry groups compared favourably with other industry groups such as structural steel fabrication and sheet metal product manufacturing, which had premium rates of 4.13% and 2.21% of payroll, respectively.

FIGURE 4 MINE WORKERS' COMPENSATION RATE TRENDS 2006-07 TO 2015-16

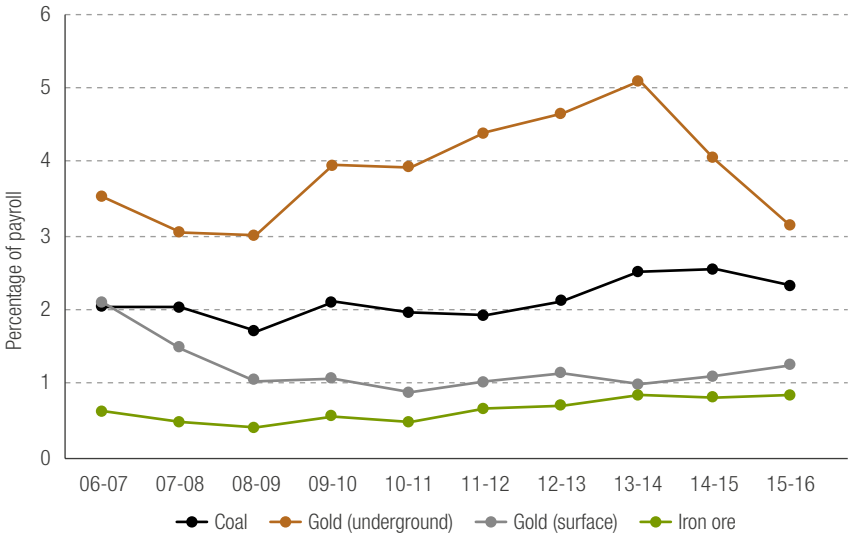
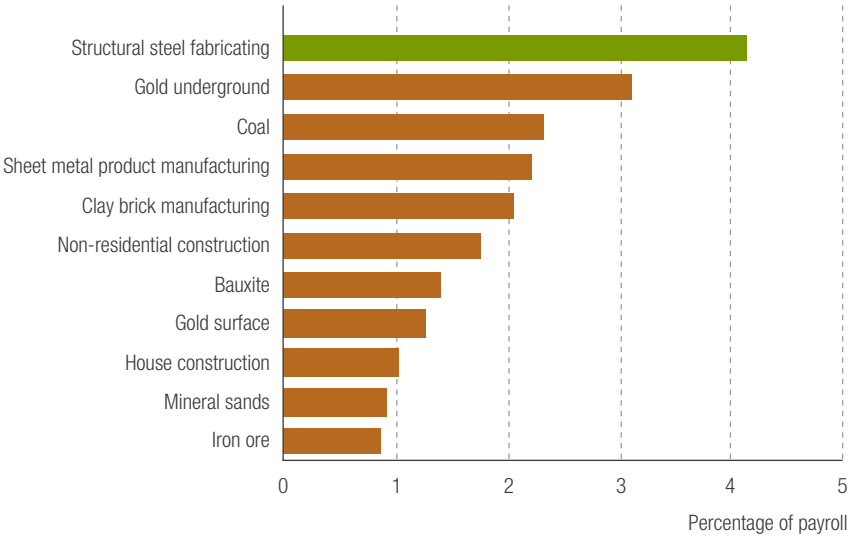


FIGURE 5 RECOMMENDED PREMIUM RATES 2015-16



INJURIES BY COMMODITIES

Metalliferous performance indicators

The performance indicators for the metalliferous mining sector show generally improving results for 2014-15. Figures 6 to 9 depict the performance indicators of incidence, frequency, duration rates and injury index (see page 2 for definitions).

Performance indicator trends for metalliferous mining in 2014-15 are summarised below.

- The overall incidence rate improved by 10%, falling from 4.2 to 3.8. The surface incidence rate and the underground incidence rate improved by 8% and 9% respectively (from 4.0 to 3.7 for surface and from 5.6 to 5.1 for underground).
- The overall frequency rate improved by 4%, falling from 2.3 to 2.2. The surface frequency rate improved by 5% (from 2.2 to 2.1), while the underground frequency rate improved by 7% (from 2.7 to 2.5).
- The overall duration rate improved by 24%, falling from 25.1 to 19.1. The surface duration rate improved by 26%, falling from 26.1 to 19.3, while the underground duration rate deteriorated by 13% (rising from 15.1 to 17.0).
- The slight fall in the frequency rate and the larger fall in the duration rate resulted in the overall injury index improving by 28%, from 57 to 41. The surface injury index improved by 31% (from 59 to 41), while the underground injury index deteriorated by 5% (from 41 to 43).

Metalliferous injury percentage breakdown for 2014-15

Appendices D and E 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: Leg injuries, at 19%, accounted for the largest proportion of underground injuries. Back injuries, at 17%, accounted for the next largest proportion. Injuries to shoulders made up 60% of arm injuries. Injuries to knees and ankles contributed 43% and 29% of leg injuries respectively.
- Surface: Leg injuries, at 26%, accounted for the largest proportion of surface injuries, followed by arm injuries (23%), hand injuries (17%) and back injuries (16%). Of the leg injuries, 41% were to knees, and 32% were to ankles. Of the arm injuries, 54% were to shoulders.

Injuries by nature

- Underground: Sprain or strain was the highest ranking nature of injury for underground injuries at 44%, followed by fracture and laceration, both at 14%.
- Surface: Sprain or strain was the highest ranking nature of injury for surface injuries at 51%, followed by fracture at 15% then laceration and crushing, both at 6%.

Injuries by location

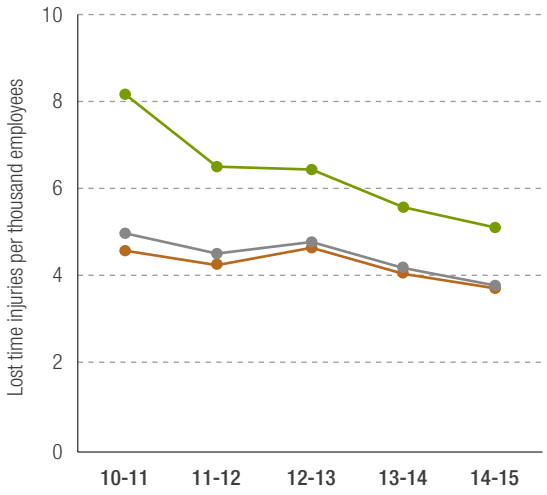
- Underground: The largest proportion of underground injuries occurred in production and development areas (53%), followed by underground access and haulage at 25%.
- Surface: The largest proportion of surface injuries occurred in treatment plants (36%), followed by open pits at 22% then workshops at 17%.

Injuries by type of accident

- Underground: Over-exertion or strenuous movements was the most common accident type for underground injuries at 28%, followed by slip or trip at 11%. Contact with chemicals or fumes, struck by object, and contact with tool each accounted for 8%.
- Surface: The most common accident type for surface injuries was over-exertion or strenuous movements at 27%, followed by stepping, at 14%, and slip or trip (12%).

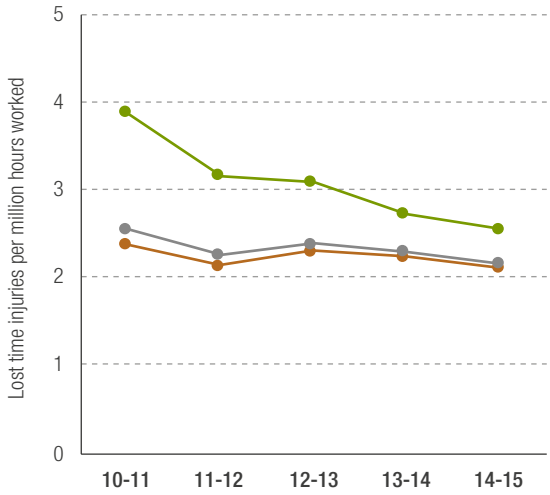
Metalliferous performance indicators 2010-11 to 2014-15

FIGURE 6 INCIDENCE RATE



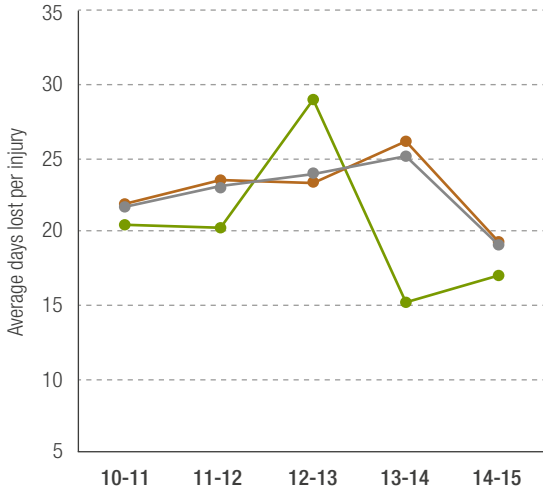
	10-11	11-12	12-13	13-14	14-15
Underground	8.2	6.5	6.4	5.6	5.1
Surface	4.6	4.3	4.6	4.0	3.7
Total	4.9	4.5	4.8	4.2	3.8

FIGURE 7 FREQUENCY RATE



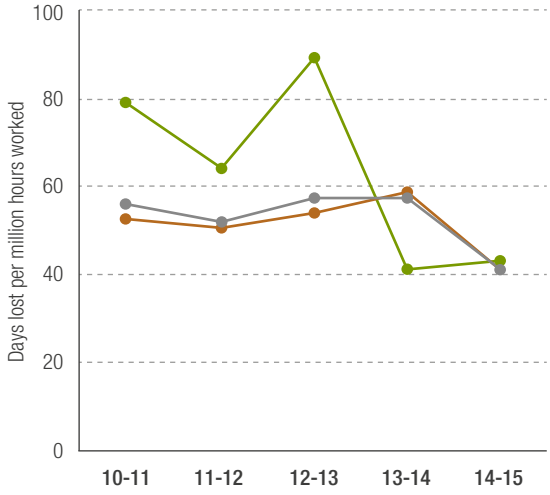
	10-11	11-12	12-13	13-14	14-15
Underground	3.9	3.2	3.1	2.7	2.5
Surface	2.4	2.1	2.3	2.2	2.1
Total	2.6	2.3	2.4	2.3	2.2

FIGURE 8 DURATION RATE



	10-11	11-12	12-13	13-14	14-15
Underground	20.5	20.3	28.9	15.1	17.0
Surface	22.0	23.5	23.2	26.1	19.3
Total	21.7	23.0	24.0	25.1	19.1

FIGURE 9 INJURY INDEX



	10-11	11-12	12-13	13-14	14-15
Underground	79	64	89	41	43
Surface	53	51	54	59	41
Total	56	52	57	57	41

INJURIES BY COMMODITIES CONTINUED

Gold performance indicators

The performance indicators for the gold sector improved during 2014-15. Figures 10 to 13 depict the performance indicators of incidence, frequency and duration rates, and injury index.

Performance indicator trends for the gold sector in 2014-15 are summarised below.

- The overall incidence rate improved by 8%, falling from 4.8 to 4.4. The surface incidence rate improved by 15% (from 5.4 to 4.6), although the underground incidence rate deteriorated by 19% (from 3.2 to 3.8).
- The overall frequency rate improved by 4%, falling from 2.6 to 2.5. The surface frequency rate improved by 10% (from 3.0 to 2.7), while the underground frequency rate deteriorated by 27%, rising from 1.5 to 1.9.
- The overall duration rate improved by 11%, falling from 22.0 to 19.6. The surface duration rate improved by 10%, falling from 21.4 to 19.3, and the underground duration rate improved by 18% (from 25.1 to 20.7).
- The overall improvement in both the frequency rate and duration rate, resulted in a 14% improvement in the injury index, falling from 56 to 48. The surface injury index improved by 19% (from 63 to 51), while the underground injury index deteriorated slightly by 3% (from 38 to 39).

Gold injury percentage breakdown for 2014-15

Appendices F and G provide a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident and type of accident for the underground and surface sectors, respectively.

Injuries by part of body

- Underground: Leg, eye and back injuries, each at approximately 17%, together accounted for the largest proportion of underground injuries. 67% of leg injuries were to knees and the remainder to ankles. All arm injuries were to shoulders.
- Surface: Arm and back injuries, at 23% and 21% respectively, were the most common injuries, followed by hand and leg injuries, each at 15%. 67% of arm injuries were to shoulders and 60% of leg injuries were to knees.

Injuries by nature

- Underground: Sprain or strain was the highest ranking nature of injury for underground injuries at 50%, followed by effects of chemicals or fumes and laceration, each at 11%.
- Surface: Sprain or strain was the highest ranking nature of injury for surface injuries at 55%, followed by fracture (17%) and crushing (8%).

Injuries by location

- Underground: The largest proportion of underground injuries occurred in production and development (56%), followed by access and haulage ways at 28%.
- Surface: The largest proportion of surface injuries occurred in open pits (44%), followed by treatment plants (26%) and surface general (18%).

Injuries by type of accident

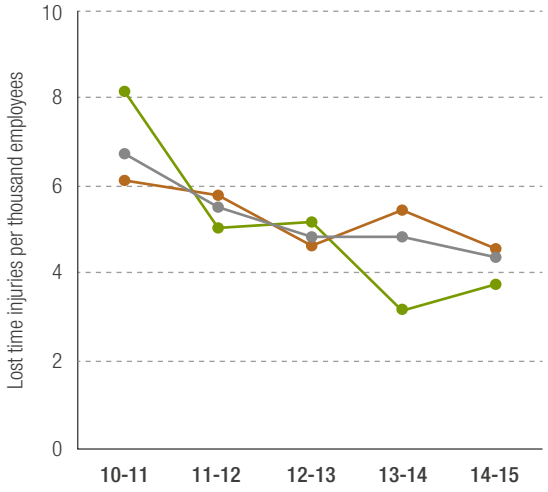
- Underground: Over-exertion or strenuous movements was the most common accident type for underground injuries at 28%, followed by contact with chemicals or fumes, contact with tools, rockfall, and slip or trip, all at 11%.
- Surface: The most common accident type for surface injuries was over-exertion or strenuous movements at slightly over 30%, followed by stepping at 11% , then struck by object and slip or trip, each at 9%.

