



seeingmachines

| **GUARDIAN**

Guardian Insights Report 2022-23 Australia & New Zealand

Introduction

Welcome to the inaugural edition of our Guardian Insights report.

The timing of this report is crucial. In 2022, Australia witnessed a distressing rise of nearly 9 percent in heavy vehicle-related fatalities, with at least 185 tragic incidents. What's even more concerning is that driver distraction played a contributing role in a staggering 71 percent of these accidents¹.

Our mission at Seeing Machines is to reduce transport fatalities to zero, leveraging our advanced driver monitoring system technology. This report is designed to aid in our collective endeavour to gain a deeper understanding of the insights and performance data that impact driver and fleet behaviour.

Guardian serves more than 800 companies with almost 52,000 connections worldwide, offering a market leading fleet safety solution that has been scientifically proven to reduce fatigue-related events by over 90 percent. Our technology is underpinned by more than 20 years of research into human behaviour in real-time, real-world scenarios. Guardian has travelled more than 14 billion kilometres globally, and together with independent and joint studies gives Seeing Machines an unrivalled amount of naturalistic driving data to draw from.

What's more, our dedicated team of highly trained analysts works tirelessly to review, confirm, and categorise every risky driving incident captured by Guardian in-vehicle systems. This allows fleets to intervene and protect their drivers before a situation escalates.

The findings in our 2022-23 Guardian Insights report are focused on Australia and New Zealand, derived from deidentified data on 25,202 vehicles across 2,585 fleets, processed through Guardian Live and confirmed by human analysts in the Guardian Centre. This data allows us to pinpoint and address risky driving habits, a crucial step in our fight to minimise preventable accidents.

To assist you in comprehending and mitigating the risks associated with distracted and fatigued driving events among your drivers, this report marks the first in our annual series. In future editions we plan to broaden the focus to encompass other regions in which Guardian operates. Importantly, at the conclusion of this report we provide a set of recommendations and key takeaways to empower you to contribute to a safer road environment for your drivers as well as all other road users.

Regrettably, driver fatigue and distraction continue to claim lives on our roads. That's why Seeing Machines is committed to delivering an annual report that deepens our understanding of trends and risks over time and assesses whether progress is being made. Only by addressing these issues and fostering a shift in driver behaviour can we collectively strive towards our shared goal of ensuring more people return home safely.

Thank you for joining us in this critical mission.

Paul McGlone
Chief Executive Officer,
Seeing Machines

"This report is designed to aid in our collective endeavour to gain a deeper understanding of the insights and performance data that impact driver and fleet behaviour."



¹ Beaini, A. (2023). 'Road experts slam truck drivers livestreaming themselves on TikTok while driving'. Daily Telegraph, 1 April. Available at: <https://www.dailytelegraph.com.au/news/national/road-experts-slam-truck-drivers-livestreaming-themselves-on-tiktok-while-driving/news-story/76df226af1fb4e33130bfcbbab22b7005> (Accessed: 13 August 2023).



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The facts behind the figures

Guardian, Seeing Machines' industry-leading driver fatigue and distraction technology is underpinned by real-world driving data collected over billions of kilometres of travel.

Supporting more than 800 commercial transport and logistics companies with almost 52,000 connections worldwide, the real-time safety solution is scientifically proven to reduce fatigue-related driving events by more than 90 percent.

The 2022-23 Guardian Insights report focuses on deidentified data on 25,202 vehicles across 2,585 fleets in Australia and New Zealand, over the last 12 months¹, gathered from our Guardian Live platform and confirmed by human analysts in the 24/7 Guardian Centre.

All data is captured and displayed in each vehicle's local time zone.

2,051,011,789

KILOMETRES TRAVELLED

2,585

FLEETS

25,202

VEHICLES

653,048

CONFIRMED EVENTS CAPTURED

Data normalisation

To ensure the data presented in this report offers relevant and valuable insights, Seeing Machines has taken into consideration a key variable when reporting on the number of events: the number of kilometres travelled. A higher number of kilometres suggests there are more trucks on the road and/or there are greater distances being driven, increasing the opportunity for an incident to occur.

For example, does Sunday have the least number of incidents recorded because drivers are more alert on weekends, or simply because there are less trucks on the road?

In this case, we have compared the number of distraction and fatigue events at any given hour, day, or month to the number of recorded kilometres driven at that time².

This report contains both raw and normalised data for the information and analysis of readers.

Human factors meets human intervention

What makes the Guardian solution unique is combining Seeing Machines' automotive-grade safety technology, driven by decades of Human Factors research, with 24/7 monitoring and intervention by our Guardian Centre team.

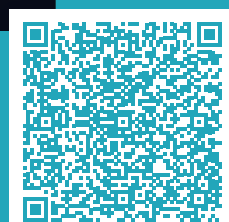
This team of highly trained analysts work around the clock to review and classify every single risky driving incident captured by Guardian. All statistics in this report are based on deidentified events captured by Guardian in-vehicle systems, processed through Guardian Live and confirmed by the Guardian Centre.



Guardian Centre

Read more about the importance of human intervention in our [lite paper](#).

[Learn more about the Guardian solution.](#)



¹ From 1 October 2022 to 30 September 2023

² Recorded kilometres refer to distance driven by vehicles with Guardian installed

At a glance

Guardian captured 653,048 risky driving events across Australian and New Zealand fleets during the last financial year.



131,806

FATIGUE EVENTS



521,242

DISTRACTED
DRIVING EVENTS

INCLUDING



55,260

INSTANCES OF MOBILE
PHONE USE ¹

Explanation of event types

Guardian uses advanced algorithms to detect when a driver is fatigued or distracted. When an event is detected, in addition to drivers being alerted in-cabin to protect them in real-time, the data is sent to our secure online event monitoring platform, Guardian Live, where a 24/7 team of analysts review, confirm and classify them.

Fatigue events

Drowsiness:

The driver's eyes appear to be heavy and eye closures are dramatically slower or more rapid. A key indicator is the continuous closures where the driver appears to be fighting the onset of fatigue.

Microsleep:

The driver appears to be in a state of sleep. Key indicators include uncontrolled eye closure, eye rolls, long eye closures, and head bobs where the driver has lost control of their neck muscles.

NOTE: Where agreed with the company, Fatigue Intervention Plans will be initiated for these types of events when confirmed.



Distraction events

Distraction:

The driver is distracted from the main task of driving the vehicle. This may include looking down at an item in their hands or looking away from the forward roadway for an extended period of time.

