REPORT

Work health and safety

AN OVERVIEW OF WORK-RELATED HARM AND RISK IN AOTEAROA NEW ZEALAND

June 2024

Te Kāwanatanga o Aotearoa
New Zealand Government

WORKSAFE
Mahi Haumaru Aotearoa

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EXECUTIVE SUMMARY

This report provides an overview of work-related harm and risk in Aotearoa New Zealand. It is based on data available as of June 2023. The overview is divided into five sections covering the following areas:

- Acute injuries
- Carcinogens and airborne risks
- Musculoskeletal risks
- Work organisation and environmental risks
- Psychosocial risks.

Much of the information in this overview is already available publicly through WorkSafe, Stats NZ, or research institutions. However, most publications only cover a single topic or period. The overview brings together data on work-related injuries and workplace exposures in a single report that explains patterns and trends in the data.

This information will help achieve shared understanding of the most important causes of work-related harm and what needs to improve for work in Aotearoa New Zealand to be healthier and safer.

Key findings are summarised under each topic.

Acute injuries

Each year in New Zealand an average of 50 to 60 workers are killed while at work, and 400 to 500 suffer serious non-fatal injuries (defined as hospitalisation with greater than 6.9% probability of death).

There are long-term downward trends in the rate of acute fatalities and serious non-fatal injuries. The fatality rate has reduced by more than half over the past twenty years. However, the rate of improvement has slowed over the past decade. During 2017-21, New Zealand's work-related fatality rate remained 40% higher than Australia's, after accounting for differences in economic activity and employment.

A vehicle is the primary cause of at least half of all work-related fatalities. Traffic accidents and accidents involving farm vehicles are the most common causes of workplace fatalities. Being hit by a falling object is the next most common fatal accident cause.

Four high-risk industries account for 80% of fatalities and 70% of serious non-fatal injuries: agriculture, forestry & fishing; manufacturing; construction; and transport, postal & warehousing. The forestry & logging sub-industry has a fatality rate that is 20 times higher than the all-industry average.

Male workers make up around 90% of all work-related fatalities and 85% of serious non-fatal injuries. Fatality and serious injury rates are significantly higher for workers aged over 55. The average age of a fatality in forestry & logging is 40, compared with 49 for all fatalities.

The serious non-fatal injury rate for Māori workers is at least 30% higher than for non-Māori. Independent research indicates that Māori also have a higher rate of work-related fatalities but at present ethnicity data for work-related fatalities is not routinely captured or reported.

The number of ACC claims is a measure of the overall number and rate of work-related injuries reported. There are around 225,000 work-related injury claims per annum, and over 35,000 claims with more than a week away from work (WAFW claims).

Over the past twenty years, the rate of work-related ACC claims has trended downwards, in a similar way to fatalities and serious non-fatal injuries. This downward trend is for all genders and

age groups, and in most industries; however, over the past decade the injury rate has not declined in manufacturing and health care & social assistance.

A contrasting trend is seen in the rate of WAFW claims, which has trended steadily up over the past decade. This might be partially driven by increasing awareness of the ACC scheme and changes in claiming behaviours. Observed differences for some population groups underlying the overall trend suggest some changes in who is more likely to be injured at work.

The rate of WAFW claims has increased for all groups but has increased the most in manufacturing, health care & social assistance, and retail trade, among younger workers, and for female workers. Musculoskeletal injuries account for more than 40% of WAFW claims, and their share of all claims has steadily increased over the past decade.

Carcinogens and airborne risks

The New Zealand Carcinogens Survey (NZCS) 2021 estimated that more than half of New Zealand's workforce (57%) is probably exposed to at least one carcinogen, and more than one in four (28%) is probably exposed at a high level. When considering only exposure to carcinogenic substances (excluding shift work and solar radiation), 50% of workers were estimated to have any exposure and 18% were estimated to have probable high exposure.

Most high exposure is concentrated in the high-risk industries of agriculture, forestry & fishing, manufacturing, construction, and transport, postal & warehousing. Workers in specific occupations, such as construction trades, farming, and vehicle trades, may be exposed to multiple carcinogens.

The carcinogens of most concern are those with the strongest evidence of causing serious harm, at exposure levels experienced by significant numbers of workers. These include diesel engine exhaust (90,000 with high exposure), respirable crystalline silica (80,000 with high exposure), and welding fumes and carcinogenic metals (45,000 with high exposure).

Fewer workers are exposed to asbestos (5,000 workers with high exposure and 100,000 with any exposure) but past exposure to asbestos is by far the largest cause of current harm, and current exposure remains a potential concern.

Other carcinogens of concern because of the large numbers of workers probably exposed include benzene (200,000 with high exposure) and wood dust (150,000 with high exposure).

Potentially harmful exposures come from activities such as demolition, welding, vehicle repair, painting, metal working, using power tools with stone, brick, concrete, or wood, and working around diesel-powered vehicles or equipment.

Results from the NZCS indicate that appropriate controls for airborne exposures are not consistently used. Of those who worked cutting or grinding natural stone, brick, or concrete (sources of respirable crystalline silica), 49% reported using neither water suppression nor local exhaust ventilation to control dust. Of those welding metals containing chromium or nickel, 77% (chromium) and 69% (nickel) did not use an air-supplied helmet.

In WorkSafe's 2021 worker survey, 6% of workers reported a work-related respiratory problem that began at any stage in their working life, with 2% saying this began in the year prior to the survey. Male workers, Māori workers, workers of lower socioeconomic status, and construction workers were more likely to report a work-related respiratory problem.

Musculoskeletal risks

Work-related musculoskeletal disorders (WRMSDs) involve pain, discomfort, or injury affecting the muscles, ligaments, bones, tendons, blood vessels, and nerves. They are caused by biomechanical demands interacting with other organisational, environmental, psychosocial, and individual factors.

Surveys indicate that approximately half of all New Zealand workers are exposed to biomechanical and physical musculoskeletal risks including lifting and carrying; awkward,

cramped, or tiring positions; prolonged standing; and vibration. Around one in eight workers are exposed to these risks at least three quarters of the time.

Workers from lower socioeconomic groups and male, Māori, Pacific, Asian, and younger workers are more likely to be exposed to biomechanical risks. Workers in the agriculture, manufacturing, construction, and transport, postal & warehousing industries are more likely to be exposed to these risks than workers in other industries, but cross-industry differences are smaller than for acute safety risks or airborne risks.

In WorkSafe's 2021 workers survey, one in three (33%) of workers reported experiencing a musculoskeletal condition caused or made worse by work, while one in ten (10%) said this began in the previous 12 months. Māori workers, workers of Other Ethnicity, workers aged 40-49, and workers from lower socioeconomic groups were more likely to report a WRMSD. However, the proportion reporting a WRMSD was broadly similar across industries and between male and female workers.

ACC claims for musculoskeletal injuries provide one indicator of musculoskeletal harm, though these injury claims do not capture all WRMSDs. Over the past decade, musculoskeletal injuries have grown as a proportion of all injury claims and have increased most rapidly in manufacturing, health care & social assistance, retail trade, among female and younger workers, and for injuries not related to lifting or handling objects.

Work organisation and environmental risks

The way work is organised, and features of the work environment, can cause harm or interact with other risk factors to increase the risk of injury or ill health.

Regular night shift work is a risk factor for chronic disease. Between 8% and 13% of workers in Aotearoa do night shift work. Māori workers, Pacific workers, male workers, workers in lower socioeconomic groups, and workers in the health care & social assistance and transport, postal & warehousing industries are more likely to work at night.

Long working hours also represent a possible risk factor for chronic disease, especially for lower socioeconomic groups and when combined with other exposures. Māori workers, male workers, and workers in agriculture, construction, and transport, postal & warehousing are more likely to work more than 50 hours per week.

Loud noise causes hearing loss and tinnitus and can contribute to musculoskeletal and cardiovascular harm. Between 36% and 46% of workers report that they are exposed to loud noise at least a quarter of the time. Male, Māori, Pacific, younger workers, workers in lower socioeconomic groups, and workers in agriculture, manufacturing, construction, and transport, postal & warehousing are more likely to report exposure to loud noise. Over 25% of construction and manufacturing workers say they are exposed to loud noise at least three quarters of the time.

In WorkSafe's 2021 workers survey, 10% of workers reported a work-related hearing problem, with 2% saying this began in the past 12 months. Pacific workers, workers over 60, workers from lower socioeconomic groups and workers in agriculture, manufacturing, construction, and transport, postal & warehousing were more likely to report work-related hearing issues. Construction workers were twice as likely as other workers to report a work-related hearing problem.

Unprotected exposure to solar radiation is a risk factor for skin cancer. According to the New Zealand Carcinogens Survey 2021, approximately 190,000 workers have high exposure to solar radiation. More than half work in agriculture and construction. Around two thirds of workers who work outside more than four hours per day wear a hat but just 6% have access to shade more than half the time.

Working constantly in hot temperatures or in cold, wet, or damp conditions can cause ill health and is a risk factor for longer-term chronic disease. Around 40% of workers are exposed at least a quarter of the time to hot conditions and a similar proportion to cold or damp conditions. Around

one in seven workers are exposed at least three quarters of the time to hot or cold conditions. Male workers and workers in the two lowest socioeconomic groups are more likely to report working in both hot and cold conditions.

Psychosocial risks

Psychosocial risks refer to aspects of work design, relationships and behaviours at work that can affect health. High work demands, low job control, insecurity, unfairness, and offensive behaviours can result in psychological distress and increase the risk of mental and physical ill health.

The New Zealand Psychosocial Survey (NZPS), conducted in 2021, offers insights into the psychosocial working environment in New Zealand. High working pace is the most frequently experienced psychosocial risk in New Zealand, followed by demands for hiding emotions and quantitative demands (volume of work). The most prevalent positive factors are a sense of community at work, role clarity, and meaningful work.

In the NZPS, approximately one in three workers (35%) said they had experienced at least one offensive behaviour in the past 12 months. Bullying was the most common behaviour, experienced by 22% of workers, followed by cyberbullying (16%), sexual harassment (14%), threats of violence (11%), and physical violence (11%).

Compared to other workers, workers in retail trade and accommodation & food services were more likely to experience high emotional demands, had less job control and job security, and were more likely to be exposed to sexual harassment. Workers in health care & social assistance faced high emotional demands and higher exposure to bullying, threats of violence, and physical violence.

Māori and Pacific workers had higher exposure to some risk factors including offensive behaviours, conflicting demands, and job insecurity. However, they also reported higher than average scores for a range of positive factors including social support from supervisors and colleagues, and meaningful work. Asian workers also had higher exposure to conflicting demands and job insecurity and reported less sense of community at work.

Migrant workers who arrived in New Zealand fewer than five years ago had consistently higher exposure to psychosocial risks. These workers scored significantly below the overall survey average on 12 out of 25 factors spanning job control, interpersonal relationships, job insecurity, job satisfaction and work-life conflict. They were also more likely to be exposed to all five offensive behaviours.

In WorkSafe's 2021 workers survey, nearly one in three (30%) workers reported a mental health condition caused or made worse by work, while one in ten (11%) reported a work-related condition that began in the previous 12 months. Female workers and workers in health care & social assistance were more likely to report a work-related mental health problem.

1.0
Introduction

INTRODUCTION

The Government's Health and Safety at Work Strategy 2018-2028 established the goal that *work is healthy and safe for everyone in New Zealand.* To achieve this goal, it is important to understand how well the work health and safety system is performing. The Strategy set an objective to *develop and share better data and insights to improve decision making.* Understanding where improvements are needed informs decisions about what to focus on.

The concept of the ***work health and safety system*** refers to the organisations, people, rules, decisions, relationships, and actions that contribute to healthy and safe work. These include:

- Laws and regulations which establish duties related to work health and safety, and regulatory actions to uphold these duties.
- Decisions about investment, economic activity, technology, land use, and work organisation that influence work health and safety.
- Actions by government, industry, worker, professional, Māori, and community groups that enable healthy and safe work.
- Creation and sharing of knowledge related to work health and safety.
- Training, education, and specialist advice which support healthy and safe work.
- Practices by people doing work that help keep themselves and others healthy and safe.

WorkSafe's role

WorkSafe New Zealand is the primary regulator of work health and safety in Aotearoa. The WorkSafe New Zealand Act 2013 establishes specific functions for WorkSafe including:

- Advising on the operation of the work health and safety system.
- Collecting, analysing, and publishing statistics and other information relating to work health and safety.
- Engaging in, promoting, and co-ordinating the sharing of information with other agencies and interested persons that contribute to work health and safety.

In 2020, WorkSafe published the *Health and Safety Strategy Outcomes Dashboard*, based on information available to 2019. This publication drew together readily available data and information to offer a snapshot of health and safety at work in New Zealand.

This overview follows on from the *Outcomes Dashboard*. It incorporates new data and information on work health and safety collected since 2019. Much of the data and information is available publicly or has already been published in separate reports. However, this is the first time it has been brought together in a single report.

Scope of the report

This report provides an overview of work-related harm and risk in Aotearoa New Zealand. Measures of harm, or harmful exposures, are sometimes referred to as 'lag indicators', since they can result from decisions taken and practices established in the past. A future report could look at 'lead indicators', which explore how current practices are contributing to work health and safety.

Harm and exposure to risk remain key indicators of the overall health and safety of work. For improvement to occur, measures of harm and risk should trend down over time. Some readily preventable harms and exposures should eventually be eliminated.

To evaluate workplace safety, the report looks at the number and rate of injuries, and the circumstances in which they occurred, where this information is available. It also gives information on the proportion of workers who are exposed to specific safety risks and the proportion who report experiencing an injury at work.

To evaluate work-related health, the report looks at the healthiness of work conditions, mostly based on survey data. It reports on exposure to carcinogens, airborne risks, musculoskeletal stressors, noise, and factors such as long hours or shift work. It looks at the overall quality of the psychosocial working environment, including measures of both risk factors and positive factors. It also summarises available information on the incidence and prevalence of work-related ill health reported by workers.

For all these indicators, the report provides relevant breakdowns as allowed by the data, including by industry, gender, age, ethnicity, and socioeconomic status.

Most of the data and information in this report is drawn from long-running administrative data series and major population-based surveys. Data sources are discussed in the respective sections and an overview is provided at the end of the document.

The overview of harm and risk is divided into sections based on the following five groupings, which account for most of the work-related harm in Aotearoa New Zealand.

WORK-RELATED ACUTE INJURIES

This section summarises trends and patterns in work-related injuries, drawing on data from WorkSafe, ACC and Stats NZ. The section is divided into two parts, the first looking at acute fatalities and serious non-fatal injuries, and the second at higher-volume injuries as represented by ACC claims, including claims resulting in more than a week away from work.

CARCINOGENS AND AIRBORNE RISKS

This section provides information on worker exposure to carcinogens and to other dusts, gases, vapours, and fumes. It largely draws on the New Zealand Carcinogens Survey (NZCS), supplemented by self-reported exposure data from WorkSafe's Workforce Segmentation and Insights Programme (WSIP) survey and surveys undertaken by Massey University. This section also summarises data on respiratory conditions reported by workers, drawn from the WSIP survey.

MUSCULOSKELETAL RISKS

This section summarises data on exposures to biomechanical and physical musculoskeletal risks such as lifting, awkward positions, and vibration. This data is drawn from the WSIP survey and surveys undertaken by Massey University. This section also summarises data on work-related musculoskeletal conditions reported by workers, drawn from the WSIP survey. ACC data on musculoskeletal injury claims provides some additional insights.

WORK ORGANISATION AND ENVIRONMENT

This section summarises information on aspects of work organisation and environment that can affect health, such as shift work, long working hours, noise solar radiation, and extreme temperatures. It draws on the New Zealand Carcinogens Survey, WSIP survey, and surveys by Massey University.

PSYCHOSOCIAL RISKS

This section provides information on exposure to psychosocial risks that can affect mental and physical health. It primarily draws on the New Zealand Psychosocial Survey 2021. It also summarises data on mental health conditions reported by workers, drawn from the WSIP survey.

Exclusions and limitations

This overview gives a broad picture of work-related harm and risk in Aotearoa. To manage time and resource constraints, some topics have been excluded, including those which require more analysis and explanation than is possible in a high-level overview.

This report excludes some areas of work-related harm and risk, including infectious disease, other biological risks, and exposures that can cause or exacerbate skin conditions.

WorkSafe receives notifications about non-worker fatalities that are caused by work activities. These are reported in WorkSafe's online Data Centre alongside worker fatalities. However, non-worker fatalities are not included in this report, as they have not been consistently defined over time and require more analysis than is possible in a high-level overview.

A decision was taken not to include data on ACC gradual process claims for cancer, respiratory disease, musculoskeletal conditions, and noise-related hearing loss. This data is not considered representative of the underlying harm and merits more detailed analysis than can be included in a high-level overview.

International comparisons are a popular means of evaluating national work health and safety performance. However, definitional, methodological, and contextual differences make comparisons difficult. The only two comparisons considered sufficiently robust for this report are with Australia for acute fatalities and for exposure to specific carcinogens evaluated using the same methods. Appropriate comparisons of other indicators and/or with other countries might be possible in the future.

The overview also has some limitations related to data quality and accessibility, and the need to manage time and scope constraints.

The document focuses on a high-level summary of injuries and exposures, broken down by single variables (e.g., industry, age, gender, or ethnicity). It does not provide more detailed, multivariate analyses that examine the correlations when these variables are considered together.

Most of the data is broken down by year (for injuries), industry, age, and gender. Where possible, breakdowns by ethnicity are provided, but this has its limitations. Ethnicity is not captured as part of fatality notifications and is incomplete in ACC data. Surveys seek to reflect the diversity of the population; however, they are limited by the scale and methods that can be used within available resources. WorkSafe acknowledges that its survey data may not be fully representative of all population groups.

Occupation and socioeconomic status are other important variables that are associated with exposure to risk at work. These variables are not consistently included, either because they are not captured in the relevant datasets, were not readily available from the summary data used, or another breakdown was considered most relevant (e.g., by industry instead of occupation). Only results from WorkSafe's Workforce Segmentation and Insights Programme (WSIP) survey are consistently broken down by socioeconomic status, which is defined based on survey responses about income, education, and occupation.

Finally, this overview is not intended to provide detailed recommendations about ways to address work-related harm and risk. It aims to give all participants in the health and safety system a shared view of current trends and patterns in work-related harm and risk. This can help identify the most important issues and focus attention on where improvement is needed.

2.0
Work-related acute injuries

WORK-RELATED ACUTE INJURIES

Acute injuries refer to bodily damage resulting from a single incident, which may or may not involve an external cause such as an object, mechanical force, fire, or poison. The definition of a work-related injury used in New Zealand is based on the following criteria:

- Fatal harm notifications to WorkSafe that are determined to be work-related.
- ACC claims where an injured person can be identified as being at work or undertaking employment-related activities at the time the injury occurred.
- ACC claims with a recorded injury scene of 'farm' by people with an agricultural occupation (not involved in a sport or recreational activity).[1]

This definition has been used since a 2013 review by Stats NZ, MBIE, and ACC which resulted in improved quality and coverage of work-related injury indicators. Changes made by the 2013 review were applied retrospectively to historical data where possible.

Fatal injuries

Work-related acute fatalities are fatal accidents that are notified to WorkSafe and determined to be work-related, or fatal ACC claims that were deemed to be work-related. This section focuses on worker fatalities, defined as those where a person was working at the time the injury occurred. This scope allows robust comparisons over time, and, to a certain extent, with other countries.

In this section, overall fatality numbers and age-standardised rates for workers are based on the official data reported by Stats NZ, while detailed analysis including breakdown by injury mechanism and industry is based on WorkSafe's data. This may result in minor differences between analyses, including differences arising from using age-standardised versus non-age-standardised rates.

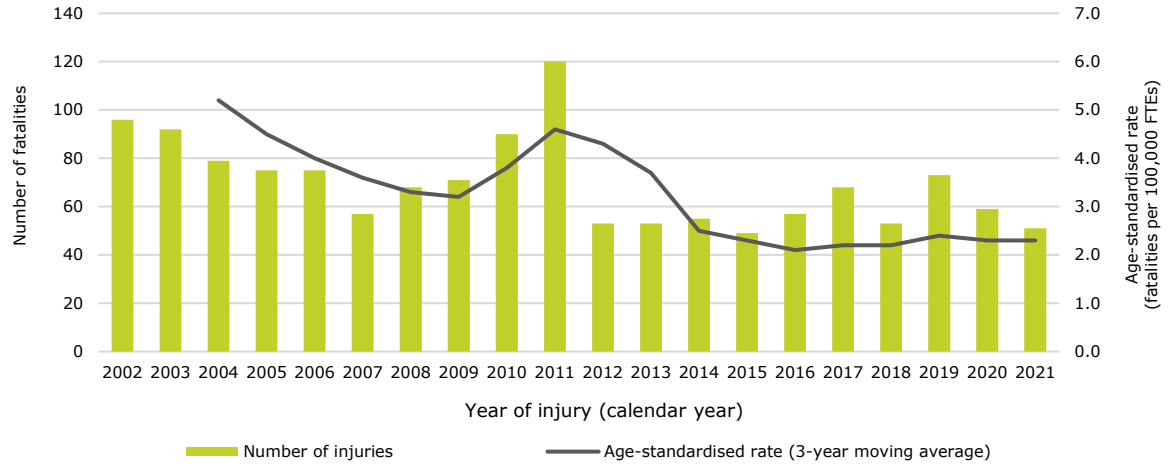
Figure 1 shows the annual number of work-related acute fatalities and the three-year rolling average rate per 100,000 FTEs from 2002 to 2021. A three-year moving average is used for fatality rates because the small numbers make changes from year to year more difficult to interpret.

The graph shows that there has been a long-term downward trend in the rate of acute fatalities since 2002. The decline was interrupted by the 2010 Pike River mine explosion (29 fatalities) and the 2011 Canterbury earthquakes (63 people killed who were working at the time of the earthquake).

The total number of fatalities reported by Stats NZ reduced from 267 in 2002-2004 to 183 in 2019-2021. After adjusting for changes in workforce size and age structure over time, the rate of fatalities per 100,000 FTEs was 2.3 in 2019-21, compared to 5.2 per 100,000 in 2002-2004. This represents 56% fewer fatalities per 100,000 FTEs compared with 2002-2004, and 8% fewer fatalities per 100,000 FTEs compared with 2012-2014.

[1] Claims in ACC's Motor Vehicle Account and Earners' Account are included if any one of the criteria above are met. Occupational disease, illness, and 'gradual process' injuries are excluded from these indicators.

Figure 1: Work-related fatal injuries, number and age-standardised rate, 2002-21

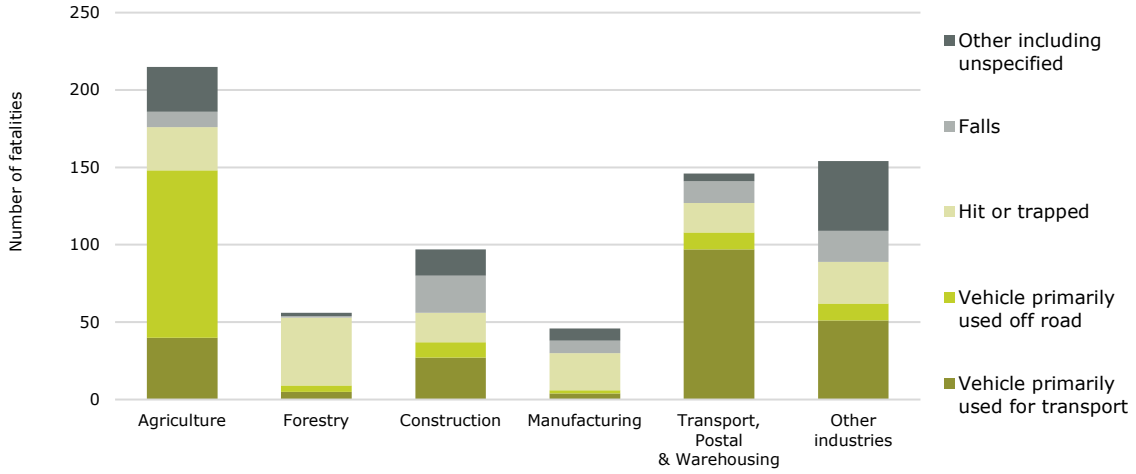


Source: Stats NZ injury data.

WORK-RELATED FATALITIES BY INJURY MECHANISM AND INDUSTRY

WorkSafe uses the Type of Occurrence Classification System (TOOCS) to classify the mechanisms of acute injuries.[2] From 2011, TOOCS codes have been manually assigned to fatalities reported through the WorkSafe Data Centre, making this a relatively complete and reliable source of information on the causes of acute work-related fatalities. **Figure 2** shows the distribution of acute fatalities by injury mechanism and industry for 2011-22.[3]

Figure 2: Number of work-related acute fatalities by injury mechanism and industry, 2011-22



Source: WorkSafe Data Centre, data accessed May 2023.

For the purposes of this analysis, TOOCS injury mechanism codes are divided into the following five groups:

- *Vehicles used primarily for transport.* This includes fatal accidents involving heavy and light road vehicles, rail, air, and sea transport.

[2] TOOCS was developed in Australia for coding details of workers' compensation claims, as well as other injury or illness. Coding for mechanism of incident is one of several coding systems within TOOCS and refers to the overall action, exposure or event that resulted in an injury. See Australian Safety and Compensation Council. (2008). Type of Occurrence Classification System, 3rd edition.

[3] See **Appendix 3** for a full breakdown of acute fatalities by injury mechanism.

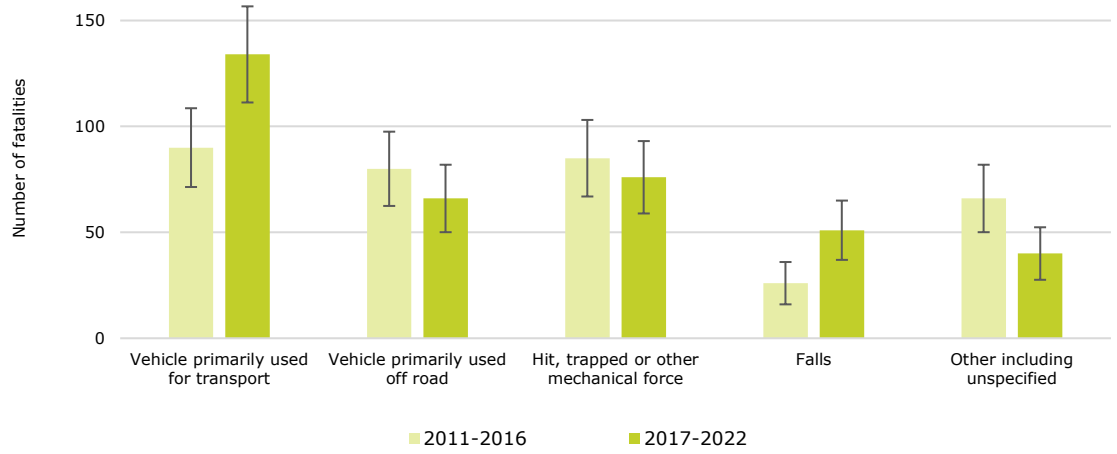
- *Vehicles used primarily off road.* This includes fatal accidents involving 4-wheeled motorbikes, tractors, other specialist vehicles and mobile plant.
- *Hit or trapped.* This includes accidents where a worker was hit by falling or moving objects, caught or trapped in machinery, or trapped between stationary and moving objects.
- *Falls.* This includes falls from height and slips or falls on the same level.
- *All other causes.* This includes electrocution, poisoning, drowning, attack by a person or animal, environmental factors, and other miscellaneous causes.[4]

During 2011-22, transport vehicles (such as trucks, cars, rail, air, or maritime transport) were coded as the primary injury mechanism for 31% of work-related acute fatalities. Off-road vehicles (including quad bikes, tractors, forklifts, and mobile plant) were coded as the injury mechanism for another 20%. Of the remaining fatalities, 23% involved workers being hit or trapped, while 11% resulted from falls, and 15% from all other causes.

During the same period, the largest proportion of fatalities occurred in agriculture, forestry & fishing, excluding the forestry & logging sub-industry (30%), followed by transport, postal & warehousing (20%), construction (14%), the forestry & logging sub-industry (8%) and manufacturing (6%). Almost 80% of fatalities occurred in these industries combined.

Prominent combinations of industry and injury mechanism included 108 fatalities involving off-road vehicles in agriculture, 97 fatalities involving transport vehicles in transport, postal & warehousing, and 44 fatalities from being hit or trapped in the forestry & logging sub-industry.

Figure 3: Number of work-related acute fatalities by injury mechanism, 2011-16 and 2017-22



Source: WorkSafe Data Centre, data accessed May 2023; WorkSafe calculations.
Error bars represent 95% confidence intervals.

Figure 3 compares the number of fatalities by injury mechanism in two six-year periods, 2011-16 and 2017-22.

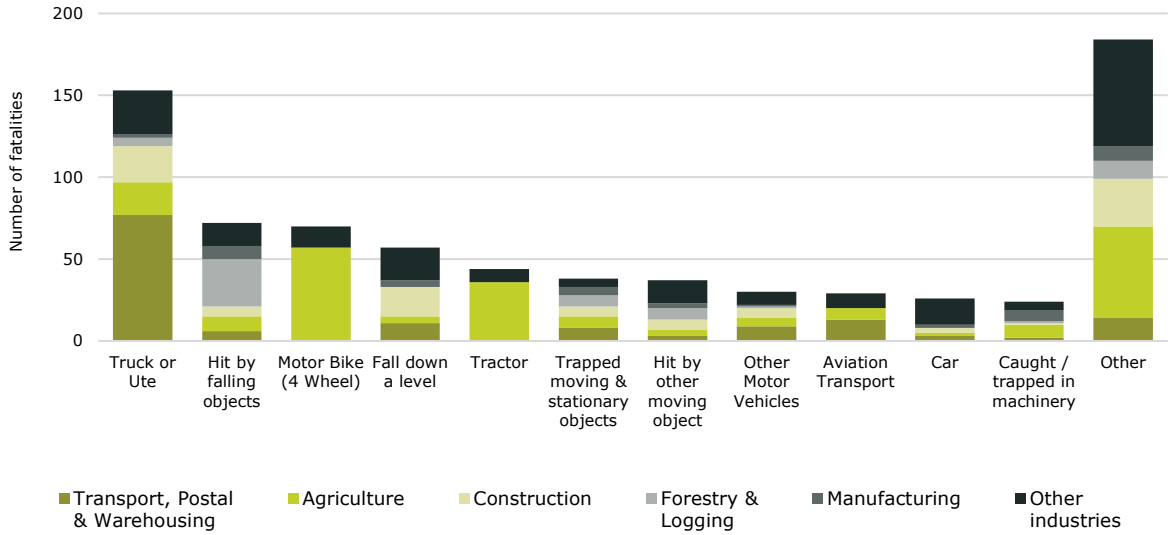
Between these two periods, there were significant increases in the number of fatalities caused by transport vehicles and by falls. Observed decreases in the number of fatalities caused by other mechanisms were not statistically significant. The proportion of fatalities caused by transport vehicles increased from 26% in 2011-2016 to 37% in 2017-2022. This reflects a known increase in fatal on-road crashes during 2013-19, particularly from accidents involving trucks.[5] However, it may also reflect increased identification and reporting of transport accidents as work-related over the past decade.

[4] This analysis excludes the 63 workers killed in the Canterbury earthquake of February 2011.

[5] See Safety — Annual statistics | Ministry of Transport.

Figure 4 shows work-related acute fatalities by specific injury mechanism across the 2011-22 period. Trucks and utes accounted for more than 20% of fatalities during this period. The next most common injury mechanisms were being hit by falling objects, 4-wheeled motorbikes, falls from height, and tractors. Collectively, these five mechanisms accounted for more than 50% of all fatalities during 2011-2022.

Figure 4: Number of work-related acute fatalities by specific injury mechanism, 2011-22



Source: WorkSafe Data Centre, data accessed May 2023.

ACUTE FATALITY RATES BY INDUSTRY

Figure 5 shows the fatality rate per 100,000 full time equivalent employees (FTEs) by industry for 2011-16 and 2017-22, based on WorkSafe's fatality data and Stats NZ workforce data.

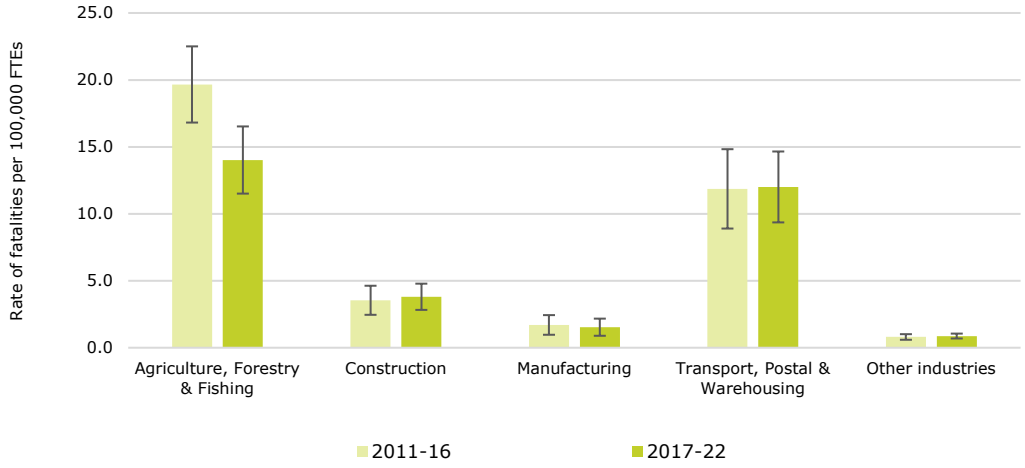
Across the 2011-22 period, the agriculture, forestry, and fishing industry had the highest fatality rate of 16.7 per 100,000 FTEs, followed by transport, postal and warehousing (11.9 per 100,000 FTEs), construction (3.7 per 100,000 FTEs) and manufacturing (1.7 per 100,000 FTEs).[6] The combined rate for all other industries was 0.8 fatalities per 100,000 FTE.