Fast facts

- 18% of people in the WA mineral industry worked on gold operations in 2014-15, making it the second largest mineral sector.
- The rate of lost time injuries per million hours worked (LTIFR) for gold was 2.7 for surface operations (compared to 2.2 for all surface mining) and 1.9 for underground (compared to 2.6 for all WA underground mining).
- About 30% of injuries at gold operations were the type 'over-exertion / strenuous activity' – with most of these resulting in sprain or strain injuries to arms and backs.

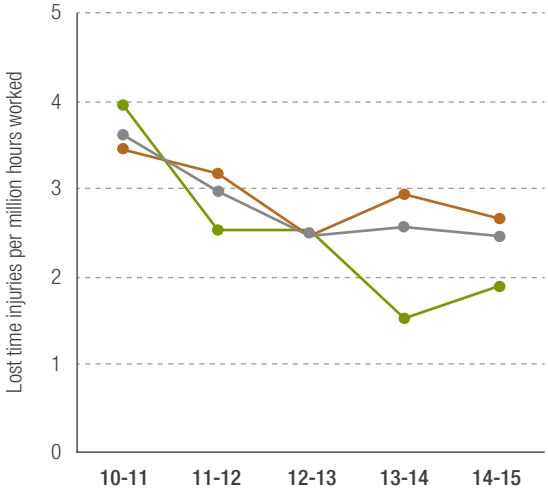
Gold performance indicators 2010-11 to 2014-15

FIGURE 10 INCIDENCE RATE



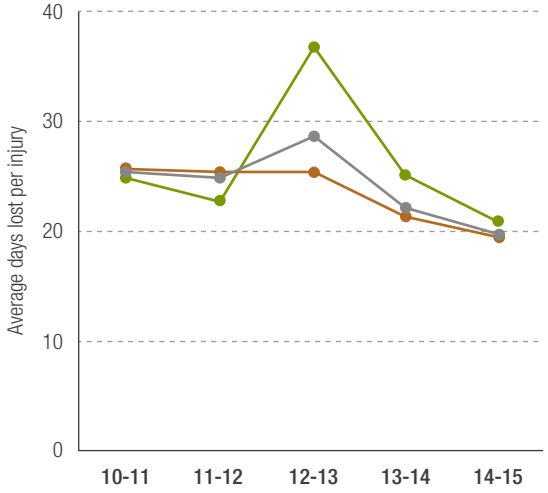
	10-11	11-12	12-13	13-14	14-15
Underground	8.2	5.0	5.2	3.2	3.8
Surface	6.1	5.8	4.7	5.4	4.6
Total	6.7	5.5	4.8	4.8	4.4

FIGURE 11 FREQUENCY RATE



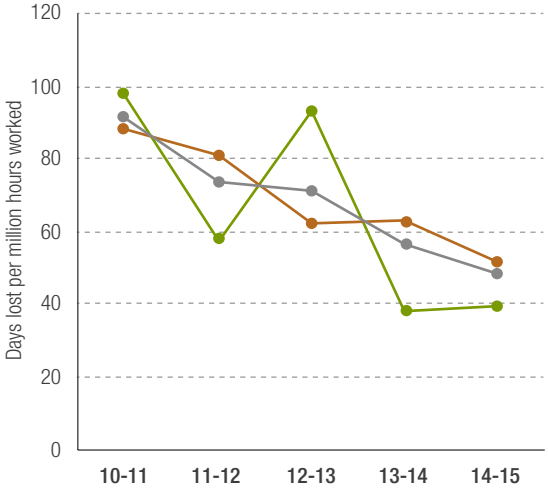
	10-11	11-12	12-13	13-14	14-15
Underground	4.0	2.5	2.5	1.5	1.9
Surface	3.4	3.2	2.4	3.0	2.7
Total	3.6	3.0	2.5	2.6	2.5

FIGURE 12 DURATION RATE



	10-11	11-12	12-13	13-14	14-15
Underground	24.8	22.7	36.7	25.1	20.7
Surface	25.6	25.5	25.4	21.4	19.3
Total	25.4	24.8	28.7	22.0	19.6

FIGURE 13 INJURY INDEX



	10-11	11-12	12-13	13-14	14-15
Underground	98	58	93	38	39
Surface	88	81	62	63	51
Total	91	74	71	56	48

INJURIES BY COMMODITIES CONTINUED

Iron ore performance indicators

The performance indicators for the iron ore sector showed significant improvement during 2014-15. Figures 14 to 17 depict the performance indicators of incidence, frequency and duration rates, and injury index.

Performance indicator trends for the iron ore sector in 2014-15 are summarised below.

- The incidence rate improved by 29%, falling from 3.1 to 2.2.
- The frequency rate improved by 24%, falling from 1.7 to 1.3.
- The duration rate improved by 36%, falling from 30.2 to 19.4.
- The fall in both the frequency rate and the duration rate resulted in an improvement of 54% in the injury index (from 52 to 24).

Iron ore injury percentage breakdown for 2014-15

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

Injuries by part of body

- Leg injuries, at 28%, accounted for the largest proportion of injuries, followed by arm injuries at 22%, hand injuries at 20% and back injuries at 15%.
- Of the leg injuries, 50% were to knees and 32% were to ankles. 66% of arm injuries were to shoulders.

Injuries by nature

- Sprain or strain was the highest ranking nature of injury at 49%.
- Fracture was the second highest ranking nature of injury at 15%, followed by crushing at 10%.

Injuries by location

- The largest proportion of injuries occurred in open pits, which accounted for 25%. The second largest proportion occurred in treatment plants at 23%, followed closely by workshops at 22%.

Injuries by type of accident

- Over-exertion or strenuous movement was the most common type of accident resulting in injury, at slightly less than 25%.
- Stepping, at 15%, was the next most common type of accident, followed by slip or trip at 14%, then caught by or between objects and struck by object, both at 10%.

Fast facts

- 56% of people in the WA mineral industry worked on iron ore operations in 2014-15
- The rate of lost time injuries per million hours worked (LTIFR) for iron ore was 1.3, compared to 2.2 for all mining.
- Iron ore had the lowest LTIFR of the 10 highest-employing mining sectors.
- Almost a quarter of injuries at iron ore operations were the type 'over-exertion / strenuous activity' – with most of these being to arms and backs.

Iron ore performance indicators 2010-11 to 2014-15

FIGURE 14 INCIDENCE RATE

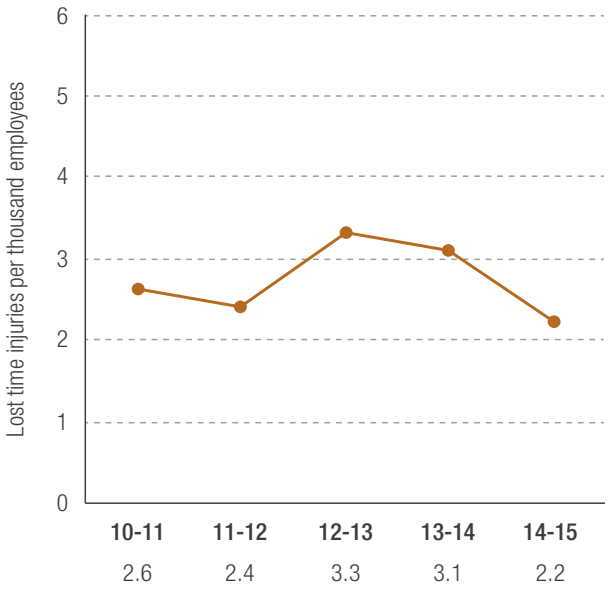


FIGURE 15 FREQUENCY RATE

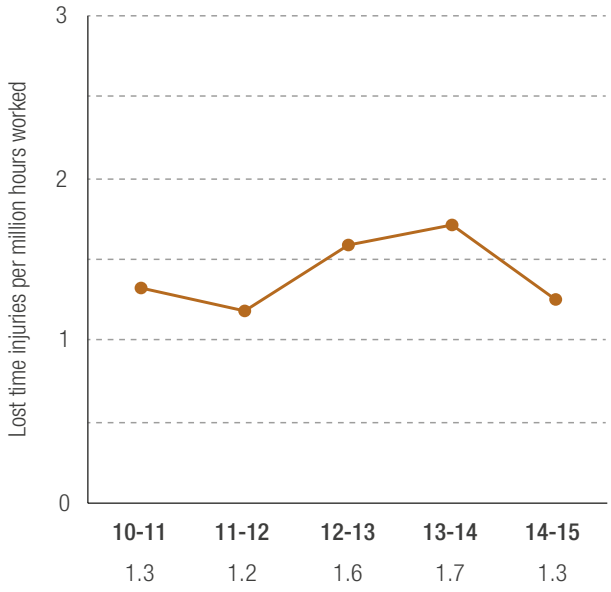


FIGURE 16 DURATION RATE

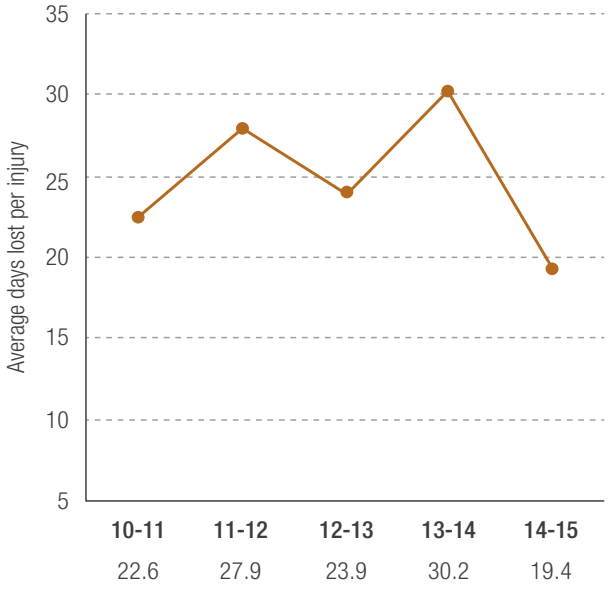
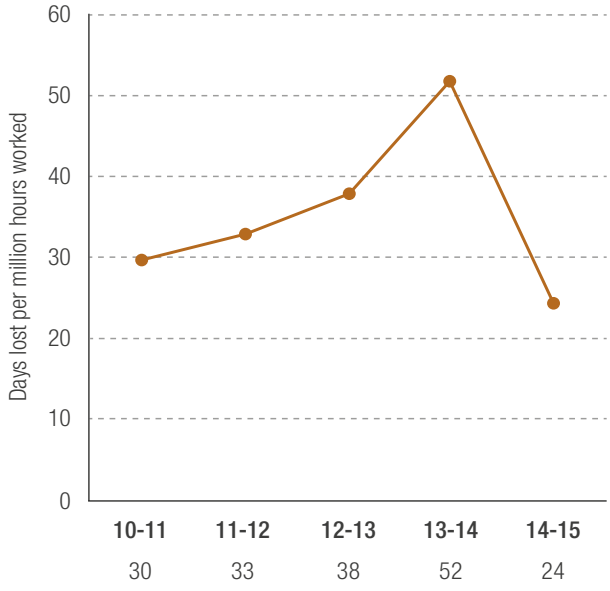


FIGURE 17 INJURY INDEX



INJURIES BY COMMODITIES CONTINUED

Bauxite and alumina performance indicators

The performance indicators for the bauxite and alumina sector improved in 2014-15. Figures 18 to 21 depict the performance indicators of incidence, frequency and duration rates, and injury index.

Performance indicator trends for the bauxite and alumina sector in 2014-15 are summarised below.

- The incidence rate improved by 4%, falling from 7.8 to 7.5.
- The frequency rate improved slightly, by less than 1%, remaining at 4.0.
- The duration rate improved by 4%, falling from 18.7 to 18.0.
- The unchanged frequency rate combined with the fall in the duration rate resulted in the injury index improving by 4%, falling from 75 to 72.

Bauxite and alumina injury percentage breakdown for 2014-15

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

- Leg injuries accounted for the largest proportion of injuries at 30%. Of these leg injuries, 47% were to ankles and 47% to knees.
- Arm injuries were the next highest proportion of injuries, at 25%, followed by hand injuries and back injuries, at 12% and 9% respectively. 64% of arm injuries were to shoulders.

Injuries by nature

- Sprain or strain was the highest ranking nature of injury at 62%.
- Fracture was the second highest ranking nature of injury at 11%, followed by effects of chemicals or fumes and laceration, both at 5%.

Injuries by location

- The largest proportion of injuries occurred in treatment plants, accounting for 64%.
- The next largest proportion of injuries occurred in open pits (11%), followed by workshops (9%).

Injuries by type of accident

- Over-exertion or strenuous movements was the most common type of accident resulting in injury (25%).
- Stepping, at 21%, contributed the next highest proportions of injury, followed by caught by or between objects and slip or trip, both at 11%.

Fast facts

- 7% of people in the WA mineral industry in 2014-15 worked on bauxite or alumina operations, the third largest employer in the mineral industry.
- The rate of lost time injuries per million hours worked (LTIFR) for bauxite and alumina operations was 4.0, compared to 2.2 for all mining. These operations had the highest LTIFR of the four highest-employing mining sectors.
- 25% of injuries at bauxite and alumina operations were the type 'over-exertion / strenuous activity' and a further 21% were of 'stepping'. Both types predominantly resulted in sprain or strain injuries.