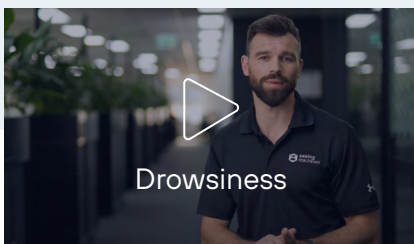
Mobile use:

The driver is observed using a mobile phone. This classification is only used where a mobile phone is visible in the video.

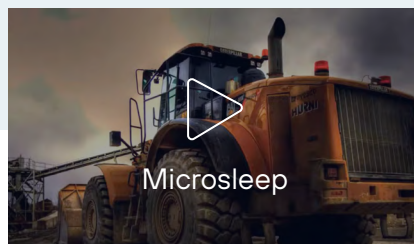


Curious to know more about the different types of events?

Check out the videos below.



Drowsiness



Microsleep



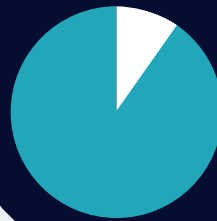
Distraction

¹ As noted above, an event can only be classified as 'mobile use' when the device is visible in captured footage.

Distracted driving

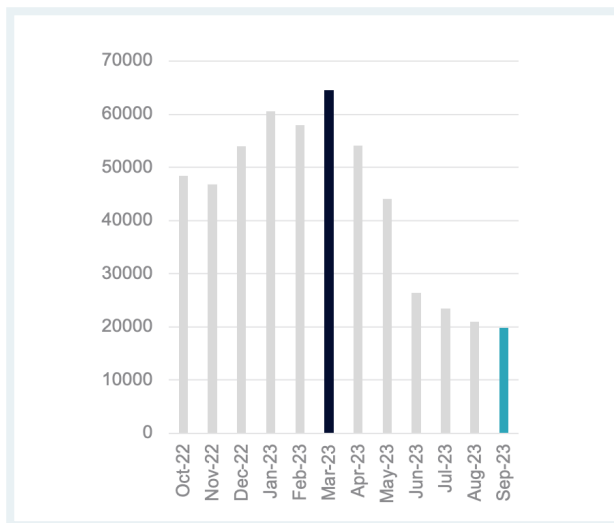
In 2022-23, Guardian captured 521,242 distracted driving events in Australian and New Zealand fleets, including 55,260 instances of mobile phone use¹.

In 24/7 operations, Australian and New Zealand fleets see (on average) almost **60 driver distraction events** per hour!!

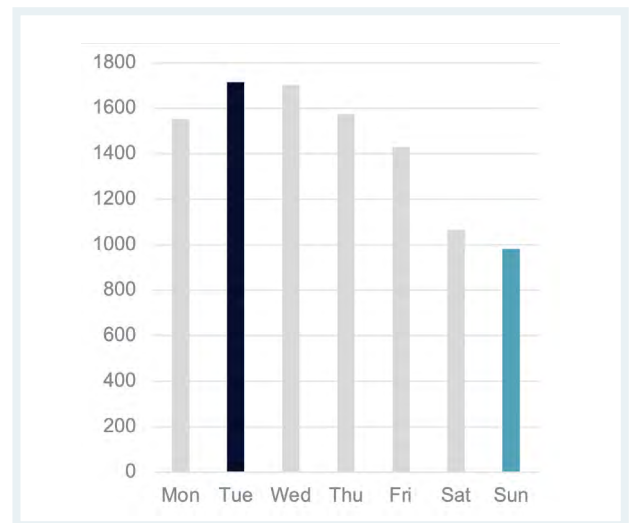


- Mobile use
- Other distraction

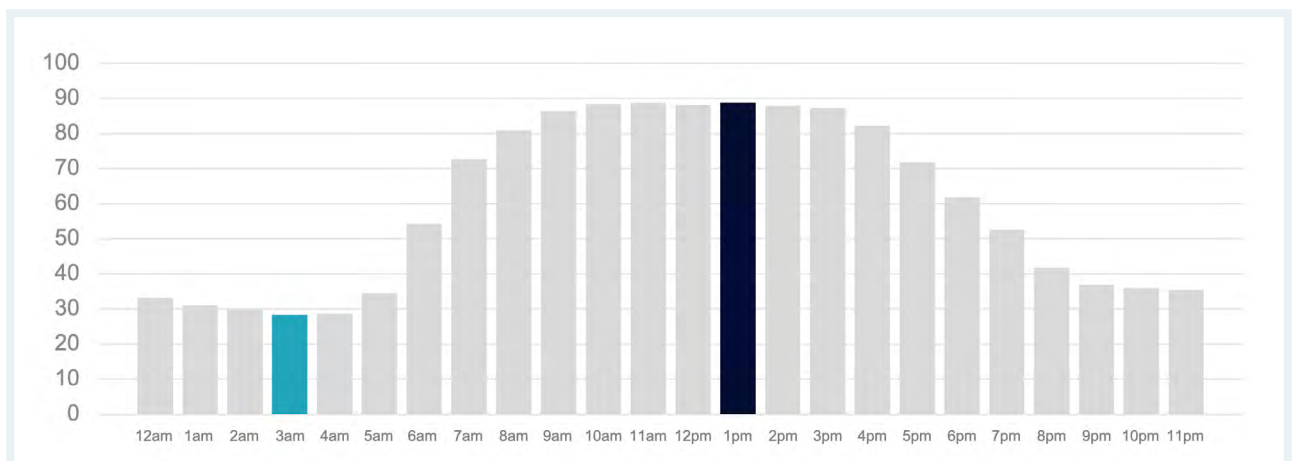
Distraction events by month (actual)



Distraction events by day (average)



Distraction events by time (average)



	Month	Day	Time
Most distraction events	March	Tuesday	1.00pm
Least distraction events	September	Sunday	3.00am

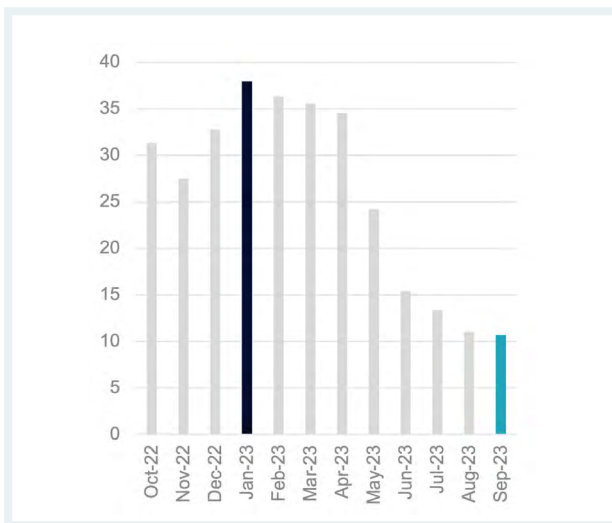
¹ This only includes events where a mobile phone is visible in the video.

