ANNUAL REPORT
1 JULY 2019 TO 30 JUNE 2020

AUSTRALIA NEW ZEALAND TRAUMA REGISTRY
Management of the Severely Injured

ATR AUSTRALIA NEW ZEALAND TRAUMA REGISTRY

ANNUAL REPORT
1 JULY 2019 TO 30 JUNE 2020

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Australian Trauma Quality Improvement (AusTQIP) Collaboration (2021). Australia New Zealand Trauma Registry, Management of the Severely Injured, 1 July 2019 to 30 June 2020. Alfred Health, Melbourne, Victoria.

@ANZTrauma

FOREWORD

The 2019-2020 Australia New Zealand Trauma Registry (ATR) annual report includes data from 27 hospitals in Australia and 7 hospitals in New Zealand. The insights and health outcomes reported will form the basis for changes to the management of the severely injured.

Trauma services across Australia and New Zealand faced an unprecedented public health emergency in 2020. It will be at least another year before we have meaningful data to evaluate the impact the COVID-19 pandemic has had on the severely injured in Australia and New Zealand. Preliminary observations indicate a comparable number of severe trauma cases with a difference in the mechanism of injury patterns, possibly explained by lockdown and social distancing measures. While non-trauma emergency department presentations reported a decline in adult attendance, Trauma Centres continued to receive high volumes of patients. We are grateful to all the collaborators across Australia and New Zealand who give their time to enter data to the registry. We understand the challenges in collecting data, especially with the COVID-19 outbreak, and the resources required to support data submission.

In the past year, the ATR has made several major advancements.

We successfully executed a new agreement signed by all 34 ATR sites to permit the identification of jurisdiction and sites in data reporting, and a streamlining of processes to add additional sites to the ATR. For the first time, we are able to identify hospitals in this annual report and are excited to welcome more sites to the ATR in the next 12 months. The data reported demonstrates consistent and comparable level of care given across New Zealand and states and territories in Australia. We will continue to engage with hospitals, currently not entering data, with the intention of capturing all hospitals that receive patients with major trauma across Australia and New Zealand.

We are increasing our outputs and researchers are now in a position to request data for geospatial analyses. The ATR portal, which will ensure an ease of data access, strengthen transparency and facilitate actionable trauma quality improvement outcomes will be live by the end of 2021.

It is important that the ATR continually evolves to cater for the growing number of collaborators and improve efficiency. The governance structure of the ATR was revised to clarify functions within the ATR and the Australia Trauma Quality Improvement Program, comply with Australian Clinical Quality Registries guidelines and streamline key ATR activities such as the data request policy. We have also formed an ATR board, through a nomination process, as the governing body of all ATR-related activities and its strategic direction. Following this restructure, Monash University was selected through a competitive tender process as the preferred data host.

The ATR's success depends on hospitals' willingness to share their de-identified information. It requires a dedicated data management group to ensure data collation and quality, as well as a strong Steering Committee with experience, diverse representation and commitment to valuable oversight.

We are once again fortunate to have received funding from the Australian Department of Health, Australian Bureau of Infrastructure and Transport Research Economics and the New Zealand Accident Compensation Corporation to continue this important work. This funding is and has been essential to the operational aspects of the ATR and without this support, we would not be able to collect data on the severely injured to monitor the quality of care. For example, it sheds light on differences in trauma management and allows health providers to benchmark with other networks. Furthermore, it contributes to understanding and reducing the burden of trauma care in Australia and New Zealand. In the next financial year, we hope to secure more funding to improve the functions of the ATR and work closely with the sites as well as contributing to the recently established Medical Future Fund Traumatic Brain Injury project. We also look forward to monitoring the impact of the soon to be released National Injury Prevention Strategy.

Finally, a huge thanks to all the dedicated nurses, doctors, paramedics, administrators, allied health workers, rehabilitators and researchers that contribute to the recovery, rehabilitation and reintegration of the severely injured.

Professor Kate Curtis
Co-chair ATR Steering Committee

Professor Mark Fitzgerald
Co-chair ATR Steering Committee

Professor Ian Civil
Clinical Lead
NZ National Trauma Network

2019-20 YEAR IN REVIEW
AUSTRALIA

DEMOGRAPHICS

8,585 severely injured

median AGE **48**

72% MALE

34% occured on the WEEKEND

CAUSE OF INJURY

3.7% penetrating trauma

<1%BURNS

94.6% BLUNT trauma

44.3% transport related

37.7% FALLS

4.9% by assault

PLACE OF INJURY

45.5% streets & highways

32.5% home

PRE-HOSPITAL

69% direct from scene to definitive HOSPITAL

Median time from injury to definitive care **1hr 29mins**

HOSPITAL

Median time spent in ED **4hrs 14mins**

median length of stay **7days**

39.7% admitted to ICU

median ICU length of stay **3.2 DAYS**

OUTCOMES

10.7% in-hospital deaths

39.5% of deaths aged 75+

14.5% of deaths OCCURED IN ED

64.2% discharged **home**

19.5% to rehabilitation

2019-20 YEAR IN REVIEW
NEW ZEALAND

DEMOGRAPHICS

1,585 severely injured

median AGE 46

73% MALE

35% occured on the WEEKEND

CAUSE OF INJURY

4.1% penetrating trauma

2.3%BURNS

93.6% BLUNT trauma

50.6% transport related

29.3% FALLS

8.4% by assault

PLACE OF INJURY

50.7% streets & highways

25.9% home

PRE-HOSPITAL

73% direct from scene to definitive HOSPITAL

Median time from injury to definitive care 1hr 36mins

HOSPITAL

Median time spent in ED 3hrs 42mins

median length of stay 7.1days

32.2% admitted to ICU

median ICU length of stay 3.8 DAYS

OUTCOMES

8.4% in-hospital deaths

35.3% of deaths aged 75+

6.8% of deaths OCCURED IN ED

62.1% discharged home

21.1% to rehabilitation

EXECUTIVE SUMMARY

The Australia New Zealand Trauma Registry (ATR) is entering an exciting phase, having established itself as a leading Clinical Quality Registry. The registry now has reliable data, collected in a consistent manner and collected over a long time period.

Site Identification/Additional Sites

A variation of the Australian Collaboration agreement and the New Zealand Memorandum of Understanding allow us to now identify sites and jurisdictions for the first time. This is essential for benchmarking and driving improvements across the region. A further variation also allows the registry to recruit additional sites, moving toward a population-based registry in the future.

This annual report provides a bi-national view of severe injury resulting in hospitalisation. It covers dates of injury between 1 July 2019 to 30 June 2020 for severely injured patients with an Injury Severity Score greater than 12 or in-hospital death following injury from 26 Australian and seven New Zealand designated trauma services. This year we have two additional sites, Royal Hobart Hospital and Townsville Hospital, submitting data for the first time.

In 2019-20 the ATR received data for 10,170 patients (8,585 in Australia, 1,585 in New Zealand). A major change is occurring in the epidemiology of severe injuries with older patients injured from low falls increasingly the most common group experiencing severe injury and death (1,2). Low falls accounted for 47.2 per cent of all severe injuries in those aged 65 years or above. Mortality from a low fall for this age group was 21.5 per cent, well above the overall binational mortality rate of 10.4 per cent.

Covid-19 Global Pandemic

In early 2020 a worldwide Covid-19 pandemic hit Australian and New Zealand shores with both nations moving into lockdowns. Overall severe injury numbers remained comparatively stable for the year, but the last quarter showed some reduction, especially in Victoria and NSW. It is likely that the major impact of this pandemic will be demonstrated in the following year, as the full effect of lockdowns and COVID were experienced.

NEW Risk-Adjustment Modelling

New risk adjustment modelling is used in this report to benchmark hospitals for length of stay and mortality. There is no consensus internationally as to the best approach to risk adjustment for comparison of death and length of stay in major trauma patients. Unfortunately any risk adjustment model must take account of missing data, differences in epidemiology, casemix and the influence of geography between regions. The new model includes previously identified risk factors, but significantly improves the methodology for age adjustment. The methods have been submitted for publication. Comparing outcomes for transferred patients is difficult because we don't have a denominator, nor do we have data from referring hospitals. It is hoped that as we move to improved data linkage with admissions and prehospital data, this will become possible.

What do these results mean for trauma services?

Despite minor decrease in overall major trauma across both nations for this reporting period, numbers have been relatively stable over the last three years. There do not appear to be any outliers with regard to mortality or length of stay after adjustment for risk factors. The engagement of trauma services across both nations, will assist with translation of improvements into practice and reassure funders that trauma services are operating at a high level. The importance of credible, reliable data from trauma registries has been shown to drive improvements to trauma systems. It is hoped that as data quality and completeness continue to improve, together with improved benchmarking of processes and outcomes, preventable death and morbidity following severe injury will decline.