During 2011-2022, the fatality rate within the forestry and logging sub-industry was 55.6 per 100,000 FTE, more than three times the rate of the agriculture, forestry & fishing industry as a whole and around twenty times the all-industry rate. On average, fatalities in the forestry & logging sub-industry occurred at a significantly younger age (39.9 years compared to 49.1 years for all fatalities).

Between the 2011-16 and 2017-22 periods, the overall fatality rate in agriculture, forestry & fishing reduced from 19.7 to 14.0 per 100,000 FTEs. The proportion of fatalities in this industry reduced from 36% to 25%.

[6] Note that fatality rates at industry level are not age standardised.

Figure 5: Acute fatality rates by industry, 2011-16 and 2017-22



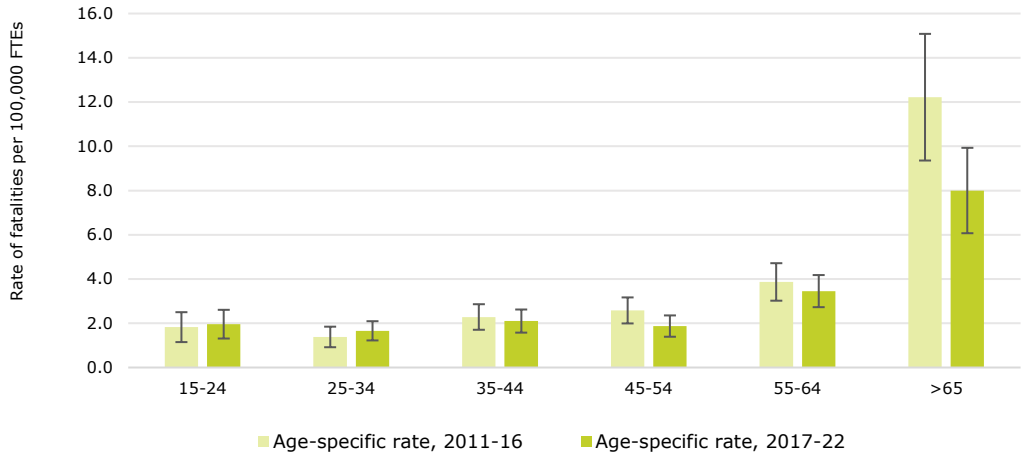
Sources: WorkSafe Data Centre, data accessed May 2023; Stats NZ HLFS data; WorkSafe calculations.
Error bars represent 95% confidence intervals.

ACUTE FATALITY RATES BY GENDER AND AGE

Over the 2011-22 period, male workers accounted for 92% of all work-related acute fatalities. **Figure 6** shows the rate of acute work-related fatalities by age group for the 2011-16 and 2017-22 periods.

Across the 2011-22 period, fatality rates were significantly higher for those aged 55-64 than for other age groups, and they were three to four times higher for those aged over 65. Between 2011-16 and 2017-22 there was an observed reduction in the fatality rate for workers aged over 65, but this fell just short of statistical significance.

Figure 6: Age-specific rates for work-related fatalities, 2011-16 and 2017-22



Sources: WorkSafe Data Centre, data accessed May 2023; Stats NZ HLFS data; WorkSafe calculations.
Error bars represent 95% confidence intervals.

INTERNATIONAL COMPARISONS

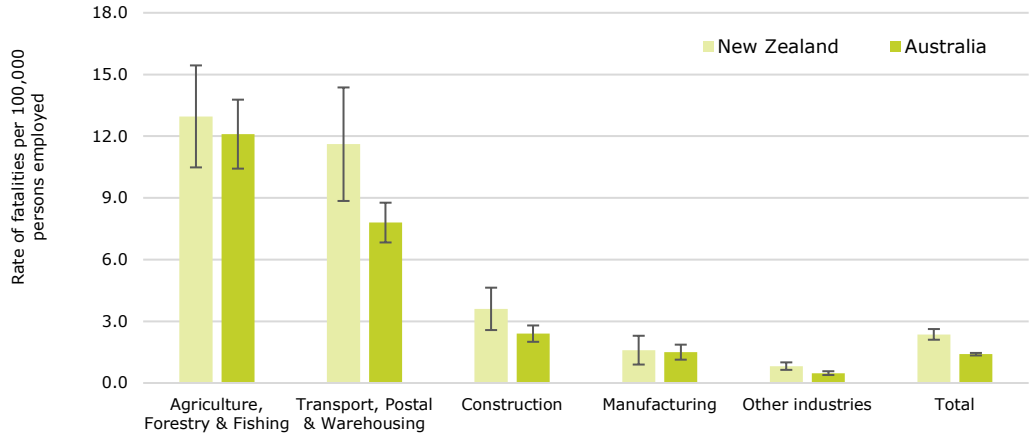
International comparisons of work-related acute fatality rates are one way of establishing benchmarks and identifying opportunities for improvement. Previous comparisons have concluded that New Zealand has a higher work-related fatality rate than the best-performing countries,

although differences are smaller once distributions of economic activity and employment are accounted for.[7]

For the purposes of this overview, direct comparison is made only with Australia. New Zealand and Australia have broad economic and social similarities, have similar legislative and regulatory frameworks, and use similar processes for collecting and classifying data. There is also a relationship of collaboration and information exchange between agencies in Australia and New Zealand.

Figure 7 shows the five-year acute work-related fatality rates in New Zealand and Australia during 2017-21, for the whole workforce, and for the industries that account for most fatalities. To match Australia's reporting approach, New Zealand rates are not age-standardised and are given based on workers employed, rather than FTEs. This means that they differ slightly from the rates shown in the previous sections.

Figure 7: Work-related acute fatality rates per 100,000 persons employed in New Zealand and Australia, 2017-21



Sources: Safe Work Australia, data accessed July 2023; Australian Bureau of Statistics Labour Force Survey; WorkSafe Data Centre, data accessed May 2023; Stats NZ HLFS data; WorkSafe calculations.
Error bars represent 95% confidence intervals.

During 2017-21, New Zealand's rate of 2.4 fatalities per 100,000 workers was 68% higher than Australia's rate of 1.4 per 100,000 workers. **Figure 7** shows that fatality rates were higher in New Zealand for each industry or industry grouping, although the only statistically significant difference was in the transport, postal & warehousing industry (11.6 in New Zealand vs. 7.8 in Australia). Differences in fatality rates fell just below statistical significance in the construction industry (3.6 vs. 2.4) and all other industries (0.8 vs. 0.5). There were no significant differences in fatality rates in the agriculture, forestry & fishing industry, or the manufacturing industry.

When New Zealand's industry-specific rates are weighted to match Australia's distribution of employment, the rate drops to 2.0 per 100,000 persons employed, which is 42% higher than Australia's rate of 1.4 per 100,000 persons employed. New Zealand's higher fatality rate in the transport, postal & warehousing industry makes the single largest contribution to this difference, suggesting that poorer road safety outcomes in New Zealand influence its work health and safety performance.[8]

The United Kingdom (UK) has some differences in the scope of work-related fatalities reported, as well as differences in industry structure. However, an industry-level comparison is useful. For the

[7] Poland, M. (2019). Internationally comparable work-related fatality numbers for New Zealand. Conference presentation to the New Zealand Association of Economists. [Available on request].

[8] This influence extends beyond the transport industry. An event-level review of fatalities recorded by WorkSafe during 2019-21 found that seven of 30 fatalities in construction, 11 of 67 in agriculture, forestry, and fishing, and 11 of 42 in other industries involved vehicle collisions or loss of control on public roads or railways.

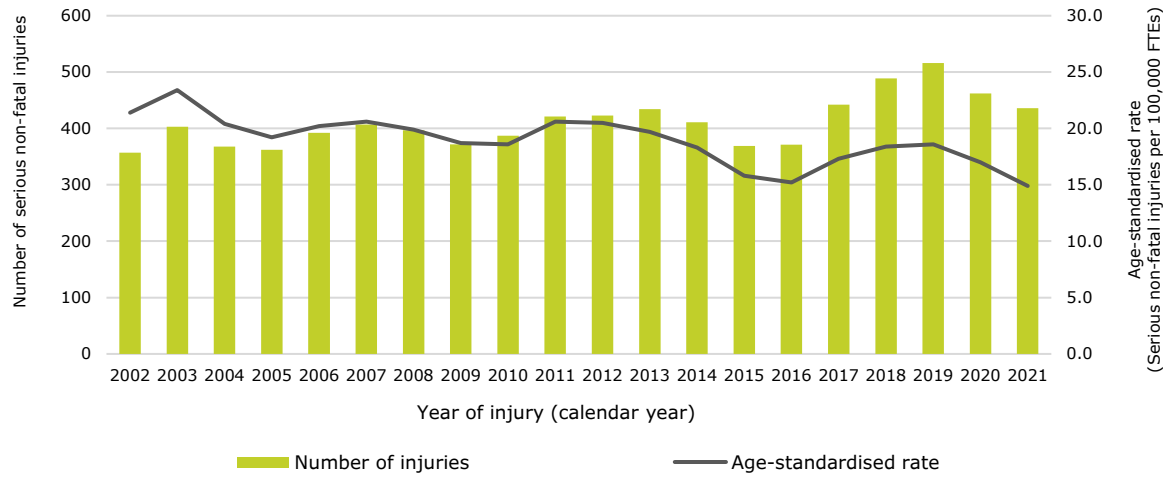
years 2017/18 to 2021/22, the overall fatality rate in the UK was 0.4 per 100,000 workers. Industry-specific rates were 0.7 per 100,000 workers in manufacturing, 1.6 per 100,000 in construction and 8.7 per 100,000 in agriculture, forestry & fishing. All rates were lower than in either New Zealand or Australia. Most notably, fatality rates in construction and manufacturing were less than half those in New Zealand, while the UK fatality rate in manufacturing was not significantly different from the 'all other industries' rate in in New Zealand.[9]

Serious non-fatal injuries

Serious non-fatal injuries are injury events in which a patient admitted to hospital is determined to have a probability of death of at least 6.9%, based on the diagnostic codes recorded in hospital records. Stats NZ identifies work-related serious non-fatal injuries by matching ACC work-related claims with publicly funded hospital discharge data from the Ministry of Health.

Figure 8 shows the number and age-standardised rate of work-related serious non-fatal injuries from 2002 to 2021.The total number of work-related serious non-fatal injuries reported by Stats NZ was 357 in 2002 and 436 in 2021. After adjusting for changes in workforce size and age structure, the rate of serious non-fatal injuries per 100,000 FTEs reduced from 21.4 in 2002 to 14.9 in 2021, a reduction of 30%.

Figure 8: Work-related serious non-fatal injuries, number and age-standardised rate, 2002-21



Source: Stats NZ injury data.

SERIOUS NON-FATAL INJURY RATES BY INDUSTRY

WorkSafe does not have its own access to serious non-fatal injury data and so it is not possible to provide the same level of analysis as for fatalities. Analysis by injury mechanism is not currently possible but work is ongoing to obtain a more detailed view of data on serious non-fatal injuries.

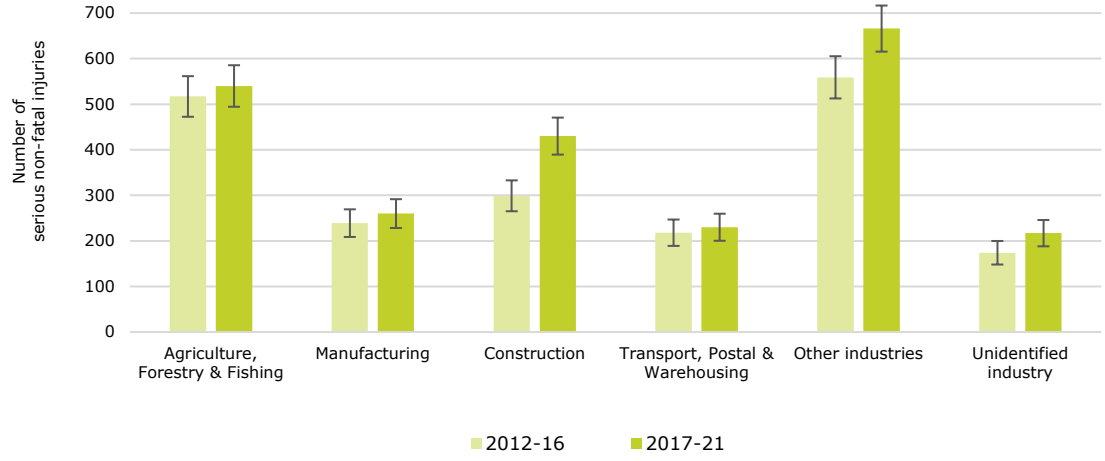
Figure 9 shows the number of serious non-fatal injuries by industry for two five-year periods, 2012-16 and 2017-21. Across both periods, four high-risk industries (agriculture, forestry & fishing, manufacturing, construction, and transport, postal & warehousing) accounted for approximately 69% of serious non-fatal injuries, compared to 80% of fatalities.

Of the serious non-fatal injuries where industry was identified, agriculture, forestry & fishing accounted for 27%, followed by construction (18%), manufacturing (13%) and transport, postal &

[9] See Statistics - Work-related fatal injuries in Great Britain (hse.gov.uk).

warehousing (11%).[10] Between 2012-16 and 2017-21 there were significant increases in the number of serious non-fatal injuries in the construction industry and in other industries.

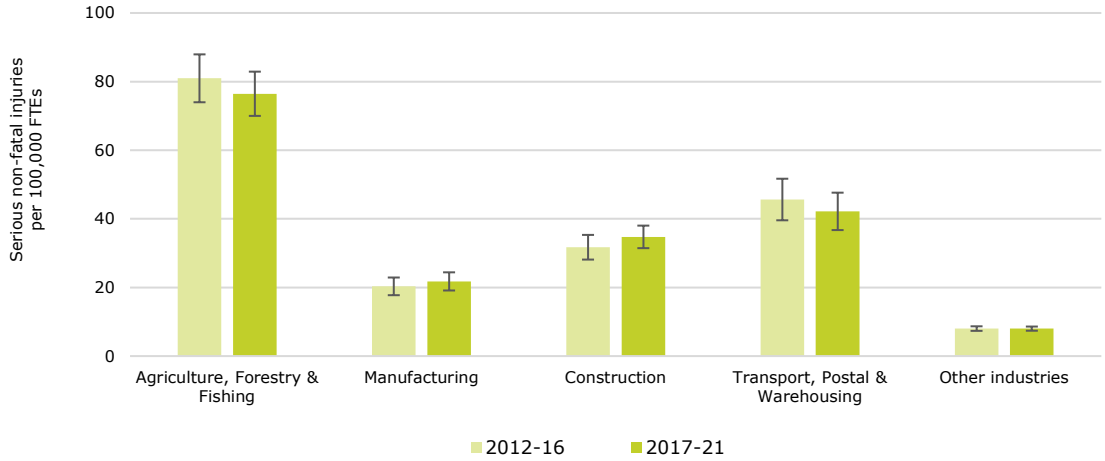
Figure 9: Number of serious non-fatal injuries by industry, 2012-16 and 2017-21



Source: Stats NZ injury data.
Error bars represent 95% confidence intervals.

Figure 10 shows that during 2012-21 the rate of serious non-fatal injuries was highest in agriculture, forestry & fishing (78.6), followed by transport, postal & warehousing (43.8), construction (33.4), and manufacturing (21.1). The combined rate in all other industries was 8.0 per 100,000 FTEs.[11] There was no significant change in the rate of serious non-fatal injuries by industry between 2012-16 and 2017-21.

Figure 10: Serious non-fatal injury rates by industry, 2012-16 and 2017-21



Sources: Stats NZ injury data; Stats NZ HLFS data; WorkSafe calculations.
Error bars represent 95% confidence intervals.

SERIOUS NON-FATAL INJURY RATE BY GENDER, AGE, AND ETHNICITY

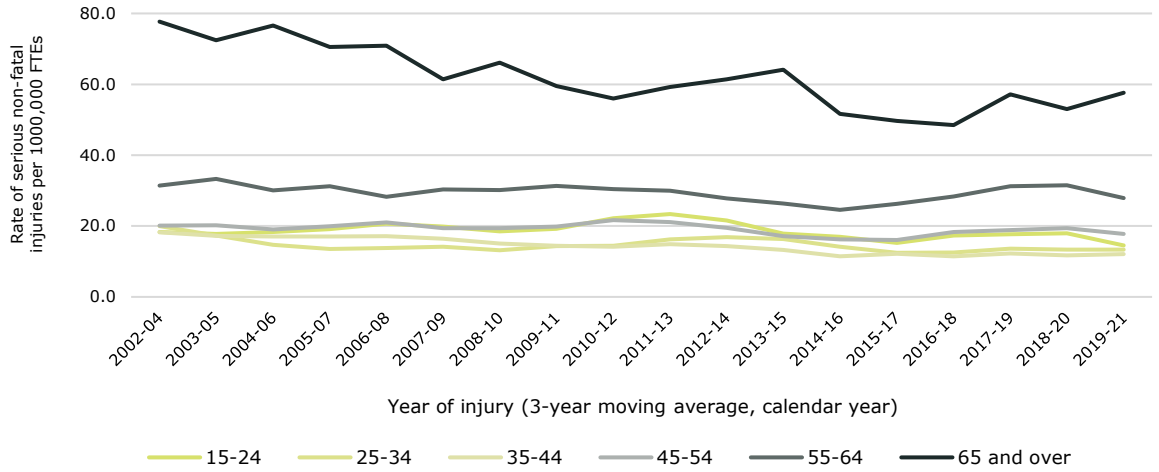
From 2002 to 2021, male workers accounted for 86% of serious non-fatal injuries, a proportion only slightly lower than for fatalities. This proportion remained largely stable over time.

[10] During 2012-21, Stats NZ did not identify the industry for 9% of serious non-fatal injuries.

[11] These rates will all be slightly underestimated, as they do not include the 9% of serious non-fatal injuries without an identified industry.

Figure 11 shows the rate of serious non-fatal injuries by age group from 2002-04 to 2019-21, using data available at Stats NZ. This shows that there was a long-term downward trend in the injury rate for all age groups, but the rate for those aged 65 and over remained three times higher than the average. During this period the injury rate reduced less for those aged 45 to 64 than for other age groups.

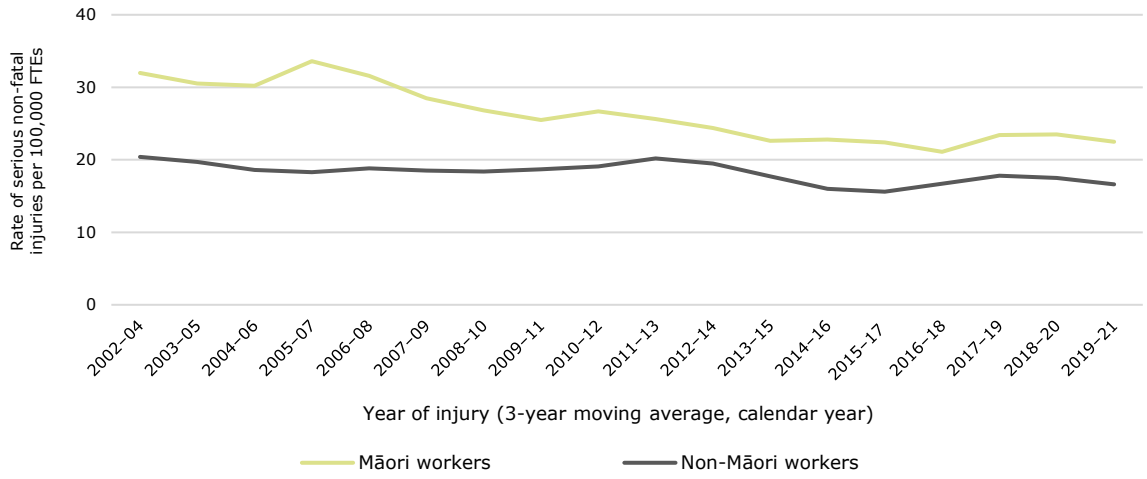
Figure 11: Work-related serious non-fatal injury rate by age group, 2002-04 to 2019-21



Sources: Stats NZ injury data; Stats NZ HLFS data; WorkSafe calculations.

Serious non-fatal injuries are currently the only type of work-related injury with a reliable ethnicity breakdown because they are identified through hospital records, which use robust processes for identifying patient ethnicity. **Figure 12** shows the number and age-standardised rate of serious non-fatal injuries for Māori workers from 2002-04 to 2019-21. The age-standardised rate for non-Māori workers is included for comparison.[12]

Figure 12: Work-related serious non-fatal injuries, age-standardised rate for Māori and non-Māori, 2002-04 to 2019-21*



Source: Stats NZ injury data.
*Injury rates are age-standardised to the respective Māori and non-Māori working populations in 2003.

The number of serious non-fatal injuries experienced by Māori workers was 192 in 2002-04 and 234 in 2019-21, which is not a statistically significant change. After adjusting for changes in workforce size and age structure, the rate of serious non-fatal injuries for Māori workers reduced from 32 per 100,000 FTEs in 2002-04 to 22.5 per 100,000 FTEs in 2019-21, a reduction of 30%.

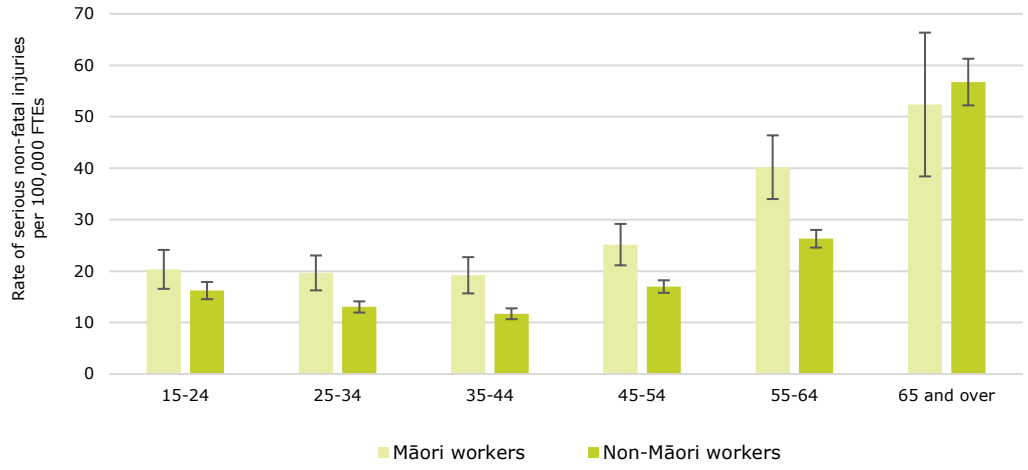
[12] Because Stats NZ does not age-standardise these data series in the same way, injury rates for Māori and non-Māori cannot be compared precisely.

This compares to a 19% reduction in the serious non-fatal injury rate for non-Māori over the same period.

Over the 2012-21 decade, the rate of serious non-fatal injuries for Māori workers remained approximately 30 to 40% higher than for non-Māori workers, while following the same overall trend.

Figure 13 shows serious non-fatal injury rates by age group for Māori and non-Māori workers during 2012-21, based on age-specific data available from Stats NZ. Injury rates were significantly higher for Māori in age groups from 25 to 64, while differences for the 15-24 and 65 and over age groups were not significant. Initial analysis suggests that a higher rate of employment for Māori in higher-risk industries may account for some of the difference in serious non-fatal injury rates. More detailed analysis is needed to assess the impact that different rates of employment by age, sub-industry, and occupation have on injury rates for Māori workers.

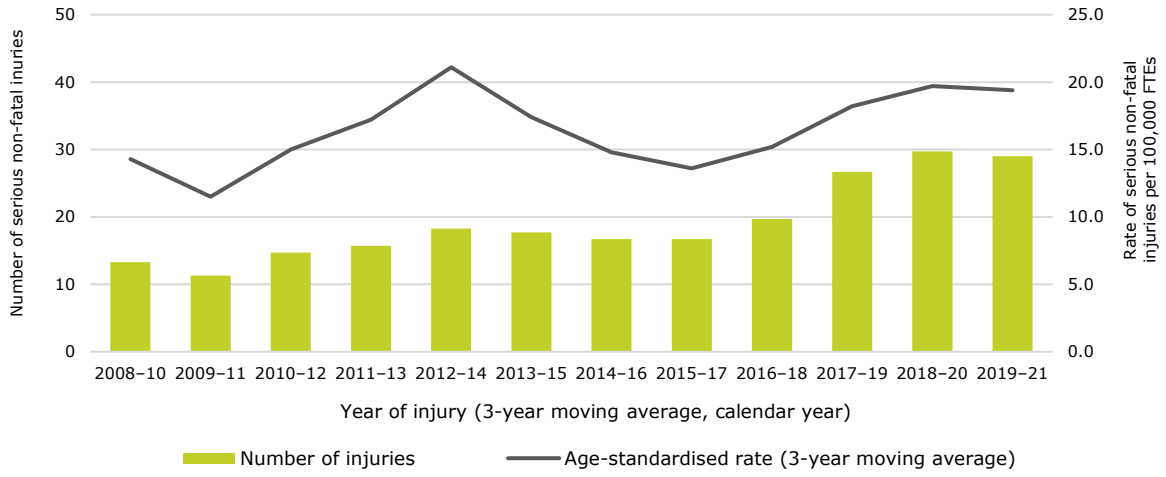
Figure 13: Work-related serious non-fatal injury rate by age group for Māori and non-Māori, 2012-21



Sources: Stats NZ injury data; Stats NZ HLFS data; WorkSafe calculations.
Error bars represent 95% confidence intervals.

Figure 14 shows the number and rate of serious non-fatal injuries for Pacific workers from 2008-10 to 2019-21. Pacific workers had 40 serious non-fatal injuries in 2008-10 and 86 in 2019-21, which is a significant increase. After adjusting for changes in workforce size and age structure, the rate of serious non-fatal injuries for Pacific workers increased from 14.3 per 100,000 FTEs in 2008-10 to 19.4 per 100,000 in 2019-21. This increase of 35% is not statistically significant because of small numbers, but there appears to be an increasing trend in the number and rate of injuries for Pacific workers.

Figure 14: Pacific worker serious non-fatal injuries, number and age-standardised rate, 2008-10 to 2019-21*



Source: Stats NZ injury data.
* Injury rate is age-standardised to the Pacific working population in 2008.

Initial analysis suggests that Pacific workers have a higher rate of employment in higher-risk industries than non-Māori, non-Pacific workers. More detailed analysis is needed to assess the impact that different rates of employment by age, sub-industry, and occupation have on injury rates for Pacific workers.

EXPOSURE TO SAFETY RISK FACTORS

Most fatal and serious non-fatal injuries result from a small group of risk factors that can potentially expose workers to traumatic impacts from gravitational, mechanical, or electrical energy. WorkSafe's 2021 workers survey asked workers about whether they were exposed to four key safety risk factors: electricity, working at height, working where objects can fall from height, and operating a vehicle or mobile plant.

Table 1 and **Table 2** show the proportion of workers that reported exposure to these key risk factors. Unsurprisingly, **Table 1** shows elevated exposure to safety risks for workers in the high-risk industries of agriculture, manufacturing, construction, transport, postal and warehousing, and in the sub-industry of forestry. Construction workers were two to three times more likely to report being exposed to all four of the identified safety risks than the survey average. Around 60% of workers in construction and forestry worked where objects could fall from a height, while around 60% of construction workers worked at height. Around half of all workers in agriculture, forestry, and transport, postal and warehousing drove a vehicle or operated mobile plant as part of their job.

Table 1: Exposure to safety risk factors by industry

	Electricity	Objects can fall from height	Working at height	Driving vehicle or operating mobile plant
All industries	**12%**	**32%**	**18%**	**24%**
Agriculture	14%	35%	25%↑	53%↑
Forestry	9%	63%↑	28%↑	53%↑
Manufacturing	18%↑	44%↑	19%	37%↑
Construction	23%↑	63%↑	58%↑	45%↑
Transport, Postal & Warehousing	9%↓	38%↑	20%	52%↑
Other	11%	26%↓	13%↓	17%↓

Source: WSIP worker survey 2021.
Note: ↑Significantly above average for all industries ↓Significantly below average for all industries (at 95% confidence level).

Male workers were more likely to report exposure to all four safety risks than female workers. The survey shows an overall association of older age with lower association to safety risks. Workers over 60 were significantly less likely to report exposure to electricity and falling objects. However, there was no clear difference by age in the likelihood of operating a vehicle or mobile plant.

Table 2: Exposure to safety risk factors by gender and age

	Electricity	Objects can fall from height	Working at height	Driving vehicle or operating mobile plant
All workers	**12%**	**32%**	**18%**	**24%**
Male	18%↑	41%↑	26%↑	35%↑
Female	6%↓	22%↓	9%↓	13%↓
18 - 29	15%	36%	22%	24%
30 - 39	16%	36%	20%	27%
40 - 49	11%	32%	16%	24%
50 - 59	9%	29%	17%	26%
60 and over	8%↓	24%â	14%	21%

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Table 3 suggests that Pacific workers were more likely to report exposure to working at heights and driving, though the observed difference is not statistically significant given survey sample size. There is a clear association between lower socioeconomic status and reported exposure to all the identified safety risks except electricity.

These results only give a broad indication of exposure to safety risks. Factors not accounted for include the amount of time that workers are exposed to risks and the detailed context of these exposures, such as the height worked at, type of vehicle operated, or the terrain and environment where these activities occurred.

Table 3: Exposure to safety risks by ethnicity and socioeconomic status (SES)

	Electricity	Objects can fall from height	Working at height	Driving vehicle or operating mobile plant
All workers	**12%**	**32%**	**18%**	**24%**
Māori	12%	31%	17%	21%
Pacific	16%	36%	26%	32%
NZ European	12%	34%↑	18%	26%
Asian	15%	28%	16%	15%
Other	12%	30%	22%	23%
Level 1 (High SES)	9%	22%↓	4%↓	7%↓
Level 2	9%	19%↓	11%↓	11%↓
Level 3	13%	32%	18%	26%
Level 4	14%	32%	21%	28%
Level 5	11%	45%↑	24%↑	32%↑
Level 6 (Low SES)	14%	39%	26%	36%↑

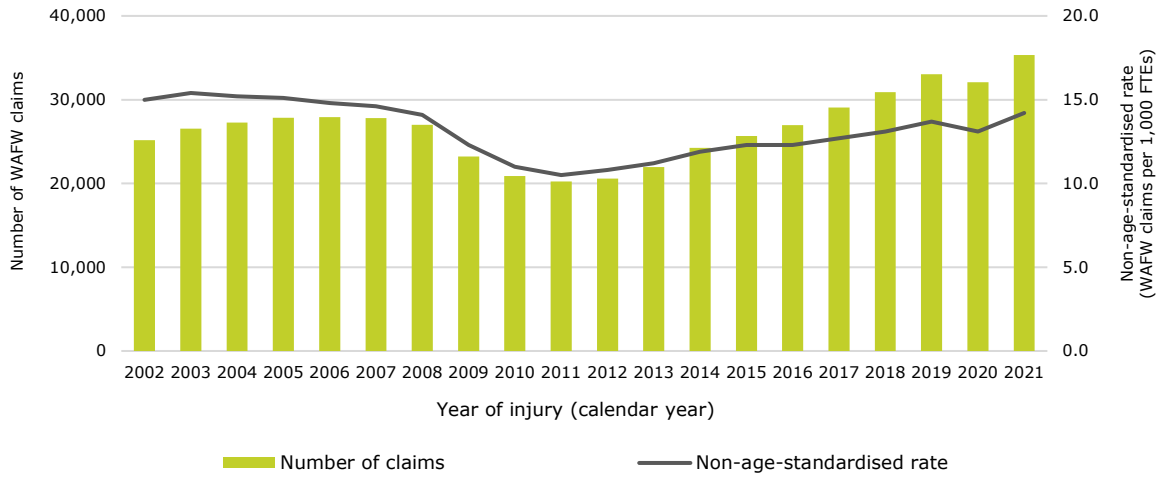
Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Injuries resulting in more than a week away from work

Injuries resulting in more than a week away from work (often referred to as 'WAFW' injuries) are identified through accepted ACC claims where the injured worker has received weekly compensation payments from ACC.[13] There are around 35,000 WAFW injury claims per year, around 70 times more than serious non-fatal injuries and 500 times more than acute fatalities.

The trend in WAFW injury claims can be segmented into two contrasting decades of change: 2002-2011 and 2012-2021. As shown in **Figure 15**, claim rates were stable from 2002 to 2007, averaging 15 claims per 1,000 FTEs. In the subsequent years from 2008 to 2011 there was a rapid decline in claim number and rate, reaching a low of 10.5 claims per 1,000 FTEs in 2011. The second decade saw a reversing trend, with injury rates rising steadily from 10.8 in 2012 to 13.7 per 1,000 FTEs in 2019, before falling temporarily to 13.1 in 2020 with the onset of the COVID-19 pandemic.

Figure 15: Work-related injury claims with more than a week away from work, number and non-age-standardised rate, 2002-21



Source: Stats NZ injury data.

While the number of WAFW claims increased by 40% from 2002 to 2021, there was strong employment growth of 48% over this period, thus resulting in a slight reduction of 5% in the rate of WAFW injuries from 2002 to 2021. Note that the claims rates shown have not been adjusted for changes in age structure over this period.