Distracted driving (normalised)

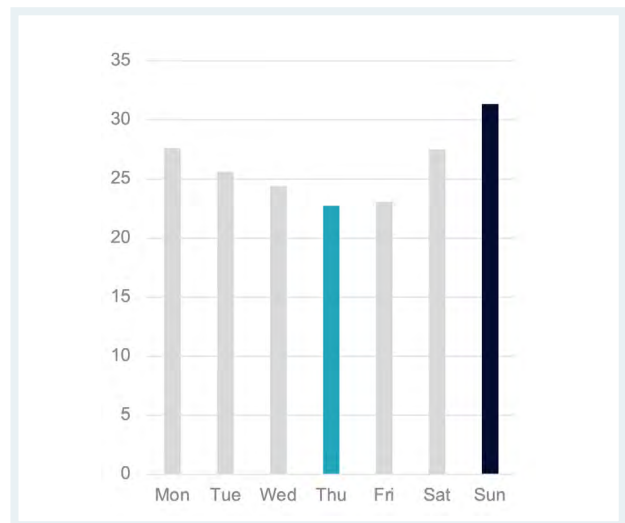
That's 1 driver distraction event every single minute

The below graphs show the number of distraction events recorded, contextualised by the number of kilometres driven by vehicles with Guardian installed during the same period. Results are displayed as number of events per 100,000km.

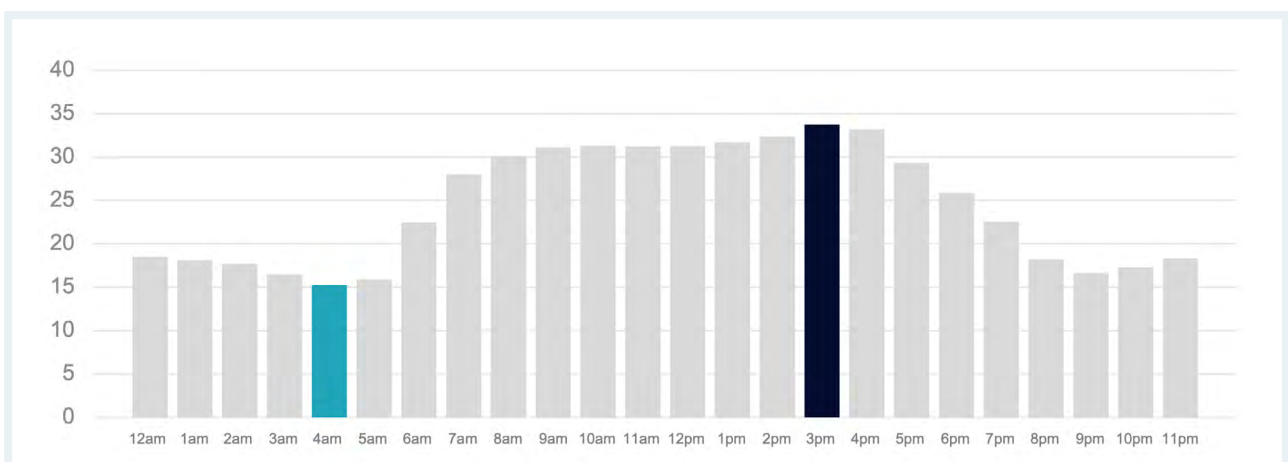
Distraction events by month (per 100,000km)



Distraction events by day (per 100,000km)



Distraction events by time (per 100,000km)



	Month	Day	Time
Most distraction events	January	Sunday	3.00pm
Least distraction events	September	Thursday	4.00am

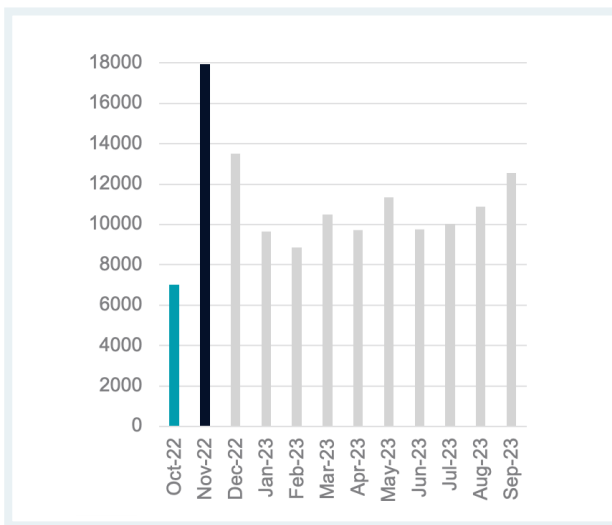
Driver fatigue

In 24/7 operations, Australian and New Zealand fleets see (on average) over **15 confirmed fatigue events** every hour!

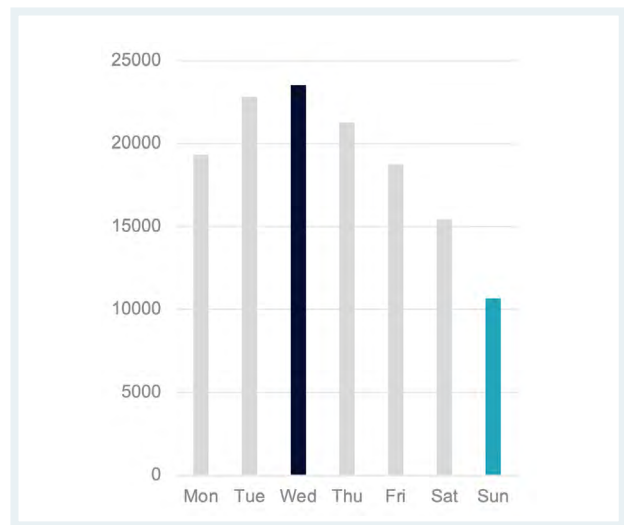
In 2022-23, Guardian captured 131,806 confirmed fatigue (drowsiness and microsleep) events across Australian and New Zealand fleets.

The Guardian Centre contacted fleet managers via phone or email over 100,000 times during the year to initiate Fatigue Intervention Plans.