The ATR has secured funding until 2022 and the next phase of the registry will be to support national injury prevention programs with accurate data, explore variations in clinical care and outcomes for specific patient groups to drive improvements in the trauma systems at a binational level. Data linkage between the ATR and admitted hospital episodes, prehospital records and death registries will be essential to use population level data to identify variation in outcomes to improve care.

Data Usage

Under the current funding agreement, the DoH and BITRE receive a bi-annual data report, and annual report. Quarterly transport-related data is provided to the Australian Automobile Association (AAA). Three new epidemiological papers have been written this previous year on risk adjustment, severe injury in the pedestrian cohort and the impact of rurality on the severely injured. All three papers are in the process of submission to academic journals and will be available for viewing on the ATR website – www.atr.org.au.

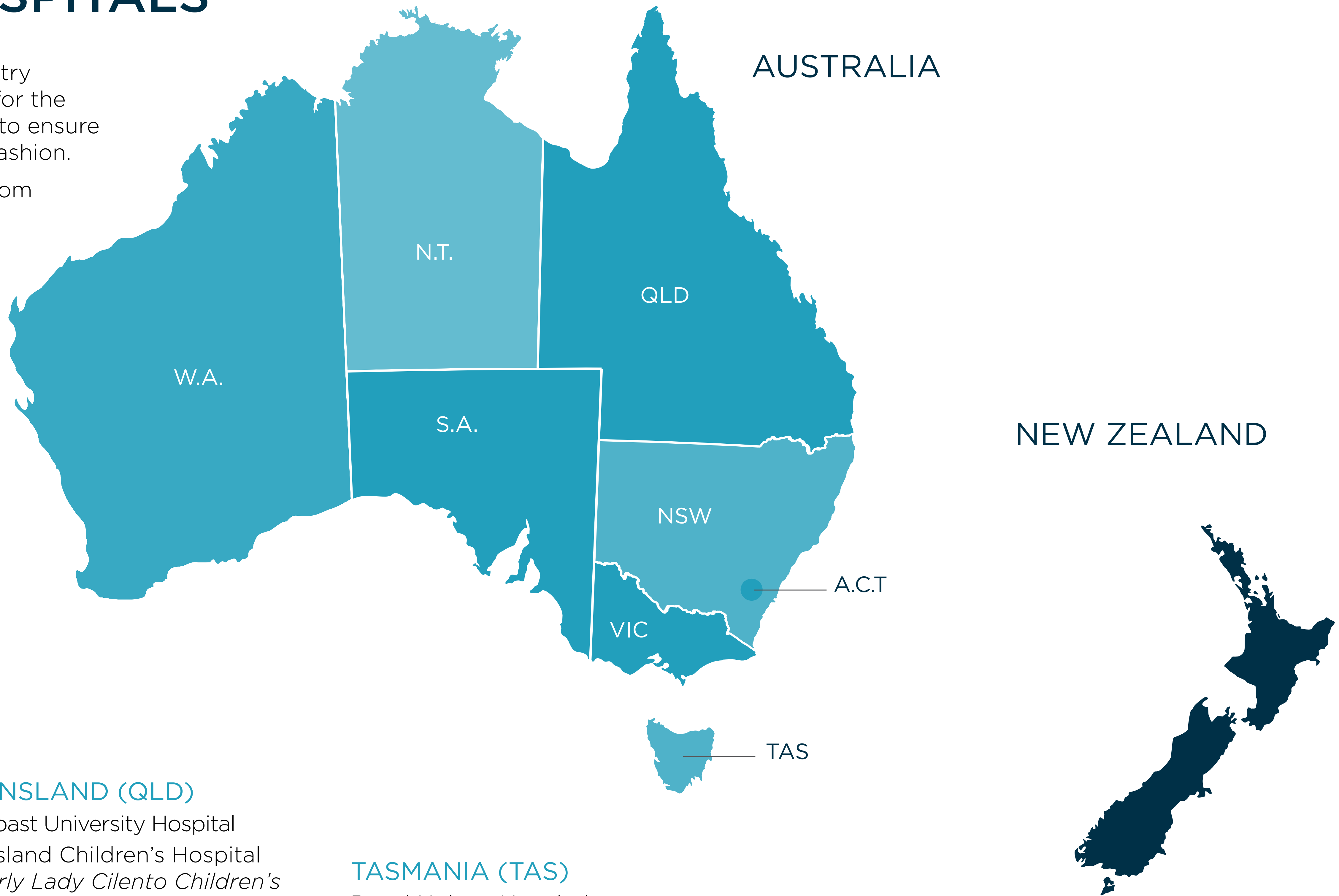
Professor Peter Cameron
University Representative
Monash University

Emily McKie
ATR Manager

CONTRIBUTING HOSPITALS

The ATR would like to thank the Trauma Registry staff from all contributing registries and sites for the invaluable work they perform on a daily basis to ensure the Registry receives quality data in a timely fashion.

The ATR has 5-years quality Australian data from 1 July 2015 to 30 June 2020 and three year's quality New Zealand data from 1 July 2017 to 30 June 2020. Sites which have commenced data submissions after these start dates are mentioned below.



JURISDICTIONS

AUSTRALIAN CAPITAL TERRITORY (A.C.T.)

Canberra Hospital

NEW SOUTH WALES (N.S.W.)

NSW data submitted by the Institute of Trauma and Injury Management (ITIM)

Children's Hospital, Westmead
John Hunter Children's Hospital
John Hunter Hospital
Liverpool Hospital
Royal North Shore Hospital
Royal Prince Alfred Hospital
St George Hospital
St Vincent's Hospital
Sydney Children's Hospital
Westmead Hospital

NORTHERN TERRITORY (N.T.)

Royal Darwin Hospital

QUEENSLAND (QLD)

Gold Coast University Hospital
Queensland Children's Hospital *(formerly Lady Cilento Children's Hospital)*
Princess Alexandra Hospital
Royal Brisbane and Women's Hospital
Townsville Hospital (from 1 January 2020)
Sunshine Coast University Hospital (from 1 October 2018)

SOUTH AUSTRALIA (S.A.)

S.A. data submitted by the S.A. Department of Health

Flinders' Medical Centre
Royal Adelaide Hospital
Women's and Children's Hospital, SA

TASMANIA (TAS)

Royal Hobart Hospital (from 1 April 2020)

VICTORIA (VIC)

Victorian data submitted by the Victorian State Trauma Registry (VSTR)

Alfred Hospital
Royal Melbourne Hospital
Royal Children's Hospital

WESTERN AUSTRALIA (W.A.)

