Centre for Automotive Safety Research

THE UNIVERSITY of ADELAIDE

Collection and analysis of EDR data from crash-involved vehicles: 2023 summary report

CASR240

ME Elsegood, G Ponte, SD Doecke, IM English

Report documentation

REPORT NO.	DATE	PAGES	ISBN	ISSN
CASR240	August 2024	20	978-1-925971-73-6	1449-2237

Title

Collection and analysis of EDR data from crash-involved vehicles: 2023 summary report

Authors

ME Elsegood, G Ponte, SD Doecke, IM English

Performing Organisation

Centre for Automotive Safety Research
The University of Adelaide
South Australia 5005
AUSTRALIA

Funding

This research was funded via a deed with the South Australian Government

Available From

Centre for Automotive Safety Research; http://casr.adelaide.edu.au/publications/list

Abstract

Modern vehicles are fitted with Event Data Recorders (EDRs) to constantly record variables such as speed, seatbelt usage, accelerator/brake pedal position, delta-*v* and safety systems deployment. When a crash occurs, a snapshot of the final few seconds of the vehicle variables are saved on the EDR. In 2017, CASR established a data collection process whereby a large number of crash-involved vehicles could be accessed regularly from a single location (an auction yard) and the EDR data downloaded. Additionally, the South Australian Police Major Crash unit provided EDR data to CASR, downloaded from vehicles involved in investigated serious crashes. In 2023, CASR successfully retrieved EDR data from 102 crashed vehicles, of which 77 (75.5%) had associated police vehicle collision reports. This collection has contributed to a current total of 1050 EDR records with 804 matched to police reports and 190 injured occupants matched to hospital injury data. In the sample of cases collected by CASR from the auction yard, 26.4% of bullet (striking) vehicles, and 41.5% of free speed vehicles were found to be speeding. The rate of seatbelt wearing for front seat occupants in the sample was 96.6%.

Keywords

Event data recorder (EDR), speed, speeding, restraint use, crash data, delta-v, impact speed, travel speed, AIS injuries

Summary

Modern vehicles are fitted with Event Data Recorders (EDRs) to constantly record variables such as speed, seatbelt usage, accelerator/brake pedal position, delta-v and safety system deployment. When a crash occurs, a snapshot of the final few seconds of the vehicle variables are saved on the EDR.

In 2017, CASR established a data collection process whereby a large number of crash-involved vehicles could be accessed regularly from a single location (a vehicle auction yard). Additionally, the South Australian Police Major Crash unit provided EDR data to CASR, downloaded from vehicles involved in investigated serious crashes. The Department for Infrastructure and Transport (DIT) funded the collection of 100 EDR downloads per year starting mid-2017. Additional funding was provided by the Victorian Transport Accident Commission to collect an extra 200 cases from July 2019 to June 2021. In 2023, CASR successfully retrieved EDR data from 102 crashed vehicles, of which 77 (75.5%) had associated police vehicle collision reports. This collection contributed to a current total of 1050 EDR records with 804 matched to police reports over the four and a half years of data collection; 797 from the auction yard and 37 from Major Crash.

The police reports supplemented the EDR data with crash location, site features, crash descriptions, and driver and occupant information. Information pertaining to other vehicles and occupants involved in the crashes, in addition to the EDR vehicle, were obtained. The matched cases yielded details from a total of 1718 crash involved vehicles and 2382 crash participants. Of the 2382 crash participants, 481 were transported to a hospital, of which 190 had hospital records examined and injuries coded according to the Abbreviated Injury Scale (AIS, 2005).

The sample of EDR cases collected were found to be reasonably representative of all passenger vehicles involved in police reported crashes in South Australia (according to injury severity and speed zones).

In the sample of cases collected by CASR from the auction yard, some key statistics are listed below:

- Of the 767 EDR vehicles matched to police reports collected from the auction yard, 458 EDR vehicles were classified as bullet vehicles
- 412 bullet vehicles had speed data recorded with 26.4% travelling above the posted speed limit by any amount
- 207 EDR vehicles were classified as travelling at a driver-selected free-speed prior to a crash with 41.5% travelling above the posted speed limit by any amount
- 15.9% of the free-speed vehicles were travelling 10 km/h or more above the posted speed limit
- 96.6% of 438 frontal occupants with seatbelt usage recorded had their seatbelt buckled at the time of the crash.

Table of Contents

1. Introduction

A significant number of modern vehicles contain Event Data Recorders (EDRs) that detect when a collision has occurred and save the log of the last few seconds of driving data prior to the crash. Data downloaded from the EDR of a crash-involved vehicle can reveal key information which are relevant in a road safety context, such as travel speed, impact speed, brake/accelerator pedal position, steering wheel angle, delta-*v* (crash impact severity), seatbelt usage and safety system deployment (for example, airbags and seatbelt pretensioners). Travel speed, pedal position and seatbelt usage are particularly valuable for road safety research as they are not easily attainable objectively through other means.