ECONOMIC AND EMPLOYMENT FACTORS

Trends in the number and rate of WAFW claims need to be considered against a backdrop of economic and employment activities. Overseas experience shows that, relative to the long-term trend towards lower claim rates, the rate of workers' compensation claims tends to decline in recessions and increase during times of economic recovery.[14] This pattern is also evident in New Zealand.

The Global Financial Crisis (GFC) set off a period of economic turmoil worldwide and led to a recession in the New Zealand economy from 2008 to 2009. The GFC was followed by the Canterbury earthquakes in 2010 and early 2011. During the prolonged period of uncertainties, unemployment rates exceeded 6% from late 2009 and peaked at 6.7% in September 2012, the

[13] Weekly compensation are earnings-related payments from ACC to a worker who is unable to work because of an injury, based on 80% of weekly income (capped) before the injury occurred. Under the legislation, there is a one-week stand down period before weekly compensation payments commence. Weekly compensation claims are also known as *workers' compensation claims* in overseas jurisdictions.

[14] See The Canadian recession and the compensation of work-related injury and illness (iwh.on.ca).

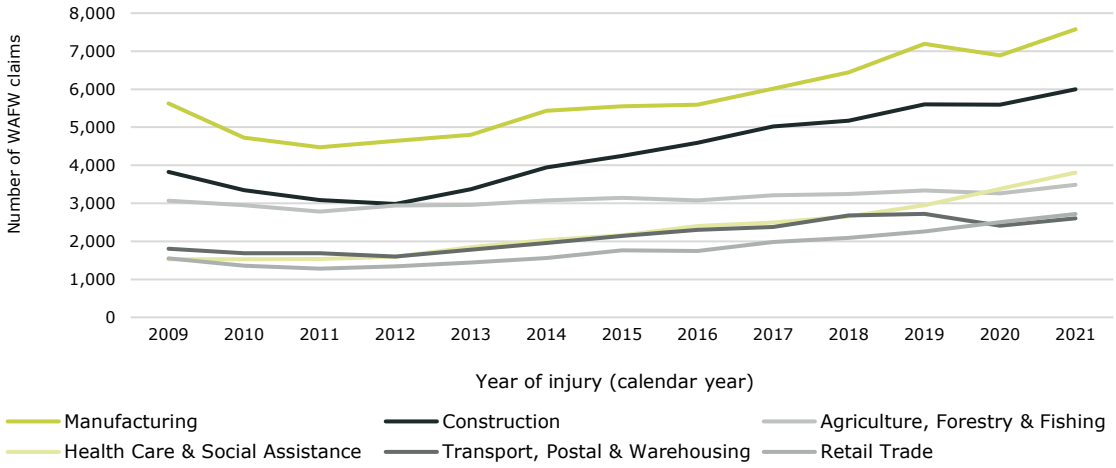
highest recorded since 1999. From 2013 the economy began to recover, led by the Canterbury rebuild activities and high levels of net migration gains, and New Zealand experienced an extended period of economic growth that lasted until 2020.

WAFW INJURIES BY INDUSTRY

Most industries saw a sharp decline in WAFW claims in the period following the economic shocks from the GFC in 2008-09 and the Canterbury earthquakes in 2010-11. These trends then reversed in subsequent years, particularly from 2014 to 2019 when the economy grew at an average rate of 3.5% per year.

The health care & social assistance industry has been less affected by the business cycles and has experienced a steadily increasing trend in injury rates since 2013. These trends are illustrated in **Figure 16**.

Figure 16: Trend in WAFW claims by selected industry, 2009-21

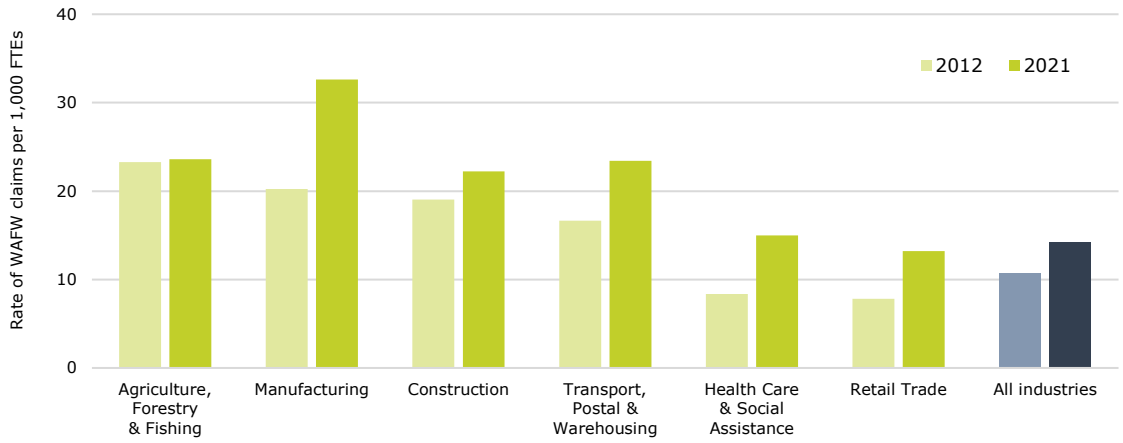


Source: Stats NZ injury data.

The six industries highlighted in **Figure 16** make up a disproportionate share of WAFW injury claims. Over the period 2017 to 2021, these industries accounted for nearly 73% of all WAFW claims, compared with just 49% of the employed workforce and 37% of GDP.

Figure 17 shows that over the 2012-21 decade, the rate of WAFW injury claims in agriculture, forestry & fishing remained unchanged, while the rate in construction increased slightly. In comparison, WAFW claim rates in manufacturing and health care & social assistance increased by 60% and 80% respectively. In 2021 the injury claim rate in manufacturing was more than double the average rate for all industries.

Figure 17: WAFW claims rate (non-standardised) by selected industry, 2012 and 2021



Sources: Stats NZ injury data; Stats NZ HLFS data; WorkSafe calculations.

Notable industry-specific trends for four selected industries are summarised below.

Manufacturing

Manufacturing has seen a notable increase in WAFW claims, particularly in the meat processing sub-industry, which accounts for 30% of all manufacturing claims.

From 2012 to 2021, the number of WAFW injuries from meat processing rose by more than 60%. In 2021, at least 1,700 workers were injured and there were 1,900 claims with more than a week off work.

Health care and social assistance

During 2012-21, health care & social assistance overtook agriculture, forestry & fishing and transport, postal & warehousing as the industry with the third-highest number of accepted WAFW claims.

The growth of nearly 80% in the rate of WAFW injuries was the highest among major industries. Injuries to workers in residential care services and hospitals more than doubled during 2012-21, partially driven by an increasing workforce in these sub-industries.

Construction

The number of WAFW injury claims in construction saw a twofold increase over 10 years, from 3,000 in 2012 to 6,000 in 2021.

The increase in claims was largely driven by the rapid growth in estimated construction employment of 72% over the same period. The overall increase in injury claim rate after accounting for the increase in the workforce was 17%.

Retail Trade

In 2021, the retail industry represented 8% of the workforce and a similar proportion of WAFW injury claims. While the rate of 13.2 injury claims per 1,000 FTEs was below the average rate for all industries of 14.2, the industry saw a 68% increase in injury rate over the 2012-21 decade.

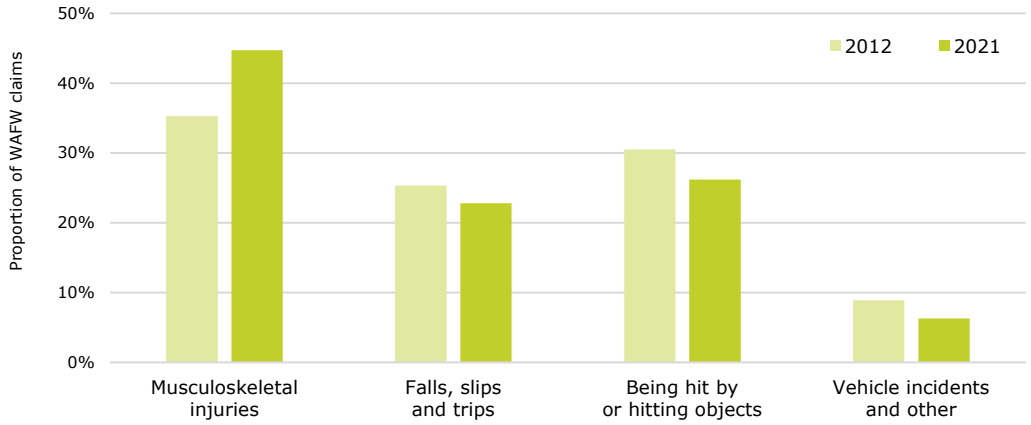
Food retailing in supermarkets and grocery stores was the main contributor to injuries, making up 47% of claims in the retail industry, and recording a 120% increase in WAFW claims over the 2012-21 decade.

WAFW INJURIES BY INJURY MECHANISM

Figure 18 shows that musculoskeletal injuries account for an increasing proportion of injuries resulting in more than a week off work. Musculoskeletal injuries are most common in occupations that involve a significant amount of muscular stress in job tasks such as repetitive movement, lifting, carrying, and putting down objects, people, or animals. Excluding claims with an unspecified mechanism of injury, these injuries accounted for 45% of WAFW claims in 2021, up from 35% in 2012.

Across the 2012-21 period, mechanisms involving being hit by or hitting objects accounted for approximately 27% of WAFW injuries where the injury mechanism was identified, while falls, slips and trips accounted for approximately 24%. As discussed in the section on **acute fatalities**, vehicles account for at least 50% of fatalities, but they are responsible for only around 5% of WAFW injuries.

Figure 18: Proportion of WAFW claims by injury mechanism in selected key industries, 2012-16 and 2017-21

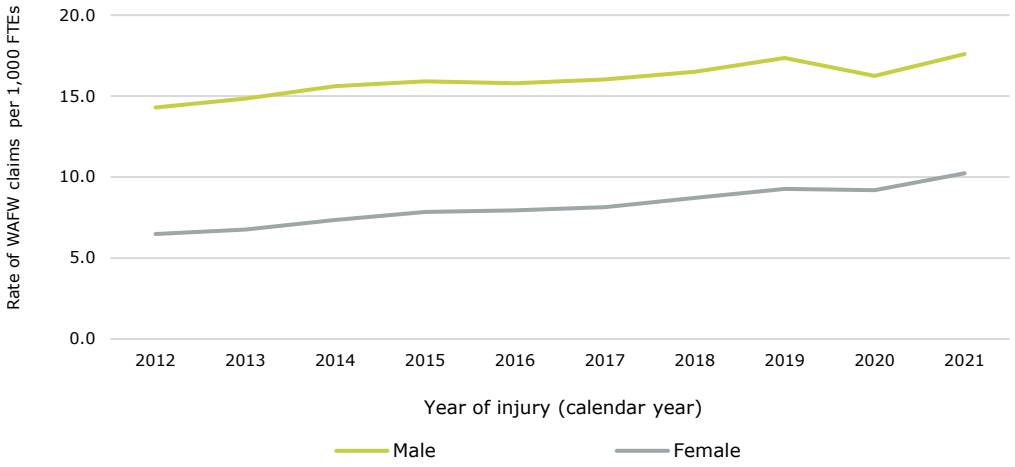


Source: WorkSafe (data accessed September 2023).

WAFW INJURIES BY GENDER AND AGE

Figure 19 shows the rate of WAFW injuries by gender from 2012 to 2021. Over this period, the rate of claims increased by 58% for female workers and 23% for male workers. In 2021, male workers accounted for 68% of WAFW claims, down from 74% in 2012.

Figure 19: WAFW claims rate (non-standardised) by gender, 2012-21

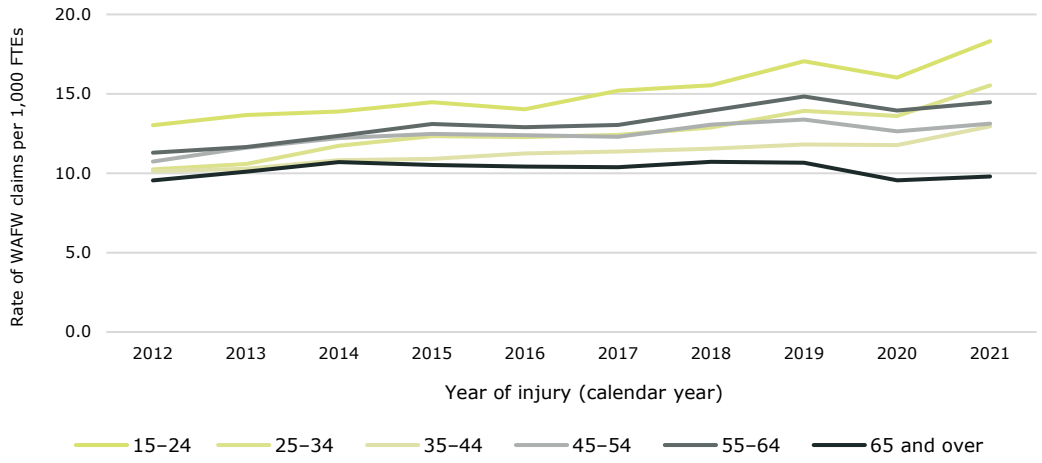


Sources: WorkSafe (data accessed September 2023); Stats NZ HLFS data; WorkSafe calculations.

Figure 20 shows the rate of WAFW injuries by age, from 2012 to 2021. This shows that the rate of WAFW claims increased throughout the period for the 15-24 and 25-34 age groups while flattening out for other age groups. The overall increase was 41% and 52% for the 15-24 and 25-34 age groups compared to a 22% to 28% increase for those from ages 35 to 64 and a 3% increase for the over 65 age group. By 2021, the WAFW claim rate for the 15-24 age group was 40% higher than for the 35-44 age group and nearly double the 65 and over age group.

Changes in WAWF injury rate by age group are different from those seen for fatal and serious non-fatal injuries. More analysis of employment patterns by age group would be needed to better understand these trends.

Figure 20: WAFW claims rate (non-standardised) by age group, 2012-21



Sources: WorkSafe data (data accessed September 2023); Stats NZ HLFS data; WorkSafe calculations.

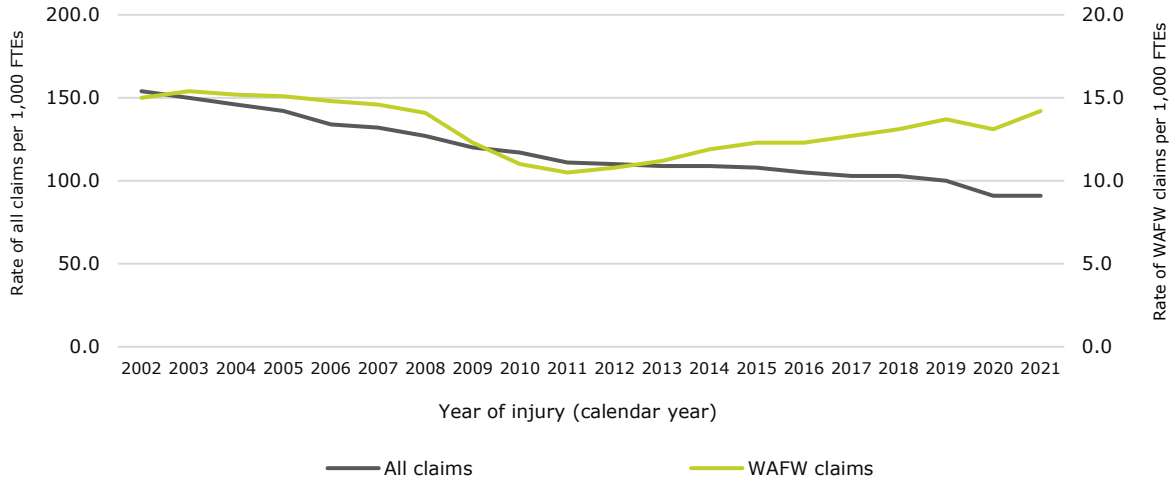
All work-related injuries

Injuries resulting in more than a week away from work are a subset of all work-related injuries. Whether an injury becomes a 'WAFW' injury depends on factors including not only severity of injury but also worker awareness of the accident compensation system and decisions by workers, employers, and medical professionals about when to return to work. Looking at the number and rate of all work-related injuries, including minor injuries, gives another indicator of how well the work health and safety system is performing.

Under New Zealand's universal and no-fault accident compensation system, seeking medical attention following an injury usually leads to the lodgement of an ACC claim. The total number of work-related ACC claims therefore gives a reasonable indication of the total number of workers experiencing injuries. There are over 200,000 work-related ACC claims per annum, around six to seven times the number of WAFW claims.

In contrast to the increasing trend in the number and rate of WAFW injuries, the overall rate of work-related claims for all injury severities has been trending steadily downwards for the past two decades. This is highlighted in **Figure 21**.

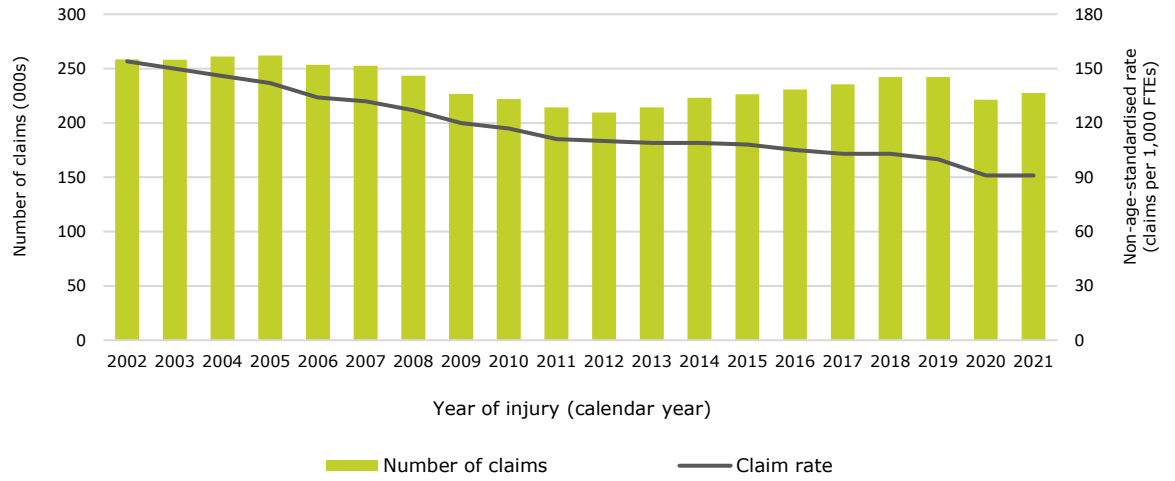
Figure 21: Work-related ACC claims, all claims and WAFW claims, non-age-standardised rate, 2002-21



Source: Stats NZ injury data.

Figure 22 shows that the total number of ACC work-related claims was affected by economic cycles. There was a sharp decrease in claims following the Global Financial Crisis and Canterbury earthquakes from 2008 to 2012 and again during the COVID-affected years of 2020 to 2021, while claim numbers increased during 2013-19. However, the reduction in the rate of claims per 1,000 workers remained steady over these periods. The total number of claims reduced from 258,000 in 2002 to 223,000 in 2021, a decline of 14%. The claim rate of 90 per 1,000 FTEs in 2021 was 42% lower than in 2002 and 17% lower than in 2012.

Figure 22: All work-related injury claims, number and non-age-standardised rate, 2002-21

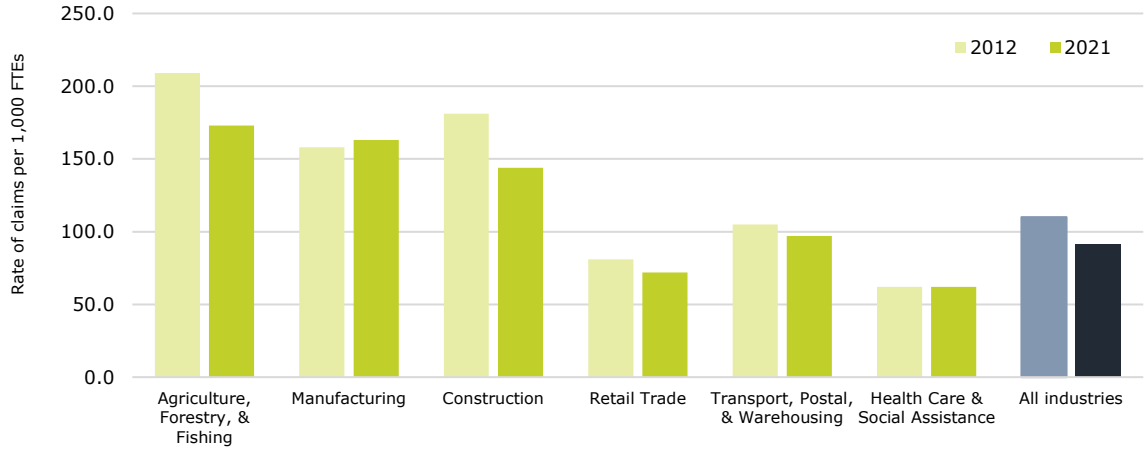


Source: Stats NZ injury data.

ACC WORK-RELATED CLAIMS BY INDUSTRY

Figure 23 shows the claim rate in 2012 and 2021 for six industries: agriculture, forestry & fishing, manufacturing, construction, retail trade, health care and social assistance, and transport, postal and warehousing. These industries together account for approximately 60% of all claims. During 2012-21, the claim rate reduced by around 20% in agriculture, forestry & fishing and construction but reduced by just 2% in health care & social assistance and increased by 3% in manufacturing. This is consistent with the higher growth in WAFW claims in the manufacturing and health care & social assistance industries, discussed in the preceding section.

Figure 23: All ACC work-related injury claims by selected industry, non-age-standardised rate, 2012 and 2021

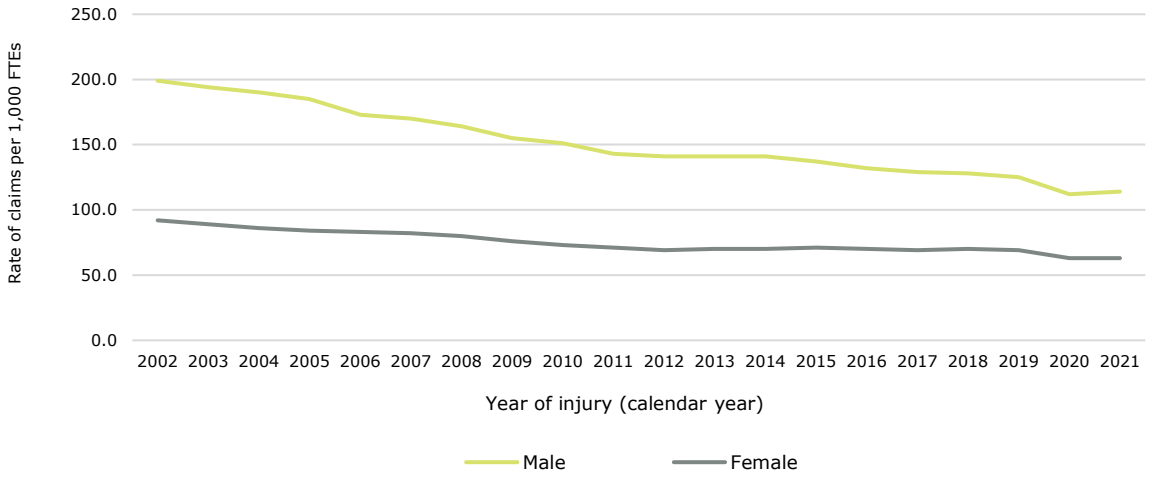


Source: Stats NZ injury data.

ACC WORK-RELATED CLAIMS BY GENDER AND AGE

Figure 24 shows that the rate of claims per 1,000 FTE male workers reduced by 44% between 2002 to 2021, while the rate of claims per 1,000 FTE female workers reduced by 33% over the same period. Male workers accounted for 69% of ACC claims in 2021, down from 75% in 2002. Higher rates of employment for males in higher-risk industries and occupations is likely to explain much of this gap.

Figure 24: All ACC work-related injury claims by gender, 2002-21

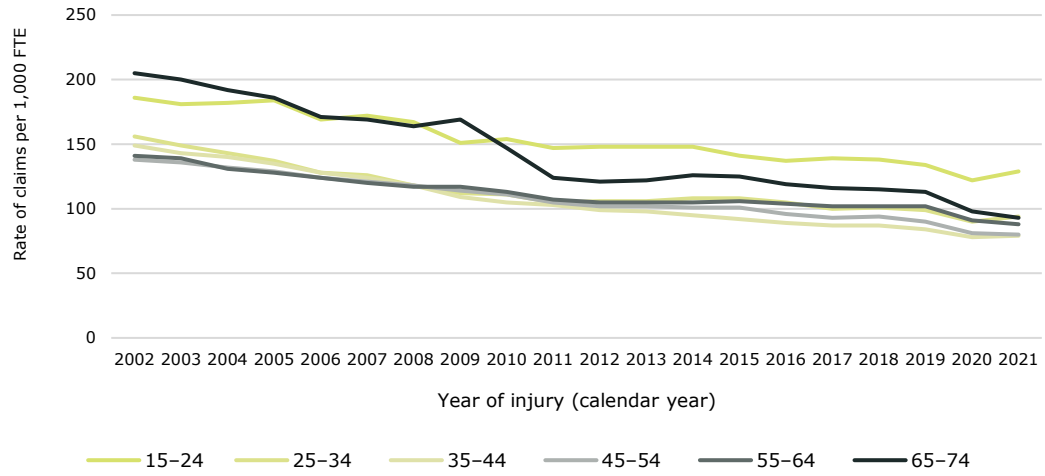


Source: Stats NZ injury data.

Figure 25 shows that the ACC claims rate trended down for all age groups over the 2002-21 period. At the start of the period both the youngest and oldest age groups (15-24 and 65-74 respectively) had a higher claims rate than other age groups. However, during 2002-21 the rate for the 65-74 age group declined rapidly to converge with other age groups, while the rate for the 15-24 age group declined more slowly and remained around 40% higher than the average across all age groups.

This is consistent with changes seen in rates of WAFW claims but different from those seen for fatal and serious non-fatal injuries. More detailed analysis would be needed to understand how changes in employment patterns influenced changes in age-specific claims rates.

Figure 25: All ACC work-related claims, rate by age group, 2002-21



Source: Stats NZ injury data.

SELF-REPORTED INJURIES

Another source of information on worker injury is WorkSafe's Workforce Segmentation and Insights Programme (WSIP) survey. The WSIP worker survey asks workers whether they experienced an injury at work that required medical attention in the previous twelve months. Follow-up questions ask about the kind of injury that they experienced.

Table 4 shows that agriculture, construction, and forestry workers were significantly more likely than the survey average to report a work-related injury, with forestry workers also more likely to report experiencing a sprain or strain, the most common type of work-related injury.

Table 4: Proportion of workers reporting an injury requiring medical attention in the past 12 months, by industry (2021)

	Any injury requiring medical attention	Sprain or strain
All industries	**11%**	**5%**
Agriculture	19%↑	8%
Forestry	17%↑	11%↑
Manufacturing	8%	3%
Construction	17%↑	7%
Transport, Postal & Warehousing	13%	7%
Health Care & Social Assistance	12%	6%
Other industries	10%	5%

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all industries ↓Significantly below average for all industries (at 95% confidence level).

Notably, the proportion of manufacturing workers reporting an injury was not significantly different from the whole workforce. In contrast, previous sections show that over the 2012-21 decade the manufacturing industry had the highest number and rate of WAFW claims and the highest number

and second-highest rate of all ACC claims. This difference between self-reported injury and claims data may reflect the composition of the survey sample for the manufacturing industry.[15]

Table 5 shows that there were no significant differences by gender and age group in the likelihood of experiencing a work-related injury in this previous 12 months. This is notable given the significantly higher rate of injury claims for male workers seen in the ACC data.

Table 5: Proportion of workers reporting an injury requiring medical attention in the past 12 months, by gender and age

	Any injury requiring medical attention	Sprain or strain
All workers	**11%**	**5%**
Male	12%	6%
Female	10%	5%
18 - 29	10%	4%
30 - 39	13%	6%
40 - 49	10%	5%
50 - 59	12%	7%

Source: WSIP workers survey 2021.

Table 6: Proportion of workers reporting an injury requiring medical attention in the past 12 months, by ethnicity, and socioeconomic status (SES)

	Any injury requiring medical attention	Sprain or strain
All workers	**11%**	**5%**
Māori	14%↑	8%↑
Pacific	16%	7%
NZ European	10%	5%
Asian	11%	6%
Other	18%	10%
Level 1 (High SES)	11%	5%
Level 2	2%↓	1%↓
Level 3	9%	4%
Level 4	13%	6%
Level 5	14%	8%
Level 6 (Low SES)	20%↑	14%↑

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Table 6 shows that Māori workers were significantly more likely than all workers to report any work-related injury in the previous twelve months and were also more likely to report a sprain or strain. The proportions of Pacific and Other Ethnicity workers reporting an injury appear high compared to the survey average, but these differences are not significant given the relatively small sample sizes for each group in the survey. There appears to be an association between lower socio-economic status and likelihood of reporting a work-related injury. Workers in the three

[15] Of the 357 manufacturing industry workers included in the 2021 WSIP workers survey, just 37% had higher-risk occupations (technician and trades workers, drivers and machinery operators, and labourers) whereas these occupations accounted for 66% of manufacturing industry workers in the 2018 Census.

lowest socioeconomic groups were about twice as likely to report a work-related injury as workers in the three highest groups.[16]

Discussion of work-related acute injuries

FATAL AND SERIOUS NON-FATAL INJURIES

Over the past two decades there has been a significant decline in the rate of work-related acute fatalities and serious non-fatal injuries in New Zealand. The acute fatality rate is now less than half what it was at the beginning of the 2000s. However, fatality rates remain higher than in Australia, after accounting for differences in economic activity.

Work-related acute fatalities in New Zealand are dominated by a few well-known causes in a handful of high-risk industries. Moving vehicles are the primary injury mechanism for at least half of all fatalities. Most fatal vehicle-related accidents occur on farms and on public roads. Older workers have a higher fatality rate than other workers. Those aged over 65 are three to four times more likely to be killed in a work-related accident.

There is some sign that over the past decade acute fatalities involving farm vehicles and older workers have reduced, while still accounting for a disproportionate share of the total. At the same time, the number of transport-related fatalities has increased. This reflects wider trends in road safety but may also reflect improved identification of the work-relatedness of transport accidents.

A continuing concern for the health and safety system is the high fatality rate in the forestry and logging sub-industry, which during 2011-22 was around twenty times higher than the all-industry rate. Workers being hit by falling objects – primarily trees or logs – is the single most common cause of fatal accidents in forestry.

Another priority for the system is reducing acute fatalities in the construction and manufacturing industries, where rates have changed little over the past decade. Most fatalities in these industries are from preventable causes including on-site vehicle incidents, falls from height, workers being hit by falling objects or being trapped in machinery.

Recent Australian research concluded that a considerable number of work-related fatalities on farms might be prevented by evidence-based harm reduction measures such as crush protection devices, seatbelts, and helmets.[17] Internal WorkSafe analyses of work-related fatalities in New Zealand have also highlighted the absence of these measures in both farm and non-farm settings. Because work-related acute fatalities are few, and many are investigated, there are opportunities for further detailed analyses that explore risk factors and possible preventive measures.

Data on acute fatalities is more detailed than in many other areas of work health and safety. However, ethnicity data is incomplete in available data sets. A study of the 2005-14 period by Otago University using coronial files and Ministry of Health records found that the acute fatality rate for Māori workers was higher than for New Zealand European workers.[18] No significant differences were identified for other ethnic groups. Routine reporting of work-related fatalities by ethnicity is a potentially achievable objective for future overviews of work health and safety.

Another information gap relates to serious non-fatal injuries. At present this data can only be reported at a summary level, limiting analysis of trends and patterns. It is hoped that more detail can be included in future overviews.

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[16] The exception to this pattern is the apparently higher injury rate in socioeconomic index (SEI) group 1 compared to group 2. A similar pattern is seen in other areas of self-reported harm and exposure in the 2021 WSIP workers survey. This might be explained by the fact that 56% of SEI group 1 workers in the survey sample were drawn from the health care & social assistance industry, which has a relatively high rate of exposure to work-related risks.

[17] See Lower and Temperly, 2018.

[18] See Lilley et al., 2021.

ACC INJURY CLAIMS

Data on work-related injuries shows contrasting trends in the rate of all work-related ACC claims and claims with more than a week away from work (WAFW claims). The rate of all work-related injury claims has steadily decreased over the past two decades. The rate of WAFW claims has been more variable. In the decade to 2021, the number and rate of WAFW claims steadily increased, with particularly striking increases seen in manufacturing and health care & social assistance.

The reasons for an increasing proportion of claims with more than a week off work are not fully understood, but they likely include changes in industry and employment activities from economic growth and recession; improved access to the ACC scheme; and workers' claiming behaviour that might be influenced by perceptions of alternative employment opportunity in the labour market (i.e., job security).

The rising trend in WAFW claims is evident across the entire ACC scheme and not limited to workplace injuries. This supports the hypothesis that systemic factors are contributing to rising WAFW claim rates.

The downward trend in all ACC work-related claims has been seen across most groups and industries but there has been little or no decline in manufacturing and health care & social assistance. The health and safety performance of the manufacturing industry remains a concern, particularly the food processing industry, which is the single largest sub-industry in manufacturing.