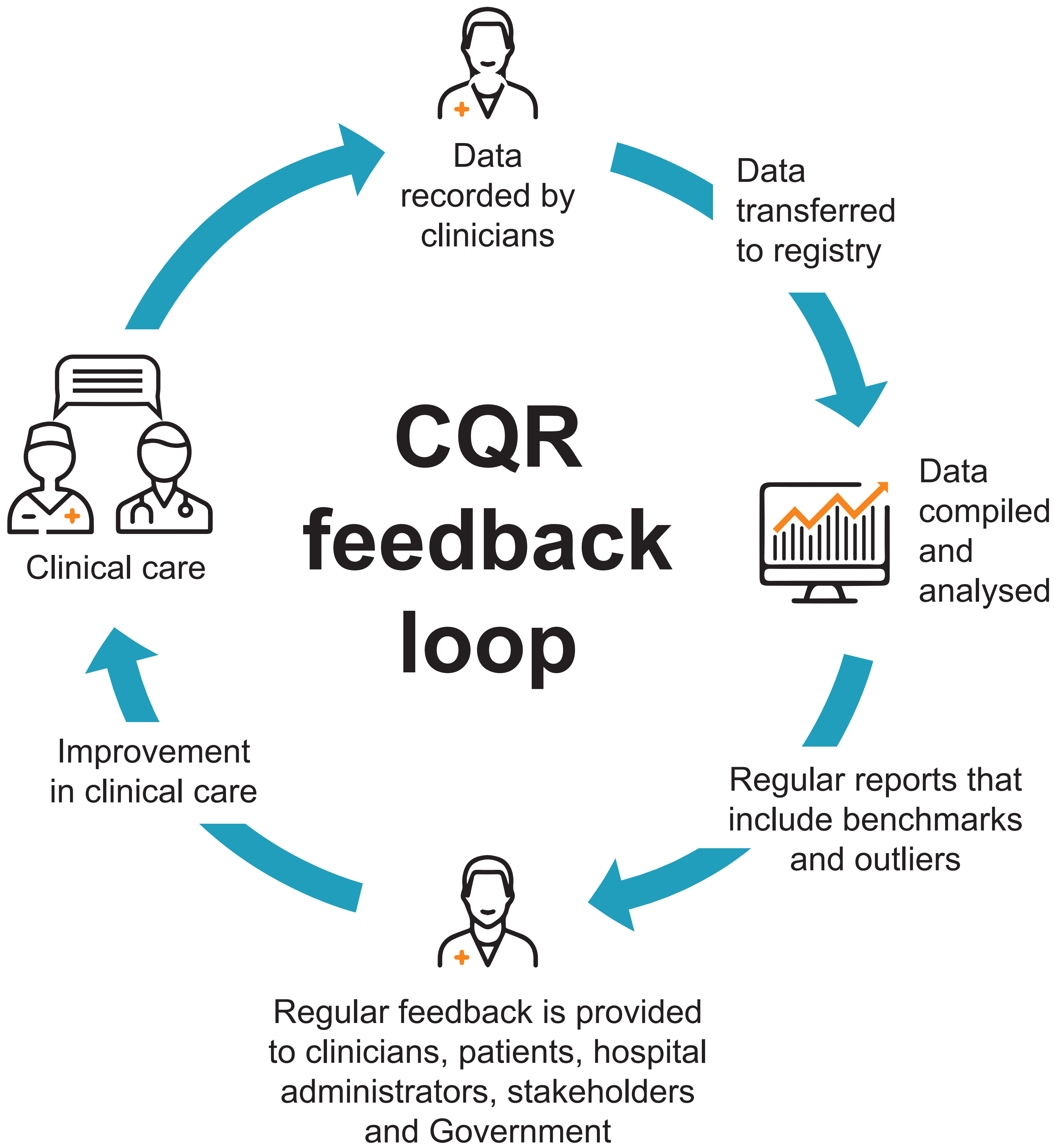
Perth Children's Hospital *(formerly Princess Margaret Hospital)*
Royal Perth Hospital

NEW ZEALAND (N.Z.)

New Zealand data submitted by the New Zealand National Trauma Network (NZMTCN)

Auckland City Hospital
Starship Hospital
Middlemore Hospital
Waikato Hospital
Wellington Regional Hospital
Christchurch Hospital
Dunedin Hospital

THE ATR AS A CLINICAL QUALITY REGISTRY

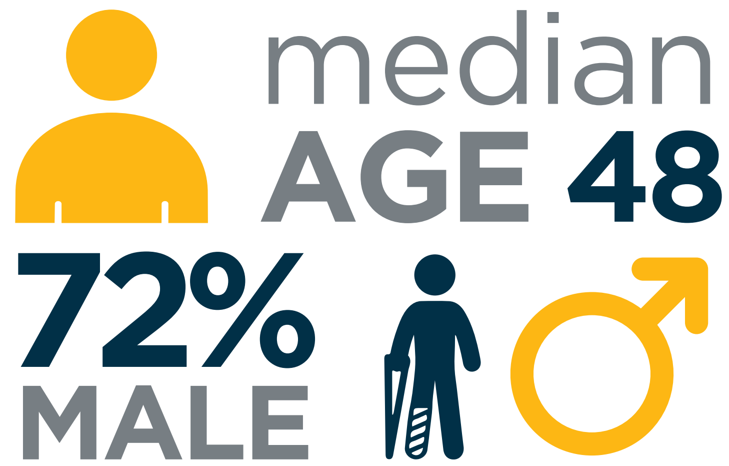


Operating since 2012, the ATR has established itself as a leading clinical quality registry (CQR). The Australian Commission on Safety and Quality in Health Care has promoted the importance of CQRs as drivers of quality improvement for over a decade, allocating trauma to the second highest priority due the high burden of disease, increasing costs and unsatisfactory outcomes associated with poor quality trauma care.

In 2016, funding for the Australian Trauma Registry was the number one recommendation from the Road Safety Senate Committee. Funding was subsequently obtained from the Department of Health and the Bureau of Infrastructure, Transport, and Regional Economies to support the registry's core responsibilities and reporting. In 2018, New Zealand joined the collaboration to become the Australia New Zealand Trauma Registry (ATR), and the registry began providing risk adjusted outcomes.

The ATR is now a leading CQR, collecting pre-hospital and in-hospital data on the most severely injured patients, defined as an Injury Severity Score (ISS) greater than 12 or death following injury, from 27 Australian and seven New Zealand level 1 trauma centres. The ATR now has five years of quality Australian data from 1 July 2015 to 30 June 2020, and three years of New Zealand data from 1 July 2017 to 30 June 2020, and continues to recruit sites with the purpose of capturing population-based data for the severely injured.

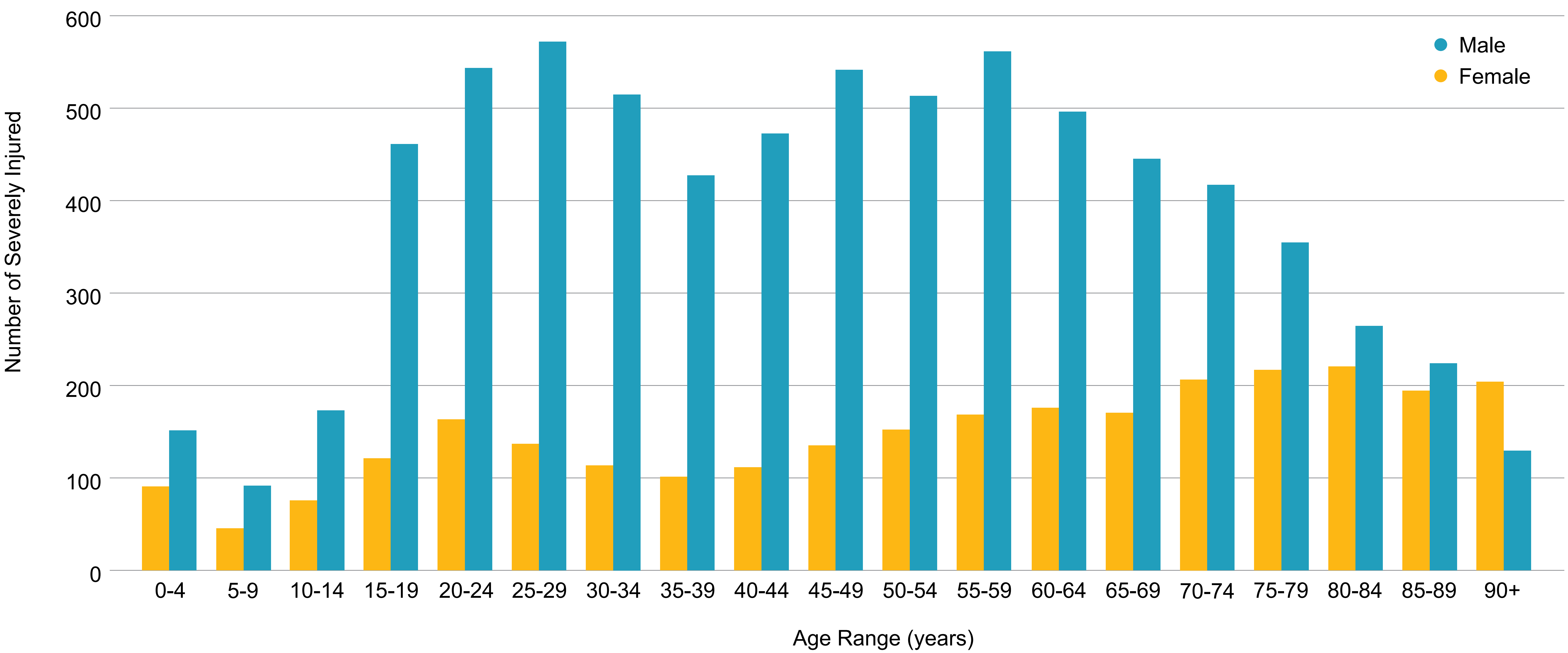
DEMOGRAPHICS



AGE AND GENDER

Incidence by age and gender showed that most severe injuries continue to involve males (72.3%). The distribution of severely injured patients according to sex and age group are shown in the figure below.

There were two main age-group peaks for males: the 20-29 year olds and the 45-59 year olds. For females, there were also two main peaks. The first was the same as males (20-29 years) but the second was in older females (75-84 years).