In 2017, CASR established a data collection process whereby a large number of crash-involved vehicles were accessed regularly from a single location (a vehicle auction yard) and from the South Australian Police Major Crash unit. The EDR data collected was matched to a police report (whenever possible) to provide crash location, a description of the crash circumstances, vehicle details, occupant details, site features and police-reported injury severity for relevant crash participants. Detailed hospital case notes were also collected for individuals involved in the crashes that were listed on the police report as having attended a major metropolitan hospital, and the injuries were coded according to the Abbreviated Injury Scale (AIS 2005). The EDR collection project was continued through to 2023 to expand the sample of crashes.

Funding for the project was provided initially by the South Australian Department for Infrastructure and Transport for the collection of 100 EDR downloads per financial year starting mid-2017. Additional funding was provided by the Victorian Transport Accident Commission to collect an additional 200 cases from July 2019 to June 2021.

2. Method

EDR data from crashed vehicles was accessed by attending a holding yard of a vehicle auction company on the day before their weekly auction (when the vehicle yard was open for public inspection). Around 80-90% of the insured, written off vehicles in South Australia are reportedly processed through this single holding yard.

To download the data from a crashed vehicle, a Bosch Crash Data Retrieval (CDR) tool was used to access and decode the data contained in the crashed vehicle's EDR via the OBD-II port. Figure 2.1 shows a section of the vehicle holding yard and a CASR researcher undertaking a download. Photographs were taken around the exterior of the vehicle as well as the interior of the vehicle and basic measurements of the deformation were recorded. On the rare occasions that the OBD-II was not accessible, the airbag control module (ACM) that contains the EDR data was requested from the purchaser of the vehicle for a monetary value, so a retrieval could be performed directly from the ACM at a later date. Three modules were obtained by this method.

Typically, 200 to 400 vehicles were auctioned every week, but only around 10-15% of the vehicles had an EDR that was supported by the Bosch CDR tool. The majority of vehicles that capture EDR data in the CASR dataset were vehicles manufactured by Toyota and Holden. EDR data can be obtained from these vehicles manufactured from as early as 2002 and 2007, respectively. Other vehicle manufacturers that had EDR data that is accessible via the Bosch CDR tool include Audi (from 2018), Bentley (from 2019), BMW (from 21019), Chevrolet (from 2020), Chrysler (from 2006), Dodge (from 2005), Fiat (from 2012), select Fords (from 2015-2016), Jeep (from 2006), Lancia (from 2012-2015), Lexus (from 2000), Mitsubishi (from 2007), Opel (from 2013), Porsche (from 2019), RAM (from 2010), Scion (from 2003), Subaru (from 2012), Volkswagen (from 2018), and Volvo (from 2014). Bosch has been actively increasing the number of supported vehicles and manufacturers over the years.

The South Australian Police Major Crash unit provided EDR files from vehicles that were supported by the Bosch CDR tool and were involved in fatal or high severity crashes. The data collected from Major Crash was coded separate from the data collected from the auction yard as it was sampled from a different crashed vehicle population, though it may be acceptable to combine both data sources for selected analyses.

Figure 2.1
Crashed vehicles at the holding yard (left) and a CASR researcher performing an EDR download via the OBD-II port (right)

Vehicle collision reports were obtained directly from the South Australian Police by supplying a registration plate number, vehicle identification number, vehicle make and vehicle model. This ensured prompt EDR and police report data matching. The police vehicle collision reports listed crash locations, a crash narrative, basic vehicle details, occupant details, site features and police-reported injury severities for relevant crash participants.

Detailed injury information was obtained from the six major metropolitan hospitals in South Australia. This process involved matching patient records by name and date of birth and physically attending the hospitals to transcribe the ambulance and hospitals' case notes related to the crash participant. These case notes were then transferred to CASR's EDR database and the injuries were coded according to the Abbreviated Injury Scale (AIS 2005). Hospitals were attended for data collection approximately once every three to six months in the years 2017 to 2021. However, throughout 2022 and 2023, there were difficulties in accessing hospital records, which has created a backlog of more recent cases.

The information from the EDR files and police reports were entered into a searchable database to enable later analyses. Each database record included all data from the EDR files, the police report, a photo of the main area of vehicle damage and a basic collision diagram of the crash based on information derived from the police report.

3. Results

3.1. Data collected and matched

During the 2023 calendar year, EDR data was retrieved from 102 crashed vehicles, with 77 (75.5%) vehicles having both a genuine crash event record and a matching police report (from both Pickles and SAPOL Major Crash). The 25 unmatched cases included those without a police report corresponding to observed vehicle damage and those where EDR data did not correspond to the observed damage.

Since June 2017, EDR data was retrieved from a total of 1050 vehicles, with 804 vehicle downloads (76.6%) containing EDR information that could be matched to a police report. This includes 767 written off vehicles from the auction yard and 37 from Major Crash. From the 804 matched police reports, there were a total of 1718 active vehicles (in motion or stationary in traffic at time of the crash) with 2382 occupants distributed within these vehicles. The number of cases collected from Pickles and matched to police reports for each collection year is shown in Table 3.1.