High-volume injuries measured through ACC claims are much larger in number than fatal and serious non-fatal injuries, have different causes, and are distributed differently across industries. Injuries to the musculoskeletal system are the single most common injury type, and they account for a growing proportion of work-related injuries. The connection between these types of injury and long-term pain and disability is explored further in the section on **musculoskeletal risks.**

Available claims and survey data indicate that younger workers, workers of lower socioeconomic status, and workers of Māori, Pacific, or Other Ethnicity are more likely to be injured at work. At present, incomplete recording of ethnicity in claims data and limited survey sample sizes limit our ability to analyse these differences.

3.0
Carcinogens and airborne risks

CARCINOGENS AND AIRBORNE RISKS

This section gives an overview of worker exposure to carcinogens and airborne risks in New Zealand. A carcinogen is anything that can cause or promote the uncontrolled growth of cells. Examples include substances (e.g., asbestos, welding fumes or respirable crystalline silica), physical energy (e.g., ultraviolet light or ionising radiation), and activity patterns that affect bodily systems (e.g., night shift work).

An airborne risk is something in the air that might be inhaled or might interact with the skin. Airborne risks include vapours, gases, dusts, and fumes. When inhaled, they can affect the lungs or respiratory system, or they may pass into the blood stream and affect other parts of the body.

Carcinogens and airborne risks are grouped together because most workplace carcinogens enter the body by being inhaled. Workplace carcinogens can also cause non-cancer respiratory diseases and other diseases. Airborne risks that are not identified as carcinogens can cause respiratory diseases such as asthma and chronic obstructive pulmonary disease (COPD), and they may also affect other bodily systems.

Cases of work-related cancer and respiratory disease cannot be counted in the same way as injuries (see explanation in **box**). To understand health and safety system performance, it is critical to understand how many workers are exposed to these risks, and how well the exposures are controlled.

Classification of carcinogens

Work-related carcinogens are defined based on classifications made by the International Agency for Research on Cancer (IARC), which is an intergovernmental agency that forms part of the World Health Organization (WHO). IARC reviews evidence about the possible carcinogenicity of 'agents and exposure circumstances', which can include substances, processes, and activities. IARC classifies agents and exposure circumstances it has reviewed into the following categories:

Group 1	Carcinogenic to humans
Group 2A	Probably carcinogenic to humans
Group 2B	Possibly carcinogenic to humans
Group 3	Not classifiable as to its carcinogenicity to humans [19]

Most assessments of worker exposure to carcinogens focus on the agents and exposure circumstances in IARC groups 1 and 2A. Assessments of carcinogenicity can change over time as new evidence becomes available. The status of an agent at any one time depends on the body of evidence and how recently it has been reviewed.

Estimated harm from carcinogens and airborne risks in New Zealand

In 2019 WorkSafe published estimates of deaths and hospitalisations from work-related ill health, and separate estimates of the overall burden of work-related harm, expressed as disability-adjusted life years lost (DALYs). This work used international estimates of harm from work-related exposures and applied these to New Zealand health data. This resulted in the following estimates:

- Approximately 400 deaths from cancer in 2015 were attributed to work-related exposures, of which approximately 350 were estimated to be from cancers of the lungs and respiratory system.
- Approximately 250 deaths from non-cancer respiratory disease in 2015 were attributed to work-related exposures, most of which were estimated to be from chronic obstructive pulmonary disease (COPD).

[19] See IARC definitions of what these categories mean and when an agent or exposure circumstance maybe classified in a particular category.

- An estimated 8,200 DALYs from cancer in 2017 were attributed to work-related exposures.
- An estimated 6,900 DALYs from non-cancer respiratory disease in 2017 were attributed to work-related exposures.

> The number of work-related cancers and cases of work-related disease are estimated, rather than directly diagnosed.
>
> Some diseases such as mesothelioma and silicosis, when diagnosed, are almost always attributed to work exposures.
>
> However, for common diseases such as lung cancer or COPD it is usually not possible to determine clinically whether an individual case was caused by work exposures. Instead, estimates are based on research studies which show the risk of disease for those who have experienced the exposures, compared to those who have not been exposed.

Disease caused by carcinogens and airborne risks can take between 10 and 50 years to develop. Therefore, the level of current disease reflects exposures that happened in the past. Further work is needed to estimate the potential future disease that could result from exposures that are occurring now. Methodologies for doing this have been used in other countries and could be applied to New Zealand. The remainder of this section focuses on available information about the current exposures experienced by workers in New Zealand.

New Zealand Carcinogens Survey

The first New Zealand Carcinogens Survey (NZCS) was undertaken between June and September 2021. The NZCS used a methodology called the Occupational Integrated Database Exposure Assessment System (OccIDEAS), a web-based software application which was developed by a team of Australian experts. The survey was undertaken by WorkSafe in partnership with the OccIDEAS team and Rangahau Aotearoa (Research New Zealand).

OccIDEAS assesses the likelihood of exposure and the level of exposure to specific agents through a process that combines information provided by workers, with the expert knowledge of occupational hygienists, physicians, and epidemiologists. This process works as follows:

- A survey questionnaire asks workers detailed questions about their daily employment tasks.
- Answers given by each worker are used to assess their probable exposure to different agents.
- Preprogrammed algorithms based on job- and task-specific modules automatically translate the information given by workers about the tasks they do, into estimates of their exposure to specific agents.[20]
- Where needed, experts manually review answers to estimate probable exposure.

Where a worker is assessed as probably exposed to a specific carcinogen, their exposure is classified in the following ways:

High	Around or above the workplace exposure standard (WES) for the relevant substance, where this is defined.[21]
Medium	Between high and low, above 10% of the workplace exposure standard, where this is defined.

[20] See New Zealand Carcinogens Survey 2021, p.8-10 for more information on OccIDEAS and an example of job-specific questions. For further detailed information see also Fristchi, 2020 and the OccIDEAS website.

[21] See Workplace exposure standards and biological exposure indices | WorkSafe.

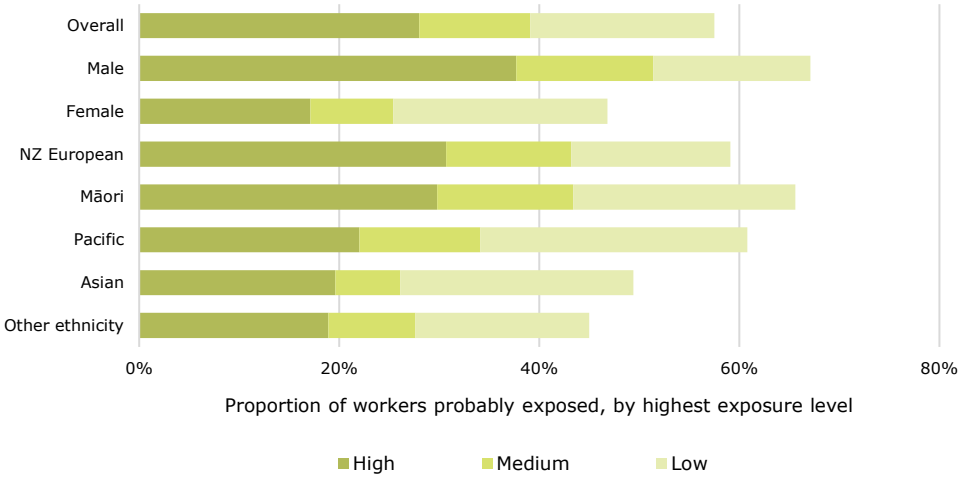
Low Above background levels but not of immediate concern to occupational health professionals.

In the NZCS, a 'main survey' sampled 3,089 workers from occupations likely to be exposed to carcinogens, and a 'control survey' randomly sampled 962 workers from all occupations. The 2018 Census was used to weight the results to reflect the New Zealand working population. A full report on the NZCS, including methodology details, is available on WorkSafe's website.[22]

WORKER EXPOSURE TO CARCINOGENS IN NEW ZEALAND

Figure 26 and **Figure** 27 show the proportion of workers probably exposed to at least one carcinogen by gender, ethnicity, and industry, based on the results of the NZCS. Overall, more than half of all workers (57%) were estimated to be probably exposed to at least one carcinogen, and 28% to be probably exposed to at least one carcinogen at a high level.

Figure 26: Proportion of workers probably exposed to at least one carcinogen, by highest exposure level, gender and ethnicity



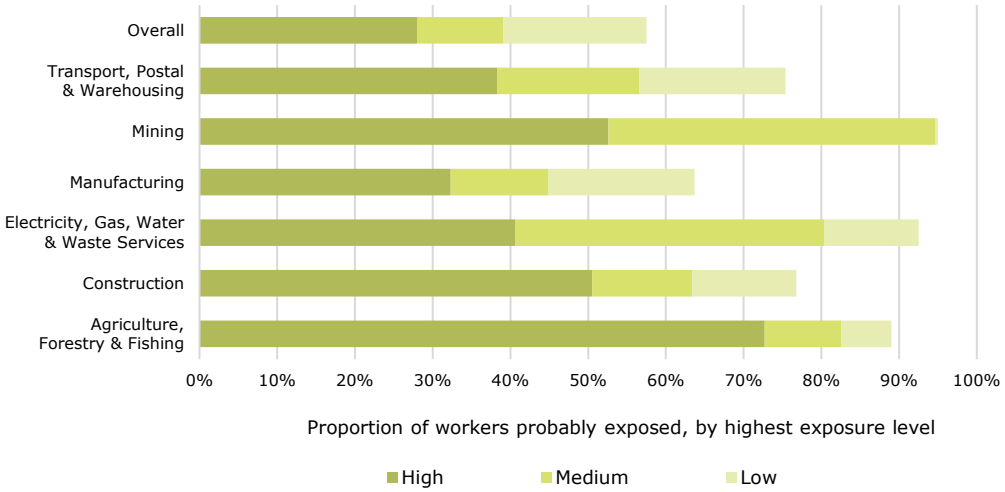
Source: New Zealand Carcinogens Survey 2021.

Male workers were more likely than female workers to be exposed to carcinogens at all levels of exposure. Māori workers were most likely to be exposed at any level, while New Zealand European and Māori workers were more likely than other ethnicities to be exposed at a medium or high level.

Workers in the agriculture, forestry & fishing, construction, manufacturing, mining, electricity, gas, water & waste, and transport, postal & warehousing industries were significantly more likely to be exposed than the all-industry average. The NZCS did not find any significant differences in exposure by age group.

[22] See New Zealand Carcinogens Survey 2021 | WorkSafe.

Figure 27: Proportion of workers probably exposed to at least one carcinogen, by highest exposure level and industry



Source: New Zealand Carcinogens Survey 2021.

Two of the most common carcinogenic exposures are solar ultraviolet radiation (classed by IARC as a Group 1 carcinogen with sufficient evidence of causing melanoma and non-melanoma skin cancer, and limited evidence of causing lip and eye cancer); and night shift work (classed by IARC as a Group 2A carcinogen with limited evidence of causing breast, prostate, and colorectal cancer). These exposures cause harm in different ways than airborne carcinogens. Further discussion of solar radiation and shift work is included in the section on **work organisation and environment.**

The remainder of workplace carcinogens are airborne or chemical substances that are breathed in or absorbed through the skin. Overall, 49.7% of workers were estimated to be probably exposed to at least one airborne or chemical carcinogen, and 18.1% were estimated to be exposed at a high level. The patterns of exposure were similar to those for all carcinogens. Male workers, Māori workers, New Zealand European workers, and those working in six high-risk industries, were more likely to be exposed to airborne or chemical carcinogens. Of note, 68% of workers in agriculture, forestry, and fishing and 43% of workers in construction were estimated to have probable high exposure to at least one airborne or chemical carcinogen.

The NZCS also found that workers in certain occupations were more likely to be exposed to any carcinogen and were also more likely to be exposed to multiple carcinogens. Workers in the following occupational groups were exposed to the highest number of carcinogens, on average:

- More than seven carcinogens: construction workers, farmers, and emergency workers.
- More than six carcinogens: carpenters, electrical workers, and vehicle trades workers.
- More than five carcinogens: handypersons, heavy vehicle drivers, painters, metal workers, and miners.

WORKER EXPOSURE TO SPECIFIC CARCINOGENS

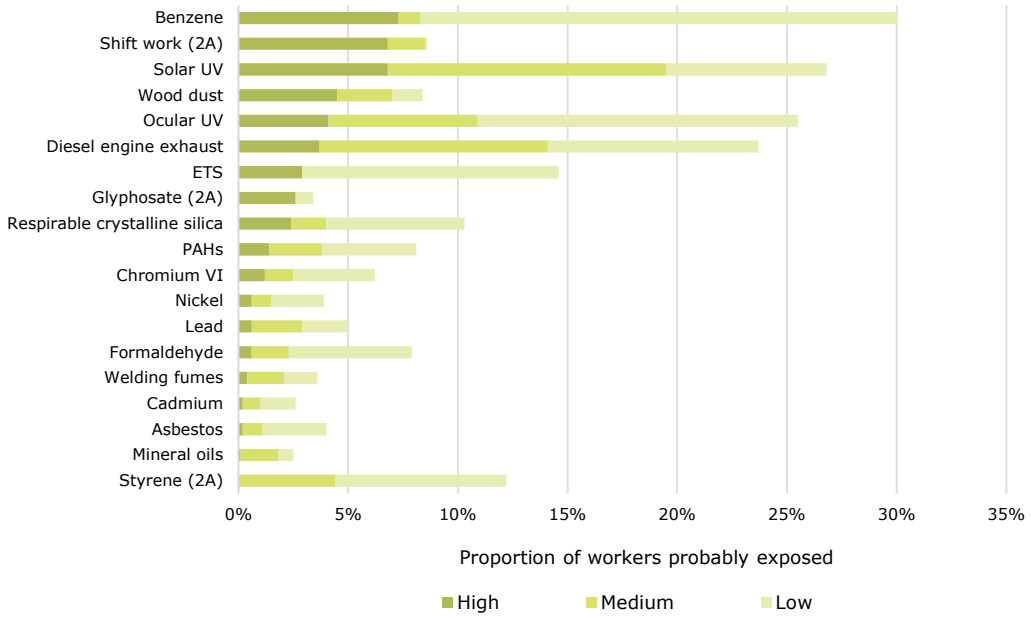
More than 50 agents or exposure circumstances were included in the NZCS. A detailed summary can be found in WorkSafe's report on the survey.[23] **Figure 28** highlights the most common carcinogens, showing the proportion of workers with low, medium, and high exposure to each agent.

The NZCS found that the most common exposures were benzene (a component of petrol and some common solvents) and solar ultraviolet radiation. The most common exposures with sufficient evidence of causing lung cancer were diesel engine exhaust, environmental tobacco smoke (also known as second-hand smoke) and respirable crystalline silica. Four of the most common

[23] See New Zealand Carcinogens Survey 2021 | WorkSafe.

exposures (shift work, glyphosate, lead, and styrene) are classified by IARC as Group 2A (probably carcinogenic to humans). All others are classified as Group 1 (carcinogenic to humans).

Figure 28: Proportion of workers probably exposed to specific carcinogens, by exposure level



Source: New Zealand Carcinogens Survey 2021.
Note: ETS = Environmental tobacco smoke, PAHs = Polycyclic Aromatic Hydrocarbons

A greater number of workers exposed at a high level does not necessarily translate to greater harm. Other factors include the duration of the exposure, the strength of association between the exposure and the risk of a particular disease, the background incidence of the disease, and the health impact of the disease. Workers may also face increased risk from being exposed to multiple carcinogens, or from interactions with other risk factors such as smoking.[24]

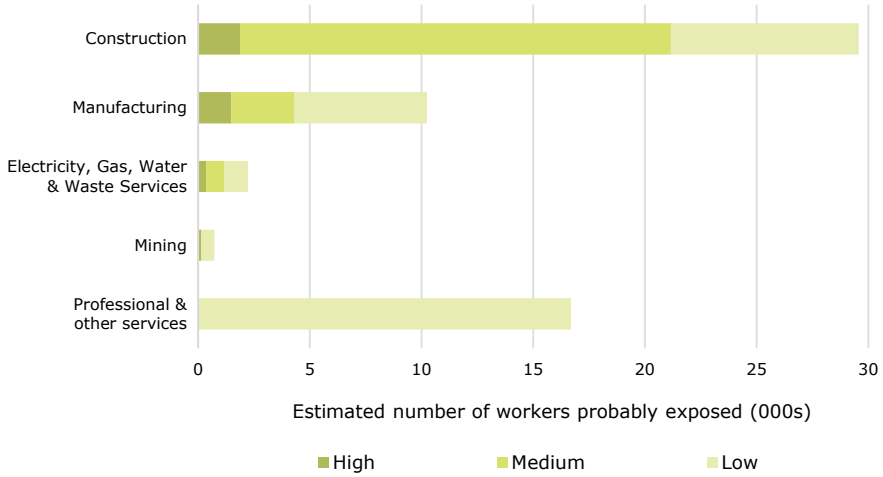
The following sections provide more details on exposure to selected carcinogens. These agents are of most concern, because of the strength of evidence linking them to specific diseases, their estimated contribution to current levels of harm, and the number of workers currently exposed at levels associated with increased risk of harm. The sections comment on the health risks associated with each carcinogen, common exposure circumstances identified in the NZCS, and information on the use of controls captured through the NZCS.

Asbestos

IARC classifies asbestos as a Group 1 carcinogen, with sufficient evidence of causing mesothelium, larynx, lung, and ovary cancer, and limited evidence of causing stomach and colorectal cancer. High exposure to asbestos can cause asbestosis, a fibrotic lung disease. WorkSafe has estimated that 200-250 deaths in 2015 could be attributed to historical exposure to asbestos. The use of asbestos in building materials was phased out and the importation of raw asbestos to New Zealand was prohibited from the 1980s, so current exposure is reduced but can still occur in some circumstances.

[24] Estimates of harm may involve different scenarios such as a large increase in risk for a rare cancer such as nasal cancer, or a smaller increase in risk for a common cancer such as lung cancer.

Figure 29: Number of workers probably exposed to asbestos, by exposure level and industry



Sources: New Zealand Carcinogens Survey 2021; Stats NZ HLFS data; WorkSafe calculations.

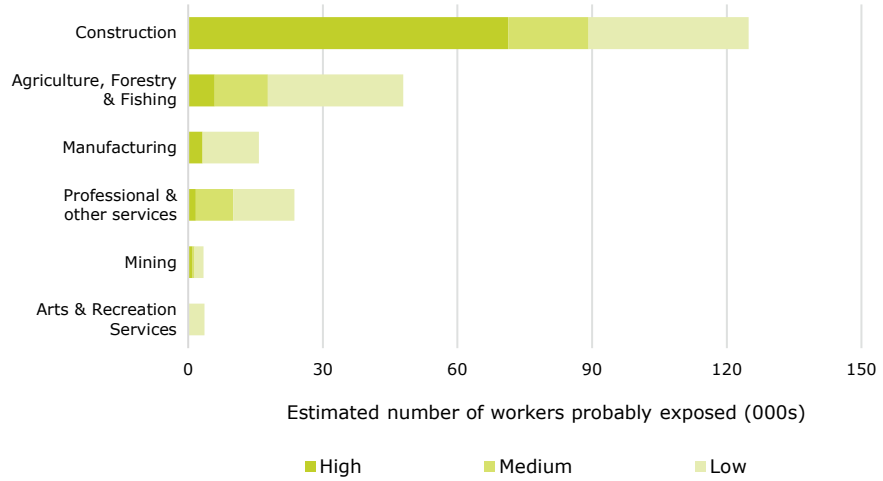
Applying the NZCS results to 2021 workforce numbers, approximately 100,000 workers were probably exposed to asbestos, with around 5,000 probably exposed at a high level. A common activity involving exposure to asbestos is working with the brakes or clutches of cars made before 2003, although exposure from this activity is rarely high. Activities that may result in high exposure to asbestos include working in buildings with crumbly lagging or insulation or disturbing or removing asbestos-containing materials.

Respirable crystalline silica

Respirable crystalline silica (RCS) is classified by IARC as a Group 1 carcinogen with sufficient evidence of causing lung cancer. Exposure to RCS also causes silicosis, a fibrotic lung disease, and it is a risk factor for chronic obstructive pulmonary disease (COPD) and tuberculosis. There are also varying levels of evidence linking RCS exposure to cardiovascular disease, kidney disease and autoimmune disease.

These diseases are normally associated with exposure to RCS over more than 20 years but in the past decade international attention has been drawn to the risks of accelerated silicosis, which can develop in ten years or less, from working with artificial (engineered) stone, which may contain up to 90% silica.

Figure 30: Number of workers probably exposed to respirable crystalline silica, by exposure level and industry



Sources: New Zealand Carcinogens Survey 2021; Stats NZ HLFS data; WorkSafe calculations.

Applying the NZCS results to 2021 workforce numbers, approximately 270,000 workers in Aotearoa were probably exposed to respirable crystalline silica, and 80,000 were probably exposed at a high level. **Figure 30** shows that most workers with a high level of exposure worked in the construction industry. Activities associated with high exposure to RCS include working with concrete, natural stone, or bricks (cutting, drilling, grinding, or polishing), mixing concrete or cement, and demolitions or teardowns.

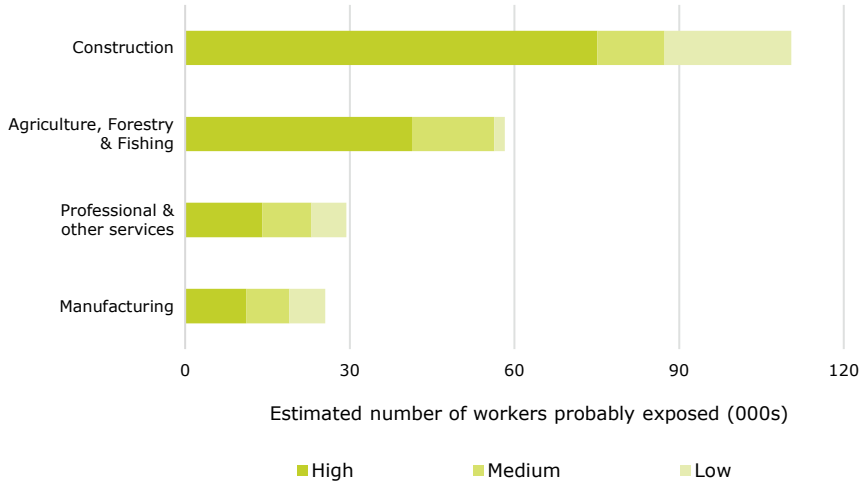
The NZCS found that of those working with concrete, natural stone, or bricks, 39% reported using tools with local exhaust ventilation, 41.2% reported using water to suppress dust, and 27.6% used both these controls, while 49.2% reported using neither control.[25]

WorkSafe data indicates that up to 1,000 workers are or have been exposed to RCS from working with engineered stone, mainly in fabricating workshops. Although these numbers are small compared to the estimated numbers exposed to RCS in construction, those working with engineered stone have a risk of exceedingly high exposure to RCS because of engineered stone's high silica content.

Wood dust

IARC classifies wood dust as a Group 1 carcinogen with sufficient evidence of causing nasal and nasopharynx cancer. Wood dust can also cause or worsen asthma, and there is some evidence of an association between exposure to wood dust and reduced lung function. Workers exposed to wood dust may also be exposed to carcinogenic agents such as formaldehyde and arsenic, which are components of some timber treatments.

Figure 31: Number of workers probably exposed to wood dust, by exposure level and industry



Sources: New Zealand Carcinogens Survey 2021; Stats NZ HLFS data; WorkSafe calculations.

Applying the NZCS results to 2021 workforce numbers, approximately 250,000 workers were probably exposed to wood dust, and 150,000 were probably exposed at a high level. **Figure 31** shows that around half the workers with a high level of exposure worked in construction, while another third worked in the agriculture, forestry & fishing industry. The NZCS found that activities associated with a high level of exposure to wood dust included cutting wood using power tools, sanding using either power tools or hand tools, demolitions or tear downs, and laying wooden floors.

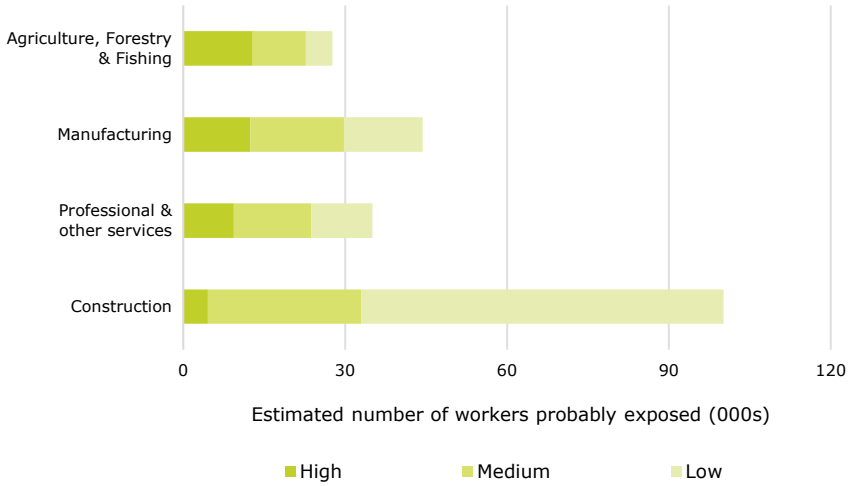
[25] The NZCS results are corroborated by small-scale research which found that the New Zealand exposure standard was exceeded in around half of 39 personal samples from a cross-section of construction workers doing tasks likely to involve exposure to RCS (see: Mclean et al, 2017).

The NZCS found that of those using power tools to sand in carpentry work, 21.2% used a rubber half-face mask with respirator, 24.9% used a local exhaust ventilation system, 9.2% used both, while 51.4% used neither. Of those using power tools to sand wood in preparation for painting work, 82.6% used a rubber half-face mask with respirator, 45.2% used a local exhaust ventilation system, 42.7% used both, while 12.9% used neither.

Welding fumes and carcinogenic metals

IARC classifies welding fumes as a Group 1 carcinogen with sufficient evidence of causing lung cancer and limited evidence of causing kidney cancer. Welding fumes have been linked to other health effects, including asthma, COPD, increased risk of pneumonia, kidney damage and skin irritation. Welding is a primary source of exposure to other carcinogens including chromium VI compounds, nickel, polycyclic aromatic hydrocarbons, cadmium, and lead.

Figure 32: Number of workers probably exposed to welding fumes and carcinogenic metals, by exposure level and industry [1]



Sources: New Zealand Carcinogens Survey 2021; Stats NZ HLFS data; WorkSafe calculations.
[1] Exposure is defined as exposure to ANY of: welding fumes, chromium VI, nickel, cadmium, or lead.

Applying the NZCS results to 2021 workforce numbers, approximately 250,000 workers were probably exposed to welding fumes or carcinogenic metals, and 45,000 were probably exposed at a high level. Exposure to welding fumes occurred most often in automotive repair, metal manufacturing, on farms and in construction. Other sources of exposure to carcinogenic metals apart from welding include grinding or machining steel or metal alloys, stripping old paint, and applying paint primers or undercoats.

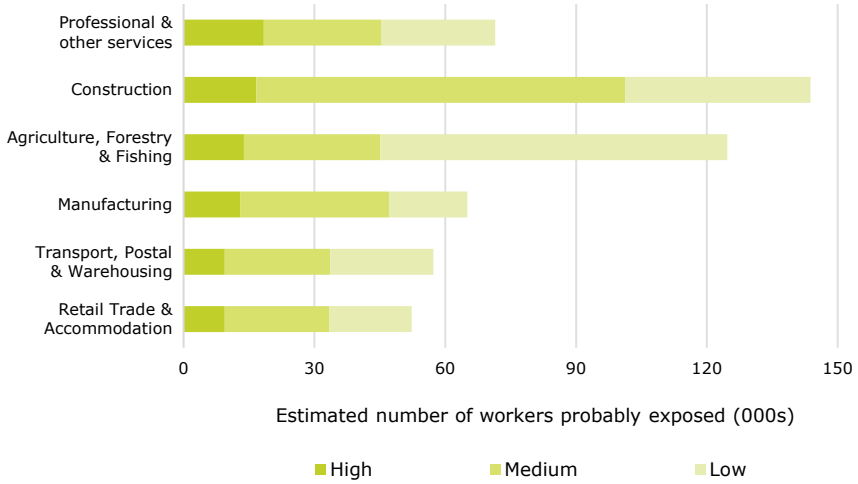
The level of exposure assigned to welders by OccIDEAS depends on whether an air-supplied welding helmet is worn, whether and how often a ventilation system (welding booth, exhaust hood or local exhaust ventilation) is used, and whether workers weld in confined spaces. Of those workers who welded metals and were probably exposed to welding fumes, 39.7% were assigned a low-level exposure because they reported wearing a welding helmet with a separate air supply. The NZCS also captured information on controls in relation to welding the following carcinogenic metals:

- Chromium VI: Of those welding stainless steel, chromium, or construction steel, 23% reported wearing an air-supplied helmet, 24.7% reported working outdoors, and 11% reported having a ventilation system in place.
- Nickel: Of those welding stainless steel, nickel, or nickel alloy, 31.2% wore an air-supplied helmet, 19% worked outdoors, and 13% had a ventilation system in place.
- Lead: Of those exposed to lead via welding, 58.1% wore an air-supplied helmet, 19.1% worked outdoors, and 7.8% had a ventilation system in place.

Diesel engine exhaust

IARC classifies diesel engine exhaust as a Group 1 carcinogen with sufficient evidence of causing lung cancer and limited evidence of causing bladder cancer. Exposure to diesel engine exhaust is also associated with non-cancer respiratory effects and adverse cardiovascular outcomes.

Figure 33: Number of workers probably exposed to diesel engine exhaust, by exposure level and industry



Sources: New Zealand Carcinogens Survey 2021; Stats NZ HLFS data; WorkSafe calculations.

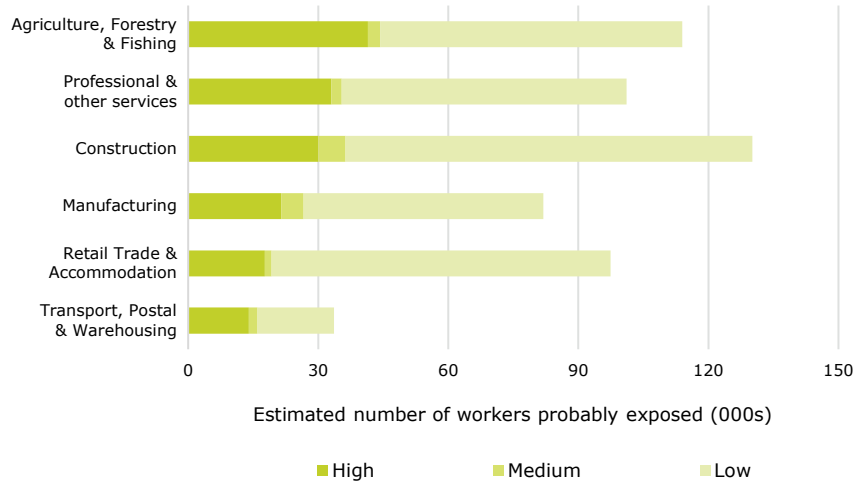
Applying the NZCS results to 2021 workforce numbers, approximately 600,000-650,000 workers were probably exposed to diesel engine exhaust with 90,000-100,000 probably exposed at a high level.

Estimated exposure was spread across several industries where diesel-powered vehicles and equipment are used. Exposure is most likely to occur where diesel engines are running in areas where workers work. The probability of high exposure is greatest when work is indoors and close to where diesel engines are operating, but high exposure may also occur in mixed indoor-outdoor or outdoor work. Driving or riding on diesel-powered vehicles on construction sites or in buildings such as warehouses is another potential source of high exposure.

Benzene

IARC classifies benzene as a Group 1 carcinogen with sufficient evidence of causing some forms of leukaemia and limited evidence of causing other forms of leukaemia, multiple myeloma, non-Hodgkin's lymphoma, and lung cancer. Exposure can also cause bone marrow damage and have immune system effects. Benzene is used as a solvent and is a component of commonly used substances such as petrol, mineral turpentine, white spirits, and paint thinners. It can also be present as a combustion product, including in vehicle exhaust and tobacco smoke.

Figure 34: Number of workers probably exposed to benzene, by exposure level and industry



Sources: New Zealand Carcinogens Survey 2021; Stats NZ HLFS data; WorkSafe calculations.

Applying the NZCS results to 2021 workforce numbers, approximately 740,000-840,000 workers were probably exposed to benzene, with approximately 180,000-200,000 probably exposed at a high level.[26] The main tasks leading to probable exposure to benzene were fuelling vehicles or equipment with petrol; using petrol, mineral turpentine, mineral spirits, white spirit, or paint thinner to clean hands; and using oil or solvent-based primer or undercoat for painting. Most probable high exposure occurred from refuelling vehicles or equipment with petrol, activities which are spread across different industries and occupations.

SELF-REPORTED EXPOSURE TO AIRBORNE RISKS

In addition to the New Zealand Carcinogens Survey 2021, other surveys have collected data on self-reported exposure to airborne risks including dusts, fumes, chemicals, and pesticides. These exposures include carcinogenic agents, and agents that have not been shown to cause cancer but present other health risks.

Information from these surveys is not reviewed by experts but is based on workers' perceptions of what they are exposed to. Self-reported exposures do not refer to particular substances but to generic categories such as 'dust,' or 'fumes'.[27] Unlike in the NZCS, self-reported exposures cannot be classified into low, medium, or high categories.

Two large-scale worker surveys of the New Zealand workforce and Māori workforce were carried out by Massey University in 2004-06 and 2009-10 respectively, with a total of 5,110 participants.[28] WorkSafe's Workforce Segmentation and Insights Programme (WSIP) workers survey undertaken in 2021 (3,627 participants) asked workers questions about exposures that were based on the wording and classifications used in the Massey research. **Table 7** compares the results from these surveys, broken down by industry.