Bauxite and alumina performance indicators 2010-11 to 2014-15

FIGURE 18 INCIDENCE RATE

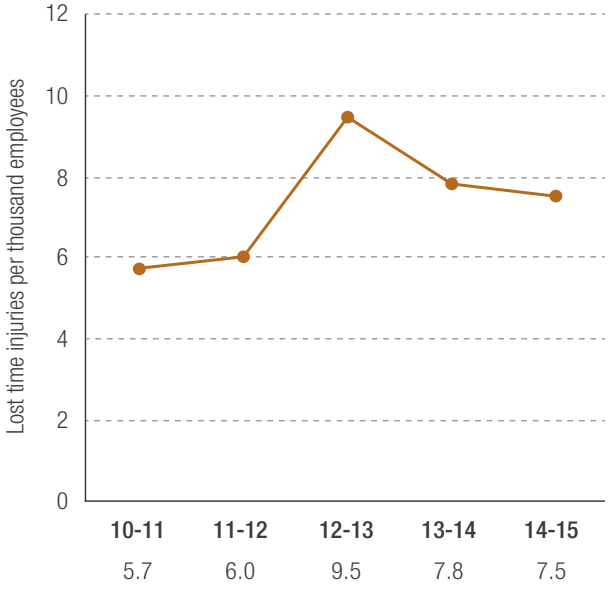


FIGURE 19 FREQUENCY RATE

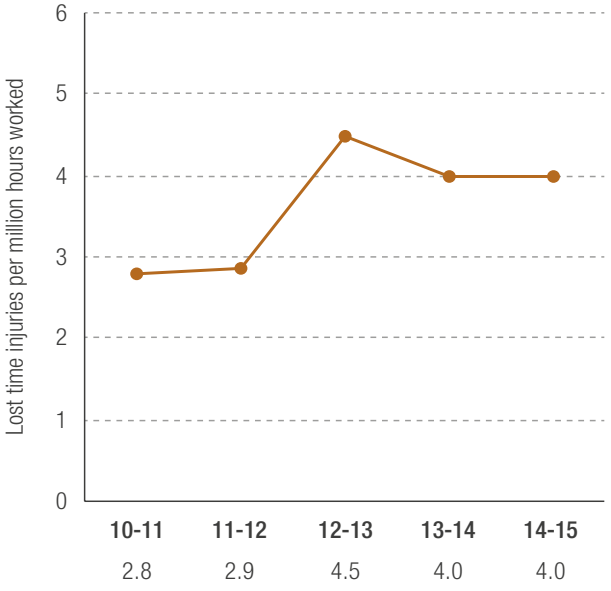


FIGURE 20 DURATION RATE

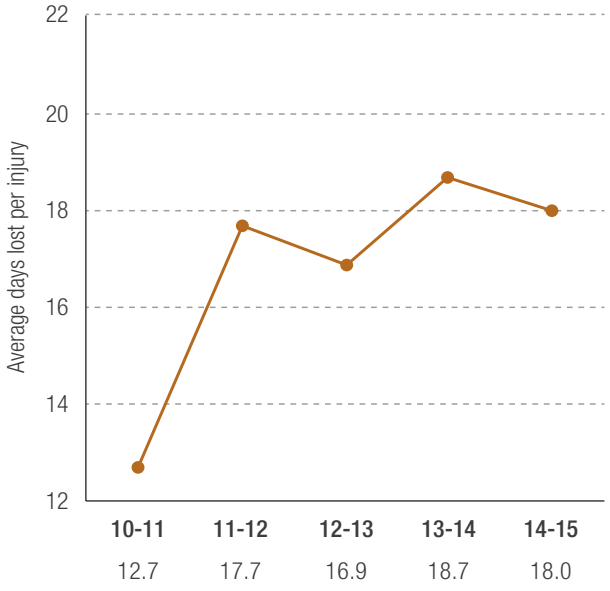
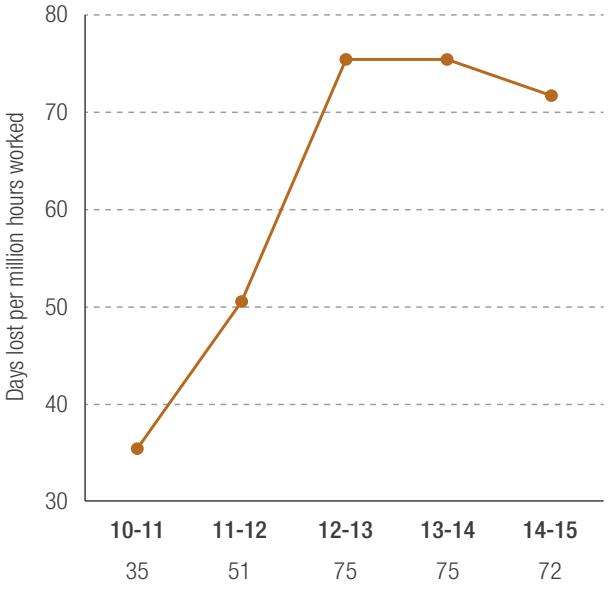


FIGURE 21 INJURY INDEX



INJURIES BY COMMODITIES CONTINUED

Nickel performance indicators

The performance indicators for the nickel sector showed an overall deterioration for 2014-15. Figures 22 to 25 depict the performance indicators of incidence, frequency and duration rates, and injury index.

Performance indicator trends for the nickel sector in 2014-15 are summarised below

- The overall incidence rate deteriorated by 9%, rising from 5.7 to 6.2. The surface incidence rate deteriorated by 24%, (from 4.5 to 5.6) whereas the underground incidence rate improved by 22%, (from 11.3 to 8.8).
- The overall frequency rate deteriorated by 10%, rising from 3.0 to 3.3. The surface frequency rate deteriorated by 25% (from 2.4 to 3.0), while the underground frequency rate improved by 22% (from 5.5 to 4.3).
- The overall duration rate deteriorated by 20%, rising from 14.3 to 17.2. The surface duration rate deteriorated by 26% (from 15.9 to 20.0), while the underground duration rate improved by 18% (from 11.4 to 9.3).
- The rise in both duration rate and frequency rate resulted in a deterioration of 30% in the injury index, rising from 43 to 56. The surface injury index deteriorated by 58% (from 38 to 60), and the underground injury index improved by 37% (from 63 to 40).

Nickel injury percentage breakdown for 2014-15

Appendices J and K 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: Arm injuries, back injuries and hand injuries together accounted for the largest proportion of underground injuries at 20% each.
- Surface: Leg injuries, at 32%, accounted for the largest proportion of surface injuries, followed by hand injuries at 21% and trunk (not otherwise classified) at 14%. Of the leg injuries, 44% were to knees.

Injuries by nature

- Underground: Sprain or strain was the highest ranking nature of injury for underground injuries at 30%, followed by fracture and laceration, both at 20%.
- Surface: Sprain or strain was the highest ranking nature of injury for surface injuries at 39%, followed by fracture at 21% and burn at 14%.

Injuries by location

- Underground: The largest proportion of underground injuries occurred in production and development areas (60%), followed by access and haulage ways at 20%.
- Surface: The largest proportion of surface injuries occurred in treatment plants (46%), followed by workshops (25%) and open pits (18%).

Injuries by type of accident

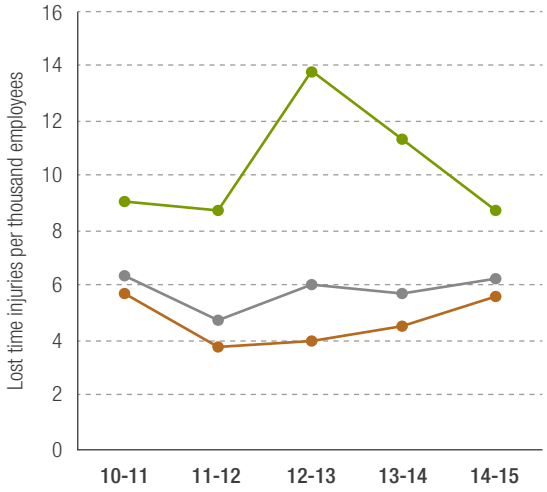
- Underground: Over-exertion or strenuous movements was the most common accident type for underground injuries at 30%, followed by struck by object at 20%.
- Surface: The most common accident type for surface injuries was over-exertion or strenuous movements at 25%, followed by struck by object at 18%, then contact with chemicals or fumes, slip or trip and stepping, all at 11%.

Fast facts

- 6% of people in the WA mineral industry in 2014-15 worked on nickel operations, the fourth largest employer in the mineral industry.
- The rate of lost time injuries per million hours worked (LTIFR) for nickel was 3.3, compared to 2.2 for all mining.
- 'Over-exertion / strenuous' activity at 26% of accidents was the most common type for nickel, resulting in sprain and strain injuries, with 'struck by object' making up a further 18.4% and resulting in fractures and lacerations.

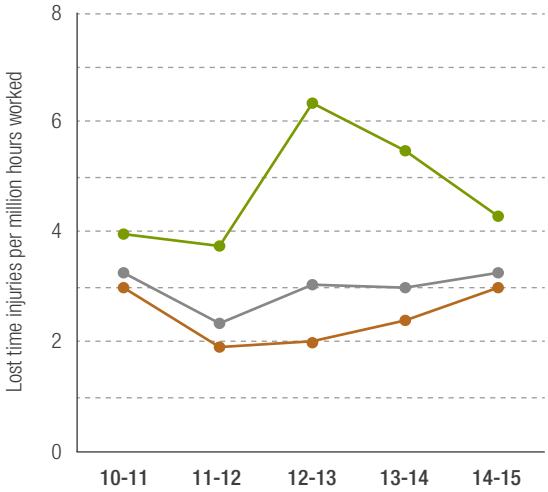
Nickel performance indicators 2010-11 to 2014-15

FIGURE 22 INCIDENCE RATE



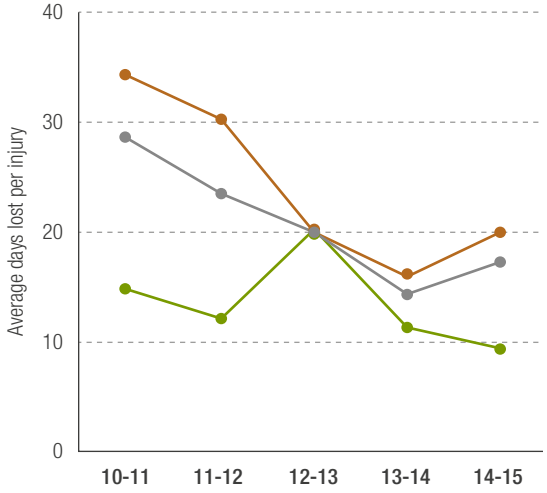
	10-11	11-12	12-13	13-14	14-15
Underground	9.1	8.7	13.8	11.3	8.8
Surface	5.7	3.7	4.0	4.5	5.6
Total	6.4	4.7	6.0	5.7	6.2

FIGURE 23 FREQUENCY RATE



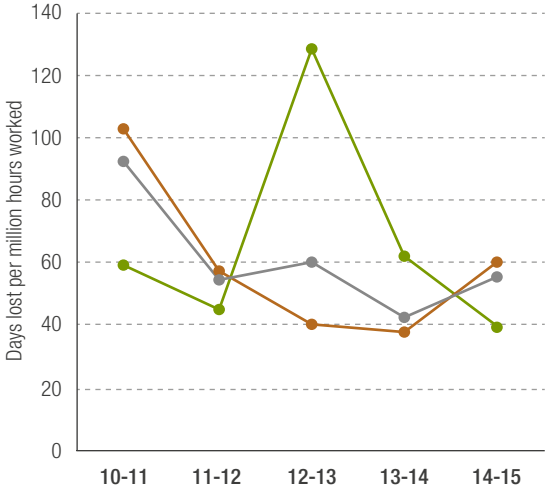
	10-11	11-12	12-13	13-14	14-15
Underground	4.0	3.7	6.4	5.5	4.3
Surface	3.0	1.9	2.0	2.4	3.0
Total	3.2	2.3	3.0	3.0	3.3

FIGURE 24 DURATION RATE



	10-11	11-12	12-13	13-14	14-15
Underground	14.9	12.1	20.1	11.4	9.3
Surface	34.2	30.2	19.8	15.9	20.0
Total	28.5	23.6	20.0	14.3	17.2

FIGURE 25 INJURY INDEX



	10-11	11-12	12-13	13-14	14-15
Underground	59	45	128	63	40
Surface	103	58	40	38	60
Total	93	55	60	43	56

RESTRICTED WORK INJURIES

Review of restricted work injuries during 2014-15

In addition to the 413 mining LTIs in 2014-15, there were 753 restricted work injuries (RWIs) reported (746 in metalliferous mines and 7 in coal mines), bringing the total number of reportable injuries to 1,166. A breakdown of these data with performance indicators is shown in Tables 10 and 11.