Table 3.1
EDR cases collected from Pickles and matched to police reports by years

Year collected	EDR files downloaded	EDR files matched to police report	Proportion matched
2017	91	69	75.8%
2018	128	98	76.6%
2019	217	169	77.9%
2020	220	160	72.7%
2021	171	143	83.6%
2022	102	83	81.4%
2023	100	75	75.0%
Total	**1029**	**797**	**77.5%**

Table 3.2 shows the hospitalised participants by crash-year, the type of hospital they attended and the percentage that had hospital notes collected. Hospital data collection in 2020 was suspended due to the pandemic, resulting in a lag of data collection for the most recent cases. Hospital data collection was also interrupted in 2022 and 2023 due to issues with access, contributing to additional delays.

Over a third of the participants listed on the police report as being hospitalised and transported to a major metropolitan hospital had their hospital case notes collected, and their injuries coded according to the AIS. Hospital and injury data could not be collected when the hospital they attended was not a major metropolitan hospital, or the hospital they attended was not specified on the police report.

The lack of data collected for cases who were treated at major metropolitan hospitals may be due to: an error on the police report, a lack of or mis-recording by an emergency department staff worker (possibly due to nil injuries being reported), or an early discharge from the emergency department.

Table 3.2
Hospital attendance, hospital type and data collection/rates for injured participants in EDR crashes, by download-year (including Major Crash cases)

Download-year	Attended hospital	Major metropolitan hospital	Other hospital	Hospital not specified	Hospital data collected	Collection rate
2017	39	30	6	3	20	51.3%
2018	53	42	9	2	27	50.9%
2019	118	96	17	5	68	57.6%
2020	116	79	31	6	32	27.6%
2021	117	95	17	5	41	35.0%
2022	39	29	5	5	-	-
2023	17	11	6	-	-	-
Total	499	**382**	**91**	**26**	**188**	**37.7%**

Representativeness of sample obtained through the auction yard

To determine the representativeness of the cases collected in the EDR database, comparisons were made to passenger vehicles in police reported crashes in South Australia reported in the Traffic Accident Reporting System (TARS). This was undertaken at the vehicle basis rather than a crash basis to align better with the EDR data collection process. As 2023 TARS data was incomplete, 2017-2022 TARS data was used for comparison.

Location

The locations of the 767 matched cases (excluding Major Crash cases) are shown in Figure 3.1. A total of 562 (81.3%) crashes occurred in the metropolitan area of Adelaide, compared to the TARS proportion of 88.4% occurring in the Adelaide metropolitan area. The remaining 129 (18.7%) EDR crashes occurred in rural and outer rural areas of South Australia. This compares to 11.6% of all passenger vehicles in police reported crashes in South Australia, 2017 to 2021 that crashed in rural areas.