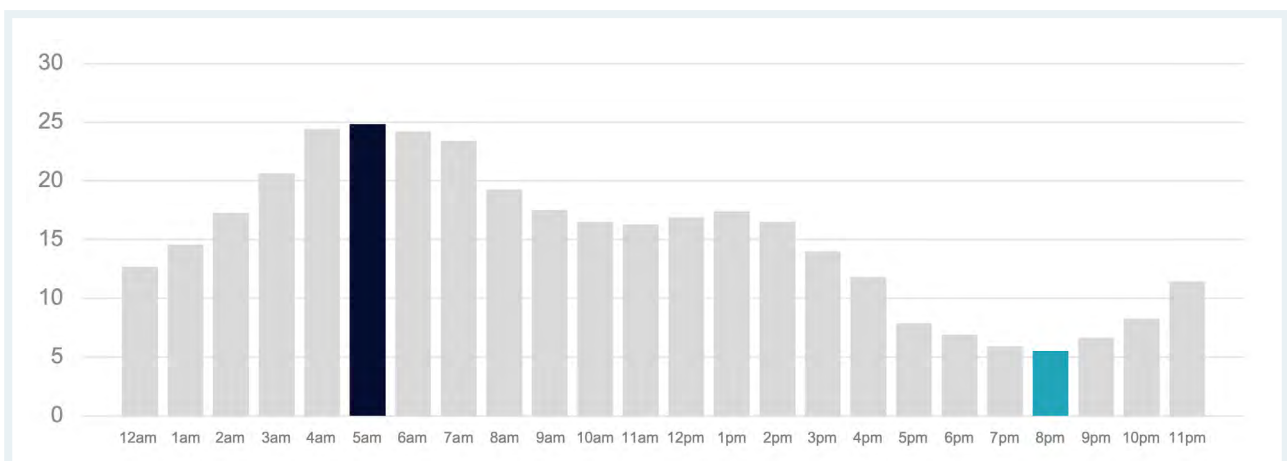
Fatigue events by month (actual)



Fatigue events by day (average)



Fatigue events by time (average)



	Month	Day	Time
Most fatigue events	November	Wednesday	5.00am
Least fatigue events	October	Sunday	8.00pm

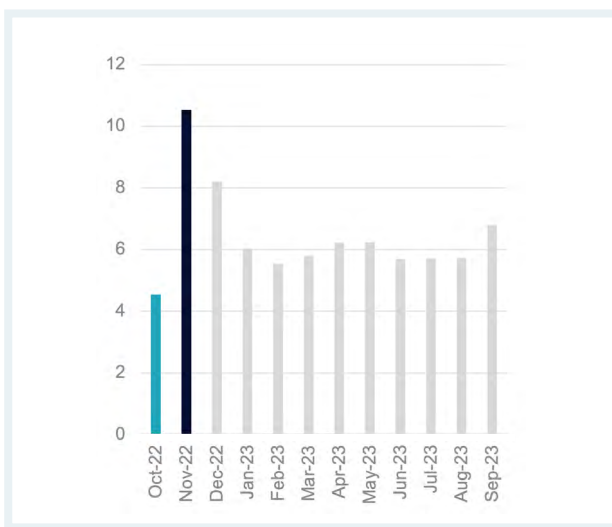
Driver fatigue (normalised)

For most people, the urge to sleep arising from the circadian rhythm peaks **between 2am and 4am***

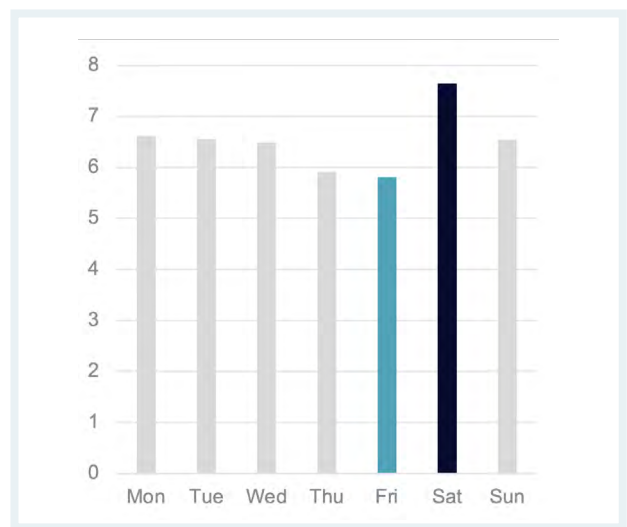
* www.news-medical.net/health/Circadian-Rhythm.aspx

The below graphs show the number of fatigue events recorded, contextualised by the number of kilometres driven by vehicles with Guardian installed during the same period. Results are displayed as number of events per 100,000km.

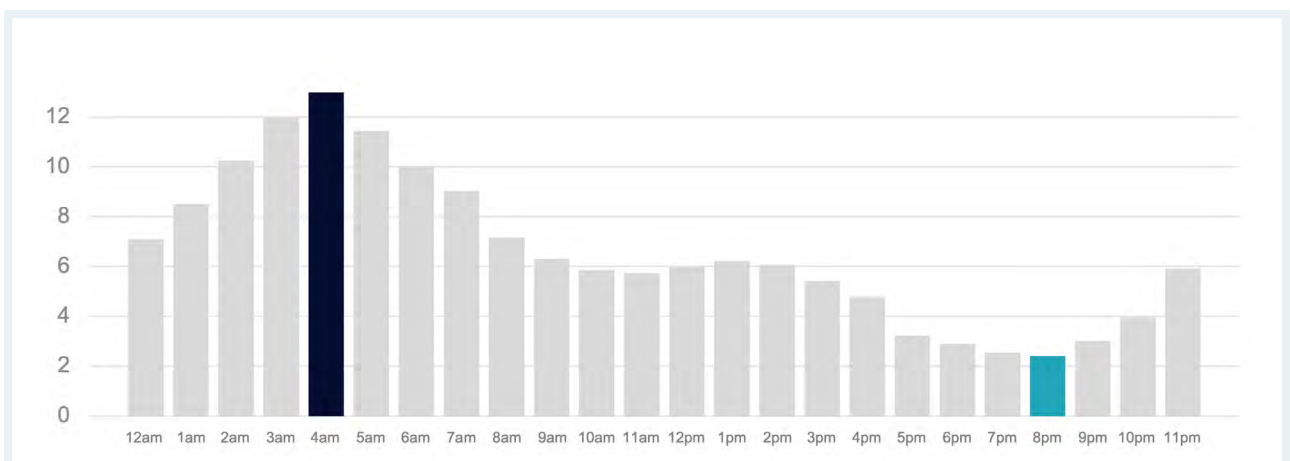
Fatigue events by month (per 100,000km)