The results show broad consistency between the two surveys, with most differences well within margins of error. **Table 7** shows that exposure to airborne or chemical risks was reported by approximately 80% of workers in both agriculture and construction, 70% in manufacturing, and

[26] New Zealand's worker exposure standard for benzene is 0.05 parts per million (ppm). This is a health-based standard which is significantly lower than standards in some overseas jurisdictions, which may be as high as 1 ppm.

[27] Surveys sometimes include follow-up questions which allow respondents to state what kind of dust, fumes or chemicals they are exposed to, e.g., 'stone, brick or concrete dust', or 'engine exhaust fumes'. In this report results are presented at the highest and most generic level, i.e., 'dust' or 'fumes'.

[28] See Eng et al., 2018.

60% in transport, postal & warehousing, compared to an all-industry average of 49% in the WSIP survey and 51% in Massey's surveys.

Self-reported exposure to dusts was highest in construction and above average in all four industries. Self-reported exposure to smoke and fumes was above average in all four industries. Exposure to pesticides was highest in agriculture but not significantly above average in the other industries.

Table 7: Exposure to airborne or chemical risks, by industry

		WSIP survey	Massey surveys [1]
All industries	**Dust**	**31%**	**32%**
	Smoke or fumes	**20%**	**19%**
	Pesticides	**9%**	**10%**
	Any airborne or chemical exposure	**49%**	**51%**
Agriculture [2]	Dust	58%↑	55%
	Smoke or fumes	27%↑	29%
	Pesticides	58%↑	51%
	Any airborne or chemical exposure	84%↑	81%
Construction	Dust	70%↑	72%
	Smoke or fumes	40%↑	33%
	Pesticides	10%	21%
	Any airborne or chemical exposure	78%↑	81%
Manufacturing	Dust	43%↑	50%
	Smoke or fumes	29%↑	29%
	Pesticides	8%	7%
	Any airborne or chemical exposure	67%↑	69%
Transport, Postal & Warehousing	Dust	35%	40%
	Smoke or fumes	35%↑	37%
	Pesticides	6%↓	7%
	Any airborne or chemical exposure	58%↑	57%

Sources: WSIP workers survey 2021; Eng et al., 2018.
Note: [1] Pooled results from the New Zealand Worker Survey (2004-06) and New Zealand Māori Worker Survey (2009-10).
[2] Agriculture includes the forestry sub-industry in the Massey survey but not in the WSIP survey.
↑ Significantly above survey average ↓ Significantly below survey average (at 95% confidence level).

Table 8 shows that in the 2021 workers survey, male workers were significantly more likely than female workers to report exposure to all types or airborne or chemical exposures. Workers over the age of 60 were less likely to be exposed to dust, smoke/fumes, or any airborne or chemical exposure.

Table 8: Exposure to airborne or chemical risks, by gender and age

	Dust	Smoke or fumes	Pesticides	Any airborne or chemical exposure
All workers	**31%**	**20%**	**9%**	**49%**
Male	42%↑	28%↑	12%↑	61%↑
Female	19%↓	11%↓	6%↓	37%↓
18 - 29	38%↑	21%	11%	54%
30 - 39	31%	26%↑	10%	55%
40 - 49	27%	17%	7%	44%↓
50 - 59	32%	20%	9%	50%
60 and over	25%↓	14%↓	10%	43%↓

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Table 9 shows that Pacific workers were significantly more likely to report exposure to smoke or fumes than the survey average. There was a clear association between lower socioeconomic status and likelihood of reporting exposures of all types. Workers with the lowest socioeconomic status (Levels 5 and 6) were around twice as likely to report any airborne or chemical exposure as those at Level 1 or 2; three times more likely to report exposure to dust, smoke, or fumes; and five times more likely to report exposure to pesticides.

Table 9: Exposure to airborne or chemical risks, by ethnicity and socioeconomic status (SES)

	Dust	Smoke or fumes	Pesticides	Any airborne or chemical exposure
All workers	**31%**	**20%**	**9%**	**49%**
Māori	29%	16%↓	8%	47%
Pacific	33%	28%↑	14%	45%
NZ European	32%	20%	9%	50%
Asian	27%	19%	10%	51%
Other	29%	11%	6%	43%
Level 1 (High SES)	10%↓	9%↓	2%↓	43%
Level 2	20%↓	14%↓	2%↓	29%↓
Level 3	31%	18%	7%	44%↓
Level 4	37%↑	23%	13%↑	54%
Level 5	37%↑	23%	15%↑	60%↑
Level 6 (Low SES)	51%↑	34%↑	14%	77%↑

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

SELF-REPORTED RESPIRATORY PROBLEMS

Workers' own perception of whether work is affecting their health can be a valid way of assessing the effects of exposures, especially where the worsening or easing of symptoms can be related to their working conditions. Some information on self-reported respiratory ill health is available through WorkSafe's WSIP survey. The survey questionnaire asks workers if during the previous 12 months they have experienced any breathing or respiratory problems, which they think have been caused or made worse by work. They are then asked whether the problem first began in the past 12 months (a measure of incidence) or at any stage in their working life (a measure of prevalence).

Table 10, **Table 11** and **Table 12** show that in 2021 approximately 2% of workers reported a work-related respiratory problem that began in the past 12 months and 6% reported a work-

related respiratory problem that began at any stage in their working life. The only significant difference in incidence of work-related respiratory problems was for workers aged 30-39. This age group also reported significantly higher exposure to smoke or fumes (see **Table 8**).

Prevalence of work-related respiratory problems was significantly higher for workers in construction, male workers, and Māori workers. There also appears to be a clear correlation between lower socioeconomic status and prevalence of work-related respiratory problems. Workers in the lowest three socioeconomic groups were nearly twice as likely as those in the highest three socioeconomic groups to report a respiratory problem that began at any stage in their working life.

Data from the WSIP survey is not clinically validated. However, the prevalence of self-reported respiratory problems was higher in groups that reported higher exposure to airborne risks.

Table 10: Self-reported work-related respiratory problems, by industry

	Began in past 12 months (incidence)	Began at any stage in working life (prevalence)
All industries	**2%**	**6%**
Agriculture	1%	6%
Manufacturing	3%	7%
Construction	3%	11%↑
Transport, Postal & Warehousing	3%	8%
Other industries	2%	6%

Source: WSIP worker survey 2021.
Note: ↑Significantly above average for all industries ↓Significantly below average for all industries (at 95% confidence level).

Table 11: Self-reported work-related respiratory problems, by gender and age

	Began in past 12 months (incidence)	Began at any stage in working life (prevalence)
All workers	**2%**	**6%**
Male	3%	8%↑
Female	2%	5%↓
18 - 29	1%	5%
30 - 39	4%↑	9%
40 - 49	2%	7%
50 - 59	2%	6%
60 and over	2%	5%

Source: WSIP worker survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Table 12: Self-reported work-related respiratory problems, by ethnicity and socioeconomic status (SES)

	Began in past 12 months (incidence)	Began at any stage in working life (prevalence)
All workers	**2%**	**6%**
Māori	3%	9%↑
Pacific	4%	8%
NZ European	2%	6%
Asian	4%	8%
Other	2%	5%
Level 1 (High SES)	3%	6%
Level 2	*	3%
Level 3	1%	4%
Level 4	3%	7%
Level 5	3%	8%
Level 6 (Low SES)	2%	9%

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

INTERNATIONAL COMPARISONS

Comparing New Zealand's levels of exposure to other countries is challenging because different methods to estimate exposure have been used at different time periods. The most viable comparison is with Australia, which used the same OccIDEAS methodology for the Australian Worker Exposure Survey (AWES), which was conducted in 2012.

Table 13 compares the proportion of workers with any exposure and with high exposure to seven carcinogenic agents in Australia and New Zealand, based on the results of the NZCS 2021 and published reports on results of the AWES 2012.

Table 13: Proportion of workers exposed to selected carcinogens in New Zealand (2021) and Australia (2012)

	New Zealand		Australia	
	Any exposure	High exposure	Any exposure	High exposure
Solar UV	26.8%	6.8%	22.0%	12.6%
Diesel engine exhaust	23.7%	3.7%	13.8%	1.8%
Respirable crystalline silica	10.3%	2.4%	6.6%	3.7%
Formaldehyde	7.9%	0.6%	2.6%	0.1%
Polycyclic aromatic hydrocarbons	8.1%	1.4%	5.9%	2.5%
Lead	5.0%	0.6%	6.1%	2.7%
Pesticides	4.0%		4.0%	

Sources: New Zealand Carcinogens Survey 2021; Australian Worker Exposure Survey 2012.

The estimated proportion of workers with any exposure was similar in both countries for most of the seven carcinogens, except for diesel engine exhaust and formaldehyde, where a significantly greater proportion of workers was estimated to be exposed in New Zealand than in Australia. The estimated proportion of workers with high exposure to solar UV, respirable crystalline silica, lead, and polycyclic aromatic hydrocarbons was greater in Australia than New Zealand.

These results may reflect differences in exposure levels between New Zealand and Australia, although they are likely to also be influenced by other factors such as the time gap between the respective surveys and some differences in the way they were carried out.[29]

Both New Zealand and Australia have generally had higher estimates of exposure than in countries such as Canada, which base their estimates on measured exposures. Exposures are usually measured over a full shift and reported as a time-weighted average (TWA). By contrast, OccIDEAS assigns high exposure if any task is likely to exceed the exposure standard, even if the job may be below the TWA standard. Further work is needed to understand differences between countries in estimates of exposure to carcinogens.

DISCUSSION OF EXPOSURE TO CARCINOGENS AND AIRBORNE RISKS

Past exposure to carcinogens and airborne risks is estimated to be responsible for more work-related fatalities than all other causes combined and to account for nearly a third of all work-related harm. Identifying where workers may be experiencing hazardous exposures to carcinogens and airborne risks is key to preventing future harm. The New Zealand Carcinogens Survey (NZCS), conducted for the first time in 2021, is a crucial step forward.

Data from the NZCS indicates that approximately one in five New Zealand workers is exposed to at least one airborne or chemical carcinogen at or above the relevant exposure standard (high exposure). Most high exposure is concentrated in the high-risk industries of agriculture, forestry & fishing, manufacturing, construction, and transport, postal & warehousing. Workers in specific occupations, particularly construction and vehicle trades, may be exposed to multiple carcinogens.

The NZCS helps pinpoint the activities that generate potentially harmful exposures. These include demolition, welding, vehicle repair, painting, metal working, using power tools with stone, brick, concrete, or wood, and working around diesel-powered vehicle or equipment. Data from the NZCS suggests that appropriate controls are used less than half the time in activities such as welding, or tasks that generate potential exposure to silica or wood dust. Ensuring controls are used more consistently is a key challenge for the work health and safety system.

Further work is needed to build on the findings of the NZCS. This includes further investigation of activities associated with probable high and/or multiple exposures to confirm where workers may be at greatest risk. Measuring exposures using the methods of occupational hygiene can more precisely evaluate exposure levels for specific activities. Initial work has explored the feasibility of pooling measured exposures in a database, which would complement population-based survey data. A combination of measured and survey-based data might allow changes in exposure to be tracked over time.

Available data on exposure could be combined with knowledge about the risks of these exposures, to estimate the future potential harm from current exposures in New Zealand. This could help clarify the importance of addressing carcinogens and airborne risks relative to other work health and safety priorities, and confirm which exposures need to be addressed most urgently.

Further work can also help understand the contribution of work-related carcinogens and airborne risks to health inequities. Available data suggests that workers of lower socioeconomic status are more likely to be exposed to airborne risks and more likely to report suffering respiratory ill health related to their work. Māori have underlying rates of lung cancer and respiratory disease that are two to three times higher than the wider population. Because of these underlying health risks, even the same level of exposure is likely to cause disproportionate harm to Māori workers.

[29] These include adjustments to the way some survey questions were asked in the NZCS to clarify ambiguities and adapt questions for the New Zealand environment, and differences in the sampling strategy used by the respective surveys.

4.0 Musculoskeletal risks

MUSCULOSKELETAL RISKS

This section gives an overview of risk factors for work-related musculoskeletal disorders (WRMSDs) in New Zealand. WRMSDs are injuries and conditions affecting the muscles, ligaments, bones, tendons, blood vessels, and nerves. WRMSDs occur when work demands cause or contribute to pain, discomfort, injury, or loss of function. Work risk factors that contribute to a musculoskeletal injury or condition include:

- Biomechanical and physical forces or loads (e.g., weight of loads, forces to move objects, sudden force)
- Awkward postures (e.g., sitting, standing, reaching overhead, stooping, kneeling, constrained postures)
- Task duration or repetition
- Vibration (e.g., hand/arm or whole-body vibration)
- Work organisation (including the design of workplace, plant or equipment, organisation of tasks or shifts, and the level of training and education provided)
- Environment (e.g., temperature, humidity, lighting, noise)
- Psychosocial factors (e.g., work demands, job control, social support, job satisfaction)
- Individual factors (e.g., age, body size, previous injuries, fitness, fatigue, mental state)

A work-related musculoskeletal injury or condition is usually caused by multiple factors. Biomechanical, organisational, psychosocial, environmental, and individual factors often work in combination. Both manual and sedentary work have risk factors that may lead to WRMSDs.

Most WRMSDs develop over time, although they can also occur suddenly from a specific event such as a work-related incident or accident. WRMSDs vary in severity. They may start as mild aches and pains but can develop into a serious condition. Symptoms may include pain or discomfort, and loss of strength, sensation, dexterity, or function. They can be recurring and long lasting. In many cases, WRMSDs impact the ability to work and do other daily activities.

Burden of harm from musculoskeletal risks

The World Health Organization (WHO) and International Labour Organization (ILO) have developed global estimates of harm from work-related risk factors judged to have a causal relationship with specific diseases and conditions. The WHO and ILO identify lifting, forceful movements, awkward postures, and vibration (which they refer to as 'ergonomic risk factors') as having a causal relationship with back and neck pain.

A recent WHO/ILO review found a positive association of exposure to 'ergonomic risk factors' with other musculoskeletal disorders (in addition to back or neck pain) and with osteoarthritis.[30] The risk factors considered in the review were force exertion, demanding posture, repetitiveness, hand-arm vibration, lifting, kneeling and/or squatting, and climbing.

In 2019, WorkSafe developed estimates of the overall burden of work-related harm in New Zealand, expressed as disability-adjusted life years lost (DALYs). Estimates for total burden of musculoskeletal harm and the contribution from work-related factors were based on international research.[31] This resulted in the following estimates:

- Approximately 10,150 DALYs from back pain
- Approximately 3,450 DALYs from other musculoskeletal conditions.

The remainder of this section focuses on the biomechanical and physical risk factors that the ILO and WHO have identified as having a causal relationship with WRMSDs. As noted above, there is evidence that other risk factors apart from these are associated with WRMSDs, including

[30] See Hulshof et al., 2021.

[31] By comparison, the estimates for cancer and respiratory disease applied international risk estimates to New Zealand health data.

organisational, environmental, and psychosocial factors. These factors are also associated with other health impacts, such as mental and cardiovascular ill health. They are covered in the following sections, on work organisation and environment, and psychosocial risks, respectively.

Exposure to musculoskeletal risks

New Zealand has not yet undertaken a specialised, internationally validated survey of work exposure to musculoskeletal risks, as it has done for carcinogens and the psychosocial working environment. However, some information about self-reported exposures is available through research by Massey University and WorkSafe's WSIP worker survey.[32]

Two large-scale worker surveys of the New Zealand workforce and Māori workforce were carried out by Massey University in 2004-06 and 2009-10 respectively, with a total of 5,110 participants.[33] WorkSafe's Workforce Segmentation and Insights Programme (WSIP) workers survey, undertaken in 2021 (3,627 participants), asked workers questions about exposures that were based on the wording and classifications used in the Massey research.

Table 14 compares the results from these surveys, broken down by industry, for four exposures: carrying, lifting, or moving heavy loads or people; awkward, cramped, or tiring positions; prolonged standing in a static position; and vibration.

The results are largely consistent between the surveys, apart from results relating to vibration, which was described more broadly in the WSIP survey questionnaire than the Massey questionnaire.[34] Across the surveys, approximately half of all workers reported exposure at least a quarter of the time to carrying, lifting, or moving heavy loads or people; and awkward, cramped, or tiring positions. In the WSIP survey, 12% of workers reported exposure to carrying or lifting at least three quarters of the time, and 13% reported exposure to working in awkward positions at least three quarters of the time.

In the WSIP and Massey surveys, 29% of workers said they had to stand still at least half the time, and in the WSIP survey 7% reported standing still all the time. In the WSIP survey, approximately 29% of workers reported exposure at least a quarter of the time to vibration from tools, vehicles, or machinery, while in the Massey surveys 16% of workers reported exposure at least a quarter of the time to vibrating tools.

Workers in the agriculture, manufacturing, construction, and transport, postal & warehousing industries were more likely be exposed to biomechanical musculoskeletal risks than the all-industry average. However, cross-industry differences were relatively small compared to those for acute safety risks or airborne risks. Workers in the agriculture and transport, postal & warehousing industries were less likely to be exposed to prolonged static standing than the all-industry average, but manufacturing workers were significantly more likely to report standing still all the time (12% vs 7%).

The Massey survey found that the highest prevalence of standing at least half the time was in retail trade (47%) and accommodation and food services (45%).[35] These results suggest that musculoskeletal risks are diverse and are widespread across industry industries.

[32] Research has indicated that worker assessment of their own exposure to biomechanical and physical MSD risks has at least the same validity as observational assessment. See: McDonald & Oakman (2022).

[33] See Eng et al., 2018.

[34] The Massey survey asked workers about their exposure to vibrating tools, while the WSIP survey asked about exposure to vibration from tools, vehicles, or machinery.

[35] Results for individual industries are not available from the WSIP survey other than for agriculture, manufacturing, construction, transport, postal and warehousing, and health care and social assistance.

Table 14: Self-reported exposure to musculoskeletal risks, by industry

	Musculoskeletal risk	WSIP survey	Massey surveys [1]
All industries	**Awkward, cramped, or tiring positions**	**52%**	**60%**
	Standing still	**29%**	**29%**
	Carrying, lifting, or moving heavy loads or people	**51%**	**46%**
	Vibration	**29%**	**16%**
Agriculture [2]	Awkward, cramped, or tiring positions	61%↑	72%
	Standing still	23%↓	31%
	Carrying, lifting, or moving heavy loads or people	77%↑	65%
	Vibration	63%↑	32%
Construction	Awkward, cramped, or tiring positions	65%↑	73%
	Standing still	29%	25%
	Carrying, lifting, or moving heavy loads or people	68%↑	67%
	Vibration	63%↑	42%
Manufacturing	Awkward, cramped, or tiring positions	49%	60%
	Standing still	33%	38%
	Carrying, lifting, or moving heavy loads or people	56%↑	55%
	Vibration	38%↑	25%
Transport, Postal & Warehousing	Awkward, cramped, or tiring positions	54%	61%
	Standing still	19%↓	25%
	Carrying, lifting, or moving heavy loads or people	54%↑	42%
	Vibration	46%↑	18%
Health Care & Social Assistance	Awkward, cramped, or tiring positions	61%↑	61%
	Standing still	28%	25%
	Carrying, lifting, or moving heavy loads or people	54%	42%
	Vibration	16%↓	7%

Sources: WSIP workers survey 2021; Eng et al., 2018.

Note: [1] Pooled results from the New Zealand Worker Survey (2004-06) and the New Zealand Māori Worker Survey (2009-10).
[2] Agriculture includes the forestry sub-industry in the Massey survey but not in the WSIP survey.
↑ Significantly above average for all industries ↓ Significantly below average for all industries (at 95% confidence level).

Table 15 shows self-reported exposure to musculoskeletal risks from the 2021 WSIP workers survey, broken down by gender and age. Male workers were more likely to report exposure to all four risks than female workers and were more than twice as likely to report exposure to vibration as females. Older age was associated with lower exposure to biomechanical musculoskeletal risks. Workers aged 18-29 were more likely, and those aged over 60 less likely, to report exposure to all four risks.

Table 15: Self-reported exposure to musculoskeletal risks, by gender and age

	Awkward, cramped, or tiring positions	Standing still	Carrying, lifting, or moving loads	Vibration
All workers	**52%**	29%	**51%**	**29%**
Male	56%↑	32%↑	57%↑	41%↑
Female	48%↓	26%↓	43%↓	15%↓
18 - 29	60%↑	36%↑	56%↑	35%↑
30 - 39	56%	33%	54%	34%↑
40 - 49	54%	28%	48%	24%↓
50 - 59	46%↓	25%	49%	28%
60+	40%↓	20%↓	42%↓	20%↓

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Table 16 shows that compared to the survey average, workers of Pacific and Asian ethnicities were significantly more likely to report working in awkward or tiring positions more than 25% of the time and to work standing still more than half the time. Māori workers were more likely to report carrying loads and working in awkward or tiring positions all the time (8% vs an average of 6%). Workers of lower socioeconomic status were more likely to be exposed to musculoskeletal risks, especially lifting/carrying and vibration. Workers in the lowest two socioeconomic groups were significantly more likely to report exposure to all four risk factors.

Table 16: Self-reported exposure to musculoskeletal risks, by ethnicity and socioeconomic status (SES)

	Awkward, cramped, or tiring positions	Standing still	Carrying, lifting, or moving loads	Vibration
All workers	**52%**	29%	**51%**	**29%**
Māori	51%	31%	52%	25%↓
Pacific	62%↑	43%↑	47%	36%
NZ European	50%↓	24%↓	51%	29%
Asian	60%↑	46%↑	51%	28%
Other	44%	21%	45%	13%
Level 1 (High SES)	64%↑	35%	55%	7%↓
Level 2	41%↓	14%↓	22%↓	13%↓
Level 3	38%↓	22%↓	38%↓	25%
Level 4	53%	28%	53%	35%↑
Level 5	65%↑	44%↑	74%↑	38%↑
Level 6 (Low SES)	77%↑	47%↑	80%↑	56%↑

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Analysis of the Massey surveys found that after segmenting by gender and controlling for age, socioeconomic status, industry, and occupation, Māori workers were significantly more likely than non-Māori workers to be exposed to biomechanical musculoskeletal risks. Male Māori workers were twice as likely to be exposed to lifting than non-Māori male workers, after controlling for these factors.

None of the surveys captured exposure to forceful movement, one of the biomechanical risk factors associated with musculoskeletal harm in global estimates. The WSIP survey did not ask workers about exposure to repetitive movement. The Massey surveys asked workers about carrying out

repetitive work tasks but did not clearly differentiate repetition of physical movement from the general repetitiveness of work tasks.

Self-reported musculoskeletal harm

Workers' own perception of whether work is affecting their health is a valid way of assessing the effects of exposures, especially where the worsening or easing of symptoms can be related to their working conditions. Some information on self-reported musculoskeletal ill health is available through WorkSafe's WSIP workers survey. The survey questionnaire asks workers if during the previous 12 months they have experienced any musculoskeletal pain, discomfort, or loss of mobility, which they think has been caused or made worse by work. They are then asked whether the problem first began in the past 12 months (a measure of incidence) or at any stage in their working life (a measure of prevalence).

Table 17 shows that in 2021, around 11% of workers reported a work-related musculoskeletal condition that began in the previous 12 months, while 33% reported a work-related musculoskeletal condition that began at any stage in their working life. There were no significant differences in the incidence of work-related musculoskeletal harm by industry, but workers in the health care & social assistance industry were significantly more likely to report a work-related musculoskeletal condition that began at any stage in their working life.

Table 17: Self-reported musculoskeletal harm by industry

	Began in past 12 months (incidence)	Began at any stage in working life (prevalence)
All industries	**11%**	**33%**
Agriculture	14%	37%
Manufacturing	12%	31%
Construction	11%	33%
Transport, Postal & Warehousing	12%	35%
Health Care & Social Assistance	13%	37%↑
Other	11%	31%

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all industries ↓Significantly below average for all industries (at 95% confidence level).

Table 18 shows that there were no differences in incidence or prevalence of work-related musculoskeletal conditions by gender. There appears to be a weak tendency for younger workers to be more likely to report a musculoskeletal condition that began in the past 12 months, but those aged 40-49 were the most likely to report a musculoskeletal condition that began at any stage in their working life.

Table 18: Self-reported musculoskeletal harm by gender and age

	Began in past 12 months (incidence)	Began at any stage in working life (prevalence)
All workers	**11%**	**33%**
Male	11%	31%
Female	11%	34%
18 - 29	14%	27%↓
30 - 39	11%	32%
40 - 49	11%	38%↑
50 - 59	10%	35%
60 and over	9%	31%

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Table 19 shows that workers of Other Ethnicity were more likely than average to report a work-related musculoskeletal condition and were almost twice as likely to report a condition that began in the past 12 months. Māori workers were more likely than average to report a musculoskeletal condition that began at any stage in their working life. Workers in the lowest socioeconomic group (Level 6) were more likely to report a musculoskeletal condition that began in the past 12 months (incidence). Collectively, the three lowest socioeconomic groups had significantly higher prevalence of self-reported musculoskeletal conditions than those in the three highest socioeconomic categories.

Table 19: Self-reported musculoskeletal harm by ethnicity and socioeconomic status (SES)

	Began in past 12 months (incidence)	Began at any stage in working life (prevalence)
All workers	**11%**	**33%**
Māori	11%	38%↑
Pacific	11%	26%
NZ European	10%	33%
Asian	12%	29%
Other	21%↑	52%↑
Level 1 (High SES)	13%	35%
Level 2	7%	26%
Level 3	10%	26%↓
Level 4	11%	38%↑
Level 5	13%	37%
Level 6 (Low SES)	18%↑	40%

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

The surveys show some clear associations between exposures and self-reported harm. Workers from the lower socioeconomic groups consistently reported higher exposure to biomechanical risks, and greater incidence and prevalence of musculoskeletal conditions. The Massey surveys found that Māori workers were more likely to report exposure to musculoskeletal risks, and the WSIP survey found that Māori workers were more likely to report being exposed to these risks all the time. These results are consistent with the WSIP survey result showing that Māori workers reported a higher prevalence of musculoskeletal conditions.

However, the survey results suggest that differences in exposure to biomechanical risks do not always correspond to differences in self-reported musculoskeletal harm. Workers in 'higher risk' industries were more likely to report exposure to biomechanical risks but were not significantly more likely to report pain, numbness, or loss of mobility. Workers of Other Ethnicity were more likely to report a work-related musculoskeletal condition but were not more likely to report exposure to biomechanical risks.

Overall, these findings are consistent with evidence that the relationship between exposure to biomechanical risks and musculoskeletal harm is not simple but is likely to be affected by other organisational, psychosocial, and personal factors.

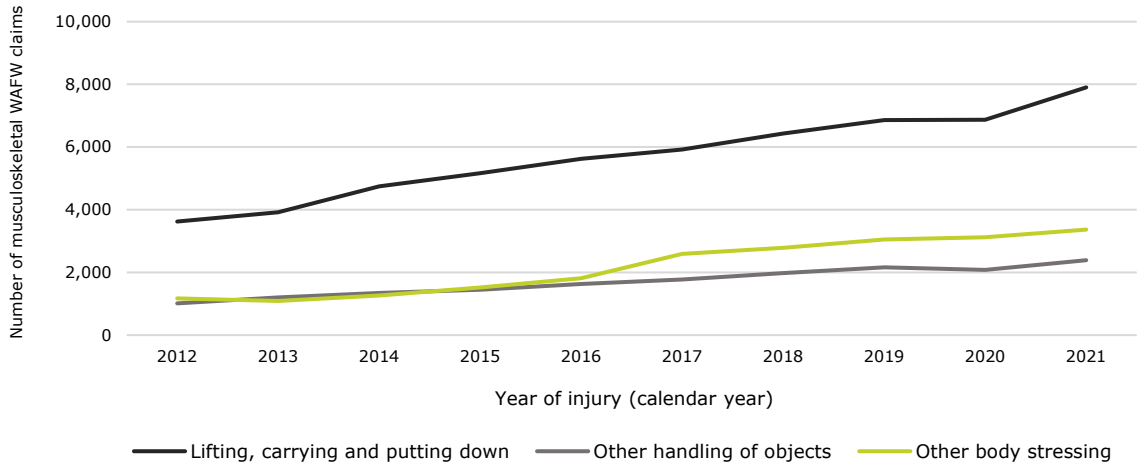
Musculoskeletal injuries in ACC claims data

The section on **work-related acute injuries** noted that musculoskeletal injuries account for the largest proportion of ACC injury claims with more than a week away from work (WAFW injuries).[36] Musculoskeletal disorders do not necessarily relate to a single injury event. However, a musculoskeletal injury is a risk factor for longer-term pain and disability, while an acute injury may occur against a background of cumulative exposure.

MUSCULOSKELETAL INJURIES BY INJURY MECHANISM

Figure 35 shows the distribution of musculoskeletal injury claims by injury mechanism for the years from 2012 to 2021. Lifting and carrying accounted for 59% of musculoskeletal injuries, with 18% relating to other handling of objects and 24% to muscular stress with no objects being handled. During the 2012 to 2021 period, the number of claims relating to muscular stress with no objects being handled increased more quickly than the number of claims relating to lifting and carrying and to other handling of objects.

Figure 35: Musculoskeletal injury WAFW claims by injury mechanism, 2012-21



Sources: WorkSafe data; Stats NZ HLFS data; WorkSafe calculations.

MUSCULOSKELETAL INJURIES BY INDUSTRY

Figure 36 shows the rate of musculoskeletal injury claims per 1,000 FTEs by industry in 2012 and 2021. While the claims rate increased in all industries between 2012 and 2021, the increase was greatest in manufacturing (140%), health care & social assistance (112%) and retail trade (102%), and much lower in the traditional 'high-risk' industries of agriculture, forestry & fishing (37%) and construction (42%).

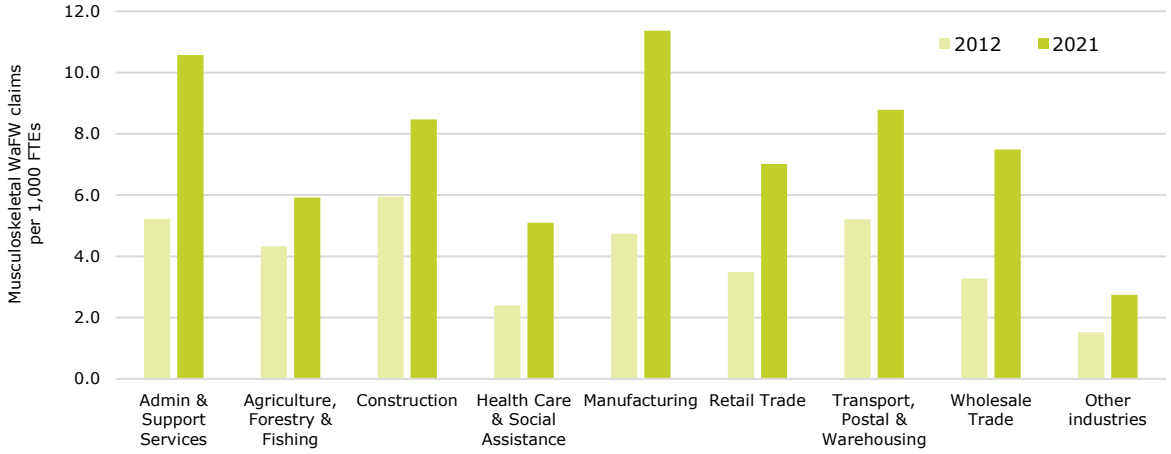
By 2021 the manufacturing industry had clearly the highest rate of musculoskeletal injury claims, alongside the administration & support services industry. In WorkSafe's data, this includes claims from the employment services sub-industry (sometimes known as 'labour hire'). Most of the claims attributed to this industry arose from work in manufacturing.

In 2021 there were as many musculoskeletal injury claims in manufacturing, which has approximately 240,000 full-time employees, as in the twelve industries clustered under 'other

[36] WorkSafe identifies these injuries through the automated application of TOOCS injury mechanism codes to ACC claims data A list of TOOCS codes used to define body stressing injuries is provided at Appendix 2. The automated application of TOOCS codes has been estimated to be at least 80% accurate when validated by manual assignation of codes. It is acknowledged that 'body stressing' injuries do not capture all WRMSDs.

industries', which have approximately 1.3 million full-time employees. The retail trade industry had the third-largest number of musculoskeletal injury claims, after manufacturing and construction.

Figure 36: Rate of WAFW musculoskeletal injury claims by industry, 2012 and 2021



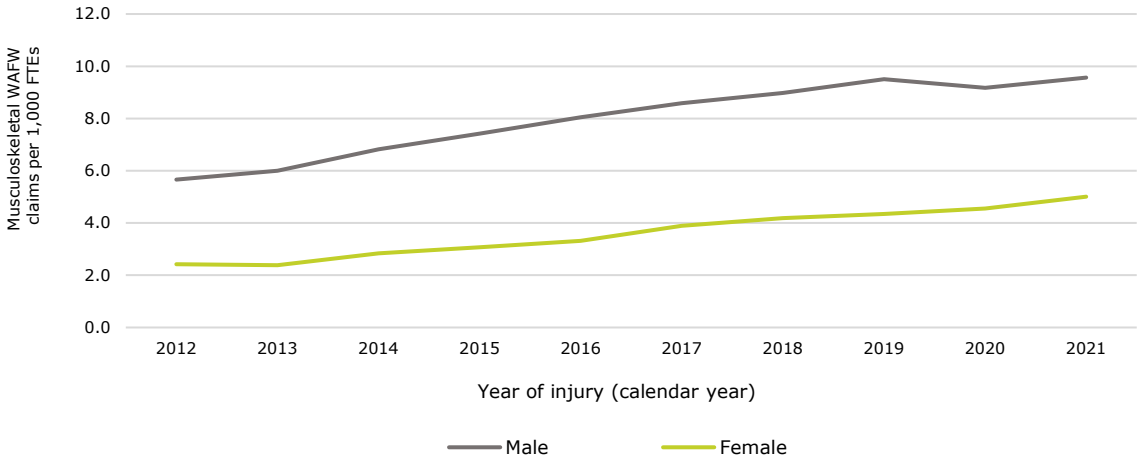
Sources: WorkSafe data; Stats NZ HLFS data; WorkSafe calculations.