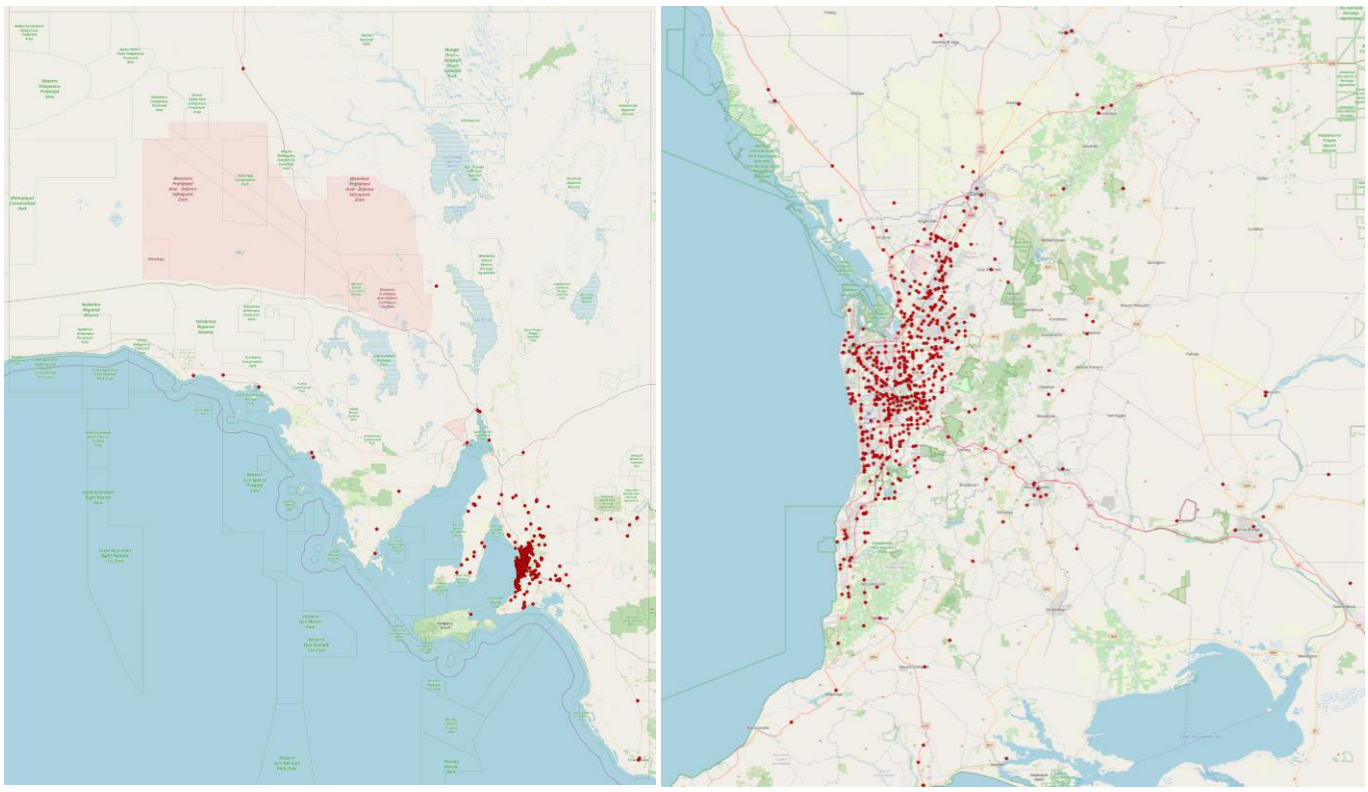


Figure 3.1
Locations of EDR crashes (left: South Australia, right: zoomed into metropolitan area)

Speed zones

The EDR vehicle sample and passenger vehicle sample in police reported crashes in South Australia are shown in Table 3.3 by speed zone. The EDR vehicle sample had a similar distribution of crash involvement by speed limit compared to the passenger vehicle data from TARS.

Table 3.3
Comparison of matched EDR vehicles to all passenger vehicle units for police reported crashes in South Australia from the TARS database, by speed limit (excluding Major Crash cases)

Speed zone (km/h)	EDR vehicles 2017-2023		TARS passenger vehicles 2017-2022	
	Count	Percentage	Count	Percentage
≤ 40	27	3.5%	2320	2.0%
50	192	25.0%	27848	23.8%
60	372	48.5%	61412	52.5%
70	18	2.3%	3714	3.2%
80	77	10.0%	10364	8.9%
90	16	2.1%	2339	2.0%
100	42	5.5%	5339	4.6%
110	23	3.0%	3574	3.1%
Total	**767**	**100.0%**	**116910**	**100.0%**

Injury severity

The injury severity of the crash, by vehicle, in the EDR cases were obtained from the matched police reports. These are shown in Table 3.4 and are compared to TARS crash severity for all passenger vehicles in crashes from 2017 to 2022. The EDR sample had a higher proportion of vehicles involved in hospital

treated crashes and a lower proportion of non-injury crashes compared to the TARS sample. Passenger vehicles involved in fatal crashes were also underrepresented in the EDR sample.

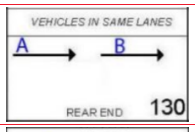
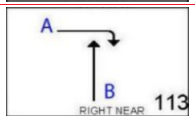
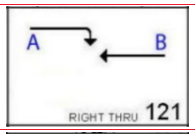
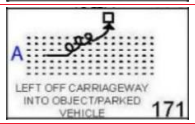
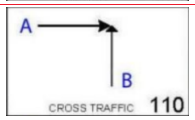
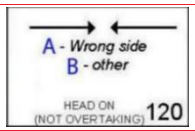
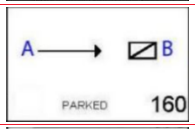
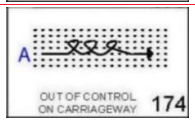
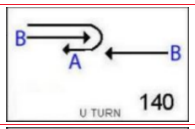
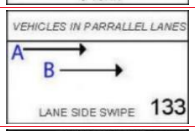
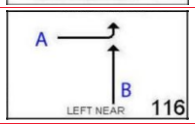
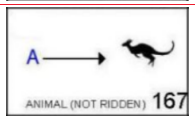
Table 3.4
Comparison of matched EDR vehicles to all passenger vehicles in police reported crashes in South Australia from the TARS database, by injury severity (excluding Major Crash cases)

Injury severity	EDR vehicles 2017-2023		TARS passenger vehicles 2017-2022	
	Count	Percentage	Count	Percentage
Non injury	425	55.4%	77140	66.0%
Doctor / minor injury	80	10.4%	10621	9.1%
Hospital treated	232	30.2%	24726	21.1%
Hospital admitted	23	3.0%	3916	3.3%
Fatal	1	0.1%	507	0.4%
Unknown	6	0.8%	-	-
Total	**767**	**100.0%**	**116910**	**100.0%**

3.2. Crash types of EDR matched cases

The crash types of all the EDR vehicles (including Major Crash cases) have been aggregated into simple crash type categories as shown in Table 3.5. Close to a third (31.8%) of the crashed vehicles were involved in rear-end crashes and around a quarter (25.5%) were involved in right-turn crashes. The right-turn crashes have been disaggregated into two categories, where the initial travel directions of the two vehicles involved in the crash were either opposite directions or adjacent directions. The complete South Australian Definition for Coding Accidents (DCA) is included in Appendix A.