Age Group	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90+
n	243	139	252	583	705	709	629	529	585	676	666	730	672	616	624	572	485	420	335

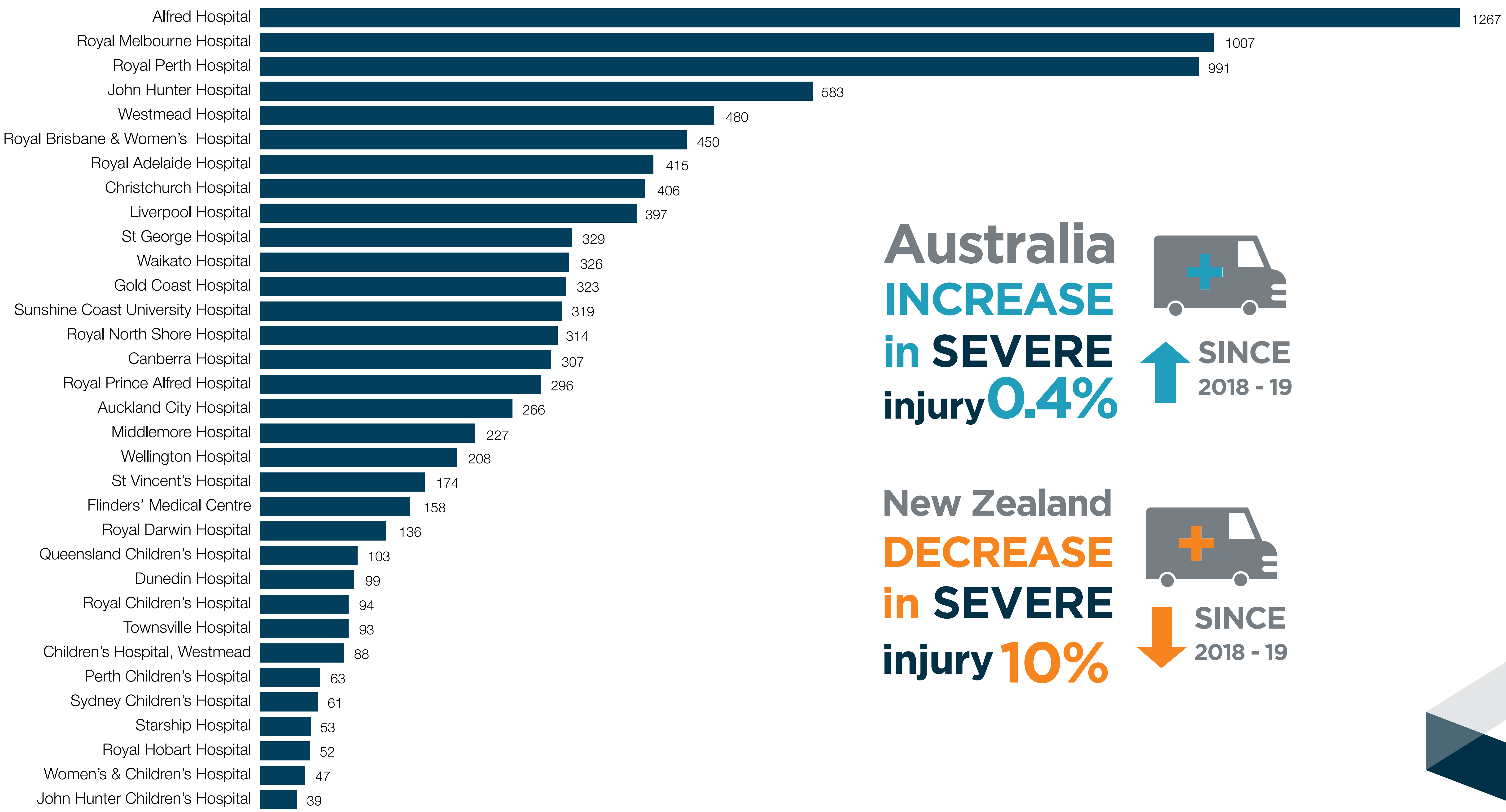
DEMOGRAPHICS

Across the 2019-20 financial year (FY) 10,170 episodes of severely injured were collected by the ATR. Australia provided 8,585 episodes from 26 major trauma centres, and New Zealand provided 1,585 episodes from seven trauma centres. This is the first ATR Annual Report which provides identifiable site and jurisdiction injury data.

Bi-nationally severe injury numbers were similar to the previous year, with an overall decrease of 1.4%. However annual fluctuations did occur between sites.

The impact of the global covid-19 pandemic, from its first confirmed diagnosis in Australia in January 2020 and New Zealand in February 2020, will be demonstrated in the next annual report when a full year's data will be available. How lock-downs and changes to trauma guidelines, including allocation of covid-designated hospitals and diversion of trauma patients to alternate hospitals, impacted trauma services will require further investigation. New Zealand saw a 10 per cent reduction in severe injury, which can be attributed to covid related restrictions and random variation (transport related trauma dropped 50 per cent for two months).

Number of Severely Injured 2019-20 , by Hospital



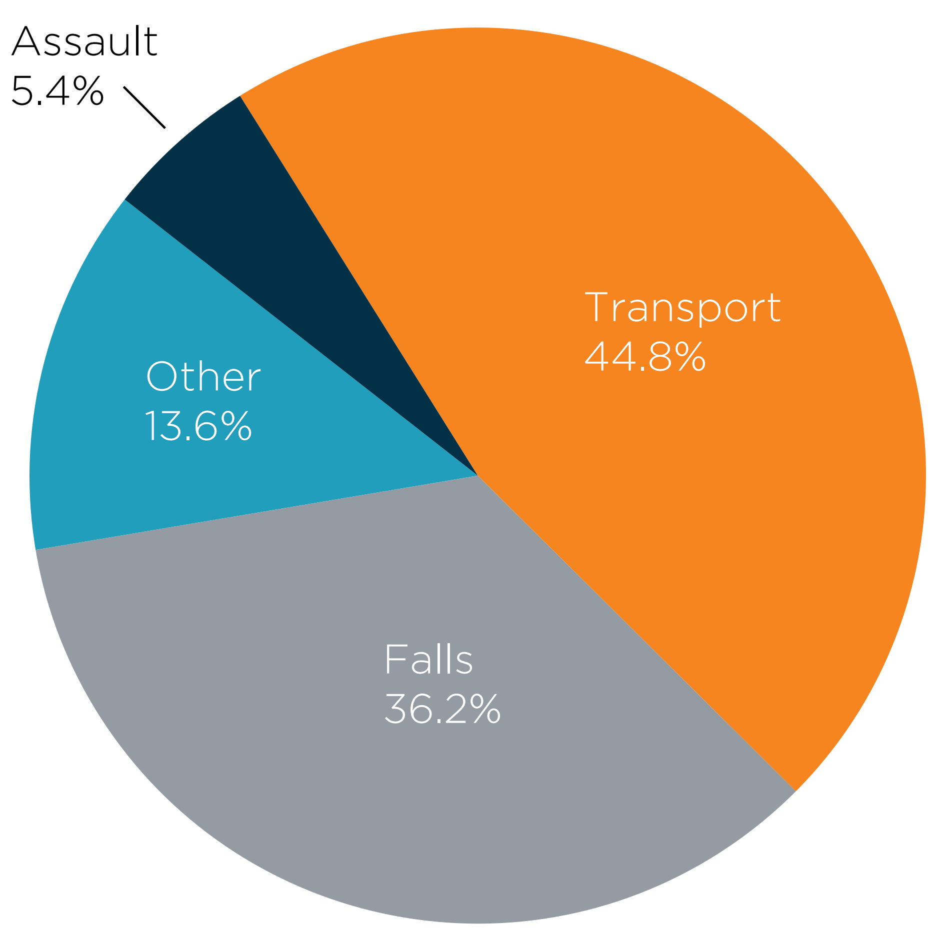
INJURY EVENT

INTENT OF INJURY

Injury intent was specified for 70 per cent of all severe injuries of which 88 per cent were related to unintentional injuries. Injury intent data is not provided by New South Wales or the Northern Territory.

TYPE OF INJURY

Bi-nationally, ninety-four per cent of severe injury was caused by blunt mechanisms, with 3.8 per cent due to penetrating trauma, and one per cent due to burns, similar to the previous three years.