Fatigue events by day (per 100,000km)



Fatigue events by time (per 100,000km)



	Month	Day	Time
Most fatigue events	November	Saturday	4.00am
Least fatigue events	October	Friday	8.00pm

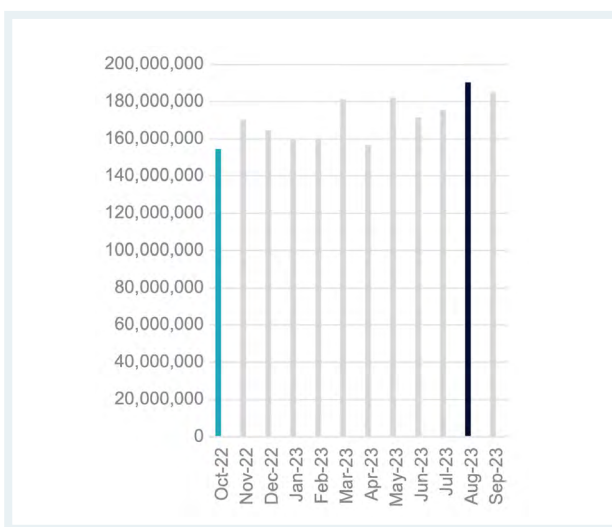
Kilometres driven

Did you know Guardian has travelled more than **14 billion kilometres** globally?

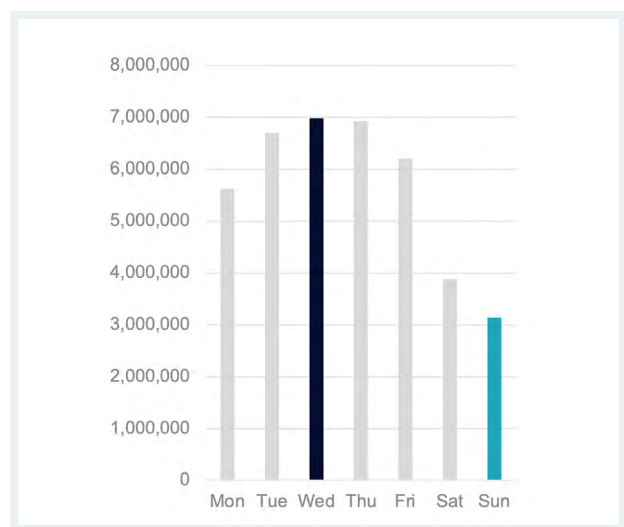
In 2022-23, Australian and New Zealand fleet vehicles with Guardian installed travelled 2,051,011,789 kilometres.

This information can be used for context when considering the number of distraction and fatigue-related driving events outlined in this report, however as noted on the [page 4](#), normalised data has also been included for ease of analysis.

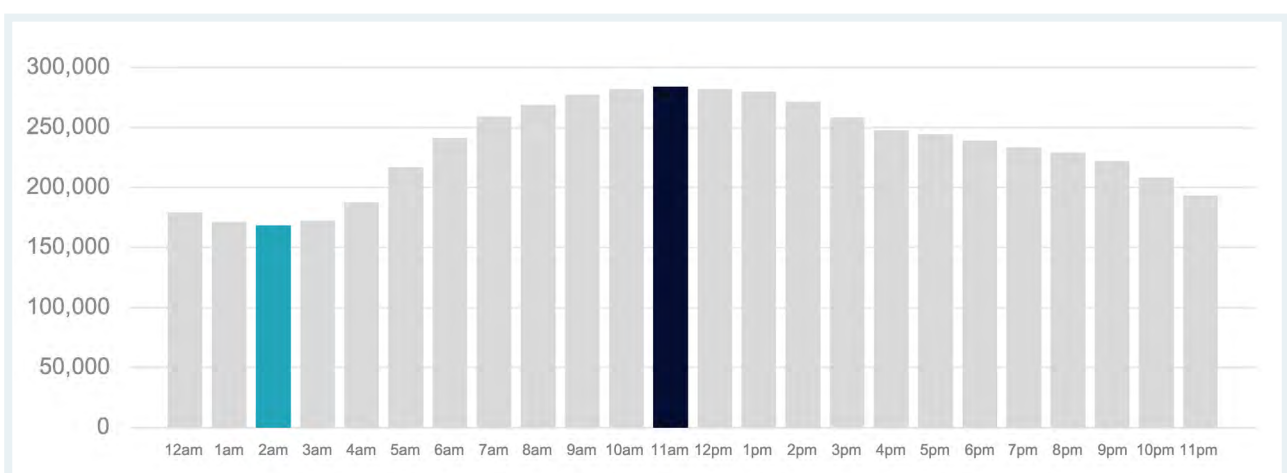
Kilometres by month (actual)



Kilometres by day (average)



Kilometres by time (average)



	Month	Day	Time
Most kilometres driven¹	August	Wednesday	11.00am
Least kilometres driven¹	October	Sunday	2.00am

¹ Refers to distance driven by vehicles with Guardian installed

Summary

Several significant trends surfaced from our comprehensive review of all distraction and fatigue events detected and analysed by our Guardian Centre team. These trends offer valuable insights that can greatly contribute to our shared goal of enhancing driver safety.

Distraction



On average there is 1 distracted driving event every single minute across Australian and New Zealand fleets, with over 10% of these attributed to mobile phone use*.

The data offers intriguing insights into the timing of distraction events:

- Drivers are more prone to distraction in the early afternoon, between **1.00pm** and **3.00pm**
- Drivers are the least distracted in the very early morning, around **3.00am** and **4.00am**
- **Tuesdays** have the highest number of distracted driving events
- **Sundays** record the lowest number of distracted driving events. But when you consider the reduced kilometres driven on **Sundays**, contextually they have the highest rate of distraction
- Likewise, when factoring in kilometres driven, **Thursdays** actually exhibit the lowest rate of distracted driving
- **March** recorded the most distracted driving events, but after factoring in kilometres driven, contextually **January** is the worst month for distraction
- Regardless of kilometres driven, **September** has the least distracted driving events

* It's crucial to note the actual proportion of mobile phone usage as a driver distraction is likely significantly higher than the reported instances. Our 24/7 analysts can only classify mobile use if they see a phone in the frame, and we can assume that some drivers may, at times, conceal their phones to prevent them from appearing in the footage. For instance, drivers may position their phones on their laps or elsewhere in the vehicle cabin.