Table 3.5
Crash types of EDR vehicles (including Major Crash cases)

Crash type	Vehicle position/action	Frequency	Crash type total	Indicative DCA diagram
Rear end (DCA 130, 131, 132)	A (rear/striking) B (first struck) C+ (following struck)	112 126 18	256	
Right turn – adjacent directions (DCA 111, 113, 114)	A (turning) B (through) Other	54 50 1	105	
Right turn – opposite directions (DCA 121)	A (turning) B (through) Other	50 47 3	100	
Single vehicle into object (DCA 141, 164, 171, 173, 174, 181, 183)	A (vehicle) Other	92 2	94	
Right angle (DCA 110)	A (crossing right of way) B (right of way)	40 38	78	
Head on (DCA 120, 150)	B (correct side) A (incorrect side)	15 15	30	
Hit parked vehicle (DCA 160, 161, 162, 163)	A (moving vehicle) B (parked vehicle)	27 3	30	
Rollover (DCA 170, 172, 174, 180, 182, 184)	A (vehicle)	25	25	
U-turn in front (DCA 140)	B (through) A (turning)	15 7	22	
Side swipe (DCA 133, 134, 135, 136, 137)	A (correct lane) B (changing lanes) Other	9 11 1	21	
Left turn – adjacent directions (DCA 112, 116)	B (through) A (turning) Other	6 3 1	10	
Hit animal (DCA 167)	A (vehicle)	9	9	
Other (All other DCAs)		24	24	
Total			804	

3.3. Data contained in the EDR files

The information stored on an EDR differs between various vehicle makes and generations of EDRs. Table 3.6 shows the rates of some data variables recorded by the EDR devices in the sample collected from the auction yard. In most crashed vehicles, longitudinal or lateral delta-*v* (vehicle change in velocity due to impact) was recorded as part of the airbag deployment system. Only two cases in the sample did not have any delta-*v* recorded. Some EDRs only record lateral delta-*v* when a crash event is classified as a side crash.

Table 3.6
Number of cases by data available (excluding Major Crash cases)

Data field	Recorded	Not recorded	Total	Percentage recorded
Longitudinal delta-*v*	724	43	767	94.4%
Lateral delta-*v*	505	262	767	65.8%
Speed history	700	67	767	91.3%
Driver seatbelt status	407	360	767	53.1%
Passenger seatbelt status	229	538	767	29.9%

3.4. Impact speeds and speeding

Vehicle speed-time history was recorded in 700 of 767 (91.3%) of crashed vehicles (not including Major Crash cases). This allowed objective determination of two important safety parameters: the crashed vehicle travel speed and impact speed. The maximum travel speeds of the vehicles (derived from EDRs) were used to determine the speeding rates of vehicles compared to the posted speed limit (PSL) for the road they were travelling on. When comparing travel speed to the posted speed limit in crashes, it was important to classify the category of vehicle involvement in a crash. A common vehicle classification useful in describing vehicle impact interactions in road crashes was the “bullet” (or striking) vehicle. These were vehicles that were travelling in a forward direction to strike another vehicle (the target or struck vehicle).

Bullet vehicles were vehicles that generally had right of way (if travelling through an intersection) and were usually travelling at a speed greater than the other vehicle involved. For crashes where a vehicle was performing a turning manoeuvre across traffic, the bullet vehicle was the through vehicle. In rear-end crashes, the rear-most vehicle was the bullet vehicle. For single vehicle crashes, the crashed vehicle was always classified as the bullet vehicle. In head-on crashes, both vehicles were classified as bullet vehicles. For side-swipe crashes, both vehicles were classified as bullet vehicles. Figure 3.2 shows the frequency of the various impact speed ranges of the bullet vehicles in the EDR sample and Figure 3.3 shows the frequency of travel speed variation relative to the posted speed limit (i.e., the maximum recorded travel speed above posted speed limit) of bullet vehicles. A total of 458 EDR vehicles (412 with speed data recorded) of the 767 matched EDR vehicles were classified as bullet vehicles with 26.4% travelling above the speed limit in the seconds before a crash.