Cause of Injury

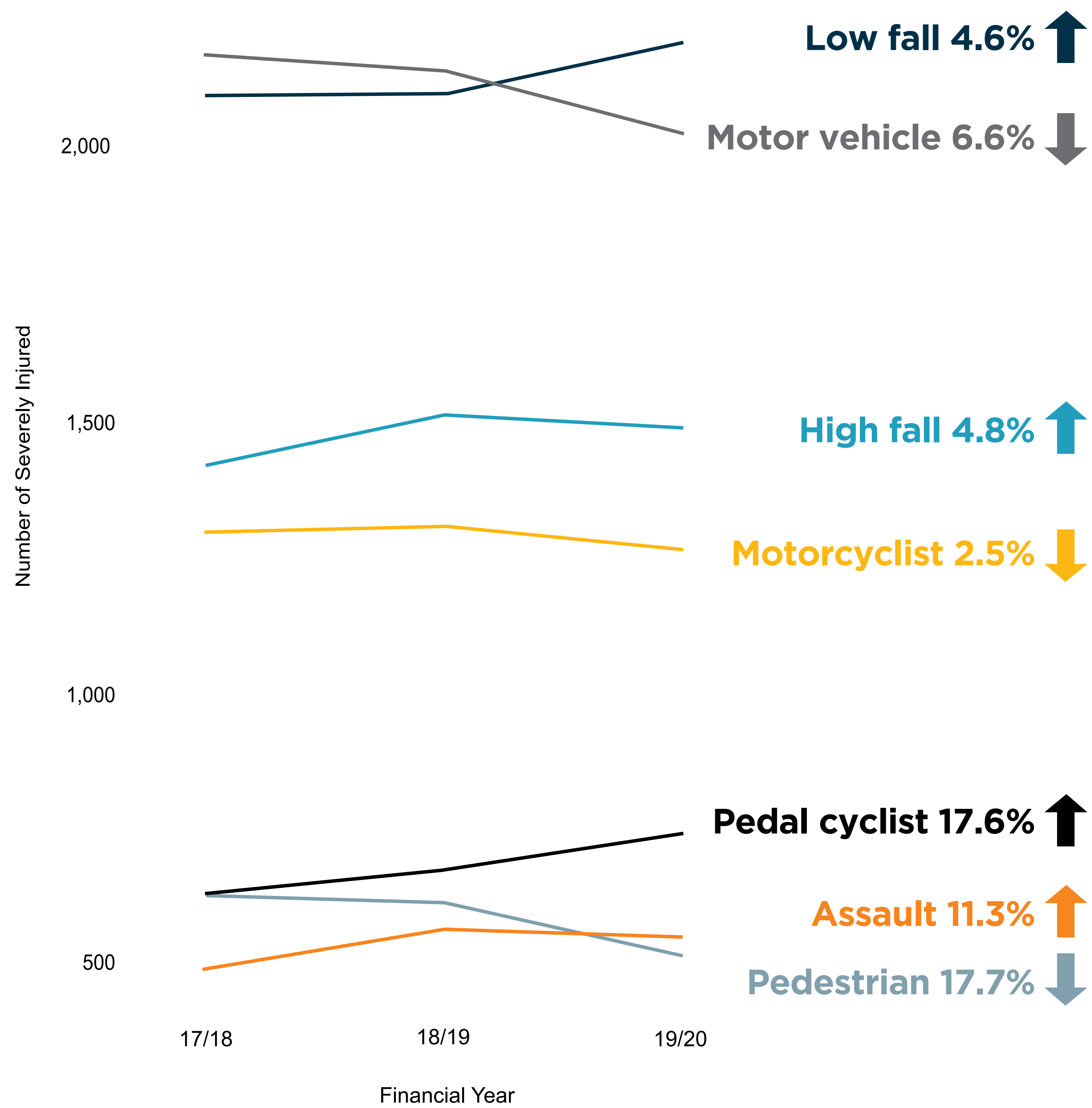
CAUSE OF INJURY

Transport-related and falls-related injuries accounted for 81 per cent of all severe injuries and remain the leading cause of in-hospital admissions for severe injury.

Forty-five per cent of severe injuries were transport related. Of these, 44.6 per cent were motor vehicle, 27.8 per cent were motorcyclists, 16.3 per cent were pedal cyclists and 11.3 per cent were pedestrians.

Thirty-six per cent of all severe injuries were caused by falls, of these low falls accounted for 59.6 per cent and high falls 40.4 per cent.

CAUSE - OVER 3 YEARS



INJURY EVENT

DAY OF INJURY

The incidence of severe injuries according to day of the week remained consistent with previous years. Saturday and Sunday remains the predominant days for injury, with 34.5 per cent of injuries occuring over the weekend.

Whilst most falls and transport-related injuries had peak incidence over the weekend some groups such as pedal cyclists and motorcyclists had much higher numbers occurring on the weekends. A larger proportion of pedestrians were injured on Friday and Saturday.

PLACE OF INJURY

Eighty-five per cent of severely injured patients had a known place of injury, with 44 per cent occurring on the street or highway and 30 per cent occurring at home. In the home was the most common place of injury for children aged 0-4 years old (70 per cent) and older adults aged 65 years and older (49 per cent). The street and highway was the most prevalent injury place for all other age groups, particularly for the 15 to 29 year age group (50 per cent). The category 'home' for patients aged 75 years and above includes residential aged care.

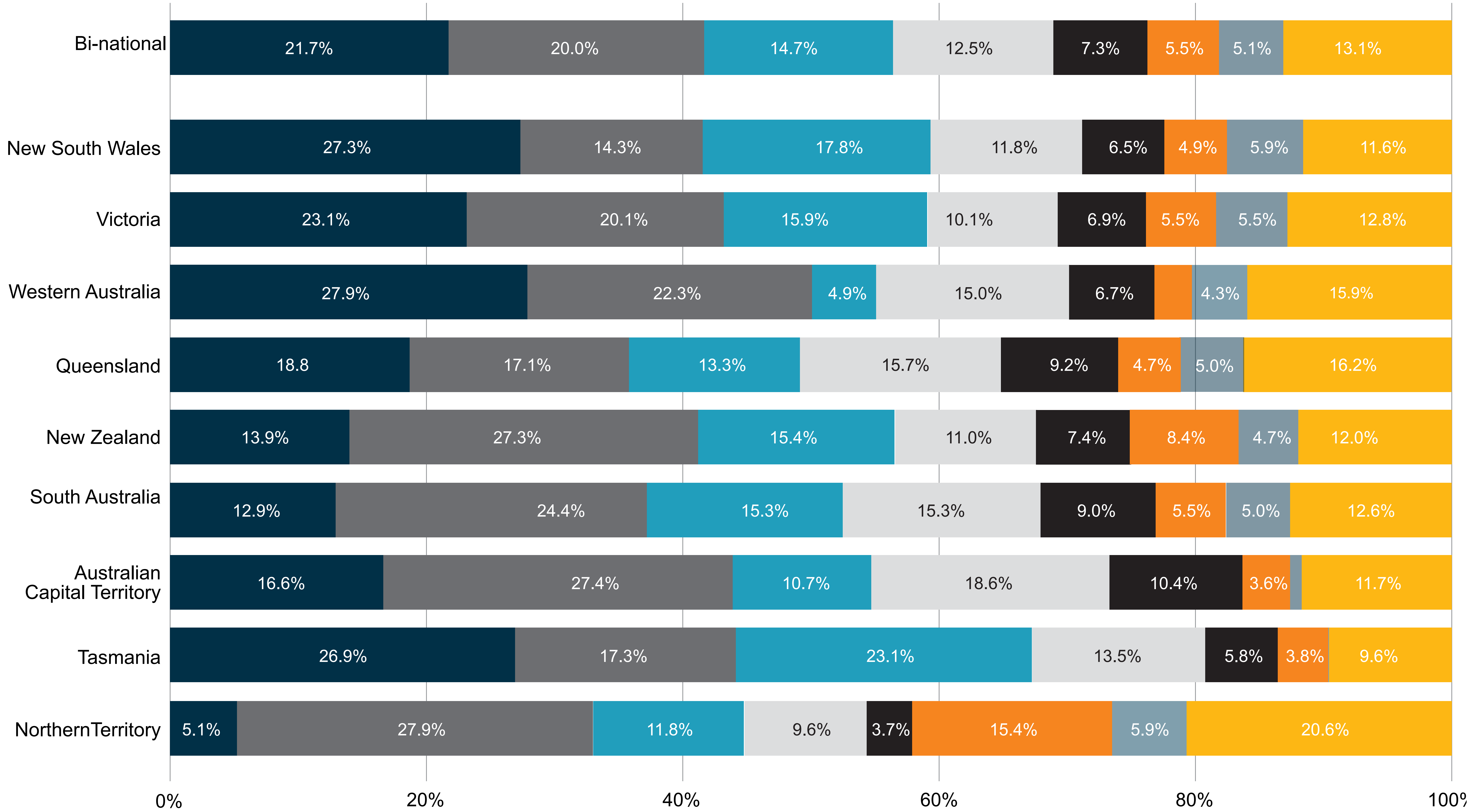
				Transport			
	Assault	High Fall	Low Fall	Motor Vehicle	Motorcyclists	Pedal Cycle	Pedestrian
Monday	13% (n=69)	14% (n=204)	12% (n=282)	11% (n=224)	10% (n=123)	13% (n=94)	13% (n=68)
Tuesday	12% (n=67)	14% (n=211)	15% (n=319)	12% (n=235)	11% (n=144)	11% (n=83)	14% (n=72)
Wednesday	14% (n=76)	15% (n=226)	13% (n=294)	14% (n=284)	10% (n=121)	14% (n=102)	14% (n=73)
Thursday	12% (n=66)	12% (n=177)	15% (n=319)	13% (n=270)	11% (n=134)	10% (n=79)	14% (n=74)
Friday	14% (n=78)	13% (n=189)	15% (n=327)	17% (n=346)	12% (n=157)	11% (n=85)	17% (n=86)
Saturday	19% (n=107)	17% (n=259)	15% (n=322)	19% (n=385)	23% (n=289)	22% (n=161)	17% (n=88)
Sunday	16% (n=91)	15% (n=222)	15% (n=331)	14% (n=284)	23% (n=295)	19% (n=139)	11% (n=56)
Total	100.0% (n=554)	100.0% (n=1,488)	100.0% (n=2,194)	100.0% (n=2,028)	100.0% (n=1,263)	100.0% (n=743)	100.0% (n=517)