In fact, a recent survey suggests that mobile phone distraction accounts for around 71% of Australian truck accidents annually!¹

¹ <https://australiareviews.au/mobile-phone-use-while-driving-statistics-australia>

² <https://drivinghealth.net/research/>

³ Williamson, A. (2007). Fatigue and coping with driver distraction. In: I.J. Faulks, M. Regan, M. Stevenson, J. Brown, A. Porter & J.D. Irwin (Eds.), *Distracted driving*. Sydney, NSW: Australasian College of Road Safety. Pages 611-622.

Fatigue



Although the number of fatigue-related events is lower than those related to distracted driving, it remains a cause for concern.

Again, the data offers interesting insights into the timing of fatigue events:

- Most fatigue events occur in the early morning, around **4.00am** and **5.00am**
- Fatigue events were their lowest after dinner time at **8.00pm**, irrespective of how many kilometres were driven
- **Wednesdays** record the highest number of fatigue-related events, and like distraction, **Sundays** have the least incidents
- However, when considering the number of kilometres driven on different days, **Saturdays** actually have the highest rate of fatigue-related incidents, and contextually **Fridays** record the lowest number
- Regardless of the kilometres driven across the year, **November** is without question the worst month for fatigue-related events, while **October** records the least incidents

■ Normalised data ■ Raw data

It's important to emphasise that comparing the rates of fatigue to distraction doesn't diminish the significance of the fatigue issue.

Concerningly, the Australian Driving Health Report, conducted by Driving Health and led by Monash University with support from various industry partners, reveals that more than 60 percent of drivers experience fatigue, with 1 in 10 admitting to falling asleep while driving.²

In fact, fatigue itself may be considered a form of internal distraction, due to its impact on drivers. Furthermore, drivers may turn to external distractors (for example mobile phones) in an attempt to manage fatigue.³

Case study

Ron Finemore Transport

Making road transport safer for all

Ron Finemore Transport passionately advocates for enhanced road safety and takes immense pride in its unwavering commitment to safeguarding its team of drivers and a fleet comprising nearly 300 prime movers and more than 500 trailer assets.

Client problem

- Operating an extensive fleet dedicated to transporting crucial customer goods across vast distances along Australia's East Coast
- Committed to maintaining exceptional customer service whilst constantly meeting contracted Key Performance Indicators, which demands a methodical approach that ensures drivers' adherence to legal and safe practices
- Eager to pioneer the detection of fatigue and distraction to enable pre-emptive intervention and reduce accidents, paramount to the company's unwavering commitment to driver safety
- Sought a technology solution capable of supplying unprecedented levels of data and insights that could inform business decisions
- Desired a solution that drivers would readily adopt as they deepen their understanding of the technology's functionality and its underlying purpose

Guardian solution

- Boasts sophisticated algorithms which meticulously track drivers' eye and head movements, complemented by a forward-facing camera that surveys the road, delivering immediate in-cab seat vibrations and audible alarms to alert the driver
- Provides around the clock human monitoring, analysis and assistance through the 24/7 Guardian Centre
- Captures video exclusively when driver fatigue or distraction instances occur, thereby enhancing driver ease and acceptance of the system
- Delivers invaluable data insights, fostering an environment of perpetual safety enhancement and operational refinement



Being assured of our drivers' safety with technology that shields them from fatigue and distractions, alleviates a significant burden from our operations team. Guardian has provided greater reassurance, allowing us to execute decisions and strategies with confidence, given the technology's role as a vigilant protector.

*Darren Wood - General Manager,
Ron Finemore Transport*

Results

- ✓ Installed Guardian across all 351 Prime Movers, as well as rigids and fleet cars
- ✓ Established driver confidence in the technology by demonstrating how they are being protected in real time
- ✓ Ensured drivers possess a better understanding of the role of fatigue and distraction
- ✓ Met customer expectations that this technology be deployed to meet contractual requirements
- ✓ Contributed significantly to managing fatigue and distraction events, ensuring the welfare of drivers, other employees and the community
- ✓ Proved to be a gamechanger for operations and managing customer requirements, providing peace of mind that company decisions and plans implemented are safeguarded by technology
- ✓ Demonstrated the company's ongoing commitment to the safety of its people and overall road transport safety
- ✓ Continues to act as an extremely reliable, accurate and valuable tool in developing a "robust and rigorous procedure to support fatigue events"

Case study

Auckland Buses

Measuring fatigue in urban bus drivers

The wellbeing of drivers, passengers and other road users is paramount for any urban bus company.

Seeing Machines' exclusive New Zealand partner, Autosense, facilitated a pilot study for Auckland Transport and an unnamed bus company to establish the existence and extent of fatigue in bus drivers, and fortify future risk management and safety protocols.

Client problem

- Auckland Transport decided to ascertain the presence and extent of fatigue risk in urban bus driving, as it is a potential threat to drivers, passengers, and fellow road users
- Sought a technology solution that could swiftly provide accurate baseline data to support the trial objectives
- Needed to mitigate anticipated potential driver resistance to in-vehicle monitoring
- Required proven technology and expert verification as they undertook this pivotal step in cementing sturdy fatigue management practices among bus operators

Guardian solution

- Utilises responsible AI based on advanced algorithms to monitor the bus drivers' eye and head movements, accompanied by a forward-facing camera observing the road
- Delivers immediate in-cab seat vibrations and audible alarms to alert the driver when a fatigue event occurs
- Provides invaluable data insights through remote monitoring, analysis and assistance
- Captures video exclusively during occurrences of driver fatigue, aiding driver acceptance of the technology



As the trial report concluded:



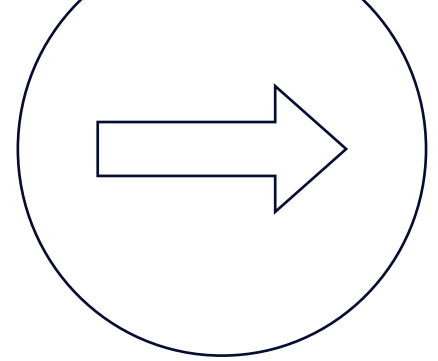
Doing nothing is not an option due to the known existence of significant fatigue risk which can cause harm to drivers, passengers or other road users, reputational damage and costs associated with avoidable repairs.

Results

- ✓ Highlighted the indisputable presence of significant fatigue risk, particularly from 5am to 11am
- ✓ Identified a striking 11 instances of driver microsleeps across 20 buses during the 2 month trial – significantly surpassing the company's national average¹
- ✓ Mitigated driver resistance through effective communication and in-person training on the technology's purpose, prior to installation
- ✓ Contributed significantly to comprehending fatigue events and shaping the technology's future role as a safety asset to protect drivers, passengers, and other road users
- ✓ Underscored the necessity for drivers to receive fatigue awareness training within a comprehensive fatigue risk management system
- ✓ Solidified Guardian's position as a premier technology solution

¹ The bus company saw 3.7 events per 10,000km versus the national average of 0.34 events per 10,000km. Statistics provided by Autosense.