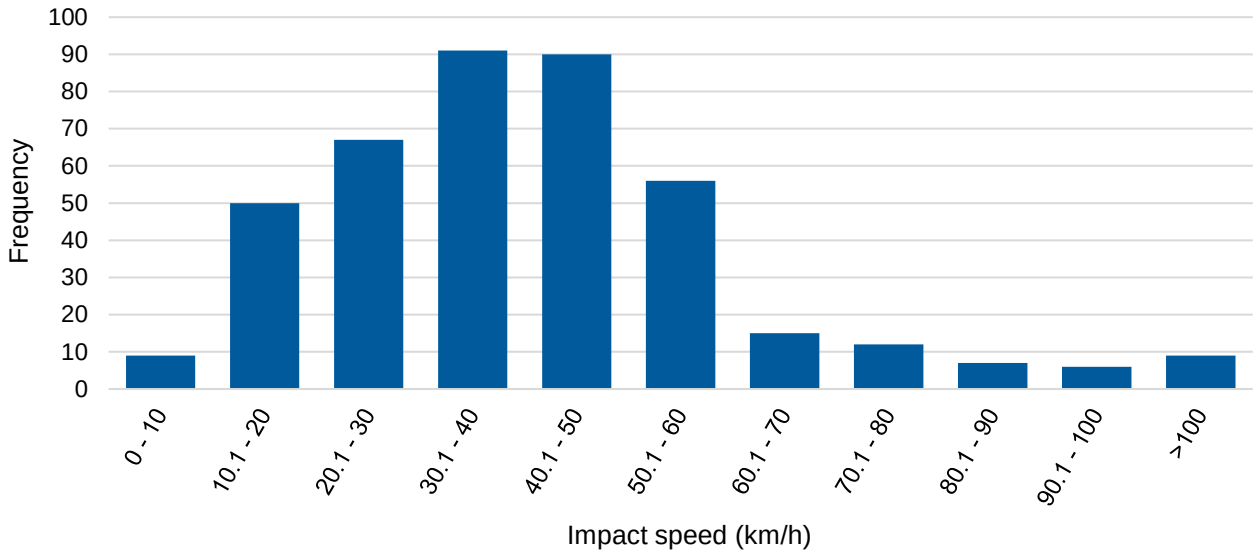


Figure 3.2
EDR bullet vehicle impact speeds (excluding Major Crash cases)

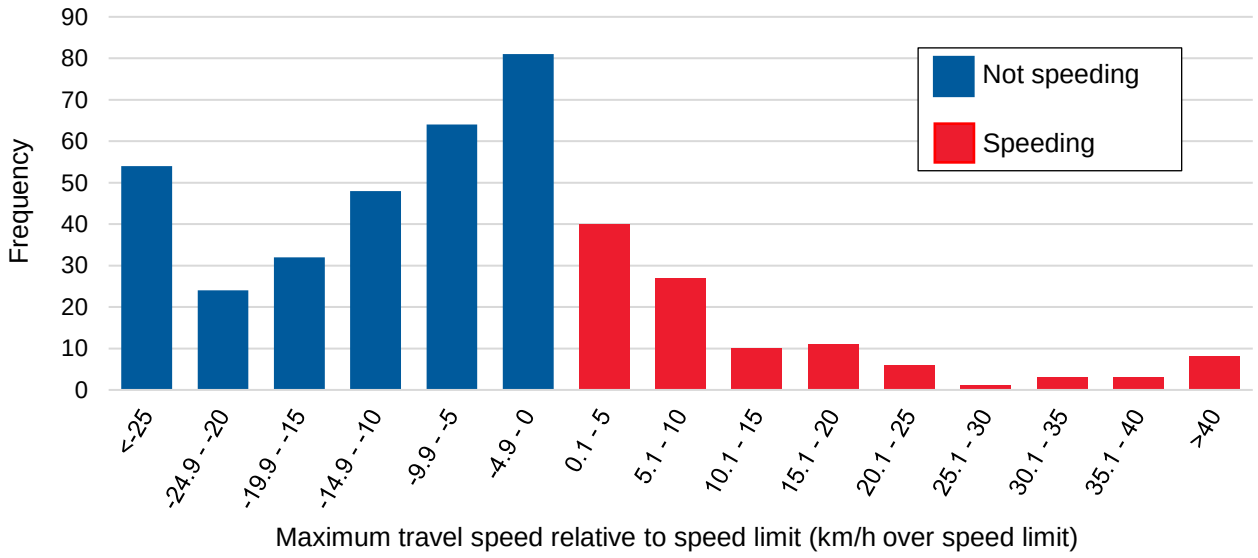


Figure 3.3
EDR bullet vehicle impact speeds (excluding Major Crash cases)

A vehicle travelling at a free-speed was also an important classification in road safety analyses. Free-speed vehicles were those assumed to be travelling at a driver-selected, non-restricted speed. A common quantifiable definition includes vehicles who had at least four seconds of no traffic ahead of them. Therefore, vehicles involved in rear-end crashes were not included in this classification, as there was insufficient information to determine if these vehicles were travelling at a self-selected free-speed. Vehicles that were performing manoeuvres, accelerating from stationary positions, performing illegal manoeuvres, travelling through work zones, or with drivers suffering from illness or fatigue were not included as free-speed vehicles. A total of 207 EDR vehicles were categorised as free-speed vehicles, with their speeding rates shown in Table 3.7. Figure 3.4 displays the distribution of speeding levels of the 207 free-speed EDR vehicles, with 86 crashed vehicles (41.5%) having travelled above the speed limit by any amount.

Table 3.7
Free-speed vehicle travel speeds relative to posted speed limit (PSL) (excluding Major Crash cases)

Maximum vehicle speed relative to posted speed limit (PSL)	Count	Percentage
At least 10 km/h under PSL	24	11.6%
Between 0 and 9.9 km/h under PSL	97	46.9%
Between 0.1 and 5 km/h over PSL	31	15.0%
Between 5.1 and 10 km/h over PSL	22	10.6%
Greater than 10 km/h over PSL	33	15.9%
Total	**207**	**100.0%**