INJURY EVENT

CAUSE OF INJURY BY JURISDICTIONS

Transport and falls-related injuries continue to be the most common severe injuries across all jurisdictions. In 2019-20, low falls were the most prevalent for five of the nine jurisdictions, whilst motor vehicle crashes were the most prevalent for four jurisdictions.

Cause of Injury by Jurisdiction



	Low Fall	Motor Vehicle	High Fall	Motorcyclists	Pedal Cyclists	Assault	Pedestrians	Other
n	2,194	2,028	1,488	1,263	743	554	517	1,329

INJURY

SEVERITY OF INJURY

Injury Severity Score (ISS) is an internationally-standardised approach to describing the overall severity of injury for each patient. Trauma patients are allocated an ISS after injury in order to determine their status as 'major trauma'. For this report major trauma is defined as an ISS > 12, which is derived from the Abbreviated Injury Scale (AIS) 2008. ISS is useful for predicting hospital length of stay, and associated morbidity and mortality.

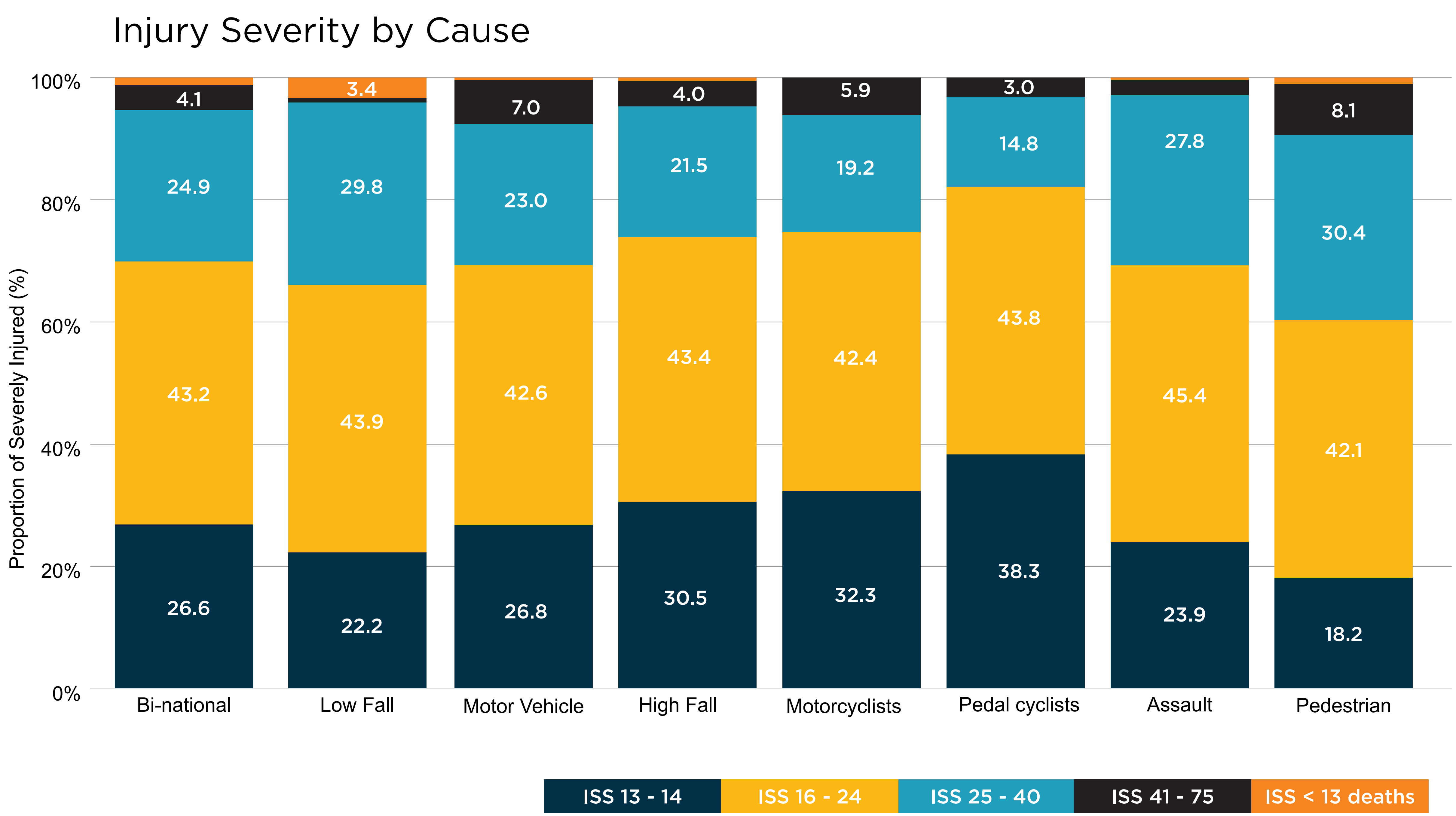
In the 2019-20 financial year, the proportion of severely injured categorised by ISS range was comparable with the previous three years. Most injuries admitted to hospital had an ISS between 16 and 24 (43.2%). When the cohort was broken down into gender, similar proportions by ISS range occured.

An ISS greater than 25 was most prevalent in the pedestrian, low fall, and assault populations whilst less severe injuries occurred in pedal cyclists. Low falls are defined as falls of one metre or less.