MUSCULOSKELETAL INJURIES BY AGE AND GENDER

Figure 37 shows rate of musculoskeletal injury claims per 1,000 FTEs for male and female workers for the years 2012 to 2021. During this period, the claims rate grew by 114% for female workers and 76% for male workers. In 2021, male workers accounted for 67% of musculoskeletal injury claims, down from 72% in 2012.

The rate of female worker claims did not see the 'dip' in 2020 that is seen in male claims. This may be explained by different experiences during the COVID-19 pandemic, when work in the (female-dominated) healthcare & social assistance industry continued largely uninterrupted, compared to other industries.

Figure 37: Rate of WAFW musculoskeletal injury claims by gender, 2012-21

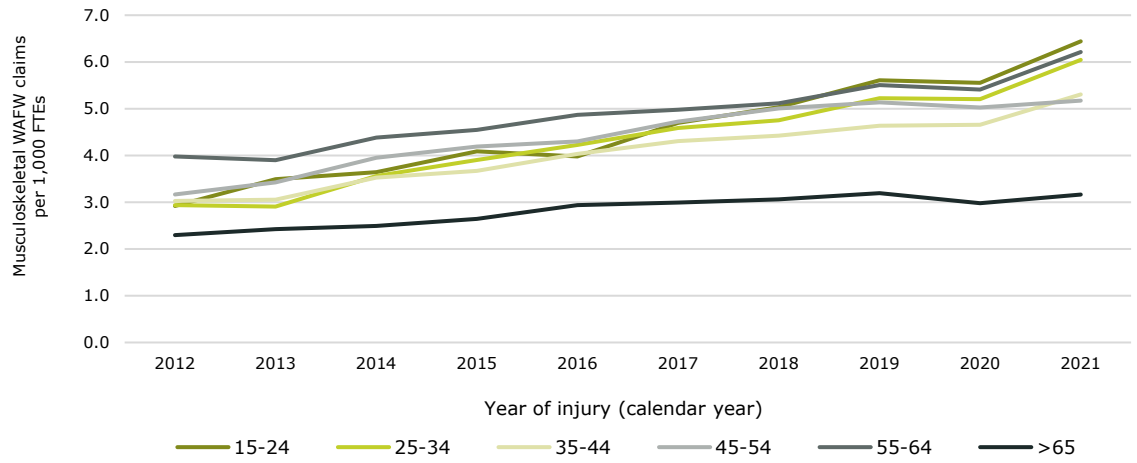


Sources: WorkSafe data; Stats NZ HLFS data; WorkSafe calculations.

Figure 38 shows the rate of musculoskeletal injury claims by age group over the 2012-21 period. The claim rate grew more quickly for younger age groups, increasing by 121% in the 15-24 age group compared to 56% in the 55-64 age group. The claim rate for the over 65 age group grew more slowly than for other age groups. Compared to other workers, workers over 65 have a significantly lower rate of musculoskeletal injuries leading to more than a week off work. This contrasts with the much higher rates of acute and serious non-fatal rate injuries for workers aged

over 65. It is consistent with survey findings that older workers are less likely to be exposed to biomechanical and physical risks.

Figure 38: Rate of WAFW musculoskeletal injury claims by age group, 2012-21



Sources: WorkSafe data; Stats NZ HLFS data; WorkSafe calculations.

DISCUSSION OF MUSCULOSKELETAL RISKS

Musculoskeletal discomfort, pain and injury have sometimes been treated as part of the 'normal wear and tear' of working. However, musculoskeletal conditions affect large numbers of workers. Recent estimates suggest that lost quality of life from WRMSDs accounts for at least a quarter of work-related harm. Musculoskeletal injuries account for easily the largest share of work-related ACC claim costs, and the overall economic burden from WRMSDs is likely to be larger still.

Compared to carcinogenic exposures and serious acute harm, musculoskeletal risks and harm are more widespread across industries and occupations. Understanding of exposures and their impact on workers is limited by the relatively small scale, non-specialist surveys that have been conducted to date, and by the limited data on overall musculoskeletal health in New Zealand.

The data that has been collected through Massey's and WorkSafe's surveys suggests that a large proportion of the working population has some exposure to biomechanical musculoskeletal risks, although there are smaller groups that are exposed to these risks most of the time. One in three workers report musculoskeletal pain, discomfort or loss of function caused or made worse by work, while one in ten report a new work-related musculoskeletal condition beginning in the last twelve months.

Surveys have found both higher exposure and greater prevalence of harm for workers of lower socioeconomic status, Māori workers, and health care & social assistance workers. There is also some evidence of higher exposure and/or harm for Pacific, Asian, Other Ethnicity, and younger workers. However, groups that report higher exposure to biomechanical risks are not necessarily more likely than other workers to report a work-related musculoskeletal condition.

Musculoskeletal injuries resulting in more than a week away from work provide one indicator of work-related musculoskeletal harm. Over the past decade, musculoskeletal injuries have increased significantly overall, but more quickly for younger workers, female workers, in industries such as manufacturing, health & social assistance care and retail trade, and for musculoskeletal injuries not involving lifting or carrying. These trends could reflect changes in access to the ACC scheme or changing practices regarding return to work after injury; however, they might also reflect changes in the kinds of pressures being placed on different groups of workers.

The relationships between musculoskeletal risk and harm are more complex than for serious acute injuries or airborne exposures. However, evidence suggests that risks can be addressed by

controlling biomechanical risk factors together with organisational and psychosocial factors. This is most likely to work well if there is management commitment and worker participation.[37]

There are opportunities for further analysis of existing data to better understand the relationship between musculoskeletal risks and harm for different groups of workers. Understanding of musculoskeletal risks and harm could be improved through a dedicated survey, as has been done for carcinogens and for the psychosocial work environment. Current knowledge could also be improved by better data on overall musculoskeletal health in New Zealand.

[37] See Report: Work-related musculoskeletal disorders definitions review | WorkSafe.

5.0
Work organisation and environmental risks

WORK ORGANISATION AND ENVIRONMENTAL RISKS

This section looks at risks related to the organisation of work and the wider work environment. The specific risk factors considered here are shift work, long working hours, noise, solar radiation, and the thermal environment. In the short term these factors can have impacts including discomfort, ill health, increased accident risk, and reduced job satisfaction. Over the longer term they have been associated with chronic ill health including cancer, heart disease, and hearing loss.

Shift work

WorkSafe has defined shift work (sometimes referred to as night shift work) as any work that requires a worker to be awake when they would otherwise be asleep. Most definitions include working between the hours of midnight and 5am. Research has identified associations between shift work and poorer health outcomes, including increased risk of cardiovascular disease and some cancers. There is also emerging evidence of an association between shift work and increased risk of Type II diabetes. The mechanisms by which shift work affects health have been theorised to include disruption of circadian rhythms and their molecular components; impacts on sleep, diet, and alcohol intake; and reduced sun exposure leading to lower intake of vitamin D.[38]

The International Agency for Research on Cancer (IARC) classifies night shift work as Category 2A (probably carcinogenic to humans), with limited evidence of causing breast, prostate and colorectal (bowel) cancer. International researchers have generally focused on breast cancer as having the strongest association with shift work, although there are still uncertainties about the dose and duration of exposure that increases risk. Quantitative estimates of the contribution of night shift work to breast cancer have been made in countries including the United Kingdom and Canada.

ESTIMATED HARM FROM SHIFT WORK

In 2019 WorkSafe published estimates of deaths and hospitalisations from work-related ill health, and separate estimates of the overall burden of work-related harm, expressed as disability-adjusted life years lost (DALYs). Both pieces of work considered the impact of shift work on cancer and cardiovascular disease. This resulted in the following approximate estimates of the harm that could be attributed to shift work:

- 25 deaths from breast cancer in 2015
- 10 deaths from cardiovascular disease (heart disease and stroke) in 2015
- 700 DALYs from breast cancer in 2017
- 330 DALYs from cardiovascular disease in 2017.[39]

A New Zealand Census-based study conducted by Massey University looked at the association of exposure to night shift work, long working hours, noise, and sedentary work, with incident heart disease during a five-year follow-up period (2013-2018).[40] An association was found between night shift work and heart disease in both males and females. The researchers calculated that 4.6% of heart disease in females and 1.8% in males could be attributed to shift work.

EXPOSURE TO SHIFT WORK

Two large-scale worker surveys of the New Zealand workforce and Māori workforce were carried out by Massey University in 2004-06 and 2009-10 respectively, with a total of 5,110 participants.[41]

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[38] See Fritschi et al., 2013.

[39] The deaths and DALYs from cardiovascular disease attributed to shift work reflected an attributable fraction of 1.02% for males and 0.64% for females in the study used by WorkSafe. The remainder of the work-related fraction of cardiovascular disease was attributed to psychosocial risk factors (job strain), noise, and exposure to environmental tobacco smoke.

[40] See Eng et al., 2023.

[41] See Eng et al., 2018.

WorkSafe's Workforce Segmentation and Insights Programme (WSIP) workers survey, undertaken in 2021 (3,627 participants), asked workers questions that were based on the wording and classifications used in the Massey research. The Massey surveys and the WSIP survey used identical wording to ask participants if they had done any paid work between the hours of midnight and 5am in the previous four weeks.

The New Zealand Carcinogens Survey (NZCS) also assessed worker exposure to shift work across 4,051 participants (see the section on carcinogens and airborne risks). In the NZCS, shift work was assessed in relation to a range of factors including light at night, phase shift, sleep disruption and changes in lifestyle factors while doing shift work.[42]

Table 20 shows that across the surveys, between 8% and 13% of workers were estimated to be exposed to shift work, with a somewhat higher proportion in the WSIP than the other two surveys. All three surveys found high exposure to shift work in the health care & social assistance industry compared to the all-industry average. The WSIP and Massey surveys found high exposure to shift work in the transport, postal & warehousing industry, but this was less marked in the NZCS.

Table 20: Exposure to shift work by industry

	WSIP survey	Massey surveys [1]	NZCS
All industries	**13%**	**9%**	**8%**
Agriculture [2]	13%	8%	4%
Manufacturing	16%	10%	9%
Construction	9%↓	5%	9%
Transport, Postal & Warehousing	27%↑	22%	11%
Health Care & Social Assistance	21%↑	14%	18%↑

Sources: WSIP workers survey 2021, Eng et al., 2018; New Zealand Carcinogens Survey 2021.
Note: [1] Pooled results from the New Zealand Worker Survey (2004-06) and New Zealand Māori Worker Survey (2009-10).
[2] Agriculture includes the forestry sub-industry in the Massey survey but not in the WSIP survey.
↑ Significantly above average for all industries ↓ Significantly below average for all industries (at 95% confidence level).

Table 21 shows exposure to shift work from the 2021 WSIP worker survey and the NZCS, broken down by gender and age. Male workers were more likely to be exposed to shift work in the WSIP survey but not in the NZCS. No significant differences in exposure by age were identified.

Table 21: Exposure to shift work by gender and age

	WSIP survey	NZCS
All workers	**13%**	**9%**
Male	16%↑	9%
Female	9%↓	9%
18 - 29	11%	9%
30 - 39	16%	9%
40 - 49	12%	8%
50 - 59	14%	8%

Sources: WSIP workers survey 2021; New Zealand Carcinogens Survey 2021.
Note: ↑ Significantly above average for all workers ↓ Significantly below average for all workers (at 95% confidence level).

Table 22 shows exposure to shift work from the 2021 WSIP worker survey and the NZCS, broken down by ethnicity, and by socioeconomic status (WSIP only). In the WSIP survey, Pacific workers were more likely to be exposed to shift work, and there was a clear association between lower socioeconomic status and working at night. In the NZCS, both Māori and Pacific workers were more

[42] See Fristschi et al., 2013.

likely to be exposed to shift work. The Massey surveys also found a slightly higher rate of exposure to shift work for Māori compared to non-Māori (10% and 7%, respectively).

Table 22: Exposure to night shift work by ethnicity and socioeconomic status (SES)

	WSIP survey	NZCS
All workers	**13%**	**9%**
NZ European	12%	8%
Māori	13%	12%↑
Pacific	21%↑	14%↑
Asian	13%	9%
Other	9%	5%
Level 1 (high SES)	16%	
Level 2	9%	
Level 3	10%	
Level 4	11%	
Level 5	17%↑	
Level 6 (low SES)	23%↑	

Sources: WSIP worker survey 2021; New Zealand Carcinogens Survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Long working hours

Working long hours has been theorized to raise the risk of cardiovascular disease both indirectly (by influencing sleep, diet, alcohol, and tobacco consumption) and directly (by stimulating the release of stress hormones).[43] The World Health Organization (WHO) and International Labour Organization (ILO) published a 2020 report which concluded that working more than 55 hours per week resulted in increased risk for heart disease and stroke. This conclusion remains debated among researchers, with some arguing that there is only evidence of increased risk for workers of lower socioeconomic status.[44]

The New Zealand Census-based study conducted by Massey University described above did not find a clear association between long working hours and incident heart disease for the 2013-2018 period for either males or females. Nevertheless, it remains important to consider exposure to long working hours, given the potentially widespread exposure. It is possible that working long hours may interact with other exposures such as shift work and psychosocial factors to increase the risk of ill health.

EXPOSURE TO LONG WORKING HOURS

Two large-scale worker surveys of the New Zealand workforce and Māori workforce were carried out by Massey University in 2004-06 and 2009-10 respectively, with a total of 5,110 participants.[45] WorkSafe's WSIP workers survey undertaken in 2021 (3,627 participants) asked workers questions about exposures that were based on the wording and classifications used in the Massey research. The Massey surveys asked workers to directly enter the number of hours they worked per week, whereas participants in the WSIP survey indicated their working hours by choosing from 10-hour categories, starting from 20 hours per week.

Table 23 compares the results from these surveys, broken down by industry. Results from the Massey surveys are reported in two categories, more than 48 hours per week, and more than 54

[43] See Li et al., 2020.

[44] See Kivimaki et al., 2020.

[45] See Eng et al., 2018.

hours per week, while the WSIP survey results show the proportion working more than 50 hours per week. Results from the WSIP survey for working more than 50 hours and from the Massey surveys for working more than 54 hours were similar. Both surveys found that 9-10% of workers worked at least this many hours. Workers in agriculture and transport, postal & warehousing were at least twice as likely as those in other industries to work long hours. Construction workers were also more likely than average to work long hours.

Table 23: Exposure to long working hours by industry

	Massey surveys (>48 hours)	WSIP survey (>50 hours)	Massey survey (>54 hours)
All industries	**22%**	**9%**	**10%**
Agriculture	41%	27%↑	27%
Manufacturing	23%	9%	7%
Construction	32%	13%↑	12%
Transport, Postal & Warehousing	40%	21%↑	19%
Health Care & Social Assistance	8%	7%↓	3%

Sources: WSIP workers survey 2021; Eng et al., 2018.
Note: [1]Pooled results from the New Zealand Worker Survey (2004-06) and New Zealand Māori Worker Survey (2009-10).
[2]Agriculture includes the forestry sub-industry in the Massey survey but not in the WSIP survey.
↑ Significantly above average for all industries ↓Significantly below average for all industries (at 95% confidence level).

It is useful to compare these results with those for shift work. Workers in the transport, postal & warehousing industry reported working long hours and were also more likely to work at night. Workers in the health care & social assistance industry had a higher rate of exposure to shift work but did not report working longer hours than average.

Table 24 shows the proportion of workers who reported working more than 50 hours in the WSIP survey, by gender and age. Male workers were more likely than female workers to report working long hours. Workers in the 18-29 age group were less likely to work more than 50 hours. A higher rate of part-time employment in the youngest age group could explain this difference.

Table 24: Exposure to long working hours (>50 hours) by gender and age

All workers	**9%**
Male	13%
Female	5%
18 - 29	5%↓
30 - 39	10%
40 - 49	8%
50 - 59	14%↑
60 and over	*8%*

Source: WSIP workers survey 2021.
Note: ↑ Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Table 25 shows the proportion of workers that reported working longer than 50 hours per week, by ethnicity and socioeconomic status. Māori workers were more likely to report working more than 50 hours, but there were no significant associations between socioeconomic status and working more than 50 hours. This is one of the few areas where there is not a clear association between socioeconomic status and exposure. This likely reflects the different circumstances in which people may work long hours, and it highlights the need to look at the interaction of working hours with other exposures.

Table 25: Exposure to long working hours (>50 hours) by ethnicity and socioeconomic status (SES)

All workers	**9%**
Māori	12%↑
Pacific	12%
NZ European	9%
Asian	5%↓
Other	8%
Level 1 (High SES)	9%
Level 2	6%
Level 3	11%
Level 4	7%
Level 5	12%
Level 6 (Low SES)	8%

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Noise

There are many sources of noise in workplaces, including vehicles, machinery, tools, impacts on hard surfaces, and electronic devices, among others. A common marker for loud noise is when a person must raise their voice to speak to someone standing a metre or less away. Noise level is expressed in decibels (dB), which is a ratio of the pressure created by a sound wave compared to a standardised pressure. Pressure is used as the measure because it is pressure of the sound wave on the ear drum, middle ear bones and cochlea (collectively the hearing mechanism) that can cause damage.

Consistent exposure to noise above 80 dB raises the risk of hearing loss, while short-term exposure to noise above 137 dB can result in immediate temporary damage to hearing. Hearing loss from noise exposure is often referred to as noise-induced hearing loss (NIHL). Other workplace factors may increase the risk of hearing loss, such as vibration, and exposure to some solvents that can have toxic effects on cells in the hearing mechanism.

Hearing loss is not the only effect of workplace noise. Tinnitus (ringing or buzzing in the ears) is caused by NIHL and has a range of impacts on mental health and wellbeing. Workplace noise can make it more difficult to hear warning signals and communicate with other workers, and it has been identified as a cause of workplace accidents. Even lower-level noise can affect concentration and information processing and may affect job satisfaction. Noise stimulates the release of stress hormones, and there is some evidence linking noise exposure with increased cardiovascular disease risk.

ESTIMATED HARM FROM WORK-RELATED NOISE IN NEW ZEALAND

A study undertaken by Auckland University estimated the proportion of hearing loss in New Zealand that could be attributed to work-related noise exposure, using methodology developed by the World Health Organization (WHO) and supported by noise exposure measurements in 99 companies covering over 500 individuals. The researchers estimated that work-related noise was primarily responsible for 14% to 18% of hearing loss in New Zealand and was a contributing factor in 23% to 26% of hearing loss.[46]

In 2019 WorkSafe developed estimates of the overall burden of work-related harm, expressed as disability-adjusted life years lost (DALYs). This work applied the Auckland University results to estimates of total hearing loss in New Zealand from the Global Burden of Disease (GBD) study. It

[46] See Thorne et al., 2011.

estimated that 3,700 DALYs from hearing loss in New Zealand in 2017 could be attributed to workplace noise.

A New Zealand census-based study conducted by Massey University looked at the association of exposure to shift work, long working hours, noise, and sedentary work with incident heart disease during a five-year follow-up period (2013-2018).[47] The study found an elevated risk of heart disease for male workers estimated to be exposed to noise above 90dB.

EXPOSURE TO LOUD NOISE

Two large-scale worker surveys of the New Zealand workforce and Māori workforce were carried out by Massey University in 2004-06 and 2009-10 respectively, with a total of 5,110 participants.[48] WorkSafe's WSIP workers survey, undertaken in 2021 (3,627 participants), asked workers questions about exposures that were based on the wording and classifications used in the Massey research. Both surveys asked workers questions about their exposure to noise. The results are shown in **Table 26**.

Table 26: Exposure to loud noise by industry

	WSIP survey	Massey surveys [1]
All industries	**46%**	**36%**
Agriculture [2]	71%↑	53%
Manufacturing	69%↑	60%
Construction	74%↑	67%
Transport, Postal & Warehousing	54%↑	50%
Health Care & Social Assistance	30%↓	22%

Sources: WSIP workers survey 2021; Eng et al., 2018.
Note: [1] Pooled results from the New Zealand Worker Survey (2004-06) and New Zealand Māori Worker Survey (2009-10).
[2] Agriculture includes the forestry sub-industry in the Massey survey but not in the WSIP survey.
↑ Significantly above average for all industries ↓ Significantly below average for all industries (at 95% confidence level).

The results were largely consistent between the surveys, although the WSIP survey generally identified a higher proportion of workers as being exposed to loud noise compared to the Massey surveys.[49] The difference between the surveys was most marked in agriculture. This might reflect differences in the agricultural sub-industries that the survey samples were drawn from.

Across the two surveys, 36% to 46% of workers reported exposure to loud noise at least a quarter of the time, while in the WSIP survey 14% said they were exposed at least three quarters of the time and 7% all the time. Workers in the agriculture, manufacturing, construction, and transport, postal & warehousing industries were significantly more likely to report exposure to loud noise than workers in other industries. In the WSIP survey, workers in manufacturing and construction were significantly more likely to report exposure to loud noise at least three-quarters of the time (31% and 25% respectively, compared to the all-industry average of 14%).

Table 27 shows that in the WSIP survey male workers were more likely to report exposure to loud noise than female workers. Younger workers reported greater exposure to loud noise. Workers in the 18-29 age group were significantly more likely than the survey average to report exposure to loud noise all the time (11% vs 7%).

[47] See Eng et al., 2023.

[48] See Eng et al., 2018.

[49] One factor may have been a difference in the way the question was worded. The Massey surveys asked workers how often they were exposed to loud noise, while the WSIP survey added the clarification 'that is, noise at a level where you would have to raise your voice to speak to someone a metre away from you'.

Table 27: Exposure to loud noise by gender and age

All workers	**46%**
Male	54%↑
Female	36%↓
18 - 29	52%↑
30 - 39	52%↑
40 - 49	41%↓
50 - 59	44%
60 and over	37%↓

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Table 28 shows that Pacific workers appear more likely to be exposed to loud noise than other workers. This observed result was not statistically significant given the survey sample size, but Pacific workers were significantly more likely than other workers to report being exposed to loud noise all the time (13% and 7%, respectively).

The results show a clear association between lower socioeconomic status and greater exposure to loud noise. Workers in the bottom two socioeconomic groups were around twice as likely as those in the top two groups to be exposed to loud noise at least a quarter of the time. Workers in the lowest socioeconomic group were around three times more likely than average to be exposed to loud noise at least three quarters of the time (41% and 14%, respectively).

Analysis of the Massey surveys found that after segmenting by gender and controlling for age, socioeconomic status, industry, and occupation, Māori workers were significantly more likely than non-Māori workers to be exposed to loud noise.

Table 28: Exposure to loud noise by ethnicity and socioeconomic status (SES)

All workers	**46%**
Māori	47%
Pacific	54%
NZ European	45%
Asian	46%
Other	37%
Level 1 (High SES)	37%
Level 2	30%↓
Level 3	42%
Level 4	46%
Level 5	57%↑
Level 6 (Low SES)	75%↑

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

SELF-REPORTED HEARING LOSS

Workers' own perception of whether work is affecting their health is a valid way of assessing the effects of exposures, especially where the worsening or easing of symptoms can be related to their working conditions. Some information on self-reported hearing health is available through WorkSafe's WSIP survey. The survey questionnaire asks workers if they have experienced any hearing loss or ringing in the ears (tinnitus) during the previous 12 months, which they think has been caused or made worse by work. They are then asked whether the problem first began in the past 12 months (a measure of incidence) or at any stage in their working life (a measure of prevalence).

Table 29 shows that 2% of workers reported work-related hearing loss or tinnitus that began in the previous 12 months, while 10% reported hearing loss or tinnitus that began at any stage in their working life. There were no significant differences by industry in the incidence of work-related hearing issues, but workers in the agriculture, manufacturing, construction, and transport, postal & warehousing industries had a significantly higher prevalence of hearing issues. Workers in the construction industry were twice as likely to report hearing problems as the survey average.

Table 29: Self-reported incidence and prevalence of hearing loss by industry

	Began in past 12 months (incidence)	Began at any stage in working life (prevalence)
All industries	**2%**	**10%**
Agriculture	4%	14%↑
Manufacturing	3%	15%↑
Construction	3%	20%↑
Transport, Postal & Warehousing	3%	17%↑
Health Care & Social Assistance	2%	8%
Other	2%	7%↓

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all industries ↓Significantly below average for all industries (at 95% confidence level).

Table 30 shows that there were no significant differences by age or gender in incidence of self-reported hearing loss or tinnitus. However, male workers were more than twice as likely as females to report work-related hearing problems that began at any stage in their working life. There was a clear association of older age with prevalence of self-reported hearing problems. Workers aged over 60 were more than twice as likely as workers aged 18-29 to report hearing loss or tinnitus that began at any stage in their working life. This is consistent with noise having cumulative effects over time, and with concurrent age-related decline in hearing acuity.

Table 30: Self-reported incidence and prevalence of hearing loss by gender and age

	Began in past 12 months (incidence)	Began at any stage in working life (prevalence)
All workers	**2%**	**10%**
Male	2%	14%↑
Female	2%	6%↓
18 - 29	2%	7%
30 - 39	3%	9%
40 - 49	2%	10%
50 - 59	1%	11%
60 and over	2%	16%↑

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Table 31 shows that Pacific workers were more likely to report work-related hearing loss or ringing in the ears that began in the past 12 months, though they were not significantly more likely to report hearing problems that began at any stage in their working life. As shown in **Table 28**, Pacific workers were nearly twice as likely to report exposure to loud noise all the time. The higher incidence for Pacific workers might reflect short-term hearing damage for workers constantly exposed to loud noise. This would also imply increased risk of long-term hearing loss.

Table 31 also shows a clear association of lower socioeconomic status with both incidence and prevalence of work-related hearing problems. This result is consistent with the greater exposure to noise reported by workers in lower socioeconomic groups. Notably, workers in the lowest

socioeconomic category (Level 6) had the same prevalence of self-reported hearing loss or tinnitus as those aged over 60.

Table 31: Self-reported incidence and prevalence of hearing loss by ethnicity and socioeconomic status (SES)

	Began in past 12 months (incidence)	Began at any stage in working life (prevalence)
All workers	**2%**	**10%**
Māori	3%	12%
Pacific	7%↑	12%
NZ European	2%↓	10%
Asian	4%	8%
Other	3%	13%
Level 1 (High SES)	1%	6%
Level 2	1%	6%↓
Level 3	1%	9%
Level 4	3%	11%
Level 5	3%	13%
Level 6 (Low SES)	5%	16%

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Solar radiation

Solar ultraviolet radiation (also known as solar UV) is classified by IARC as a Group 1 carcinogen (carcinogenic to humans) with sufficient evidence of causing melanoma and non-melanoma skin cancer and limited evidence of causing lip cancer and eye cancer.

Work-related exposure to solar radiation has been generally accepted as a causal factor in the development of non-melanoma skin cancer (NMSC), and corresponding estimates of work-related NMSC have been made in several countries. There continues to be debate about the role of work-related solar UV exposure (as opposed to non-work-related exposure) as a causal factor for malignant melanoma.

In 2019 WorkSafe published estimates of deaths and hospitalisations from work-related ill health, and separate estimates of the overall burden of work-related harm, expressed as disability-adjusted life years lost (DALYs). This work used international estimates of harm from work-related exposures and applied these to New Zealand health data. The following estimates were made for work-related harm from solar radiation:

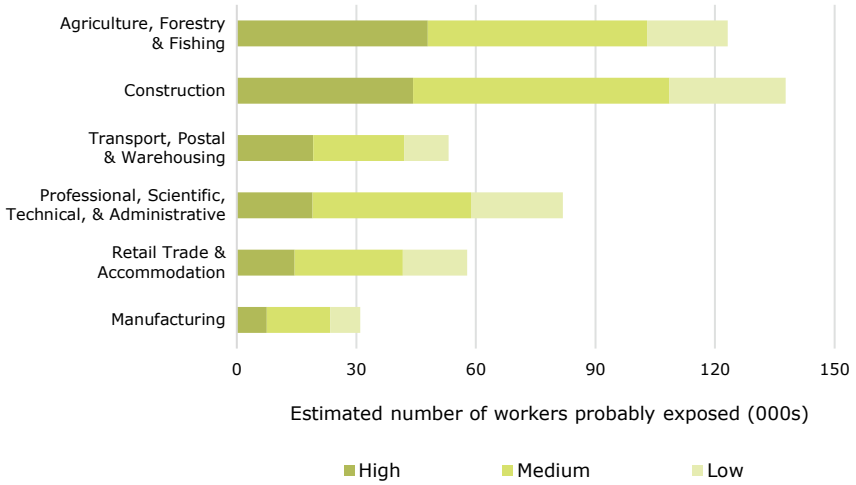
- 11 deaths from non-melanoma skin cancer were attributed to solar radiation, and 9 deaths from melanoma were included in an upper estimate of work-related deaths including risk factors with less certain evidence.
- Approximately 170 DALYs from non-melanoma skin cancer and 170 DALYs from melanoma were attributed to solar UV radiation.

EXPOSURE TO SOLAR RADIATION

Applying the result of the New Zealand Carcinogens Survey (NZSC) to 2021 workforce numbers, approximately 670,000-750,000 workers are probably exposed to solar radiation and approximately 190,000 have probable high exposure. Exposure is evaluated based on the time spent working outdoors (those working more than four hours per day outdoors are considered to have medium or high exposure) and the controls used. Of those that reported working more than four hours per day outdoors in the NZSC, 79.1% wore clothing covering most of the body, 65.1%

wore a hat, 47.3% wore sunscreen at least half the time, but only 5.8% had shade at least half the time.

Figure 39: Exposure to solar radiation by industry



Sources: New Zealand Carcinogens Survey 2021; Stats NZ HLFS data; WorkSafe calculations.

Figure 39 shows that around half of the workers estimated to have high exposure to solar radiation worked in the agriculture, forestry & fishing industry or the construction industry. This is consistent with the Massey workforce surveys, which found that 83% of workers in agriculture and 71% of workers in construction reported working outside, compared to a survey average of 36%. The 2021 WSIP survey did not ask workers about working outside or exposure to solar radiation.

Thermal environment

Working in extremely hot, cold, or damp conditions can have a range of effects on health. Thermal extremes can result in discomfort, illness, and even death, from dehydration, heat exhaustion, heat stroke, frostbite, or hypothermia. Ongoing exposure can increase the risk of chronic ill health or exacerbate underlying conditions. There is evidence that exposure to cold working conditions increases the risk of musculoskeletal disorders. Hot working conditions are associated with an increased risk of workplace injuries, and there is evidence that heat can trigger underlying cardiovascular disease.

Two large-scale worker surveys of the New Zealand workforce and Māori workforce were carried out by Massey University in 2004-06 and 2009-10 respectively, with a total of 5,110 participants.[50] WorkSafe's WSIP workers survey, undertaken in 2021 (3,627 participants), asked workers questions about exposures that were based on the wording and classifications used in the Massey research. **Table 32** compares the results from these surveys.

A higher proportion of workers reported being exposed to cold or damp working conditions at least 25% of the time in the WSIP survey than the Massey surveys (43% and 31%, respectively), while the proportions reporting exposure to hot conditions were similar across the surveys (41% in the WSIP survey and 36% in the Massey surveys). Difference in seasonal timing of the surveys and slight differences in question wording could have contribute to the differences in results.[51] In the WSIP survey, 7% of workers said they worked in hot conditions at least three quarters of the time, and the same proportion said they worked in cold or damp conditions at least three quarters of the time.

[50] See Eng et al., 2018.

[51] The WSIP survey asked about the frequency of "working in high temperatures which make you sweat even when not working", compared to "working in an (unpleasant) hot / warm environment" in the Massey surveys. The WSIP asked about the frequency of "working in cold, wet or damp conditions whether indoors or outdoors", compared to "working in cold / damp environment" in the Massey surveys.

Table 32: Exposure to hold or cold working conditions by industry

	Hot conditions		Cold conditions	
	Massey	**WSIP**	**Massey**	**WSIP**
All industries	**36%**	**41%**	**31%**	**43%**
Agriculture	54%	66%↑	58%	84%↑
Manufacturing	38%	46%	41%	49%↑
Construction	56%	63%↑	54%	73%↑
Transport, Postal & Warehousing	45%	47%↑	48%	64%↑
Health Care & Social Assistance	31%	33%↓	16%	26%↓

Sources: WSIP workers survey 2021; Eng et al., 2018.
Note: [1] Pooled results from the New Zealand Worker Survey (2004-06) and New Zealand Māori Worker Survey (2009-10).
[2] Agriculture includes the forestry sub-industry in the Massey survey but not in the WSIP survey.
↑ Significantly above average for all industries ↓Significantly below average for all industries (at 95% confidence level).

The data shows that workers in the agriculture, construction, manufacturing, and transport, postal & warehousing industries were more likely to report working in both hot and cold conditions. Workers in construction were more than twice as likely to report working in cold conditions at least three quarters of the time as the survey average (14% and 7%, respectively).

Table 33 shows that in the WSIP survey male workers were more likely than female workers to report working in both hot and cold conditions. No clear associations between age group and exposure to thermal extremes were identified.