Of the restricted work injuries, 528 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 2014-15

Sector	No. of employees	Restricted work injuries			Reportable injuries (RWIs and LTIs)		
		No. of injuries	Incidence	Frequency	No. of injuries	Incidence	Frequency
Metalliferous surface	97,941	637	6.5	3.7	1,000	10.2	5.9
Metalliferous underground	7,065	109	15.4	7.7	145	20.5	10.3
Metalliferous total	**105,006**	**746**	**7.1**	**4.0**	**1,145**	**10.9**	**6.2**
Coal total	**958**	**7**	**7.3**	**4.3**	**21**	**21.9**	**13.0**
Total mining	**105,964**	**753**	**7.1**	**4.0**	**1,166**	**11.0**	**6.3**
Exploration	**2,179**	**10**	**4.6**	**2.5**	**20**	**9.2**	**5.0**

TABLE 11 RESTRICTED WORK INJURIES BY MINERAL MINED 2014-15

Mineral mined	No. of employees	Restricted work injuries			Reportable injuries (RWIs and LTIs)		
		No. of injuries	Incidence	Frequency	No. of injuries	Incidence	Frequency
Iron ore	59,918	303	5.1	2.8	437	7.3	4.1
Gold	19,194	180	9.4	5.3	264	13.8	7.7
Bauxite and alumina	7,481	113	15.1	8.1	169	22.6	12.0
Nickel	6,099	111	18.2	9.5	149	24.4	12.8
Base metals	2,531	10	4.0	2.2	20	7.9	4.5
Mineral sands	2,241	6	2.7	2.2	19	8.5	7.0
Construction materials	1,452	5	3.4	2.9	10	6.9	5.7
Diamonds	1,398	6	4.3	2.3	16	11.4	6.2
Coal	958	7	7.3	4.3	21	21.9	13.0
Salt	957	0	0.0	0.0	5	5.2	3.8
Manganese ore	517	1	1.9	1.0	1	1.9	1.0
Tin, tantalum and lithium	499	1	2.0	1.2	2	4.0	2.5
Sand - silica sand	346	0	0.0	0.0	13	37.6	27.3
Other	2,373	10	4.2	3.5	40	16.9	13.8
Total mining	**105,964**	**753**	**7.1**	**4.0**	**1,166**	**11.0**	**6.3**

RESTRICTED WORK INJURIES CONTINUED

Restricted work injury performance indicators

The restricted work injury performance indicators for the mining sector improved during 2014-15. Figures 26 to 29 depict the performance indicators of incidence rate, frequency rate, days off per injury and days off per million hours worked.

- The overall incidence rate improved by 16%, falling from 8.5 to 7.1. The surface incidence rate improved by 18% (from 7.9 to 6.5), and the underground incidence rate improved by 6% (from 16.4 to 15.4).
- The overall frequency rate improved by 15%, falling from 4.7 to 4.0. The surface frequency rate improved by 16%, falling from 4.4 to 3.7, and the underground frequency rate improved by 4%, falling from 8.0 to 7.7.
- The average days off per restricted work injury improved by less than 1%, falling from 47.2 to 47.0. The days off per surface restricted work injury deteriorated by 3% (from 47.1 to 48.6), and the days off per underground restricted work injury improved by 21% (from 48.0 to 37.9).
- The fall in the frequency rate and slight decrease in days off per restricted work injury resulted in an improvement of 14% to the overall days off per million hours worked, down from 220 to 190. The days off per surface million hours worked improved by 13% (from 207 to 181), and the days off per million hours worked underground improved by 24% (from 383 to 292).

Restricted work injury percentage breakdown for 2014-15

Appendices L and M 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: Arm injuries accounted for the largest proportion of underground injuries, at 26%, followed by leg injuries at 24%, hand injuries at 17% and back injuries at 14%. The largest proportions of arm injuries were to shoulders (43%) and elbows (32%), while injuries to ankles and knees contributed the largest proportions of leg injuries (at 50% and 35% respectively).
- Surface: Arm injuries accounted for the largest proportion of surface restricted work injuries at 25%, followed by hand injuries at 23%, leg injuries at 19% and back injuries at 18%. Of the arm injuries, 55% were to shoulders, 19% were to elbows and 16% were to wrists. Of the leg injuries, 46% were to knees and 33% were to ankles.

Injuries by nature

- Underground: Sprain or strain was the highest ranking nature of injury for underground restricted work injuries at 55%, followed by laceration at 15% and bruise or contusion at 10%.
- Surface: Sprain or strain was the highest ranking nature of injury for surface restricted work injuries at 54%, followed by pain at 11% then laceration at 10%.

Injuries by location

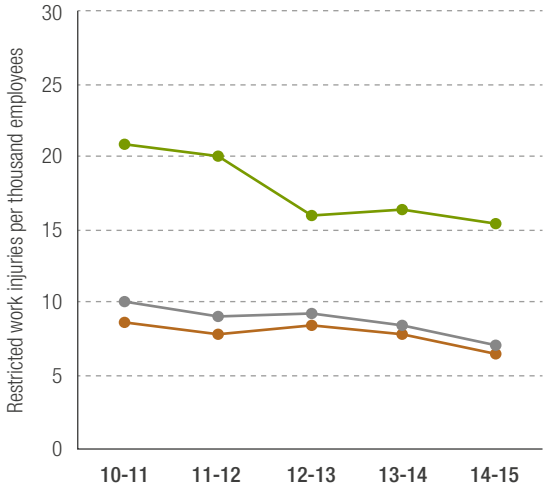
- Underground: The largest proportion of underground injuries occurred in production and development areas (73%), followed by access and haulage ways at 14% then underground dumping, at 8%.
- Surface: The largest proportion of surface injuries occurred in treatment plants (34%) followed by open pits (22%), and workshops (20%).

Injuries by type

- Underground: Over-exertion or strenuous movements at 35% was the most common accident type for underground injuries, followed by stepping at 15%, then slip or trip at 10%.
- Surface: The most common accident type for surface injuries was over-exertion or strenuous movements at 37%, followed by stepping at 13%, struck by object at 11%, and caught by or between objects, at 10%.

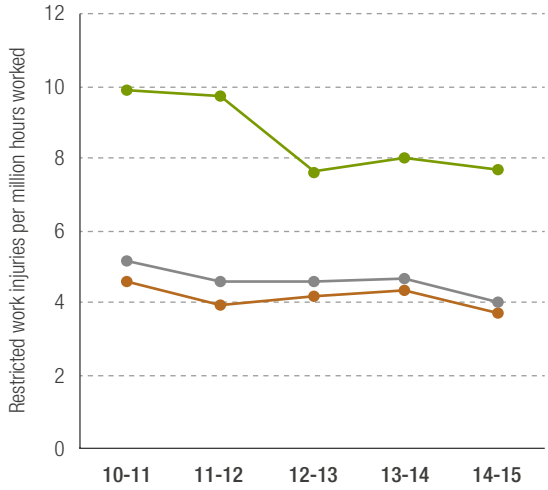
Restricted work injury performance indicators 2010-11 to 2014-15

FIGURE 26 INCIDENCE RATE



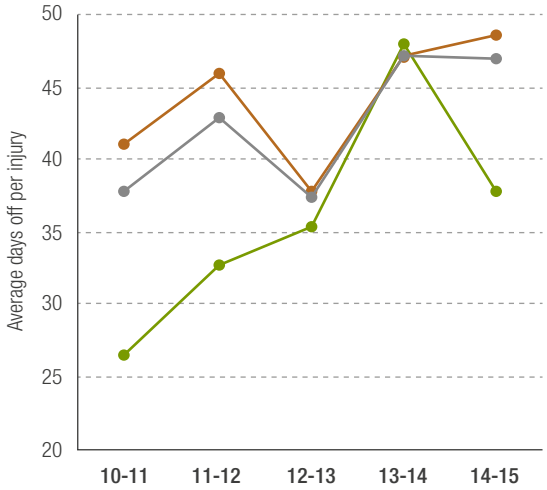
	10-11	11-12	12-13	13-14	14-15
Underground	20.9	20.0	15.9	16.4	15.4
Surface	8.7	7.8	8.5	7.9	6.5
Total	10.0	9.1	9.2	8.5	7.1

FIGURE 27 FREQUENCY RATE



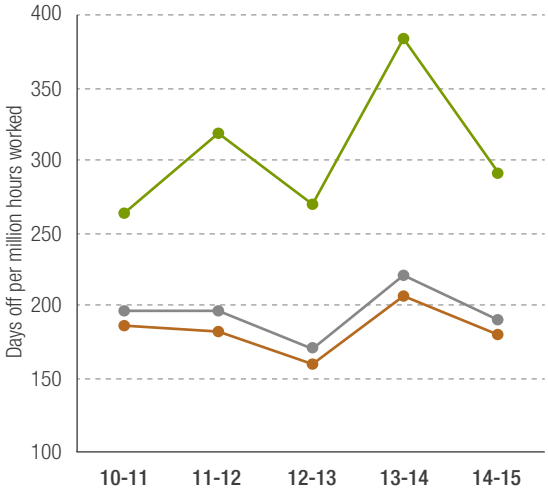
	10-11	11-12	12-13	13-14	14-15
Underground	9.9	9.7	7.6	8.0	7.7
Surface	4.6	4.0	4.2	4.4	3.7
Total	5.2	4.6	4.6	4.7	4.0

FIGURE 28 DURATION RATE



	10-11	11-12	12-13	13-14	14-15
Underground	26.5	32.8	35.4	48.0	37.9
Surface	41.0	46.0	37.8	47.1	48.6
Total	37.8	42.9	37.4	47.2	47.0

FIGURE 29 INJURY INDEX



	10-11	11-12	12-13	13-14	14-15
Underground	263	318	271	383	292
Surface	188	182	160	207	181
Total	196	197	171	220	190