DEATHS WITH ISS<13

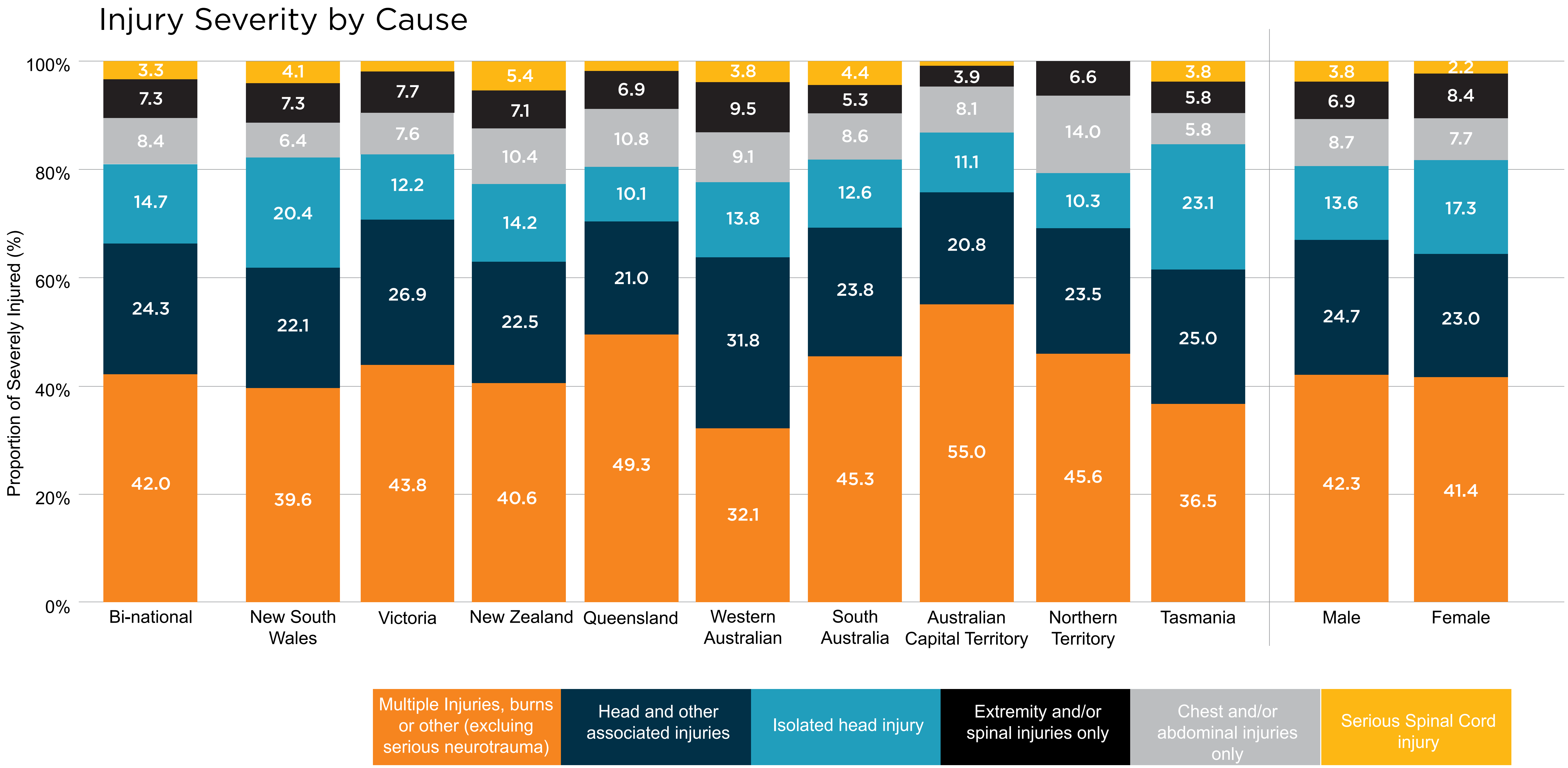
The ATR also collects data on in-hospital deaths with an ISS less than 13. For the 2019-20 financial year there were 125 patients.

- 68 per cent were aged 70+ years
- 59.2 per cent were caused by a low fall
- 12 per cent died in the Emergency Department



INJURIES SUSTAINED

Multiple injuries were the most prevalent across all jurisdictions for the severely injured, followed by 'head and other associated injuries' and 'isolated head injuries'. Head injuries, both complex and isolated, make up nearly 40 per cent of all injuries.



Jurisdiction	Severly Injured (n)	Jurisdiction	Severly Injured (n)
Bi National	10,170	Western Australia	1,054
New South Wales	2,760	South Australia	620
Victoria	2,368	Australian Capital Territory	307
New Zealand	1.585	Northern Territory	136
Queensland	1,288	Tasmania	52

Gender	Male	Female
n	7,357	2,812

Multiple injuries, burns or other = includes multiple body region injuries (excluding serious neurotrauma), burns and other injuries that do not fit into any of the other groups.

Head and other associated injuries = head injury with AIS > 2 in addition to another injury.

Isolated head injury = head injury with AIS > 2 and no other injury with AIS > 1.

Extremity and/or spine injuries only = extremity injury with AIS > 1 and/or spine injury with AIS 2 or 3 and no other injury with AIS > 1.

Chest and/or abdominal injuries only = chest and/or abdominal injury with AIS > 2 and no other injury with AIS > 1 in other body regions.

Serious spinal cord injury = spinal cord injury with AIS > 3 with or without other injuries.

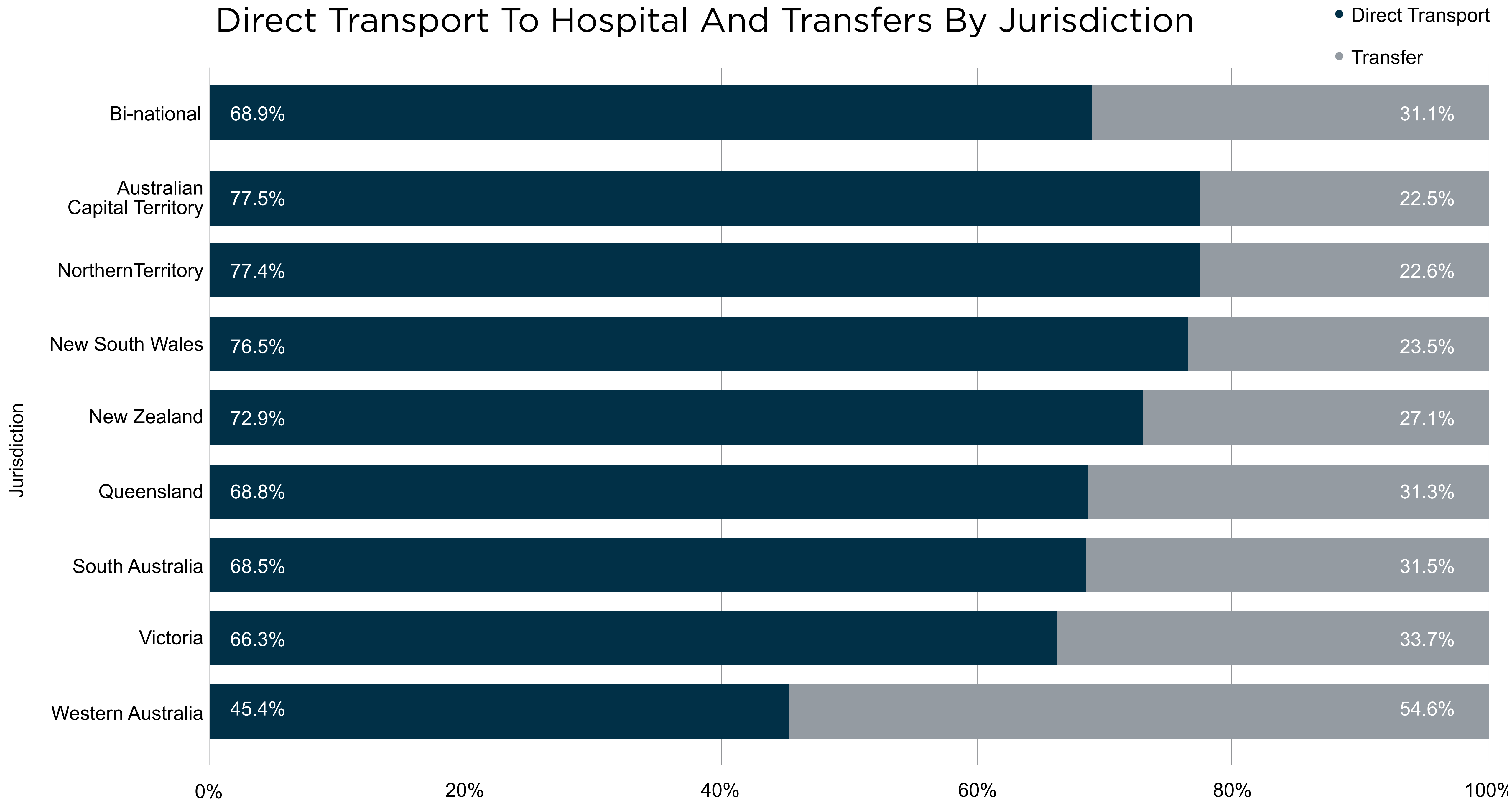
TRANSPORT TO HOSPITAL

Two-thirds (69.4%) of severely injured patients were transported direct from the scene to definitive care. Of those transported direct, 74.1 per cent arrived via road ambulance, 19.1 per cent via helicopter and 5.4 per cent via private vehicle/walk-in.

For the severely injured that arrived at a major trauma service via one or more hospitals, 64.5 per cent were transported from the scene via road ambulance, 22.6 per cent via private vehicle/walk-in, 6.5 per cent via helicopter. The majority of those who were transferred (97%), attended only one other hospital prior to arrival at a major trauma service.