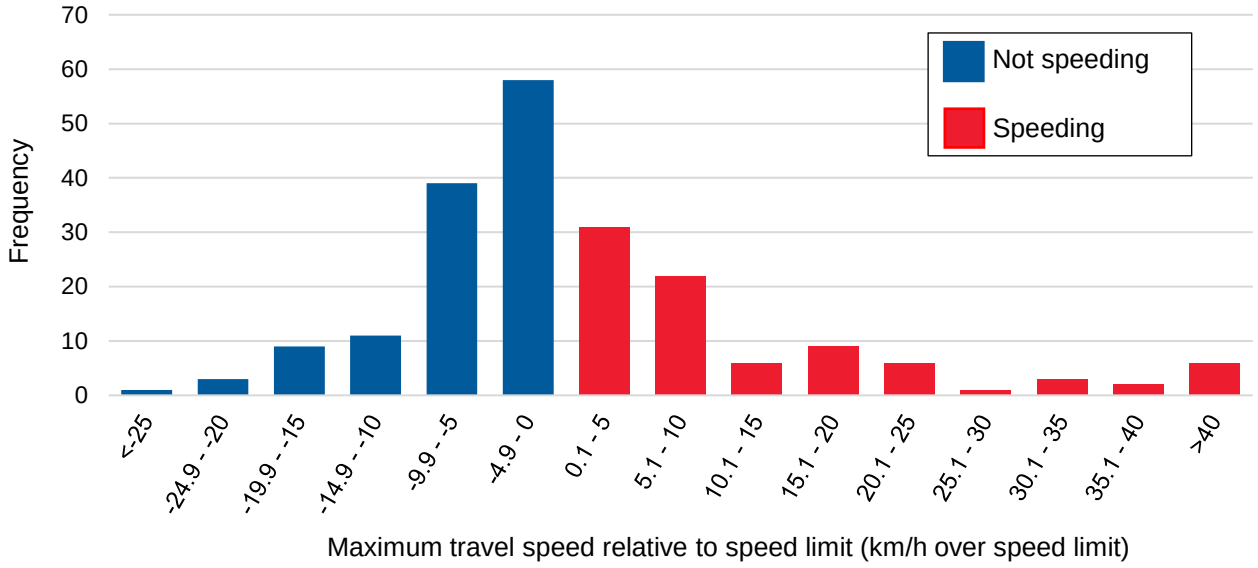


Figure 3.4
EDR free-speed vehicle's maximum travel speed relative to speed limit (excluding Major Crash cases)

3.5. Seatbelt use

Seatbelt usage by vehicle occupant is an important safety parameter recorded by EDRs. A summary of seatbelt use in the EDR sample is shown in Table 3.8. Of the 407 EDRs (not including Major Crash cases) with recorded driver seatbelt usage, 395 (97.1%) of the drivers had their seatbelt buckled at the time of the crash. Of the 229 EDR reports (not including Major Crash cases) with passenger seatbelt usage recorded, only 31 of the vehicles had a person seated in the left-front seat at the time of the crash (according to the matched police report) and 28 (90.3%) were recorded as having their seatbelt buckled at the time of the crash.

Table 3.8
Seatbelt statuses according to EDR records (excluding Major Crash cases)

Position	EDR seatbelt buckled	EDR seatbelt unbuckled	Percentage positive	Total
Driver	395	12	97.1%	407
Front seat passenger	28	3	90.3%	31
Total	**423**	**15**	**96.6%**	**438**

3.6. Impact severity (delta-*v*)

Delta-*v* is a measurement of the change in velocity that occurs for a vehicle during an impact. It is a commonly used parameter that is indicative of the impact severity and has been correlated with injury: higher delta-*v*s are associated with higher probability of injury. The distribution of maximum delta-*v*s (in 5 km/h increments) recorded by the EDR vehicles is shown in Figure 3.5.