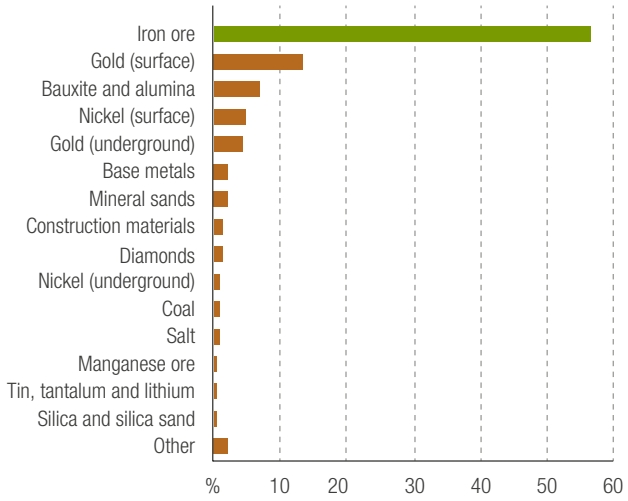
APPENDICES

APPENDIX A

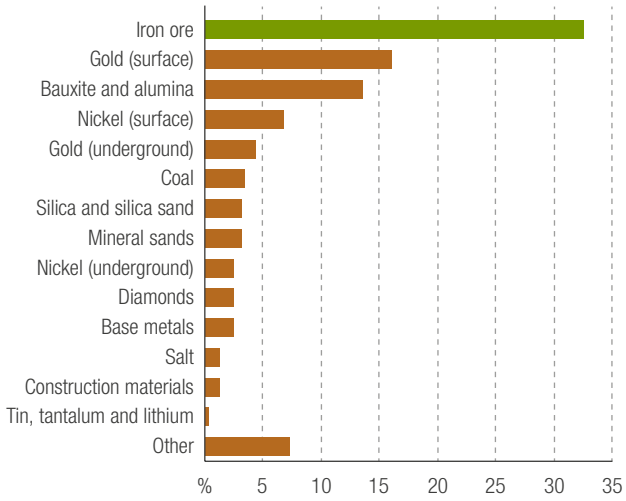
WESTERN AUSTRALIAN MINES 2014-15

413 lost time injuries

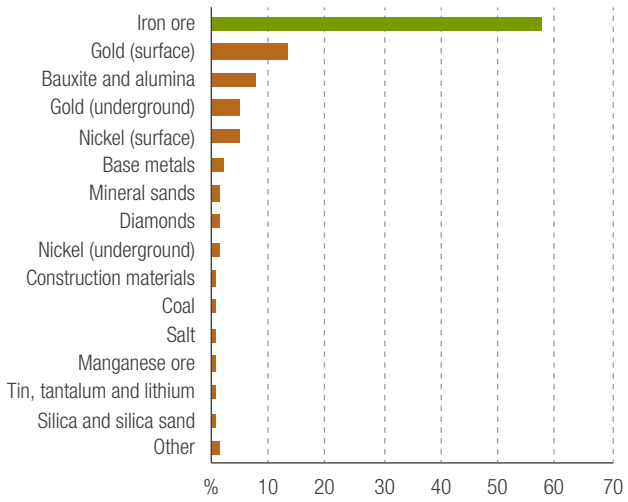
PERCENTAGE OF EMPLOYEES



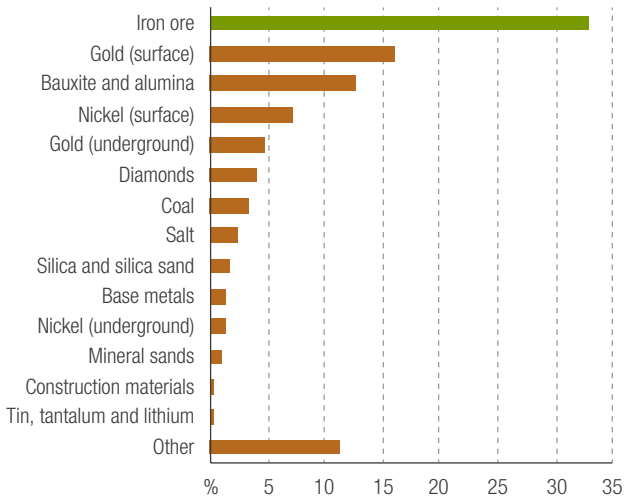
PERCENTAGE OF INJURIES



PERCENTAGE OF HOURS WORKED



PERCENTAGE OF WORK DAYS LOST

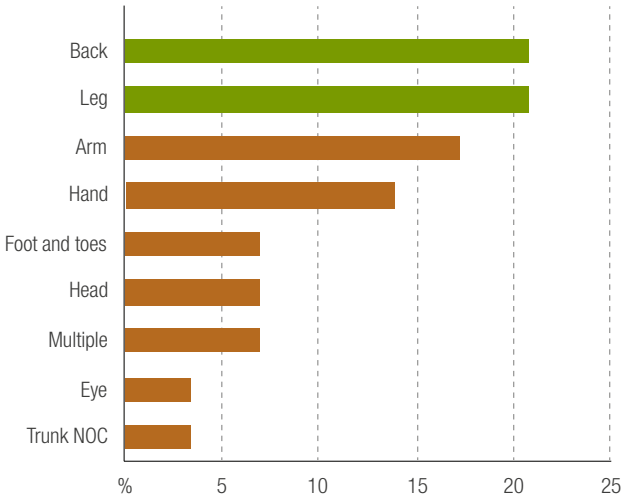


APPENDIX B

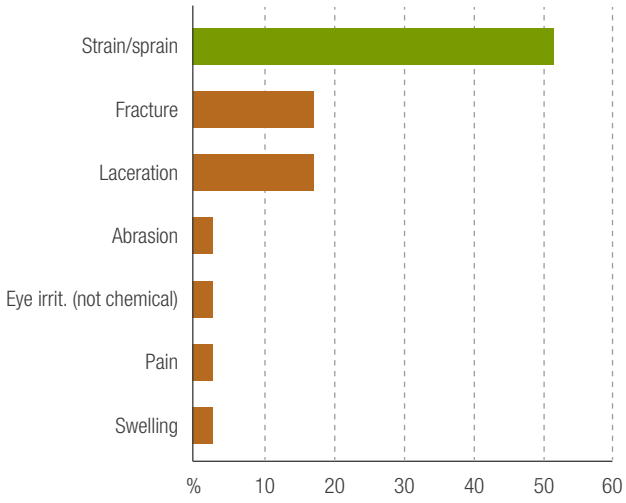
SERIOUS INJURIES UNDERGROUND 2014-15

29 lost time injuries

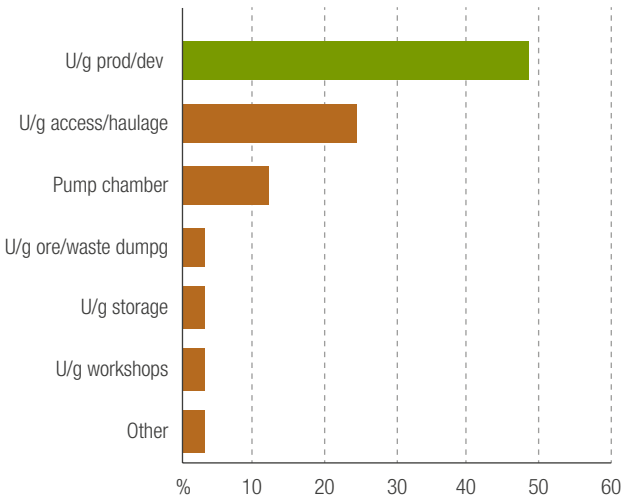
PART OF BODY



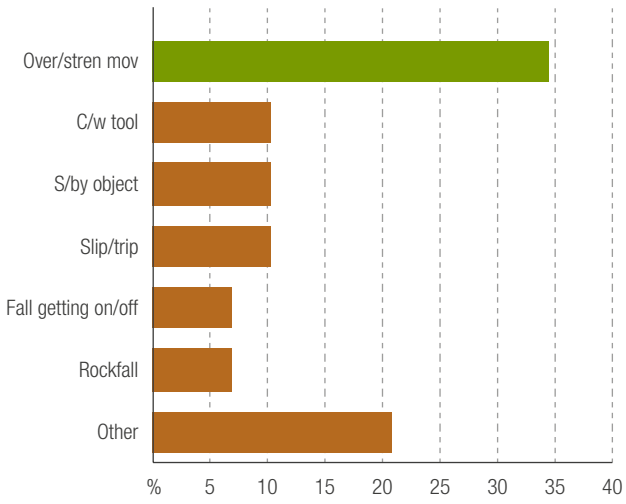
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

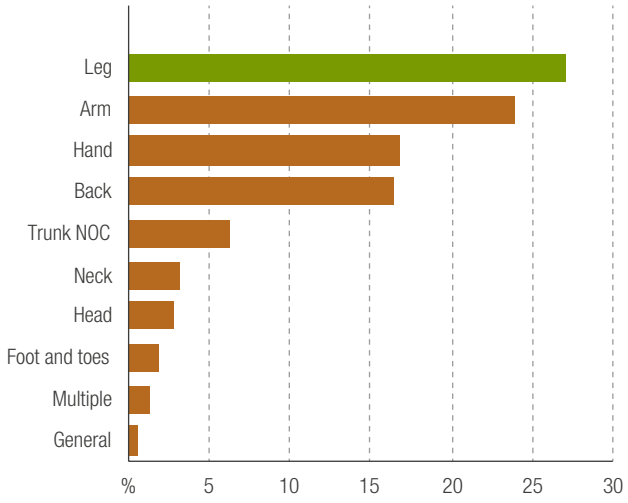


APPENDIX C

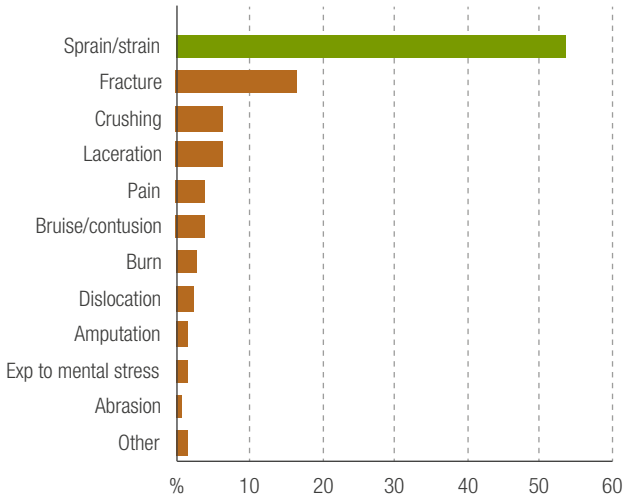
SERIOUS INJURIES SURFACE 2014-15

322 lost time injuries

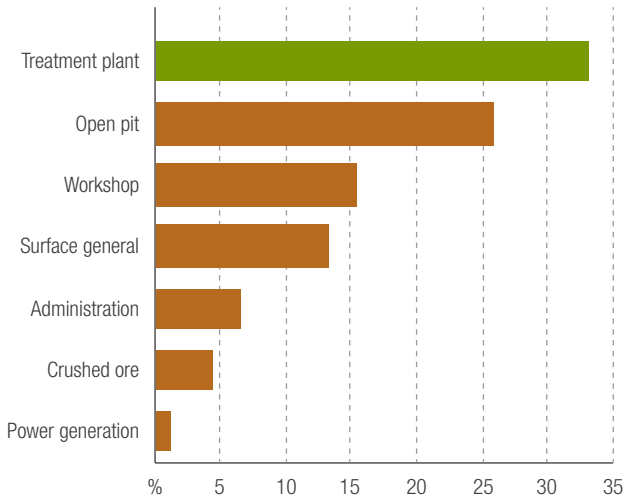
PART OF BODY



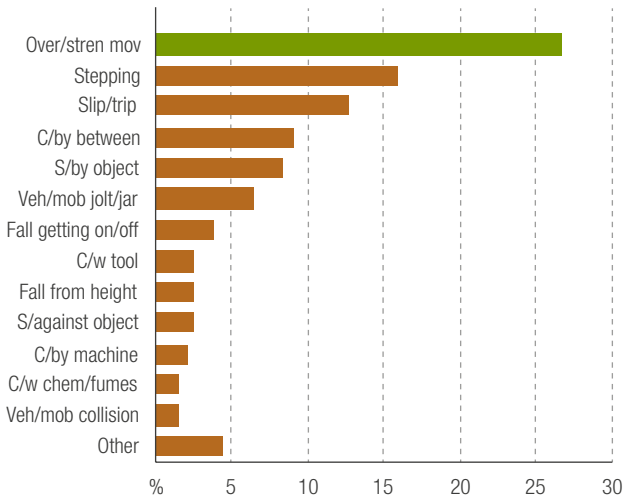
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

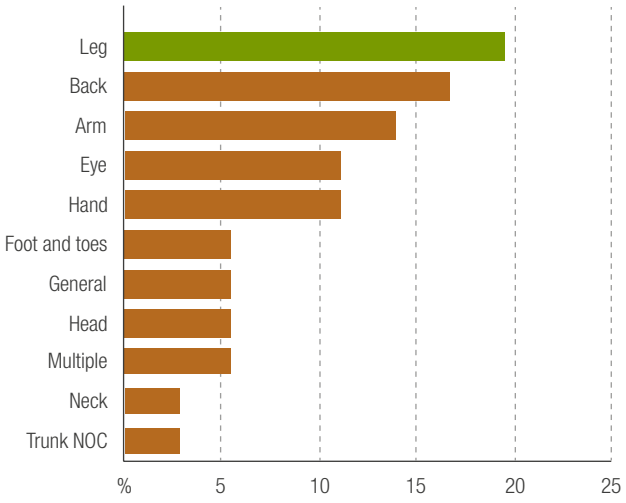


APPENDIX D

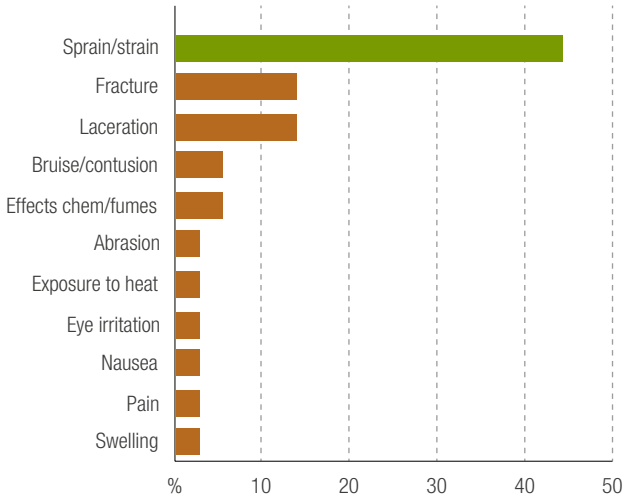
METALLIFEROUS UNDERGROUND INJURIES 2014-15

36 lost time injuries

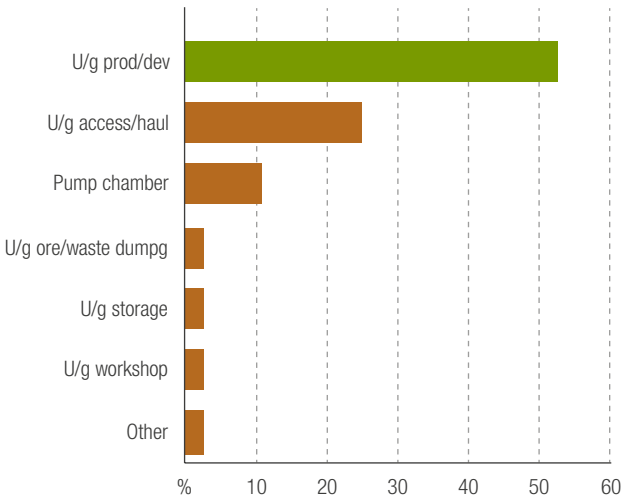
PART OF BODY



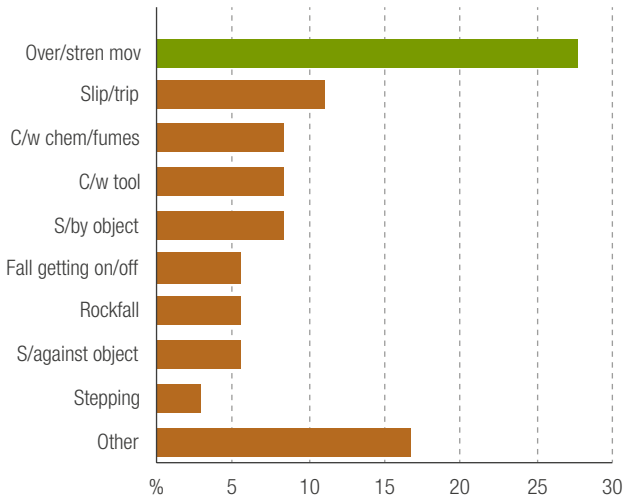
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