Table 33: Exposure to hot or cold working conditions, by gender and age

	Hot conditions	Cold conditions
All workers	**41%**	**43%**
Male	47%↑	54%↑
Female	33%↓	31%↓
18 - 29	46%	46%
30 - 39	40%	43%
40 - 49	38%	42%
50 - 59	41%	43%
60 and over	35%	40%

Source: WSIP workers survey 2021.
Note: ↑ Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Table 34 shows an association between lower socioeconomic status and exposure to hot or cold conditions. Workers in the two lowest socioeconomic groups were more than twice as likely to report working in both hot and cold conditions as those in the two highest groups. Pacific workers were more than twice as likely as the survey average to report working in cold, wet, or damp conditions at least three quarters of the time (17% and 7%, respectively).

Table 34: Exposure to hot or cold working conditions, by ethnicity and socioeconomic status (SES)

	Hot conditions	Cold conditions
All workers	**41%**	**43%**
Māori	44%	43%
Pacific	43%	51%
NZ European	42%	44%
Asian	34%↓	40%
Other	37%	39%
Level 1 (High SES)	31%↓	29%↓
Level 2	23%↓	26%↓
Level 3	31%↓	35%↓
Level 4	44%	50%↑
Level 5	59%↑	57%↑
Level 6 (Low SES)	69%↑	67%↑

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Discussion of work organisation and environment

The organisation of work and the environment in which it occurs can have an important influence on health and safety. At least 10% of the burden of work-related harm in New Zealand has been attributed to noise, shift work and solar radiation. Working long hours has been identified by international bodies as making a major contribution to the overall burden of work-related harm, although this has not been validated for New Zealand. Organisational and environmental factors increase the risk of long-term conditions including cancer, cardiovascular disease, and hearing loss. They can also interact with biomechanical and psychosocial factors to increase the risk of musculoskeletal conditions, mental ill health, and workplace accidents.

Survey data shows that at least a third of all workers are exposed to loud noise and/or uncomfortable temperatures at least a quarter of the time, while around one worker in ten experiences these conditions at least three quarters of the time. Approximately one worker in ten regularly works at night and a similar proportion works more than 50 hours per week.

Workers in the 'high-risk' industries of agriculture, manufacturing, construction, and transport, postal & warehousing are significantly more likely to be exposed to night shift work, long working hours, noisy conditions, and temperature extremes. The combination of night shift work and long working hours in the transport, postal & warehousing industry is notable given the safety risks for this industry highlighted in previous sections. This is a reminder that work-related health and safety are not separate but are strongly interlinked.

Survey data suggests that workers with existing disadvantage are more likely to face unpleasant working environments. Compared to the average worker, workers of lower socioeconomic status were more likely to experience noisy, hot, or cold working conditions and to work at night. Across the Massey and WSIP surveys, Māori and Pacific workers were more likely to be exposed to night shift work and loud noise, while in the WSIP survey Pacific workers were twice as likely to report working in noisy or cold conditions at least three quarters of the time.

Risks relating to environmental conditions or the need to work at night often cannot be eliminated, but there are evidence-based methods to control these risks. Appropriate controls depend on the context of work and the needs of workers. Case studies in New Zealand offer examples of how risks can be successfully managed through business leadership and worker participation.

Data on working hours and shift work can be collected more easily and reliably than for some other exposures, allowing changes in exposure to these risks to be tracked over time. Further analysis of existing data can identify the proportion of workers that have multiple exposures to organisational and environmental risk factors, as well as to biomechanical and safety risks.

6.0
Psychosocial risks

PSYCHOSOCIAL RISKS

Psychosocial factors refer to aspects of work design, social relationships, and behaviours at work that affect workers' health. They can be positive (referred to as protective factors) or negative (referred to as risk factors). Specific psychosocial factors include:

- The demands that workers face in their job, such as workload, work pace, and emotionally challenging work.
- The amount of control that workers have over their work, including their ability to use discretion and make appropriate use of their skills.
- Interpersonal relationships, including with colleagues, supervisors, clients, and customers.
- People's overall relationship to work, including job security and ability to maintain a work-life balance.
- Trust and fairness within an organisation, sometimes referred to as social capital.

There is substantial evidence supporting the associations between work-related psychosocial risk factors and psychological harm, including high stress, burnout, and relationship difficulties, as well as common mental health disorders such as depression and anxiety. There is also evidence that psychosocial risk factors contribute to risks of acute injury, musculoskeletal disorders, and cardiovascular disease.[52] On the other hand, factors such as social support from colleagues and supervisors and doing meaningful work can protect against risks and may enhance wellbeing.

Researchers have developed models to explore the relationship between psychosocial factors and health risks. These include:

- The job strain model, which evaluates the interaction between the psychological demands that workers face and the amount of control they have over their work.
- The effort-reward imbalance model, which evaluates the relationship between the amount of effort a worker puts in, and the recognition, rewards, and security they receive.
- A combination of high demands and low control (job strain), or an imbalance between effort and rewards (effort-reward imbalance), have been associated with increased risk of mental and physical ill health.
- Psychosocial risks also include one-off or repeated patterns of offensive behaviour in the workplace such as bullying, sexual harassment, and threats of violence. These behaviours can cause immediate distress and are associated with increased risks of ill health.

Burden of harm from psychosocial risks

In 2019, WorkSafe developed estimates of the overall burden of work-related harm, expressed as disability-adjusted life years lost (DALYs). This work used international estimates of harm from work-related factors and applied these to New Zealand. This resulted in the following estimates:

- An estimated 6,300 DALYs from depression and anxiety in 2017 were attributed to work-related psychosocial factors.
- An estimated 3,200 DALYs from cardiovascular disease in 2017 were attributed to work-related factors, about half of which were attributed to psychosocial factors.
- An estimated 2,200 DALYs from alcohol and drug misuse in 2017 were attributed to work-related psychosocial factors.

[52] See Niedhammer et al. (2022) for the estimation of the burden of mental and cardiovascular ill health that can be attributed to work-related psychosocial factors in Europe.

It is likely that this underestimates the negative impact of work-related psychosocial factors on mental health as it only considered clinical disorders (i.e., diagnosed depression or anxiety), and excluded other psychological harm such as stress, burnout, trauma, and relationship difficulties. In addition, most other work-related harm is likely to include a psychological component. For example, a worker with a significant musculoskeletal injury may experience psychological distress, or even a diagnosable mental disorder such as depression or anxiety.

International research indicates that mental health problems are the leading cause of long-term sickness absence from work worldwide, and that the average length of time away from work is greater following mental health harm than physical harm.[53]

Work-related fatalities reported by WorkSafe specifically exclude deaths from self-harm, given the difficulty in determining their work-relatedness. However, there is growing international evidence of an association between work-related psychosocial factors and risk of self-harm. In addition, coronial and regulatory investigations in several countries have identified workplace factors as the primary cause of some suicide deaths. WorkSafe recently reviewed closed coronial files for 1,689 confirmed suicide deaths between 2017 and 2021. Work-related factors were identified as contributing to the circumstances of the suicide in 11.7% of cases and as being the predominant factor in 1% of cases.[54] This is consistent with international estimates.

New Zealand Psychosocial Survey

The New Zealand Psychosocial Survey (NZPS) 2021 was conducted from January to June 2021. It surveyed a total of 3,612 workers who were employed or were working without pay in a family business. Respondents were sourced from online research panels, supplemented by a variety of other methods to increase the diversity of the survey sample. Full details are provided in WorkSafe's report on the NZPS.[55]

To evaluate the psychosocial working environment in New Zealand, WorkSafe selected the Copenhagen Psychosocial Questionnaire (COPSOQ), a widely used psychosocial risk assessment and organisational development instrument developed by the Danish National Research Centre for the Working Environment. COPSOQ has been recognised by the European Union (EU) Occupational Safety and Health Agency, the World Health Organization, and the International Labour Organization, and it has been validated in 21 countries worldwide.

The COPSOQ largely consists of questions on a five-point scale. Respondents state how frequently or to what extent they experience specific conditions at work. Questions with a similar focus are grouped together and their results combined. These grouped questions represent psychosocial factors. The factors are in turn organised into thematic groups called *domains*.

In total, the NZPS included 74 questions covering 31 factors across the following seven domains:

- Demands at work
- Work organisation and job content
- Interpersonal relations and leadership
- Work-individual interface
- Social capital
- Offensive behaviours
- Health

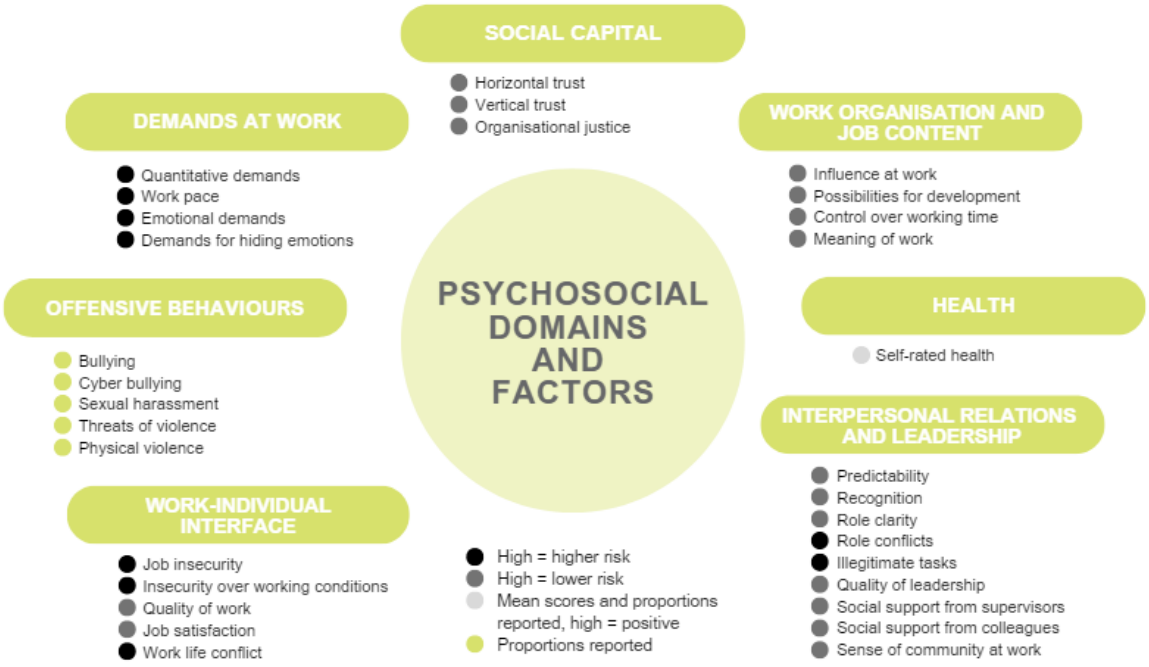
The psychosocial factors under each domain are illustrated in **Figure 40**. Further details on each factor can be found in **Appendix 6.**

[53] See for example, Harvey et al., 2017; Petrie et al., 2018.

[54] See Work-related suicide: Examining the role of work factors in suicide | WorkSafe.

[55] See New Zealand Psychosocial Survey | WorkSafe.

Figure 40: Overview of psychosocial domains and factors, NZPS 2021



Source: New Zealand Psychosocial Survey 2021.

The following sections provide a brief overview of NZPS results related to the psychosocial working environment. Results are presented as an average score for each psychosocial factor. **Table 35** shows how scores reflect the frequency or extent that working conditions are experienced. For some factors, a higher score represents greater risk (e.g., role conflict or quantitative demands). For other factors, a higher score represents lower risk (e.g., social support from colleagues or role clarity). Charts in the following sections are colour coded to show whether higher scores represent higher or lower risk.

Table 35: Interpretation of scores in the NZPS

Score	Frequency	Extent
100	Always	To a very large extent
75	Often	To a large extent
50	Sometimes	Somewhat
25	Seldom	To a small extent
0	Never / hardly ever	To a very small extent / not at all

Note: For job satisfaction, the scores are very satisfied (100), Satisfied (75), Neither/Nor (50), Unsatisfied (25), Very unsatisfied (0).

In the NZPS, most differences in average score between population groups and industries were small. This suggests that an important part of the variation in psychosocial working conditions is between, or even within, individual organisations. However, some differences between groups are worth commenting on, especially where they form a consistent pattern.[56]

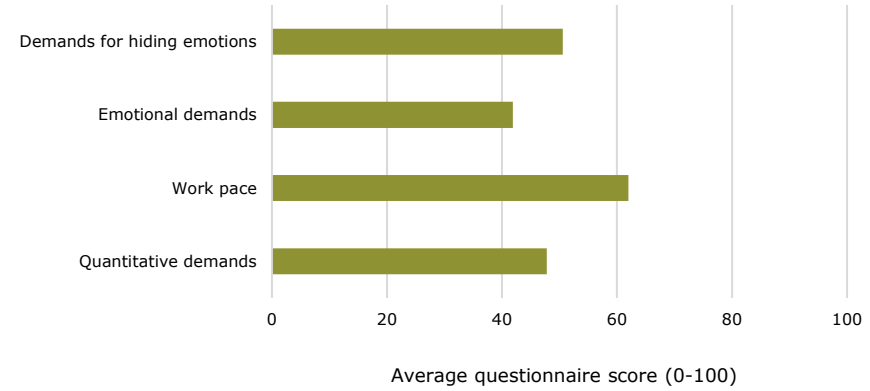
[56] The NZPS was conducted during the COVID-19 pandemic, which might have had an influence on responses for industries more affected by the pandemic, such as health and education.

DEMANDS AT WORK

Work demands form one part of the job strain model of psychosocial risk. When high demands are combined with low decision latitude and ability to use skills, this is theorized to result in high job strain, which is associated with a higher risk of mental and physical ill health. Work demands are also a key risk factor in the effort-reward imbalance model.

The NZPS measured four factors relating to work demands. **Figure 41** shows that work pace (working at very high speed or working quickly throughout the day) was the most commonly experienced risk factor, with an average score of 62 out of 100. Other scores were 50.6 for demands for hiding emotions, 47.8 for quantitative demands (volume of work), and 41.9 for emotional demands.

Figure 41: Average scores for psychosocial factors related to demands at work



Source: New Zealand Psychosocial Survey 2021. Higher score = higher risk for these factors.

Compared to the survey average, workers in the public administration & safety, education & training, and health care & social assistance industries reported higher emotional demands and demands for hiding emotions. Those in education & training also reported higher quantitative demands. Workers in the accommodation & food services industry had higher than average work pace and demands for hiding emotions.

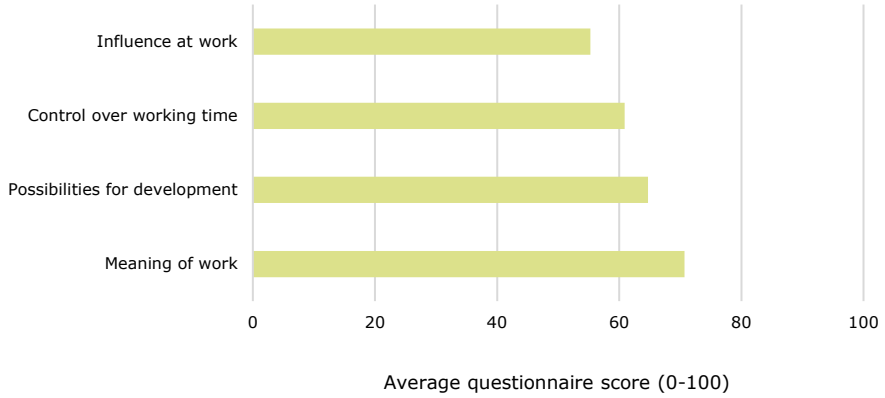
On average, emotional demands and demands for hiding emotions were higher for females, while male workers reported higher quantitative demands. Workers aged over 60 had lower exposure to work pace, emotional demands, and demands for hiding emotions.

WORK ORGANISATION AND JOB CONTENT

The NZPS measured four factors relating to job control and professional development. Low job control forms one part of the job strain model of psychosocial risk and has been independently associated with increased risk of mental and physical ill health.

Higher scores for these factors imply lower risk. **Figure 42** shows that the highest-scoring factor was the meaning of work (70.7) and the lowest was influence at work (55.3). Influence at work relates to worker control over the type and amount of work they do and how it is done.

Figure 42: Average scores for psychosocial factors related to work organisation and job content



Source: New Zealand Psychosocial Survey 2021. Higher score = lower risk for these factors.

On average, workers in retail trade had lower scores across all four factors, while workers in the transport, postal & warehousing and the accommodation & food services industries scored lower on three out of four factors. The previous section shows that workers in accommodation & food services faced higher than average work pace and demands for hiding emotions, suggesting that workers in these industries may be at higher risk according to the job strain model.

Workers in the education & training and health care & social assistance industries scored above average for meaning of work and possibilities for development but below average on control over working time. Workers in education & training scored almost 20 points below the average. The previous section shows that workers in these industries also had higher emotional demands and demands for hiding emotions than the survey average.

Differences between male and female workers were small for all four factors. Pacific workers had lower than average scores for control over working time but higher for meaning of work. Migrant workers who had been in New Zealand for fewer than five years had significantly lower scores on all four factors compared to the survey average or migrant workers who had been in New Zealand for more than five years.

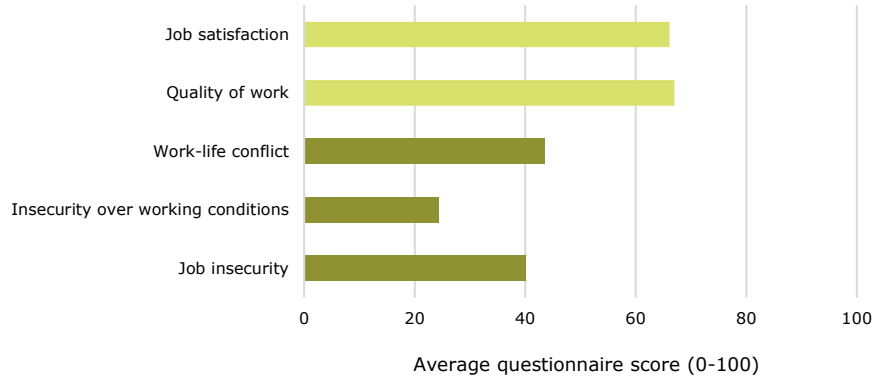
WORK-INDIVIDUAL INTERFACE

This domain covers the relationship of a person with their work, including security of employment, security of conditions, and overall job satisfaction. Job insecurity is part of the effort-rewards imbalance model and has been independently associated with increased risk of ill health.

The most prevalent risk factor within this domain was work-life conflict with an average score of 43.5, followed by job insecurity with an average score of 40. For comparison, a score of 50 corresponds to a response of 'somewhat' to questions about the extent that workers experience job insecurity or work-life conflict. Insecurity over working conditions was experienced to a lesser extent, with an average score of 24. This refers to concerns about involuntary transfer to another job, changes in timetable, or negative changes to salary or wages.

Average scores for quality of work and job satisfaction were 67 and 66 respectively. For comparison, a score of 75 corresponds to a response of 'satisfied' to questions about job satisfaction. The same score corresponds to satisfaction 'to a large extent' with the quality of work done at the respondent's workplace.

Figure 43: Average scores for psychosocial factors related to work-individual interface



Source: New Zealand Psychosocial Survey 2021.
Lighter bars: higher score = lower risk. Darker bars: higher score = higher risk.

Workers in retail trade reported higher job insecurity, higher insecurity of working conditions, and lower job satisfaction than the survey average. Workers in accommodation & food services had a higher level of work-life conflict and scored lower for quality of work and job satisfaction. By contrast, workers in education & training had higher job security and security of working conditions and reported higher job satisfaction.

Pacific and Asian workers faced significantly greater job insecurity and insecurity over working conditions. Scores for these ethnic groups were 10 points higher for job insecurity and 15 points higher for insecurity of working conditions than for NZ European workers. Asian workers also had lower scores for quality of work and job satisfaction. Migrant workers also reported greater job insecurity and insecurity of working conditions compared to workers born in New Zealand. The differences were greater for those with fewer than five years in New Zealand, and these workers also had lower scores for quality of work and job satisfaction.

Workers aged over 60 had lower scores for work-life conflict, job insecurity and insecurity of working conditions, and higher scores for quality of work.

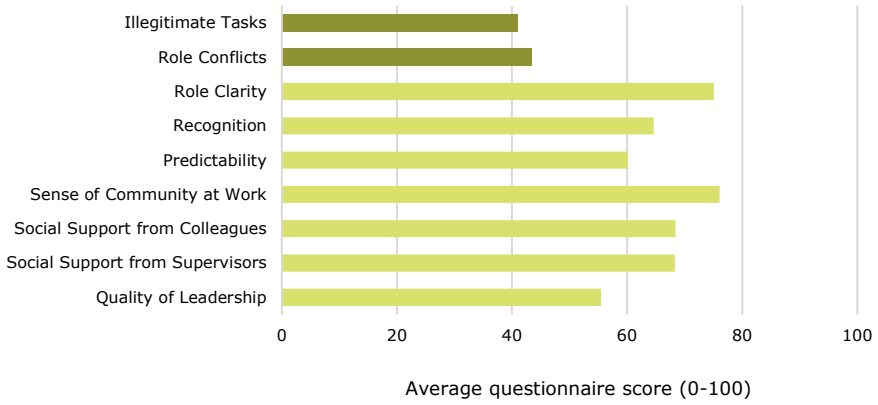
INTERPERSONAL RELATIONS AND LEADERSHIP

This domain covers social relationships in the workplace. The NZPS measured nine factors, which can be subdivided into two groups. Social support factors relate to the support a person experiences, including from their colleagues and supervisor, and their sense of belonging at work. Strong social support is theorized to mediate other risk factors such as high demands and low control. The other group of factors relates to social relations in day-to-day work, including whether tasks are predictable, coherent, and reasonable, and whether a person receives recognition for the work they do.

Overall, scores relating to social support were relatively high, especially for sense of community at work (average 76.4). However, the average score for quality of leadership was significantly lower (55.3) than the other factors. Leadership quality measures how good a person's immediate manager is at work planning, solving conflicts, and providing development opportunities.

Among the job and task-related factors, the highest-scoring positive factor was role clarity, with a score of 75.1, followed by recognition (64.6) and predictability (60.1). Scores for the negative factors were 43.4 for role conflicts (contradictory demands or things which should have been done differently) and 41 for illegitimate tasks (tasks that seem unnecessary and/or a threat to a worker's professional identity).

Figure 44: Average scores for psychosocial factors related to interpersonal relationships and leadership



Source: New Zealand Psychosocial Survey 2021.
Lighter bars: higher score = lower risk. Darker bars: higher score = higher risk.

Female workers consistently scored slightly higher than males on measures of social support and sense of community. Asian workers had consistently though not significantly lower scores in the same areas. Migrant workers with fewer than five years in New Zealand scored significantly lower on sense of community at work.

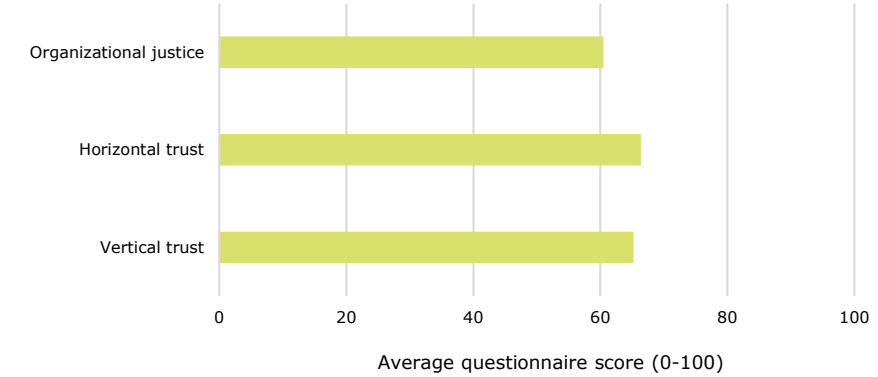
Māori workers, Pacific workers, and workers in construction scored higher than average for predictability, recognition, and quality of leadership. However, the same groups were more likely to report role conflicts and illegitimate tasks.

Other groups with greater likelihood of both role conflicts and illegitimate tasks included workers in retail trade, public administration & safety, information, media & telecommunications, male workers, Asian workers, younger workers (18-39), and migrant workers with fewer than five years in New Zealand. Workers in retail trade also scored lower for quality of leadership.

SOCIAL CAPITAL

This domain covers worker perceptions of the organisation where they work. The factors measured are vertical trust (the trust and communication between employees and management), horizontal trust (trust between employees) and organisational justice (whether work is distributed fairly, conflicts are resolved fairly, and employees are appreciated for good work). A high level of workplace social capital may enhance the ability for workers to deal with their job demands and contribute to sustaining psychological well-being.

Figure 45: Average scores for psychosocial factors related to social capital



Source: New Zealand Psychosocial Survey 2021. Higher score = lower risk for these factors.

Figure 45 shows that scores for these factors ranged from 60.5 to 66.4. Organisational justice scored somewhat lower than the other two factors.

Workers in the public administration & safety industry had lower than average scores on all three of the measures, while manufacturing workers recorded lower scores for vertical trust and horizontal trust. Scores were slightly higher for male than female workers across all three measures. There were no important differences by age, ethnicity, or migrant status.

EXPOSURE TO OFFENSIVE BEHAVIOURS

Exposure to offensive behaviours either through personal experience or witnessing the behaviour of others at work can lead to psychological distress and increased risk of longer-term ill health. The NZPS asked about the following offensive behaviours:

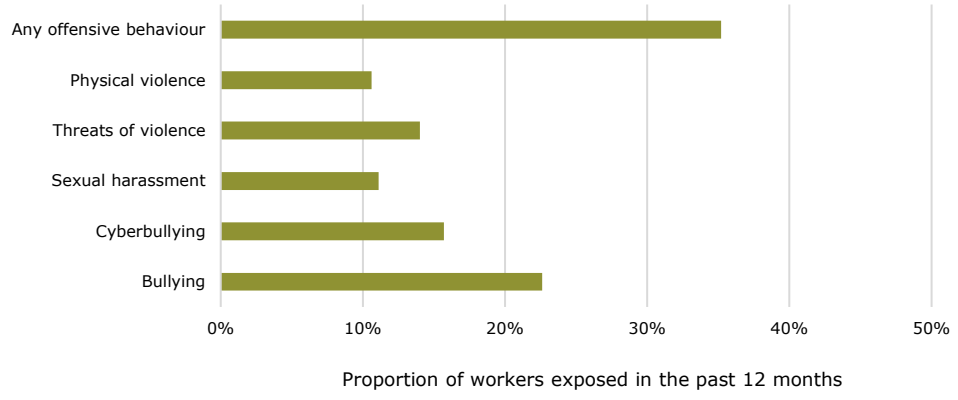
- Bullying, defined as the repeated exposure to unpleasant or degrading treatment, which a person finds it difficult to defend themself against.
- Cyberbullying, defined as the exposure to work-related harassment on social media, by e-mail or text messages.
- Sexual harassment, defined as undesired sexual attention in the workplace.
- Threats of violence in the workplace, including verbal abuse, intimidation, and threatening behaviours.
- Physical violence, referring to physical assault at work.

The NZPS found that over one third of workers surveyed (35.2%) reported being exposed to at least one offensive behaviour in the last 12 months. Bullying was the most common hostile act reported by workers (22.6%) followed by cyberbullying (15.7%), threats of violence (14%), sexual harassment (11.1%), and physical violence (10.6%).

Workers most often reported that their colleagues and managers were responsible for bullying and cyberbullying incidents while threats of violence and physical violence were most often committed by clients and customers. Workers were equally likely to report that customers, superiors, and colleagues were responsible for sexual harassment.

Of particular concern, 50% of those reporting bullying or cyberbullying, 30% of those experiencing sexual harassment, and 22% of those faced with threats of violence or physical violence said that their immediate manager was responsible for these behaviours.

Figure 46: Exposure to offensive behaviours



Source: New Zealand Psychosocial Survey 2021.

Additional analysis by WorkSafe found that workers who reported exposure to offensive behaviour had consistently higher scores for risk factors under other domains. Differences in scores were up to 20 points. The biggest differences varied according to the type of offensive behaviour but were consistently high for emotional demands, role conflicts, illegitimate tasks, job insecurity, insecurity over working conditions and work-life conflict.

The NZPS found that workers in health care & social assistance were more likely than average to be exposed to bullying, threats of violence and physical violence. Nearly half of all workers in health care & social assistance (45.1%) reported exposure to at least one offensive behaviour, compared to an all-industry average of 35.2%. Workers in public administration & safety also had higher exposure to threats of violence and physical violence. In total, 42.3% reported exposure to at least one offensive behaviour.

Workers in information, media & telecommunications reported higher exposure to all five offensive behaviours. The overall proportion of workers in this industry exposed to any offensive behaviour was not significantly higher than the average (37% vs 35.2%), which suggests that the same workers may have been exposed to multiple offensive behaviours. Workers in retail trade and accommodation & food services were more likely to report exposure to sexual harassment.

Male workers were more likely to report exposure to cyberbullying, threats of violence, and physical violence, but there were not significant gender differences in reported exposure to bullying and sexual harassment. Workers aged 18-29 were more likely to report exposure to cyberbullying, sexual harassment, threats of violence and physical violence, while workers over 60 were less likely to be exposed to all types of offensive behaviour.

Compared to the survey average, Māori workers were more likely to report exposure to all five offensive behaviours. Pacific workers were more likely to be exposed to cyberbullying and threats of violence, while Asian workers reported higher exposure to cyberbullying. Workers who had been in New Zealand fewer than five years were more likely to report offensive behaviours compared to those who had been here longer and compared to the survey average.

WorkSafe's 2021 Workforce Segmentation and Insights Programme (WSIP) workers survey also asked about exposure to sexual harassment and threats of violence using the same or similar questions as the NZPS. The overall prevalence of these behaviours was similar in the two surveys; however, there were some differences in breakdowns by group. Both surveys found that health care & social assistance workers had high exposure to threats of violence (29% in the WSIP and 30% in the NZPS). However, in the WSIP health care & social assistance workers had higher exposure to sexual harassment (15% and 10%, respectively) while in the NZPS health care & social assistance workers reported lower exposure (6.8% and 11.1%, respectively).

Table 36: Exposure to sexual harassment and threats of violence by gender and age

	Sexual harassment		Threats of violence	
	WSIP	**NZPS**	**WSIP**	**NZPS**
All workers	**10%**	**11%**	**14%**	**14%**
Male	8%↓	12%	14%	16%↑
Female	13%↑	10%	15%	12%↓
18 - 29	16%↑	20%↑	15%	19%
30 - 39	17%↑	12%	20%↑	15%
40 - 49	9%	10%	13%	14%
50 - 59	5%↓	4%↓	14%	11%
60 and over	1%↓	1%↓	8%↓	6%↓

Sources: New Zealand Psychosocial Survey2021; WSIP workers survey.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

The WSIP survey found that female workers had a significantly higher rate of exposure to sexual harassment than male workers, but this difference was not seen in the NZPS. Both the NZPS and the WSIP surveys found that younger workers were more likely to be exposed to threats of violence and sexual harassment, and workers over 60 were less likely to be exposed to these behaviours.

Table 37 shows that in both the NZPS and WSIP, Māori and Pacific workers were more likely to be exposed to threats of violence. Additional analysis of NZPS results found that after controlling for occupation, education, income, age, and gender, Māori workers were 1.4 to 1.7 times more likely

to be exposed to threats of violence and physical violence. Asian workers were more likely to report exposure to sexual harassment and threats of violence in the WSIP but not in the NZPS. Māori workers were more likely to report exposure to sexual harassment in the NZPS but not in the WSIP.

Table 37: Exposure to sexual harassment and threats of violence by ethnicity and socioeconomic status

	Sexual harassment		Threats of violence	
	WSIP	**NZPS**	**WSIP**	**NZPS**
All workers	**10%**	**11%**	**14%**	**14%**
Māori	8%	15%á	20%↑	20%↑
Pacific	11%	13%	18%	18%↑
NZ European	10%	11%	13%	14%
Asian	16%↑	12%	20%↑	11%
Other	6%	5%↓	10%	
Level 1 (High SES)	7%		24%↑	
Level 2	10%		9%↓	
Level 3	11%		12%	
Level 4	9%		13%	
Level 5	11%		17%	
Level 6 (Low SES)	9%		12%	

Sources: New Zealand Psychosocial Survey2021; WSIP workers survey.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

These differences may reflect variations in the makeup of survey samples by gender, age, ethnicity, industry, and occupation.[57] They highlight the different patterns of exposure to psychosocial risks. Whereas exposure to other risks is primarily determined by the nature of the work being done, psychosocial risks may involve interactions between job tasks, organisational context, environmental or social factors, and the specific vulnerabilities of workers.

Self-reported mental ill health

Workers' own perception of whether work is affecting their health is a valid way of assessing the effects of exposures, especially where the worsening or easing of symptoms can be related to their working conditions. Some information on self-reported mental ill health is available through WorkSafe's WSIP workers survey. The survey questionnaire asks workers if during the previous 12 months they have experienced any mental health problem, which they think has been caused or made worse by work. They are then asked whether the problem first began in the past 12 months (a measure of incidence) or at any stage in their working life (a measure of prevalence).

Table 38 shows that in the WSIP survey, 11% of all workers reported a work-related mental health problem that began in the past 12 months. Workers in agriculture and construction were less likely to report a new mental health problem related to work. Nearly one in three workers (30%) reported a work-related mental health problem that began at any stage in their working life. Prevalence was higher than average for workers in health care & social assistance and lower for workers in agriculture, construction, and transport, postal & warehousing.

[57] While survey results are weighted to match overall population distributions of age, gender, ethnicity and industry, there are limits to how much this can correct for imbalances in survey samples.