Next steps for Guardian customers



So, you know driver fatigue and distraction are both serious problems. You even know the times, days, and months these risks may be more prevalent. But what can you do about it?

Be informed

Fleet managers have 24/7 access to valuable data via our secure, cloud-based platform, Guardian Live. The comprehensive, near real-time driver and vehicle data can be used to understand situations as they evolve, and support compliance and reporting requirements.

The Guardian Live dashboard provides a fleet or account level snapshot of current events and vehicles at any point in time, and when detected to be at an elevated risk.

Rather than continuously monitoring the dashboard, customers can set up email notifications for specific event types. Additionally, fleets can elect to receive a phone call for a confirmed fatigue event, according to their agreed Fatigue Intervention Plan.

Users with the appropriate permissions in Guardian Live can then drill further into event details and associated

footage. Customers can also view the event in the context of a vehicle's entire trip, to better understand patterns over the shift.

Importantly, the insights available through Guardian Live can also enable companies to improve driver training, education and safety programs and identify operational improvements that help keep your drivers and other road users safe.

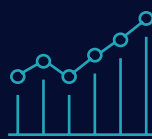
Guardian Live's current diagnostics and activity reports provide a daily summary of events and issues. Seeing Machines will soon be releasing a new range of reports including daily and weekly digests and a monthly insights report.

This monthly report will provide a regular snapshot of event trends and risks, including a comparison against Guardian Live averages. It will provide similar insights to this annual report, but at an account and fleet level, to inform actionable decisions for fleet managers to improve safety.

Guardian live provides the Insights needed to enable driver and fleet safety



Insights that build an understanding of trends and risks over time



Performance data that contributes to driver and fleet behavior change



An integrated, efficient and scalable service

Educate employees

Ensuring that your drivers comprehend the dangers associated with fatigue and distraction is of paramount importance. Driver education and training plays a pivotal role in mitigating these risks, promoting road safety, reducing accidents, and safeguarding not just their own lives but those around them.

One of the most effective ways fleet managers can coach employees and help them understand the risks of fatigue and distraction whilst driving, is by showing a driver one of their own events captured by Guardian. This is particularly successful with fatigue-related events, often serving to emphasise the importance of this technology and support driver adoption.

By educating your team on the signs of fatigue and the dangers of distractions, they become better equipped to recognise and manage these risks proactively. The following pages include tips and tricks to assist with this. You can also share the data from this report, making your drivers aware of the riskiest times on the road.

Other helpful resources include:

Seeing Machines

News and resources:

A range of Human Factors articles and videos explaining fatigue, distraction, driver monitoring systems and more.

National Heavy Vehicle Regulator (NHVR)

Fatigue management:

A comprehensive collection of information and resources to ensure both companies and drivers understand the rules and requirements of fatigue management.

Regulatory Advice – Driver distraction:

Provides guidance on obligations under the Heavy Vehicle National Law (HVNL) to manage the safety risks associated with driver inattention and distraction.

National Road Safety Partnership Program (NRSP)

Knowledge Centre – Fatigue:

Handbooks, toolkits, articles, and other helpful information to support companies and drivers understand, manage, and prevent fatigue-related events.

Knowledge Centre – Distraction:

A large collection of distraction resources, including videos, webinars, fact sheets, posters and more.

Protect and prevent

Guardian can only protect your drivers if it can see them. If the in-cab sensor is misaligned or tampered with, for example turning it to face another direction, it can have devastating consequences.

Seeing Machines recently released a new range of driver adoption resources to assist companies in explaining the technology and alleviating any concerns that drivers may have.

Visit the [Australian and New Zealand driver information page](#) or speak to your Account Manager about ordering in-vehicle tags, dashboard stickers and posters for your sites.



Tips for managing distracted driving

#EYESUPNZ

Courtesy of #EYESUPNZ – an Autosense initiative, sponsored by Seeing Machines

Why it matters

Distraction kills people on our roads

Too many think it won't hurt them

Hard to combat completely

Driver distraction



What is distraction?

- Inattention to road
- Mind off the driving task
- Delay in recognising important info
- Secondary activities e.g. phones



Sort your tech

- Connect Bluetooth
- Phone on silent
- Store phone out of reach
- Set up playlist, audiobook or radio station
- Set auto notifications



Know your vehicle

- Keep cab clean and tidy
- Get organised
- Understand safety features



Know yourself

- When are you most distracted
- What distracts you
- Impact of food and hydration
- Impact of fatigue
- Educate family/friends



Know your route

- Plan breaks
- Check weather/traffic
- Focus on what's coming next



What else drivers can do

- Avoid distractions
- Change how you respond
- Be prepared
- Share experiences – support safe culture

How to combat distraction



Self

- Hydration – drink water
- Impact of food choices
- Sort out high-stress distractions



Vehicle

- Clean, tidy and organised
- Understand dimensions and limitations
- Understand dashboard and safety features



Technology

- Phone on silent
- Bluetooth connected
- Set up playlist, audiobook or radio station



Route

- Directions Set
- Weather and traffic conditions checked
- Breaks planned

Tips for managing drowsiness and fatigue

#EYESUPNZ

Courtesy of #EYESUPNZ – an Autosense initiative, sponsored by Seeing Machines

Why it matters



- Fatigue is human and affects everyone
- Contributes to 40% of truck accidents¹
- Professional drivers manage this risk
- Fatigue can sneak up on you

What is fatigue?