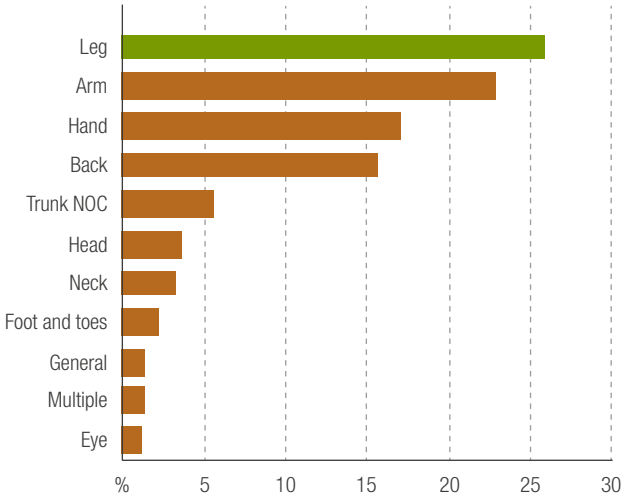


APPENDIX E

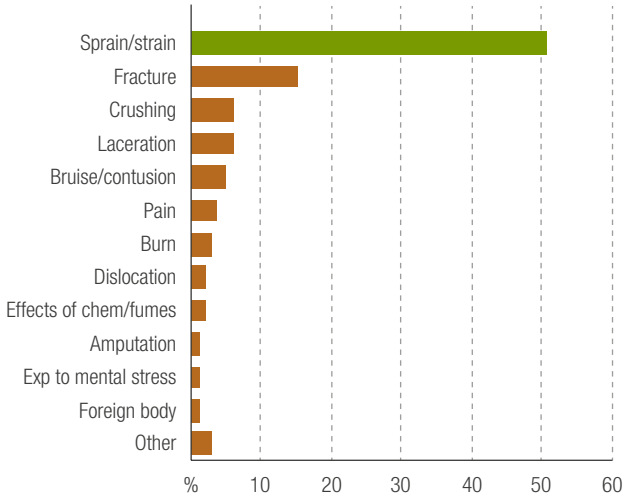
METALLIFEROUS SURFACE INJURIES 2014-15

363 lost time injuries

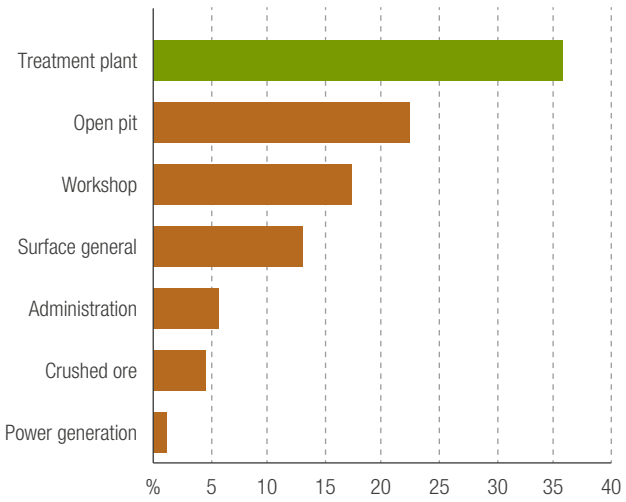
PART OF BODY



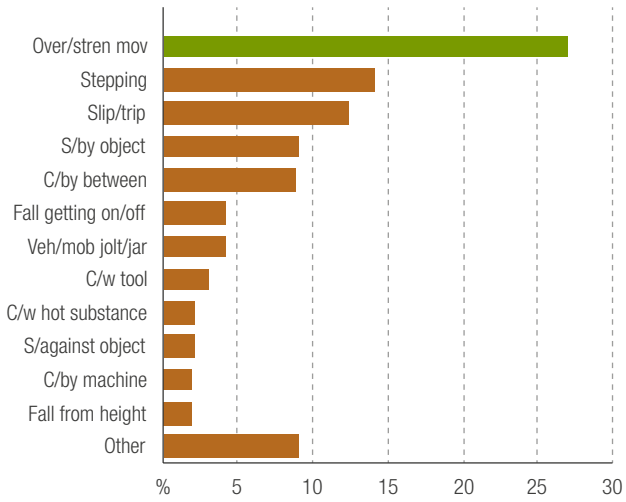
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

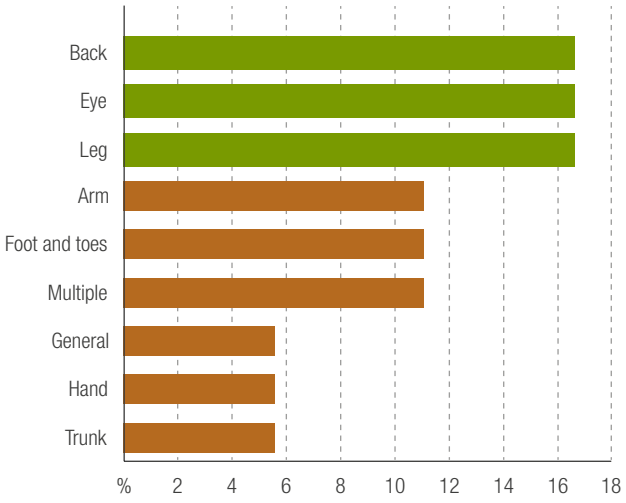


APPENDIX F

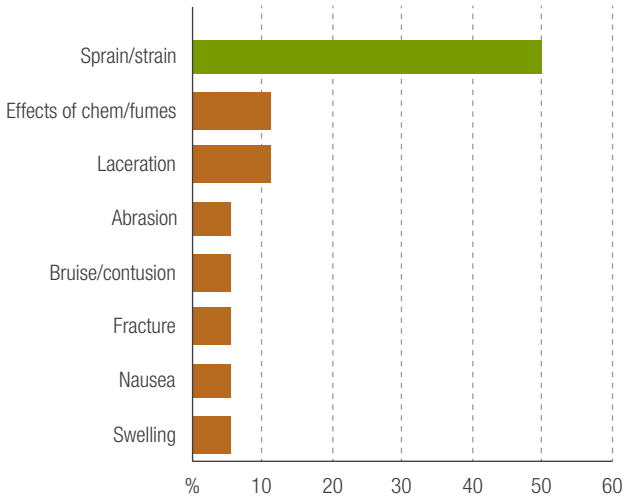
GOLD UNDERGROUND INJURIES 2014-15

18 lost time injuries

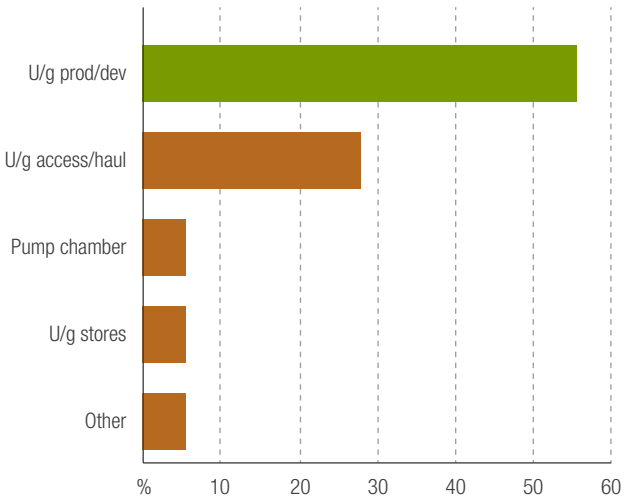
PART OF BODY



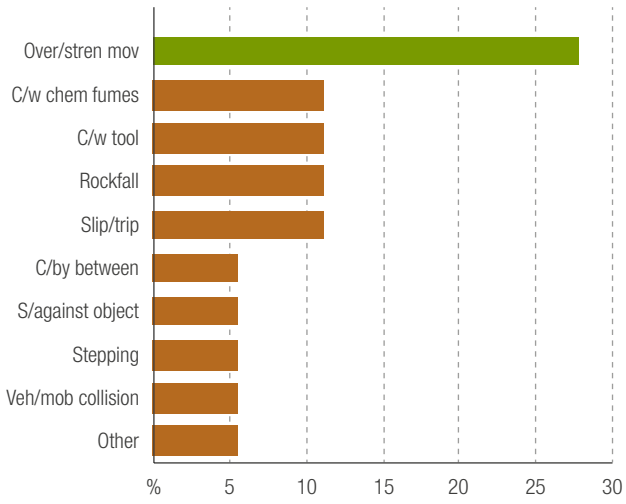
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

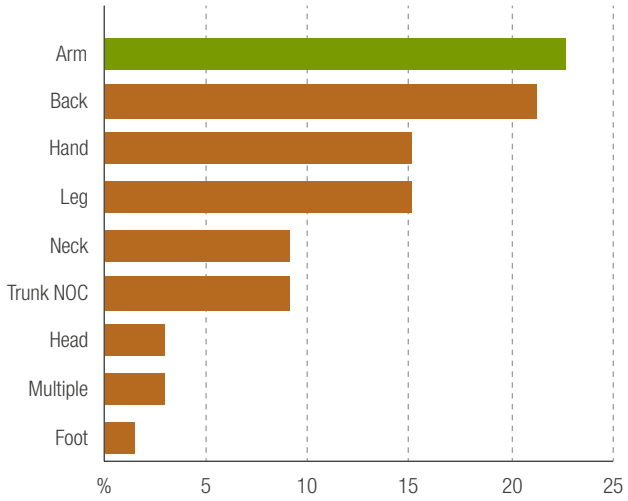


APPENDIX G

GOLD SURFACE INJURIES 2014-15

66 lost time injuries

PART OF BODY



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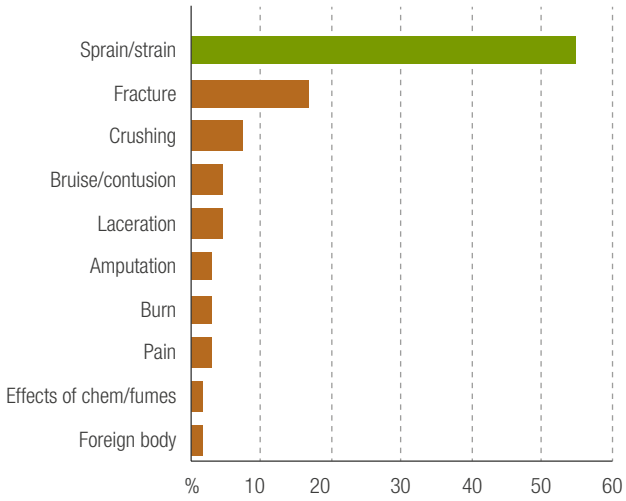

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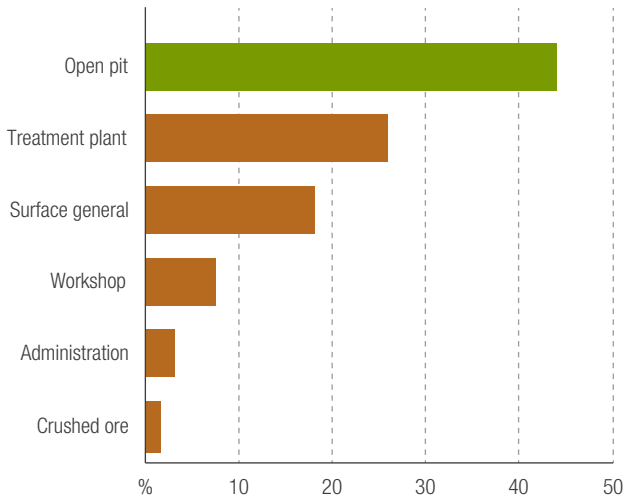
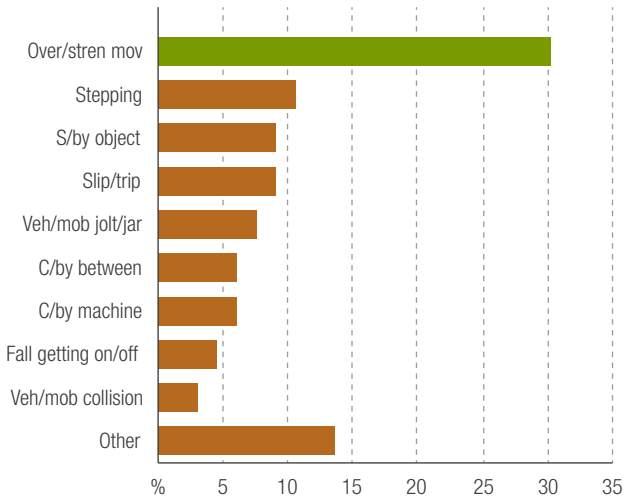


TYPE OF ACCIDENT

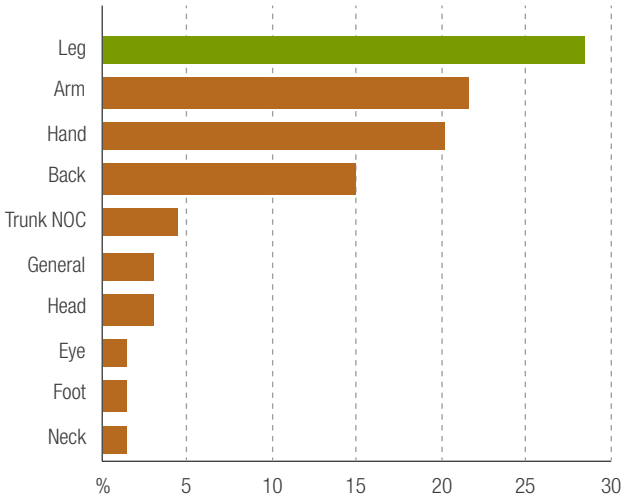


APPENDIX H

IRON ORE INJURIES 2014-15

134 lost time injuries

PART OF BODY



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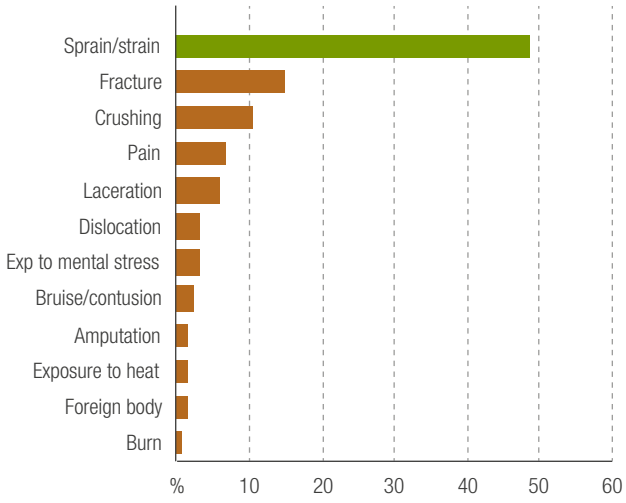