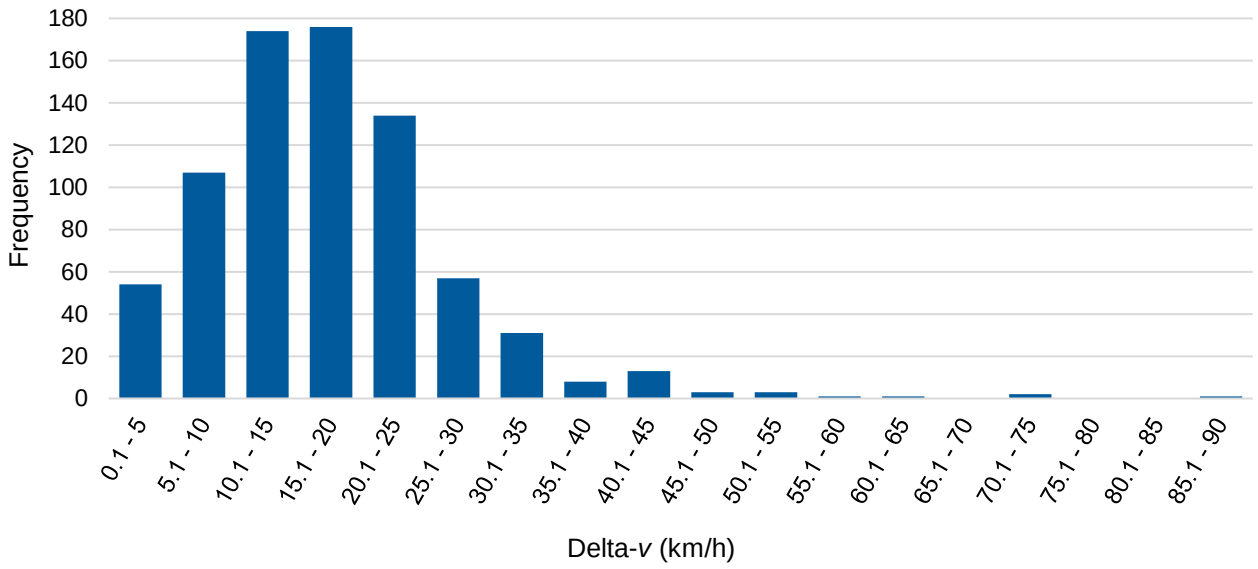


Figure 3.5
Frequency of delta-*v* of EDR vehicles in 5 km/h increments (excluding Major Crash cases)

3.7. Police-reported severities and injuries

There were 190 participants of all crashes involving EDR vehicles (including Major Crash cases) who were coded for AIS injuries based on hospital records. Table 3.9 shows the distribution of maximum AIS coded injury severities for each level of police reported severity. The AIS scoring system uses a simple method to rank injuries by severity and performs well as a measure of mortality. Each injury receives an individual AIS code, and from all injuries attributed to a single person, the maximum AIS severity can be determined. An AIS score of 0 indicates no injury was detected, whereas a score of 6 indicates an almost certain fatal injury. Four cases reported as non-injury and minor injury may have self-reported to a hospital rather than be transported via ambulance from the scene. Only three fatalities were coded (even though Major Crash cases were included) as the remainder may have died at scene and were transported directly for an autopsy rather than to a hospital for their injuries to be assessed. Their injuries will be coded when their Coroner's reports are obtained. Only 12.7% of participants with a 'hospital treated' status had an injury with an AIS severity of 2 or greater.

Table 3.9
Maximum AIS coded injury severities by police reported severity (excluding Major Crash cases)

Police reported severity	Maximum AIS coded injury severity							Total
	0	1	2	3	4	5	6	
Non injury	1	1	-	-	-	-	-	**2**
Doctor / minor injury	1	1	-	-	-	-	-	**2**
Hospital treated	67	64	12	7	-	-	-	**150**
Hospital admitted	4	7	7	11	3	1	-	**33**
Fatal	-	-	-	-	1	2	-	**3**
Total	**73**	**73**	**19**	**18**	**4**	**3**	**-**	**190**

4. Discussion

The primary aim of this project to expand the collection of EDR cases matched to police reports was achieved in 2023, with this summary report presenting an overview of the collected data. The collection was shown to be broadly representative of the crashes that occur in the South Australian passenger vehicle crash sample population. The matching rates of EDR downloads to police records was 78%, and the matching rate of injury data from hospitals for police reported hospital-attendees was 38%. The data from the project was used to determine the percentage and extent of speeding in crashes by bullet vehicles and by vehicles travelling at a free-speed, something that can only generally be undertaken with detailed crash investigations and reconstructions. Over a quarter of bullet vehicles (26.4%) were found to be speeding before a crash, and 41.5% of free-speed vehicles were found to have been speeding, with nearly half of those (15.9%) travelling 10 km/h or more above the speed limit. The seatbelt usage reported by the EDR files indicated that 96.6% of frontal occupants were buckled at the time of the crash.

The speed data from EDRs is not only useful for determining speeding, but has the potential to be useful for other applications such as:

- Exploring driver reactions and avoidance strategies from crash-involved vehicles
- Determining characteristics of drivers that choose to travel above the speed limit
- Examining the timing of pre-impact braking in different crash scenarios
- Investigating the level and effectiveness of pre-impact braking
- Determining the effects of different vehicle technologies and how/if they would avoid or reduce the severity of a crash
- Examining the speeds of vehicles navigating different infrastructure
- Investigating the relationship between delta-*v* and injury risk

It is important to note that this project has allowed for the efficient collection of data from non-injury crashes. Non-injury crashes are important for use as the denominator when calculating risk. They are also important for comparison and contrast between the desired outcome should a crash occur (no injury), and an undesirable outcome (injury). Current methods of detailed data collection are typically resource intensive and focus their finite resources on injury crashes.

Acknowledgements

This study was funded via a deed with the South Australian Government and the Transport Accident Commission (TAC) through project grants to the Centre for Automotive Safety Research. The TAC project manager was Paulette Ziekemijjer and the Department project managers were Matthew Lohmeyer and Tim Harker.

The Centre for Automotive Safety Research is supported by the South Australian Department for Infrastructure and Transport.

The authors would like to acknowledge: Pickles Auctions for allowing CASR researchers to access crashed vehicles; Christine Basso and Kasey Yates from SAPOL for providing police reports matching the EDR vehicles; and Tori Lindsay and Siobhan O'Donovan from the Centre for Automotive Safety Research for accessing hospital records and AIS coding the injuries.

The views expressed in this report are those of the authors and do not necessarily represent those of the University of Adelaide or the funding organisations.

Appendix A – DCA codes