- Reduced alertness
- Slower reaction times
- Making mistakes
- Reduced ability to assess situations

Driver warnings



- Most people often can't assess their own fatigue accurately or how their performance is downgrading.
- Studies show if you've been awake for 17 hours you have the same level of impairment as a drunk driver (blood alcohol concentration of 0.05).²
- Time of day is a factor that is often overlooked. This is related to circadian rhythm³ (a person's body clock), which drivers have little control over, making real-time driver monitoring so important.
- Studies show that up to 41% of professional drivers have treatable, but undiagnosed sleep apnoea*.⁴
*sleep disorder that reduces your quality of sleep

Causes of fatigue



- Not enough, or low-quality sleep
- Working too many hours
- Time of day (circadian rhythm)
- Dehydration or poor diet
- Underlying health issues

What drivers can do



- Get a good night's sleep
- Limit Caffeine
- Maintain a healthy diet
- Stay hydrated - drink water
- Regular exercise
- Adjust your environment
- Take frequent breaks
- Get regular health check-ups
- Take a pre/mid-drive nap

Signs of fatigue



- Frequently yawning
- Struggling to keep your eyes open
- Head nodding (head hitting your chest or backrest)
- Difficulty maintaining speed
- Drifting in and out of your lane
- Making poor gear changes
- Making more mistakes (e.g. under turning, nicking curbs, etc)
- Daydreaming (e.g. no recollection of the last 10kms)
- Slower reaction time

¹ <https://www.nts.gov.au/safety/safety-studies/Pages/SS9502.aspx>

² D.B. Boivin and P. Boudreau, "Impacts of shift work on sleep and circadian rhythms," *Pathologie Biologie*, no. 62, pp 292-301, 2014. www.ncbi.nlm.nih.gov/pmc/articles/PMC1739867/

³ Ingre, M. et al. *Validating and Extending the Three Process Model of Alertness in Airline Operations*. *PLoS ONE* 9, e108679 (2014)

⁴ Sharwood LN; Elkington J; Stevenson M; Grunstein RR; Meuleners L; Ivers RQ; Haworth N; Norton R; Wong KK. *Assessing sleepiness and sleep disorders in Australian long-distance commercial vehicle drivers: self-report Versus an "at home" monitoring device*. *SLEEP* 2012;35(4):469-475. <https://academic.oup.com/sleep/article/35/4/469/2558854>

Appendix

Glossary*

Algorithms: Step-by-step instructions or rules followed by a computer to perform a specific task or solve a problem.

Automotive Grade: Refers to components, systems, or software that meet the strict standards and requirements for use in the automotive industry.

Baseline Data: The initial set of data used as a reference point for comparisons or analysis.

Circadian Rhythms: Natural, internal processes that regulate the sleep-wake cycle and other physiological and behavioural processes.

Connections: Vehicles with Guardian installed.

Deidentified Data: Information that has been stripped of any personally identifiable (or in this case, customer) details, making it anonymous.

Distraction (Event): The driver is distracted from the main task of driving the vehicle. This may include looking down at an item in their hands or looking away from the forward roadway for an extended period of time.

Driver Monitoring System: Technology that monitors a driver's behaviour and alerts or intervenes if signs of drowsiness or distraction are detected.

Drowsiness (Event): The driver's eyes appear to be heavy and eye closures are dramatically slower or more rapid. A key indicator is the continuous closures where the driver appears to be fighting the onset of fatigue.

Event: When fatigue or distraction¹ is detected by the Guardian in-cab sensor, it triggers a brief video recording which is sent securely, in real-time to the Guardian Centre for analysis.

Fatigue (Event): Confirmed instance of a driver experiencing drowsiness or a microsleep.

Fatigue Intervention Plan: Used by the Guardian Centre to call or email contacts who are responsible for reacting to a confirmed fatigue event. These plans are created to support the business needs of customers (for example, customers can nominate different contacts on different days of the week and for different shifts).

Guardian: Seeing Machines' world-leading Driver Monitoring System for fleets, which alerts a driver to fatigue and distraction events.

Guardian Centre: A team of highly trained human analysts who work 24/7 to review, analyse and classify every event captured by Guardian, and initiate Fatigue Intervention Plans as required.

Guardian Live: A secure online platform which provides companies with access to near real-time driver and vehicle data and fleet insights.

Human Factors: The study of how humans interact with systems, equipment, and environments, with a focus on optimising safety, efficiency, and usability.

Microsleep (Event): The driver appears to be in a state of sleep. Key indicators include uncontrolled eye closure, eye rolls, long eye closures, and head bobs where the driver has lost control of their neck muscles.

Mobile use (Event): The driver is observed using a mobile phone. This classification is only used where a mobile phone is visible in the video.

Naturalistic Driving Data: Data collected from real-world driving scenarios, providing insights into actual driving behaviour and conditions.

Normalised Data: Data that has been contextualised by the number of kilometres driven by vehicles with Guardian installed.

Sleep Apnoea: A sleep disorder characterised by interruptions in breathing during sleep, often leading to daytime sleepiness and other health issues.

¹ Other event types (e.g., Field of View) are not referenced in this report.
* Terms are defined in the context of use in this report.

By the numbers

Raw data

Time of day	Kilometres driven	Distracted driving events	Driver fatigue events
0:00	65,383,308	12,103	4,643
1:00	62,505,049	11,343	5,325
2:00	61,566,500	10,914	6,310
3:00	62,898,294	10,343	7,534
4:00	68,587,483	10,476	8,909
5:00	79,171,905	12,593	9,066
6:00	88,099,570	19,809	8,830
7:00	94,654,227	26,557	8,544
8:00	98,118,814	29,548	7,030
9:00	101,256,669	31,546	6,398
10:00	102,961,462	32,262	6,029
11:00	103,730,452	32,397	5,959
12:00	102,908,950	32,205	6,177
13:00	102,137,788	32,405	6,359
14:00	99,185,976	32,088	6,034
15:00	94,311,108	31,828	5,115
16:00	90,471,797	30,029	4,327
17:00	89,210,392	26,219	2,877
18:00	87,299,125	22,589	2,522
19:00	85,199,338	19,215	2,165
20:00	83,636,320	15,234	2,017
21:00	81,000,055	13,449	2,439
22:00	76,126,292	13,141	3,019
23:00	70,590,915	12,949	4,178

Day of week	Kilometres driven	Distracted driving events	Driver fatigue events
Monday	292,345,330	80,754	19,320
Tuesday	348,516,607	89,149	22,830
Wednesday	362,855,573	88,547	23,531
Thursday	360,114,159	81,871	21,281
Friday	322,333,810	74,339	18,739
Saturday	201,752,803	55,478	15,427
Sunday	163,093,507	51,104	10,678

Month of year	Kilometres driven	Distracted driving events	Driver fatigue events
October 2022	154,618,486	48,427	7,029
November 2022	170,257,063	46,850	17,939
December 2022	164,655,301	53,970	13,512
January 2023	159,646,957	60,548	9,640
February 2023	159,771,597	58,029	8,859
March 2023	181,230,665	64,482	10,489
April 2023	156,621,021	54,123	9,736
May 2023	182,240,605	44,122	11,354
June 2023	171,526,250	26,439	9,761
July 2023	175,419,347	23,460	10,028
August 2023	190,182,660	20,986	10,903
September 2023	184,841,837	19,806	12,556



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