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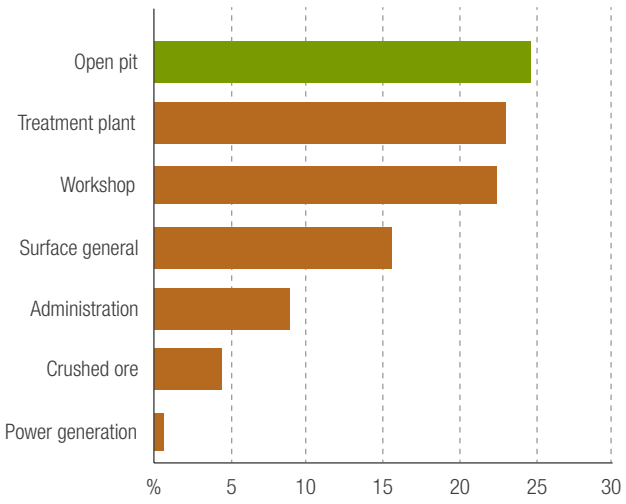

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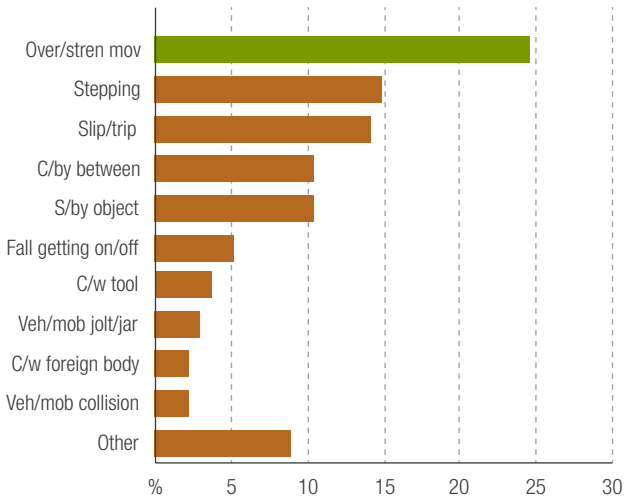
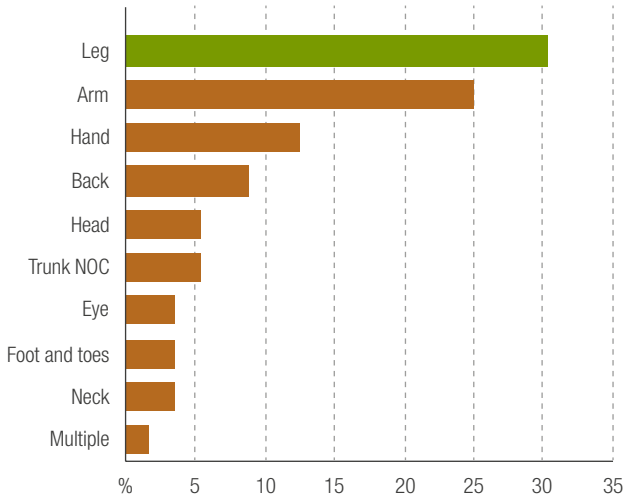


APPENDIX I

BAUXITE AND ALUMINA INJURIES 2014-15

56 lost time injuries

PART OF BODY



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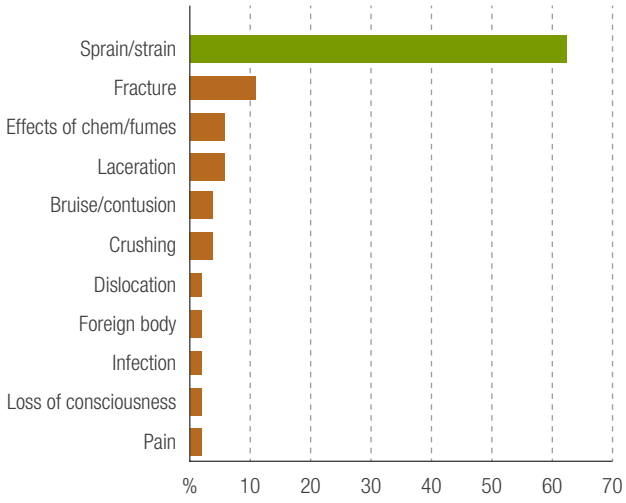

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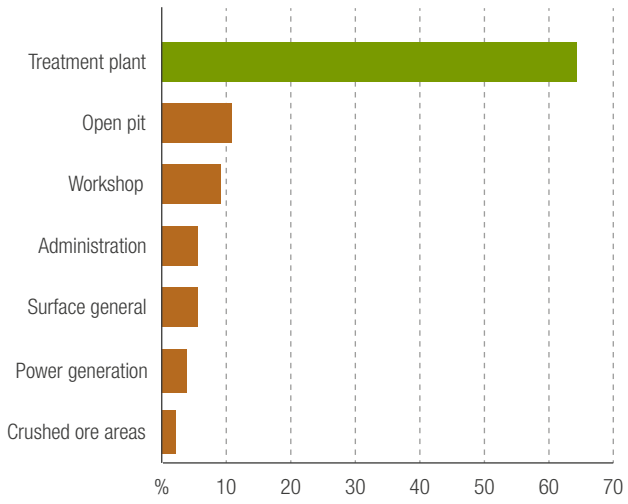
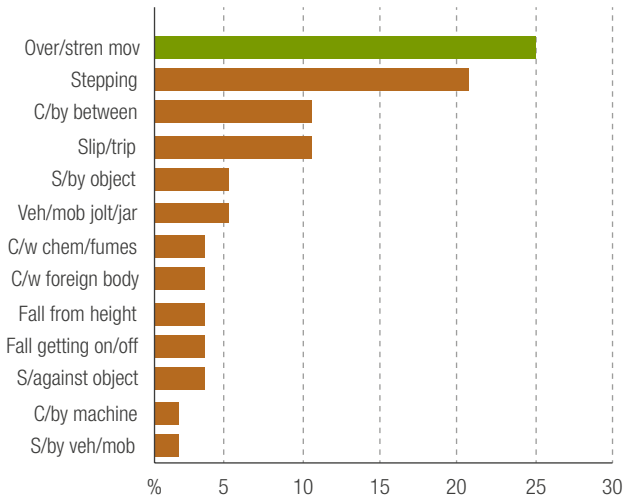


TYPE OF ACCIDENT

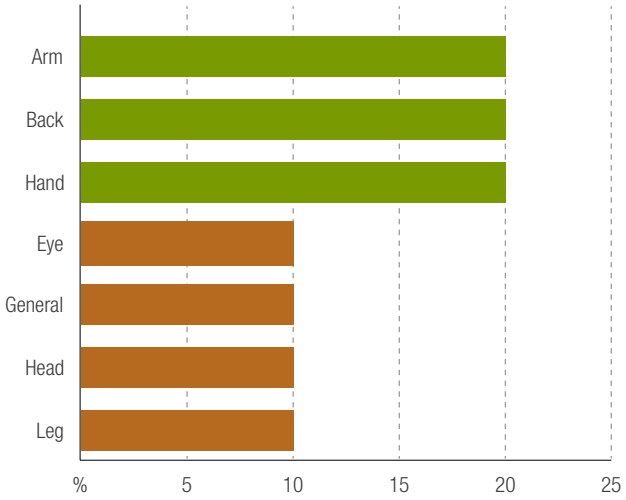


APPENDIX J

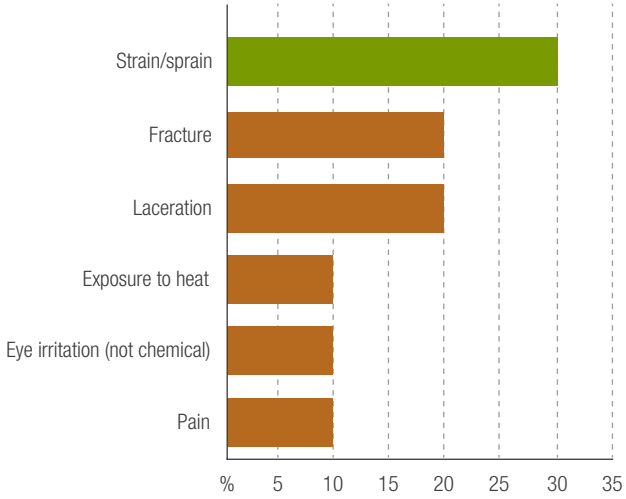
NICKEL UNDERGROUND INJURIES 2014-15

10 lost time injuries

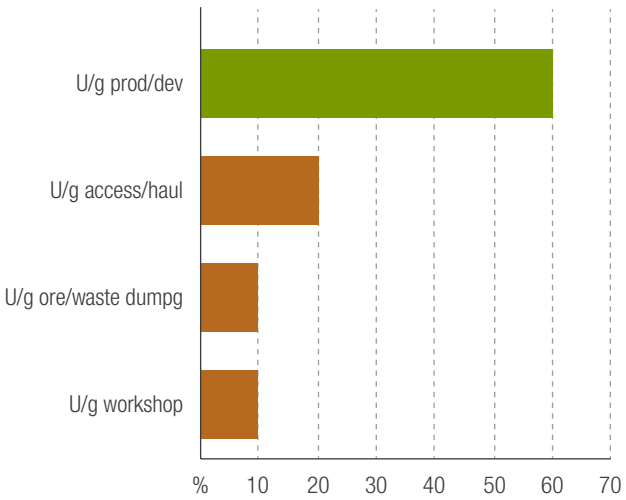
PART OF BODY



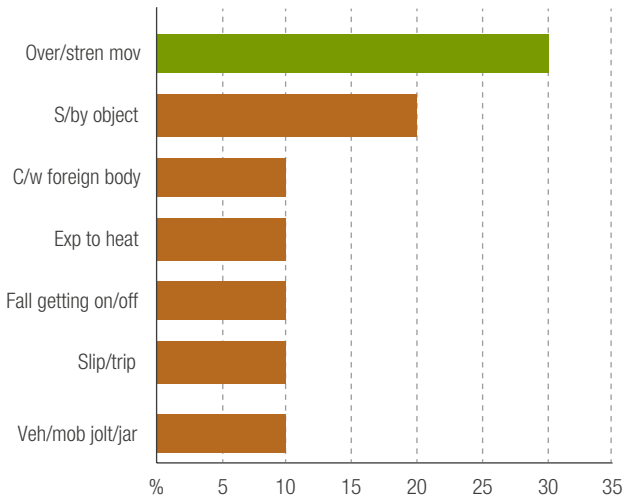
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

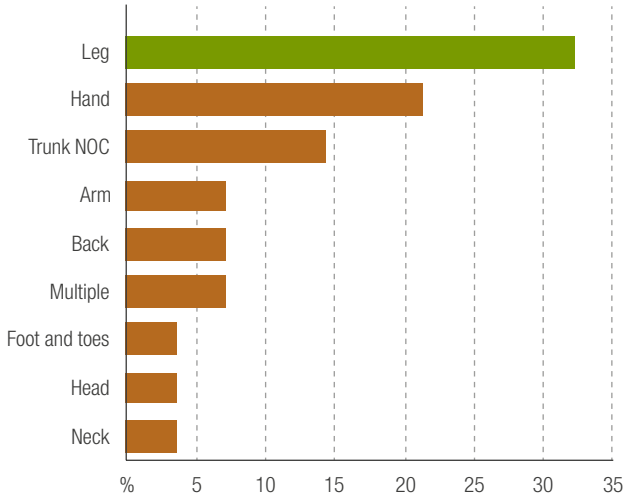


APPENDIX K

NICKEL SURFACE INJURIES 2014-15

28 lost time injuries

PART OF BODY



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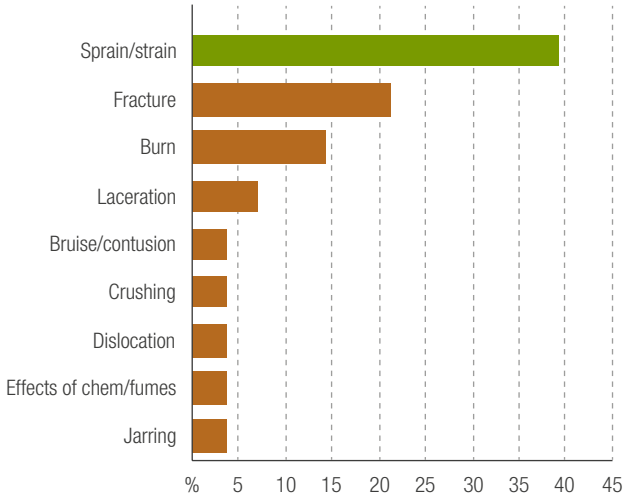
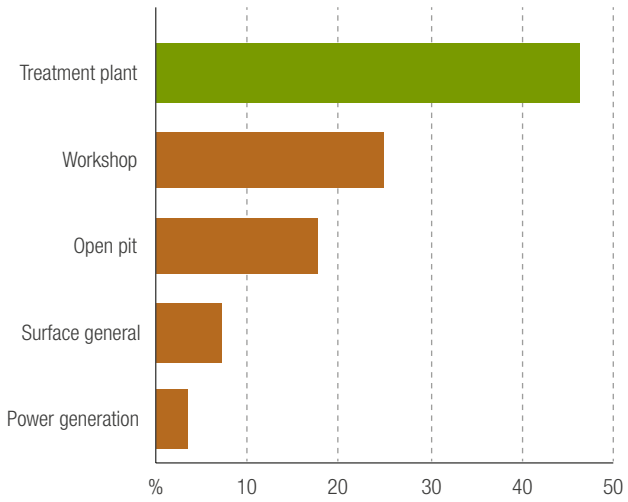
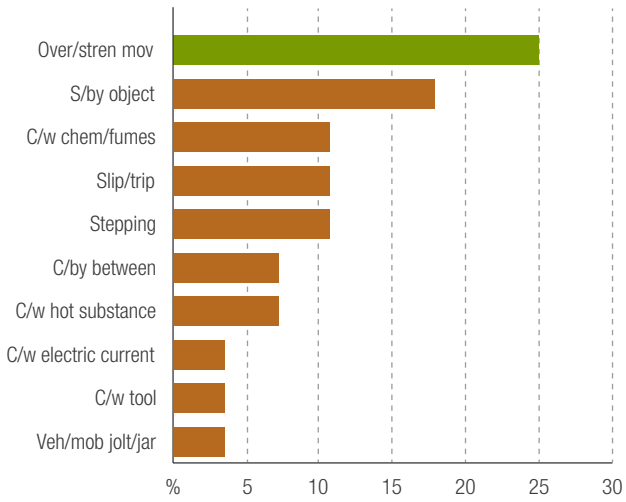