Table 38: Self-reported work-related mental ill health by industry

	Began in past 12 months (incidence)	Began at any stage in working life (prevalence)
All industries	**11%**	**30%**
Agriculture	5%↓	20%↓
Manufacturing	9%	26%
Construction	7%↓	23%↓
Transport, Postal & Warehousing	11%	25%↓
Healthcare & Social Assistance	14%	43%↑
Other	13%	31%

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all industries ↓Significantly below average for all industries (at 95% confidence level).

Table 39 shows that both incidence and prevalence of self-reported mental health problems were higher for female than for male workers. Both incidence and prevalence were significantly above the survey average for the 40-49 age group and lower for workers aged 60 and over. There is some suggestion of an 'inverted U' in the survey results, with the likelihood of mental health problems increasing until middle age, then decreasing.

Table 39: Self-reported work-related mental ill health by gender and age

	Began in past 12 months (incidence)	Began at any stage in working life (prevalence)
All workers	11%	30%
Male	9%↓	23%↓
Female	14%↑	38%↑
18 - 29	12%	30%
30 - 39	14%	33%
40 - 49	15%↑	36%↑
50 - 59	10%	28%
60 and over	5%↓	20%↓

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Table 40 shows that there were no significant differences by ethnicity or socioeconomic status in self-reported mental ill health that started in the past 12 months. However, workers in the highest socioeconomic group were more likely than average to report a work-related mental health problem that started at any stage in their lives, and more than twice as likely as workers in the lowest socioeconomic group.

This may be partly explained by the high proportion of the Level 1 socioeconomic group in the survey sample who were health care & social assistance workers. Workers in this industry reported higher exposure to psychosocial risks in both the NZPS and the WSIP surveys. The lower prevalence of self-reported mental ill health in the lowest socioeconomic group is interesting, given that this group reports higher exposures to other work-related risks, including noise, musculoskeletal risks, airborne risks, and safety risks, and is more likely to report work-related injury, musculoskeletal harm, and hearing loss.

Table 40: Self-reported work-related mental ill health by ethnicity and socioeconomic status (SES)

	Began in past 12 months (incidence)	Began at any stage in working life (prevalence)
All workers	11%	30%
Māori	12%	34%
Pacific	14%	36%
NZ European	11%	31%
Asian	12%	25%
Other	11%	30%
Level 1 (High SES)	13%	42%↑
Level 2	12%	34%
Level 3	12%	28%
Level 4	13%	28%
Level 5	10%	29%
Level 6 (Low SES)	6%	18%↓

Source: WSIP workers survey 2021.
Note: ↑Significantly above average for all workers ↓Significantly below average for all workers (at 95% confidence level).

Deep-dive surveys

To follow up on the NZPS and explore links between organisational culture, risk exposure, and worker wellbeing, WorkSafe has conducted several deep-dive surveys within industries identified as higher risk. The first of these surveys was conducted in 2022 in the healthcare industry.

The survey included a representative sample of 1,067 healthcare workers. Participants in this survey completed three questionnaires:

- The COPSOQ-III questionnaire, as used in the NZPS.
- The World Health Organisation Wellbeing Five-item Index (WHO-5) which is a widely used measure of psychological wellbeing.
- The twelve-item version of the Psychosocial Safety Climate (PSC) measure (PSC-12). This examines worker perceptions of senior management commitment to worker health and safety. A growing body of research suggests that when the psychosocial safety climate of an organisation is good, workers are exposed to fewer psychosocial risks and are harmed less frequently.

Survey results showed a clear association between worker wellbeing, as measured by the WHO-5, and exposure to a range of psychosocial risks, as measured by the COPSOQ questionnaire. The healthcare deep-dive found that the most common risk exposures were high work pace, emotional demands, and high workload. However, work-life conflict, low job satisfaction, and perceived poor organisational justice were rated as being more harmful based on their stronger association with lower psychological wellbeing.

The results also showed a clear association between worker wellbeing and the psychosocial safety climate (PSC) of their workplace. This supports the idea that PSC may be useful as a lead indicator of psychosocial risk exposure. The PSC score was also highly correlated with exposure to offensive behaviours.

Discussion of psychosocial risks

Analysis of psychosocial risks has evolved from a focus on single issues such as stress or bullying, to a deeper understanding of how social relationships and demands at work interact to affect workers' health. Most attention has focused on the longer-term effects of psychosocial risks; however, recent research on work-related suicide suggests they can also result in serious acute harm.

The NZPS offers insights into the psychosocial working environment in Aotearoa. High working pace, high workload, and widespread exposure to offensive behaviours are among the most common risk factors, while social support from colleagues and supervisors, sense of community at work, and meaningful work are the most common positive factors.

The NZPS found that psychosocial risks were widespread across different industries and occupations, but some groups of workers had higher exposure to risk. On average, workers in retail trade and accommodation & food services reported lower job control and fewer opportunities for development compared to other workers, while facing high psychological demands, job insecurity, conflicting or unnecessary tasks, and higher exposure to behaviours such as sexual harassment.

Workers in health care & social assistance and faced high psychological demands, low control over working time, and high exposure to offensive behaviours. Workers in public administration & safety reported higher exposure to offensive behaviours and had worse than average scores for a range of psychosocial factors.

Workers in manufacturing and transport, postal & warehousing did not have consistent pattern of higher exposure to psychosocial risks but had lower scores on factors related to job control. Previous sections show that workers in these industries may also be exposed to long working hours, shift work, noise, and biomechanical demands, which can interact with psychosocial factors to increase the risk of musculoskeletal and cardiovascular harm as well as mental ill health. These interactions may also increase injury risk.

The NZPS found that Māori and Pacific workers had higher exposure to offensive behaviours and some risk factors including job insecurity. However, they also reported higher than average scores for a range of positive factors including social support and meaning of work. Asian workers had higher exposure to job insecurity and some offensive behaviours.

Overall, the group with the most consistent exposure to higher risk was migrant workers who arrived in New Zealand fewer than five years ago. These workers scored below the survey average on 12 out of 25 factors spanning job control, interpersonal relationships, insecurity, job satisfaction and work-life conflict. They were also more likely to be exposed to all five offensive behaviours.

These results suggest at least three types of factors influence the psychosocial working environment. First, the nature of the work itself and the pressures it generates, including from a changing external environment. Second, the culture, policies, and relationships within organisations. Third, the characteristics and vulnerabilities of workers, including structural disadvantages that may be related to gender, age, ethnicity, socioeconomic status, or migrant status.

It may not be possible for businesses and organisations to control all these factors; however, they can take action to control psychosocial risks at an organisation level through evidence-based approaches that are fair, inclusive, and incorporate worker participation alongside management commitment.

Work has not yet been undertaken to assess the scale and distribution of psychosocial risks in New Zealand using models such as job strain or effort-reward imbalance. This would be possible using data collected through the NZPS. Relatively high average scores for work demands, combined with moderate average scores for job control and job security, suggest there is likely to be a significant number of workers at risk according to these models.

Appendices

IN THIS SECTION:

APPENDIX 1: DATA SOURCES

This report uses injury data from WorkSafe, the Accident Compensation Corporation (ACC), and Stats NZ, and draws from four major population-based surveys: the New Zealand Carcinogens Survey; the New Zealand Psychosocial Survey; the Workforce Segmentation and Insights Programme (WSIP) worker survey (all conducted in 2021); and the combined results of Massey University's New Zealand Workforce Survey and Māori New Zealand Workforce Survey (conducted in 2004-06 and 2009-10 respectively).

Brief descriptions of these data sources are given below, including an explanation of how they have been used in the document.

ACC claims

ACC is New Zealand's no-fault personal injury scheme and covers all injuries that happen in New Zealand. ACC's claims management system contains detailed claims data on all injury events that are lodged, including descriptions of the injured person's accident and information about the person at the time of accident such as age, gender, occupation, and employer.

ACC injury claims are determined to be work-related when a person can be identified as being at work or undertaking employment-related activities at the time the injury occurs, or when the injury scene is recorded as 'farm' and the injured person has an agricultural occupation (not involved in a sport or recreational activity).[58]

ACC work-related injury claims data is an input into WorkSafe and Stats NZ injury data, discussed further below.

WorkSafe data

The Health and Safety at Work Act 2015 requires certain events to be notified to WorkSafe New Zealand. These include any death arising from work, or any notifiable injury, illness, or notifiable incident as defined in the Act. Deaths notified to WorkSafe are recorded and reviewed by WorkSafe's Fatality Committee to assess whether they arose from work. WorkSafe supplies data from fatality notifications to Stats NZ for its official injury data series (discussed below).

WorkSafe also receives monthly extracts of ACC work-related claims data and undertakes transformation of this data. This includes coding injury mechanism using the Type of Occurrence Classification System (TOOCS, see **Appendix 3**: Fatalities by injury mechanism and **Appendix 4**: ACC claims by injury mechanism for more information).

WorkSafe combines fatality notifications with ACC fatal claims data to produce an overall data set of work-related fatalities which is published in its online Data Centre.

This report uses WorkSafe's injury data for detailed analyses of fatalities and injuries that incorporate information on injury mechanism.

Stats NZ serious injury outcome indicators

In its legislated role as New Zealand's Injury Information Manager, Stats NZ publishes annual data on serious injury outcome indicators (SIOI), including work-related fatal and serious non-fatal injuries. The data series in the SIOI date back to 2002.

[58] Claims in ACC's Motor Vehicle Account and Earners' Account are included if any one of the criteria above are met.

To produce data on work-related fatalities, Stats NZ combines WorkSafe fatality notifications with ACC work-related fatal claims. To produce data on work-related serious non-fatal injuries, Stats NZ matches work-related ACC claims against Ministry of Health hospitalisation records.[59]

Rates of work-related injury are calculated in relation to the estimated number of full-time equivalent employees (FTEs), drawn from the Stats NZ's Household Labour Force Survey (HLFS). Stats NZ age-standardises all fatal and serious non-fatal injury rates in the SIOI against a baseline or reference year population.

Alongside the SIOI, Stats NZ publishes data on the number and rate of ACC claims with more than a week away from work (also known as WAFW claims).[60] Separately, Stats NZ also publishes data on the number and rate of all work-related ACC injury claims, including claims relating to gradual process injuries such as noise-induced hearing loss. Claim rates are not age standardised.

This report uses Stats NZ data for overall numbers and rates of work-related fatality and injury claims dating back to 2002. Stats NZ is the source of all information on serious non-fatal injuries. Serious non-fatal injuries are the only injuries that can be broken down by ethnicity, because claims are matched against Ministry of Health hospitalisation data, which includes complete ethnicity information.

There may be small discrepancies between WorkSafe data and Stats NZ data on fatalities and injury claims; however, this does not affect the overall trends and patterns discussed in the document.

New Zealand Carcinogens Survey

The first New Zealand Carcinogens Survey (NZCS) was undertaken between June and September 2021. The NZCS assessed worker exposure to carcinogens using the OccIDEAS methodology developed in Australia. OccIDEAS ask workers questions about the tasks they do at work, based on structured job- and task-specific modules. Algorithms based on expert knowledge are then applied to worker responses, to assess their probable exposure to different carcinogenic agents.

For the NZCS 2021, two surveys were undertaken. A 'main survey' sampled 3,089 workers from occupations likely to be exposed to carcinogens, and a 'control survey' randomly sampled 962 workers from all occupations. Further details are provided in the section on carcinogens and airborne risks.

New Zealand Psychosocial Survey

The New Zealand Psychosocial Survey 2021 (NZPS) was conducted from January to June 2021 using the Copenhagen Psychosocial Questionnaire (COPSOQ), a widely used international psychosocial risk assessment instrument. Developed by the Danish National Research Centre for the Working Environment, COPSOQ is designed for workplace psychosocial risk assessment and organisational development in a broad range of areas. The COPSOQ largely consists of questions on a five-point scale. Respondents state how frequently or to what extent they experience a specific condition at work. The NZPS 2021 surveyed a total of 3,612 workers. Further details are provided in the section on psychosocial risks.

[59] Serious non-fatal injuries are defined as injury events in which an injured patient admitted to hospital is determined to have a probability of death of at least 6.9%, based on diagnostic codes. For a brief explanation, see: Probability of Admission: Empirical Validation of the NZIPS Serious Non-Fatal Injury Indicators – Injury Prevention Research Unit, University of Otago, New Zealand.

[60] See: Work-related injury targets at a glance: 2008–2021 | Stats NZ.

Workforce Segmentation and Insights Programme (WSIP) Survey

WorkSafe's Workforce Segmentation and Insights Programme Survey, commonly referred to as the WSIP survey, is a biennial survey of workers and employers covering a range of topics relating to work health and safety. The WSIP survey was first undertaken in 2019 and was repeated in 2021. For the 2021 survey, questions some questions about exposure to align more closely with Massey University's New Zealand Workforce Exposure Survey and Māori Workforce Exposure Survey, conducted in 2004-06 and 2009-10 respectively.

The WSIP 2021 survey was undertaken from June to August 2021. The worker survey involved 3,627 workers drawn from the General Electoral Roll and Māori Electoral Roll. Workers were contacted through a range of online, telephone, mail-out, and face-to-face methods.

This report uses the WSIP worker survey as a source of information on exposures and working conditions reported by workers, and on work-related ill health reported by workers. In several sections, results from the WSIP worker survey are provided alongside those from other surveys. This helps corroborate findings and identify where results differ because of survey sampling or for some other reason.

The WSIP survey is the only data source in the system performance story where a breakdown by socioeconomic status (SES) is readily available. Socioeconomic status is calculated based on information about occupation, income and education level provided by survey participants.[61] This is distinct from New Zealand deprivation index, which is based on place of residence and calculated from Census information.

Massey University worker exposure surveys

Massey University's Centre for Research on Hauora and Health (CRHH) conducted two major population-based surveys of workforce exposures: the New Zealand Workforce Survey (NZWS), undertaken in 2004-06, and the Māori New Zealand Workforce Survey, undertaken 2009-10. In 2016, WorkSafe commissioned population-based data on self-reported worker exposures. In response to this, Massey CRHH produced a comprehensive report involving new analyses of the 2004-06 and 2009-10 surveys.

This report draws on the high-level results of these surveys for information about worker exposure. For some exposures, questions in the WSIP worker survey were asked in the same or very similar way as the Massey surveys. This allows corroboration of results or identification of differences between the surveys. Pooled data from the NZWS and Māori NZWS, representing a combined total of 5,110 participants, is used for the analyses in this report.

Demographic data

Demographic data provides the denominator for analyses involving rates, and it allows extrapolation from a sample to the wider population. The following sources of demographic data are used in this report or in work that it draws from.

NZ CENSUS

Census 2018 was used to develop weighting strategies for the New Zealand Carcinogens Survey, New Zealand Psychosocial Survey, and the Workforce Segmentation and Insights Programme (WSIP) worker survey to ensure that the survey results reflected the working population as closely as possible in terms of age, gender, ethnicity, industry, and occupation.

[61] See New Zealand Socioeconomic Index - The University of Auckland.

HOUSEHOLD LABOUR FORCE SURVEY

The Household Labour Force Survey (HLFS) is a national survey conducted by Stats NZ on a quarterly basis. It is used to produce official estimates for employment-related measures including the numbers of employed and unemployed people, those not in the labour force, and the official unemployment rate for New Zealand.

The HLFS is the primary source of denominator (population) data used in this report to calculate injury rates. The data is used in official rates published by Stats NZ and for analyses undertaken by WorkSafe. Consistent with the practice used by Stats NZ and internationally, most injury rates are presented as the number of injuries per 100,000 full-time equivalent employees (FTEs). However, for some purposes, such as comparison of acute fatality rates with Australia, and estimating the number of workers exposed to carcinogens, the number of workers employed is used.

For injury rate calculations undertaken by WorkSafe, HLFS data from June 2023 was used as the denominator population.

APPENDIX 2: EXPLANATORY NOTES

Age Standardisation

Age standardisation is a statistical technique used to account for changing proportions of people in different age groups. A 'baseline' age structure is used to calculate what the overall rate would be if the population age structure had not changed.

Ethnicity

Ethnicity, as defined by the Stats NZ Ethnicity standard classification, refers to the ethnic group or groups an individual identifies with or feels a sense of belonging to.[62]

Given that individuals may identify with multiple ethnic groups, ethnicity is considered a multiple-response measure in the data context. Consequently, the total count of ethnicities may exceed the total number of individuals in the data.

Exposure

Exposure refers to a physical, chemical, or biological agent, an activity, or a set of circumstances that can cause harm. Workers may be described as exposed if an agent is present in their environment, or if they do an activity, to a greater extent than is normal for the general population.

Incidence

In this report, incidence refers to the number of injuries or new cases of a health condition that occur in a population in a specified time period.

Industry Classification

Industry classifications adhere to the Australia and New Zealand Standard Industry Classification (ANZSIC) 2006.[63] Breakdown by industry is presented at ANZSIC Level 1, except for fatal harm within the Agriculture, Forestry & Fishing industry. Here, due to its high rates of harm, the sub-industry Forestry & Logging at ANZSIC Level 2 is analysed separately.

In this report, the Agriculture, Forestry & Fishing industry is treated as follows:

- For breakdowns of work-related acute fatalities by mechanism and industry, 'forestry' refers to the Level 2 sub-industry of Forestry & Logging, while 'agriculture' refers to all other sub-industries within Agriculture, Forestry & Fishing.
- The workers survey within WorkSafe's Workforce Segmentation and Insights Programme (WSIP) collected distinct survey samples relating to workers in forestry and in agriculture. This allows survey results to show worker exposure to safety risks in these two groups separately. In all other data drawn from the WSIP survey, results for agriculture only are shown.
- All remaining injury data and survey data refer to the entirety of the Agriculture, Forestry & Fishing industry.

[62] Stats NZ ethnicity classification standard is explained here.

[63] See The detailed classification | Australian Bureau of Statistics (abs.gov.au).

Injury Mechanism

'Injury mechanism' refers to the overall action, exposure, or event that best describes the circumstances that resulted in injury. Understanding injury mechanisms is an important step in identifying risks and implementing preventive measures.

WorkSafe uses the Type of Occurrence Classification System (TOOCS), developed in Australia, to classify injury mechanisms based on available information about how an injury occurred. Common work-related injury mechanisms include falls, collision, machinery accidents, musculoskeletal stress, and exposure to harmful substances. See **Appendix 3** and **Appendix 4** for full lists of TOOCS codes used for injury mechanism.

Prevalence

In this report, prevalence refers to the number of people in a population with a health condition in a specified time period, regardless of when the condition started.

Risk

In the context of work health and safety, risk is defined by the interaction of two key components: a) the presence of a potentially harmful exposure or activity, and b) the likelihood that the exposure or activity leads to harm.

Within the scope of this report, 'risks' serves as an inclusive term for work-related exposures, activities, or circumstances likely to cause harm. It encompasses what might also be termed hazards, risk factors, or causal factors.

Statistical Significance

Statistical significance refers to the probability that observed differences are not merely the result of random variations. In this report, statistical significance is determined at the 95% confidence level, unless explicitly specified otherwise. This means that if a difference is deemed significant, there is a less than 5% probability that it occurred solely by chance.

Work-related burden of harm

In this report, 'work-related harm' refers to injury or illness that is caused, made worse, or made more likely, by work activity.

The burden of harm refers to the total amount of harm that can be attributed to work. This is usually described in terms of disability-adjusted life years lost (DALYs). DALYs are calculated using agreed methods to estimate lost years of life and lost quality of life from different injuries and diseases.

The specific figures used in this report come from work undertaken by WorkSafe in 2019, which is summarised here: Work-related health estimates and burden of harm | WorkSafe. More detail is provided at **Appendix 7**.

APPENDIX 3: FATALITIES BY INJURY MECHANISM

WorkSafe assigns a single injury mechanism code to each work-related fatality recorded in its Data Centre, based on available information about how the event occurred. **Table 41** shows the number of fatalities by injury mechanism during 2011-22. It is ordered by the categories used in the section of this report on acute fatalities, then by number of fatalities within each category.

Table 41: Work-related acute fatalities by TOOCS codes and code groupings, 2011-22

Category	TOOCS code	Description	Number of fatalities 2011-22
Vehicles usually used for transport [1]	922	Truck or Ute	153
	944	Aviation transport	26
	921	Car	24
	923	Motor bike (2-wheel)	9
	943	Marine transport	5
	945	Rail transport	3
	942	Bus transport	2
Vehicles usually used off road	924	Motor bike (4-wheel)	57
	926	Tractor	38
	927	Other motor vehicles	29
	931	Mobile plant rollover	22
Falls	011	Fall down a level	44
	021	Slips, trips, and stumbles	21
	022	Falls of short distances	7
	013	Fall off an animal	5
Hit or trapped	211	Hit by falling objects	70
	261	Trapped between moving and stationary objects	37
	281	Hit by other moving object	30
	251	Caught or trapped in machinery	23
	111	Bumping into objects	1
Other	591	Other environmental factors	72[2]
	999	Unspecified	23
	581	Drowning	18
	571	Electric shocks	14
	291	Assault	11
	231	Hit or bitten by an animal	10
	621	Single contact with chemical or substance	6
	121	Hitting or cutting oneself with tool	5
	381	Explosion	4
	911	Cave-in, earth collapse	4
	951	Sports injury	2
	821	Exposure to workplace or occupational violence	1
	981	Other	1

[1] Two event-level analyses undertaken in WorkSafe suggest that the total proportion of acute fatalities involving vehicles is somewhat higher than indicated by TOOCS coding. An environmental scan on vehicles found that 65% of all acute fatalities during 2013-2017 occurred to someone working in or on a vehicle, with a further 8% occurring around a vehicle.

Another event-level analysis of fatalities recorded during 2019-2021 found that a moving vehicle was the primary cause of 57% of all fatalities, including some cases where other TOOCS codes were used. Accidents

where a vehicle struck someone outside the vehicle were sometimes coded to the vehicle and sometimes to another code such as 'hit by moving object' or 'trapped between moving and stationary object'.

The 2019-2021 analysis found that approximately 85% of fatalities coded to a transport-type vehicle occurred on a public road, roadside, or another transport setting. Approximately 90% of fatalities coded to off-road vehicles occurred on farms or other worksites.

[2] Includes 63 people who were killed while working at the time of the Canterbury earthquakes in February 2011.

APPENDIX 4: ACC CLAIMS BY INJURY MECHANISM

WorkSafe uses an automated process to assign injury mechanism codes to ACC work-related claims data, based on available information in the accident description field. **Table 42** shows the number of claims with more than a week away from work (WAFW claims) by injury mechanism, for 2017-21. It is ordered by the categories used in the section of this report on WAFW claims, then by number within each category.

Table 42: ACC work-related claims with more than a week away from work by TOOCS code and code grouping, 2017-21

Category	TOOCS code	Description	Number of claims 2017-21
Musculoskeletal injuries	411	Lifting, carrying putting down (back)	18,626
	431	Muscular Stress with no Objects being Handled	14,464
	412	Lifting, carrying putting down (non-back)	11,158
	422	Other handling of objects (non-back)	6,475
	421	Other handling of objects (back)	3,903
	414	Lifting, carrying putting down lost footing (non-back)	1,920
	413	Lifting, carrying putting down lost footing (back)	1,302
	416	Lifting, carrying putting down animals (non-back)	567
	415	Lifting, carrying putting down animals (back)	413
	441	Repetitive movement	454
Falls, slips and trips	022	Falls of short distances	11,940
	021	Slips, trips and stumbles	10,466
	011	Fall down a level	6,558
	014	Fall down stairs	1,620
	012	Jump from height	925
	013	Fall off an animal	452
	031	Stepping, kneeling or sitting on objects	107
Being hit by or hitting objects	121	Hitting or Cutting Oneself with Tool	7,585
	211	Hit by falling objects	4,906
	261	Trapped between moving and stationary objects	4,045
	113	Contact with stationary object	3,889
	231	Hit or Bitten by an animal	3,302
	281	Hit by other moving object	2,632
	251	Caught or trapped in machinery	2,318
	241	Hit by person accidentally	2,400
	111	Bumping into objects	2,228
	291	Assault	1,733
	282	Foreign body in eye	1,057
	131	Rubbing and chafing	153
	271	Mechanical vibration	67
	112	Picking up objects	44
Vehicle incidents and other	925	Motor Bike (Unidentified)	1,611
	511	Hot objects	1,264
	951	Sports Injury	1,176
	922	Truck or Ute	857
	927	Other Motor Vehicles	785
	924	Motor Bike (4 Wheel)	609
	943	Marine Transport	599
	621	Single Contact with Chemical or Substance	484
	921	Car	371
	981	Other	321

Category	TOOCS code	Description	Number of claims 2017-21
	942	Bus Transport	208
	926	Tractor	184
	923	Motor Bike (2 Wheel)	151
	641	Insect and Spider Bites and Stings	175
	381	Explosion	132
	571	Electric shocks	104
	944	Aviation Transport	77
	941	Pedal Cyclist	37
	391	Other variations in pressure	32
	521	Cold objects	23
	821	Exposure to Workplace or Occupational Violence	21
	591	Other environmental factors	7
	881	Other Harassment	19
	911	Cave-in, Earth collapse	12
	311	Single, sudden sound	11
	551	Non-ionisiong radiation	6
	711	Exposure to Biological Factors of Non-human Origin	14
	851	Suicide or Attempted Suicide	8
	561	Ionising radiation	6
	541	Environmental cold	4
	841	Work Pressure	3
	811	Exposure to Traumatic Event	3
	721	Exposure to Biological Factors of Human Origin	1
	871	Work Related Harassment or Bullying	1
	581	Drowning	2
Not classified	999	Not Classified	23,489

APPENDIX 5: CLASSIFICATION OF WORKPLACE CARCINOGENS

The International Agency for Research on Cancer (IARC) classifies the carcinogenicity of agents and exposure circumstances based on its latest review of evidence. IARC also classifies the level of evidence linking the carcinogen to specific cancerous diseases.

Table 43 shows IARC's classification of the carcinogens commonly found in New Zealand workplaces. Note that carcinogens classified as category 1 (carcinogenic to humans) may have sufficient evidence of causing some cancers and limited evidence of causing other cancers. Carcinogens classified as category 2A (probably carcinogenic to humans) only have limited evidence of causing specific cancers.

Table 43: IARC classification of cancer risks for the most common workplace carcinogens

Carcinogen	IARC category	Cancers with sufficient evidence	Cancers with limited evidence
Asbestos	1	Lung, larynx, mesothelium, ovary	Pharynx, stomach, colorectal
Benzene	1	Acute myeloid leukaemia, other acute non-lymphocytic leukaemia	Lung, non-Hodgkin's lymphoma, chronic myeloid leukaemia, chronic lymphocytic leukaemia, multiple myeloma
Cadmium	1		
Chromium VI	1	Lung	Nasal
Diesel engine exhaust	1	Lung	Bladder
Environmental tobacco smoke	1	Lung	Pharynx, larynx
Formaldehyde	1	Pharynx, leukaemia	Nasal
Glyphosate	2A		Non-Hodgkin's lymphoma
Lead	2A		Stomach
Mineral oils	1	Non-melanoma skin cancer	
Nickel	1	Lung, nasal	
Polycyclic aromatic hydrocarbons	1	Lung*, non-melanoma skin cancer	Lung*, bladder, oral cavity, pharynx, oesophagus, larynx
Respirable crystalline silica	1	Lung	
Shift work	2A		Colorectal, breast, prostate
Solar UV	1	Melanoma, non-melanoma skin cancer	Lip, eye
Styrene	2A		Leukaemia, lymphoma, multiple myeloma
Welding fumes	1	Lung	Kidney
Wood dust	1	Nasal, nasopharynx	

APPENDIX 6: PSYCHOSOCIAL DOMAINS AND FACTORS

The New Zealand Psychosocial Survey (NZPS) used the Copenhagen Psychosocial Questionnaire (COPSOQ) to evaluate the psychosocial work environment in Aotearoa. The COPSOQ questionnaire is divided into thematic 'domains', each of which includes a number of psychosocial factors that are assessed by specific questions.

Table 44 provides brief descriptions of the psychosocial factors included in the NZPS. The exact questions that workers were asked can be found in the appendix of WorkSafe's report on the NZPS.

Table 44: Definition of domains and psychosocial factors in New Zealand Psychosocial Survey

Domain	Factor	Description
Demands at work	Quantitative demands	Workload
	Work pace	Speed and intensity of work
	Emotional demands	Dealing with other people's feelings or being placed in emotionally difficult situations
	Demands for hiding emotions	The need to conceal one's own feelings from other people at work
Work organisation and job content	Meaning of work	Worker understanding of the purpose and context of their work, and their sense of its importance.
	Possibilities for development	Opportunities for learning and development not only in the job, but also at the personal level, plus whether tasks are challenging for the employee
	Control over working time	Influence over conditions surrounding work, for example, breaks, length of the working day, or work schedule
	Influence at work	Ability to influence aspects of work itself such as the planning of work or deciding the order of tasks
Interpersonal relations and leadership	Predictability	Ability to avoid uncertainty and insecurity, facilitated by receiving the right information at the right time
	Recognition	The management acknowledges worker contributions
	Role clarity	Worker understanding of their role at work, for example, content of tasks, expectations to be met, and responsibilities
	Role conflicts	Possible conflicts when prioritising different tasks
	Illegitimate tasks	Being asked to perform tasks that the workers perceived to be unnecessary or unreasonable
	Quality of leadership	Direct manager's leadership capability
	Social support from supervisors	Support from the immediate superior if needed
	Social support from colleagues	Possibility to obtain support from colleagues if needed
	Sense of community at work	Feeling of being part of the team/community or sense of belonging to a group of co-workers at work
Work-Individual Interface	Work-life conflict	Work's effect on privacy or on personal or family life
	Quality of work	Experience of the immediate output of one's work

Domain	Factor	Description
Social Capital	Job insecurity	Employment insecurity for the employee
	Insecurity over working conditions	Lack of security of working conditions within job, such as working hours, work location, pay, etc
	Job satisfaction	Work-related satisfaction
	Vertical trust	The trust and communication between management and employees
	Horizontal trust	The trust built among employees
	Organisational justice	If the workers are treated fairly in their workplace
Offensive Behaviours	Bullying	Repeated exposure to unpleasant or degrading treatment, which a person finds it difficult to defend themself against
	Cyberbullying	Exposure to work-related harassment on social media, by e-mail or text messages
	Sexual harassment	Undesired sexual attention in the workplace
	Threats of violence	Threats of violence in the workplace, including verbal abuse, intimidation, and threatening behaviours
	Physical violence	Physical assault at work

APPENDIX 7: ESTIMATED WORK-RELATED BURDEN OF HARM IN NEW ZEALAND

In 2019, WorkSafe undertook work to estimate the total burden of harm in New Zealand from work-related injury or disease. This work used international research on the proportion of disease and injury that can be attributed to work (referred to as the attributable fraction) and applied these estimates to data on injury and disease in New Zealand.

Table 45 shows the estimated number of disability-adjusted life years lost (DALYs) in New Zealand in 2017 from different categories of work-related disease and injury, alongside the associated risk factors.

Note that these estimates are indicative only, as there are several sources of imprecision. Meaningful updates of these estimates are only possible following detailed review of evidence, rather than from year to year. Note also that some work-related ill health is associated with exposures that may have occurred many years in the past.

Table 45: Estimated disability-adjusted life years (DALYs) from work-related harm, by disease or condition

Category	Disease or condition	Work-related risks	DALYs attributed to work, 2017*
Acute injury	All injuries	Vehicles, falls, other unintentional injuries, work-related violence	5,350
Cancer	Lung cancer	Asbestos, silica, diesel engine exhaust, welding fumes, chromium VI, nickel, environmental tobacco smoke	5,350
	Mesothelioma	Asbestos	1,400
	Breast cancer	Night shift work	700
	Non-melanoma skin cancer	Solar radiation	200
	Melanoma	Solar radiation	150
	Bladder cancer	Diesel engine exhaust	150
	Other cancers	Benzene, wood dust, asbestos, various other exposures	220
Respiratory disease	COPD	Vapours, gases, dusts, and fumes	5,000
	Asthma	Various asthmagens	1,700
	Pneumoconiosis	Asbestos, silica, coal dust	250
Kidney disease	Chronic renal failure and nephritic syndrome	Lead, copper, chromium, tin, mercury, welding fumes, silica	400
Musculoskeletal disorders (MSDs)	Back pain	Lifting, awkward positions, forceful movements, vibration	10,200
	Other MSDs	Lifting, awkward positions, forceful movements, vibration, repetitive movements	3,500
Cardiovascular disease	Ischaemic heart disease	Job strain, night shift work, environmental tobacco smoke	3,000
	Ischaemic stroke	Job strain	150
Hearing loss	Noise-induced hearing loss	Loud noise, vibration	3,700
Mental ill health	Depression and anxiety	Job strain	6,300
	Alcohol / drug misuse	Low job control	2,200

*Rounded to the nearest 100 for figures above 1,000; rounded to the nearest 50 for figures below 1,000

APPENDIX 8: ACRONYMS

ACC: Accident Compensation Corporation

AWES: Australian Worker Exposure Survey

COPD: Chronic obstructive pulmonary disease

COPSOQ: Copenhagen Psychosocial Questionnaire

CRHH: Centre for Research on Hauora and Health (Massey University)

DALYs: Disability-adjusted life years

FTE: Fulltime equivalent employees

HLFS: Household Labour Force Survey

IARC: International Agency for Research on Cancer

ILO: International Labour Organization

MSD: Musculoskeletal disorder

NZCS: New Zealand Carcinogens Survey

NZPS: New Zealand Psychosocial Survey

OccIDEAS: Occupational Integrated Database Exposure Assessment System

PAH: Polycyclic aromatic hydrocarbons

PSC: Psychosocial safety climate

RCS: Respirable crystalline silica

TOOCS: Type of Occurrence Classification System

WHO: World Health Organization

WRMSD: Work-related musculoskeletal disorder

WSIP: Workforce Segmentation and Insights Programme

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