LOCATION OF ACCIDENT



TYPE OF ACCIDENT

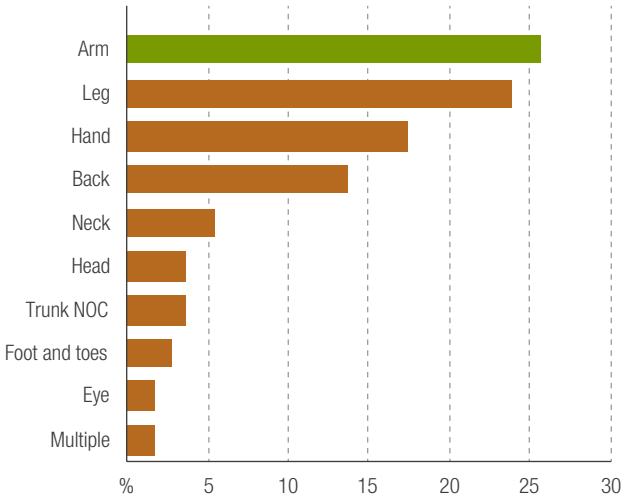


APPENDIX L

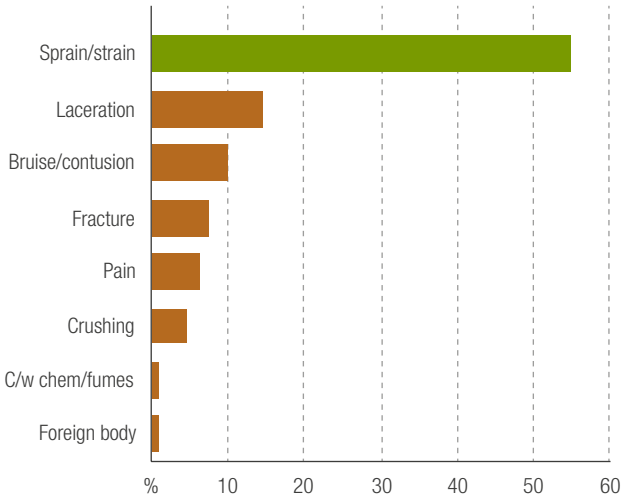
RESTRICTED WORK INJURIES UNDERGROUND 2014-15

109 restricted work injuries

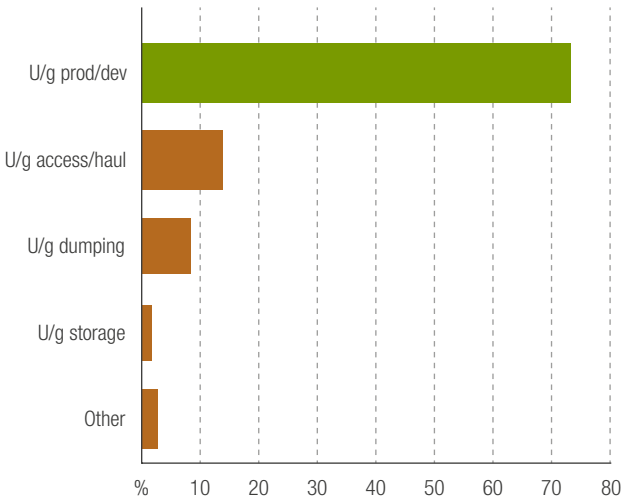
PART OF BODY



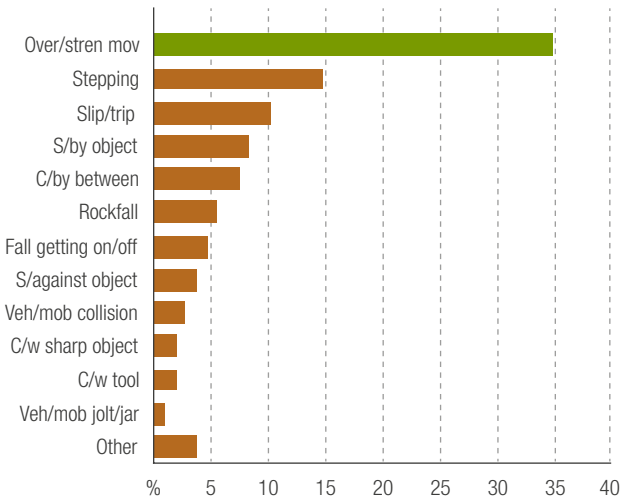
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT

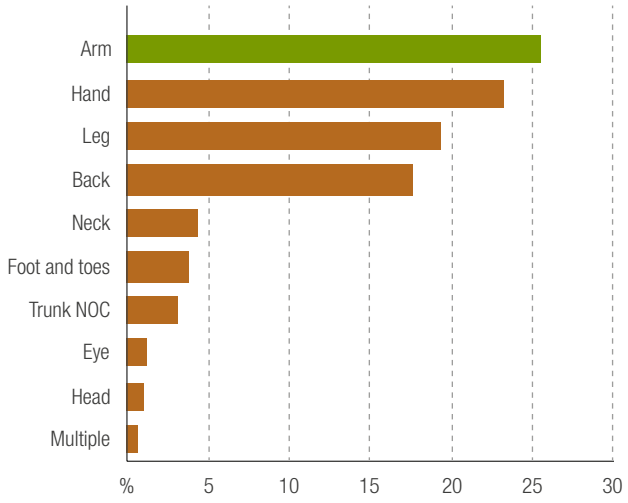


APPENDIX M

RESTRICTED WORK INJURIES SURFACE 2014-15

644 restricted work injuries

PART OF BODY



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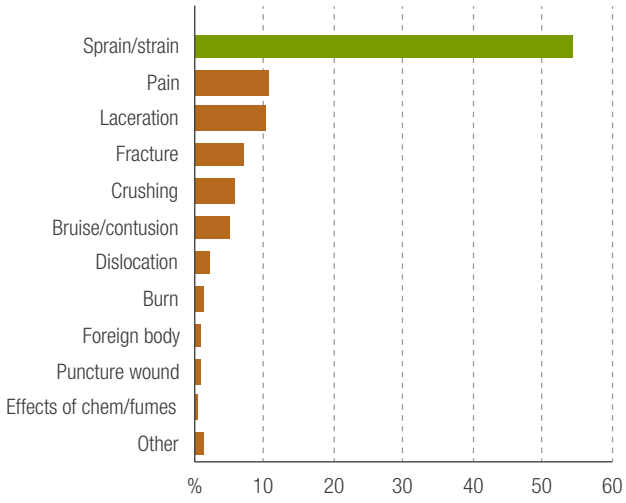
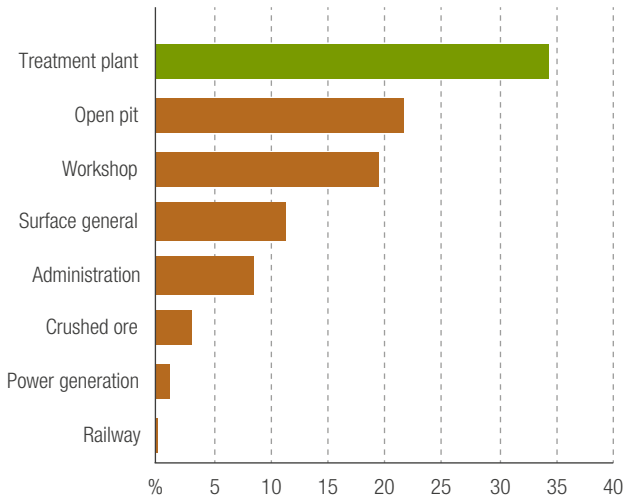
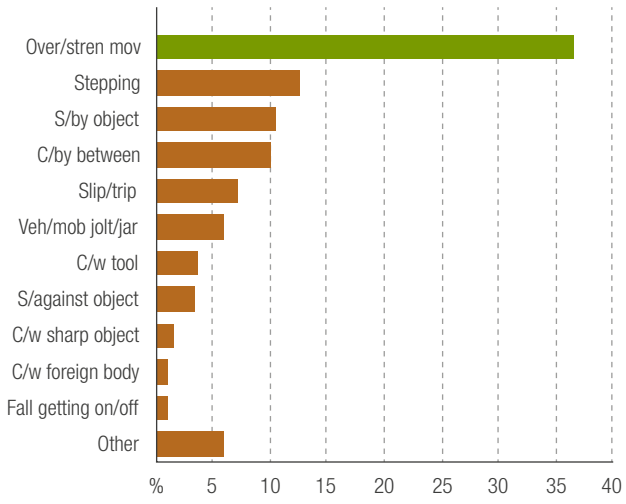


LOCATION OF ACCIDENT



TYPE OF ACCIDENT

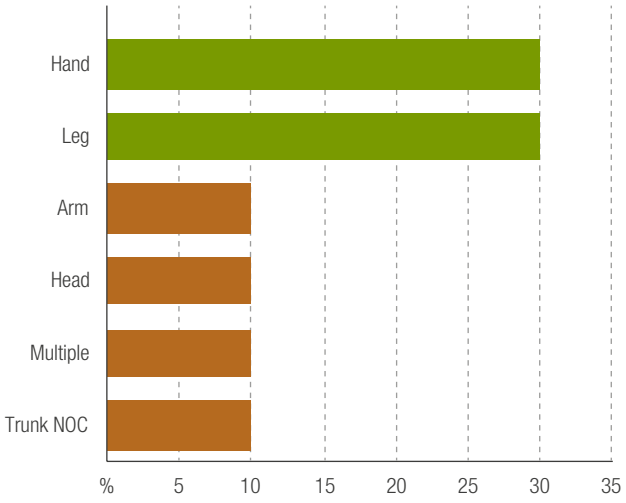


APPENDIX N

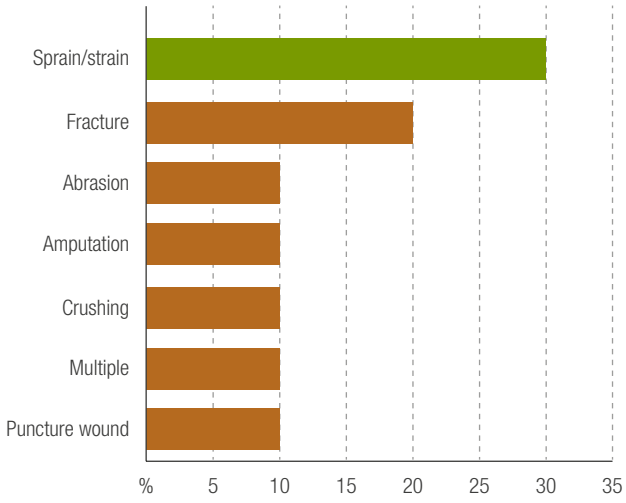
EXPLORATION INJURIES 2014-15

10 lost time injuries

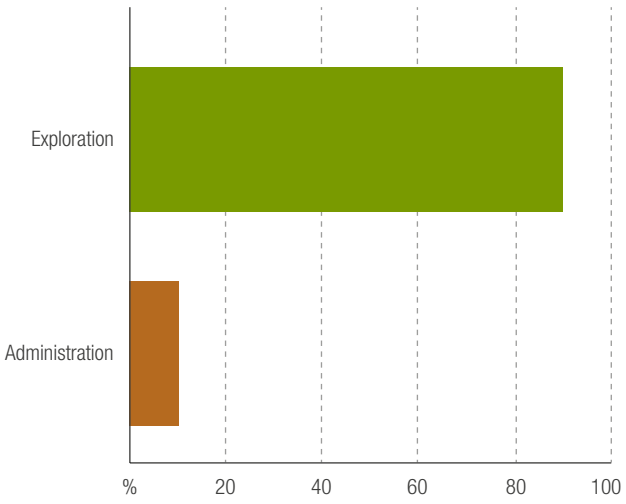
PART OF BODY



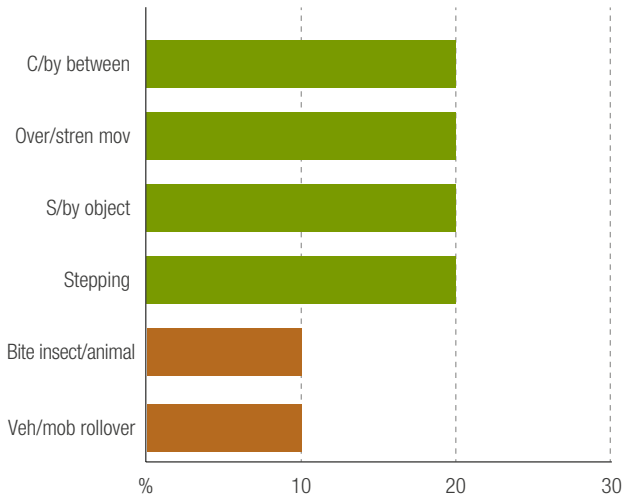
NATURE OF INJURY



LOCATION OF ACCIDENT



TYPE OF ACCIDENT



APPENDIX 0

DESCRIPTIONS OF COMMONLY USED TERMS FOR 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 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 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

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