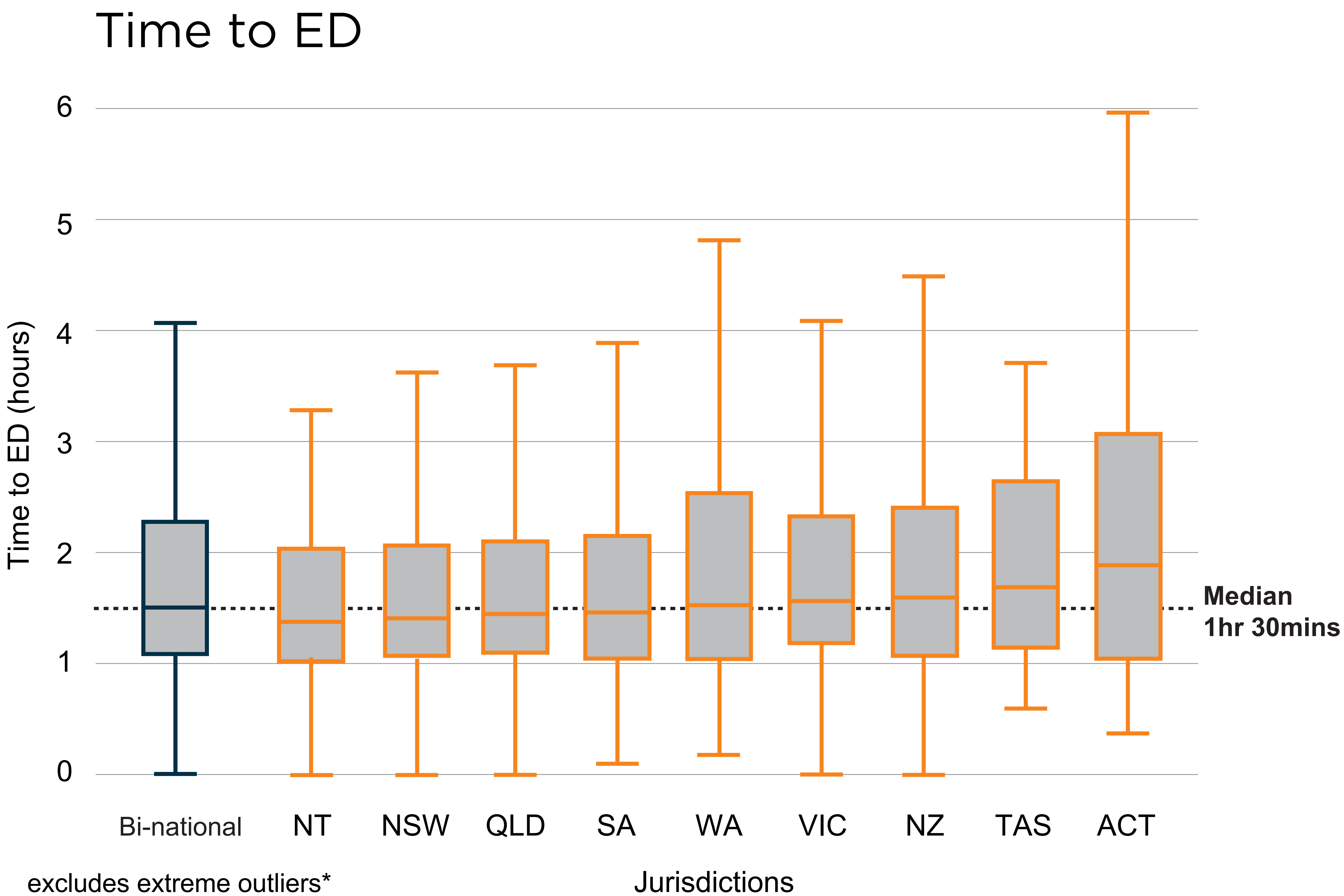
The number of patients who arrived at definitive care either directly from the scene or via a different health service, varied between jurisdictions. Direct transport from the scene to hospital ranged from 42.9% to 77.2%. Tasmania was excluded from the graph below as they only commenced data submission for the final quarter of the year with fewer than 50 transfers.

Direct Transport To Hospital And Transfers By Jurisdiction



TIME FROM INJURY TO EMERGENCY DEPARTMENT

Time to the Emergency Department (ED) was analysed for patients conveyed directly from injury to definitive care. The median time from injury to definitive care was **1 hour 30 minutes**, similar to the previous financial year.

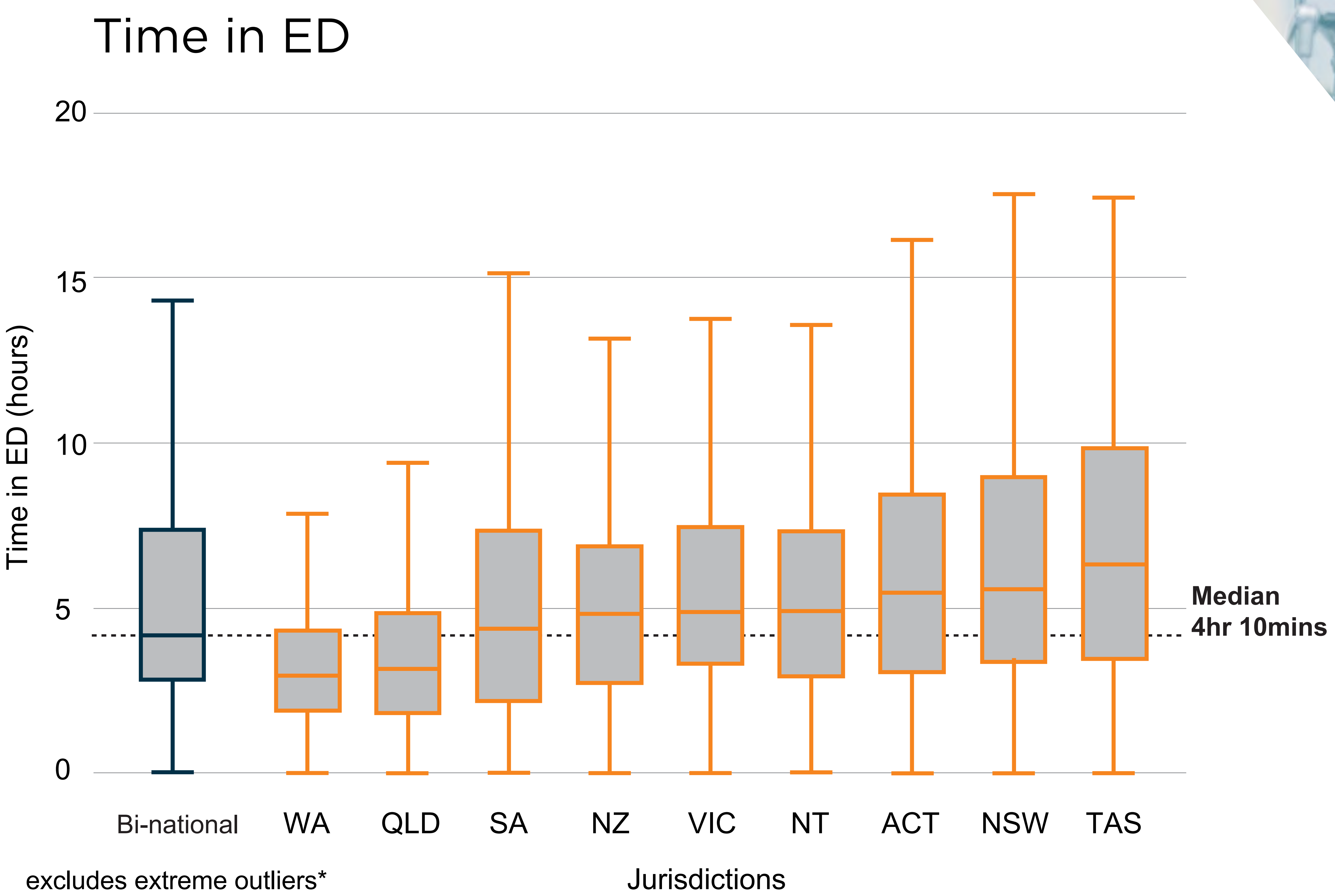


* Extreme outliers are values smaller than the lower quartile minus 1.5 times the interquartile range (IQR) or values larger than the upper quartile plus 1.5 times the IQR (Tukey, 1977)

TRAUMA CENTRE CARE

TIME IN EMERGENCY DEPARTMENT (ED)

The bi-national median time spent in the ED was **four hours and 10 minutes**. This time varied when categorised by jurisdiction. The Australian National Healthcare Agreement, 2018, states the importance of Emergency Department care remaining within 4-hours is a key performance indicator for improved outcomes.



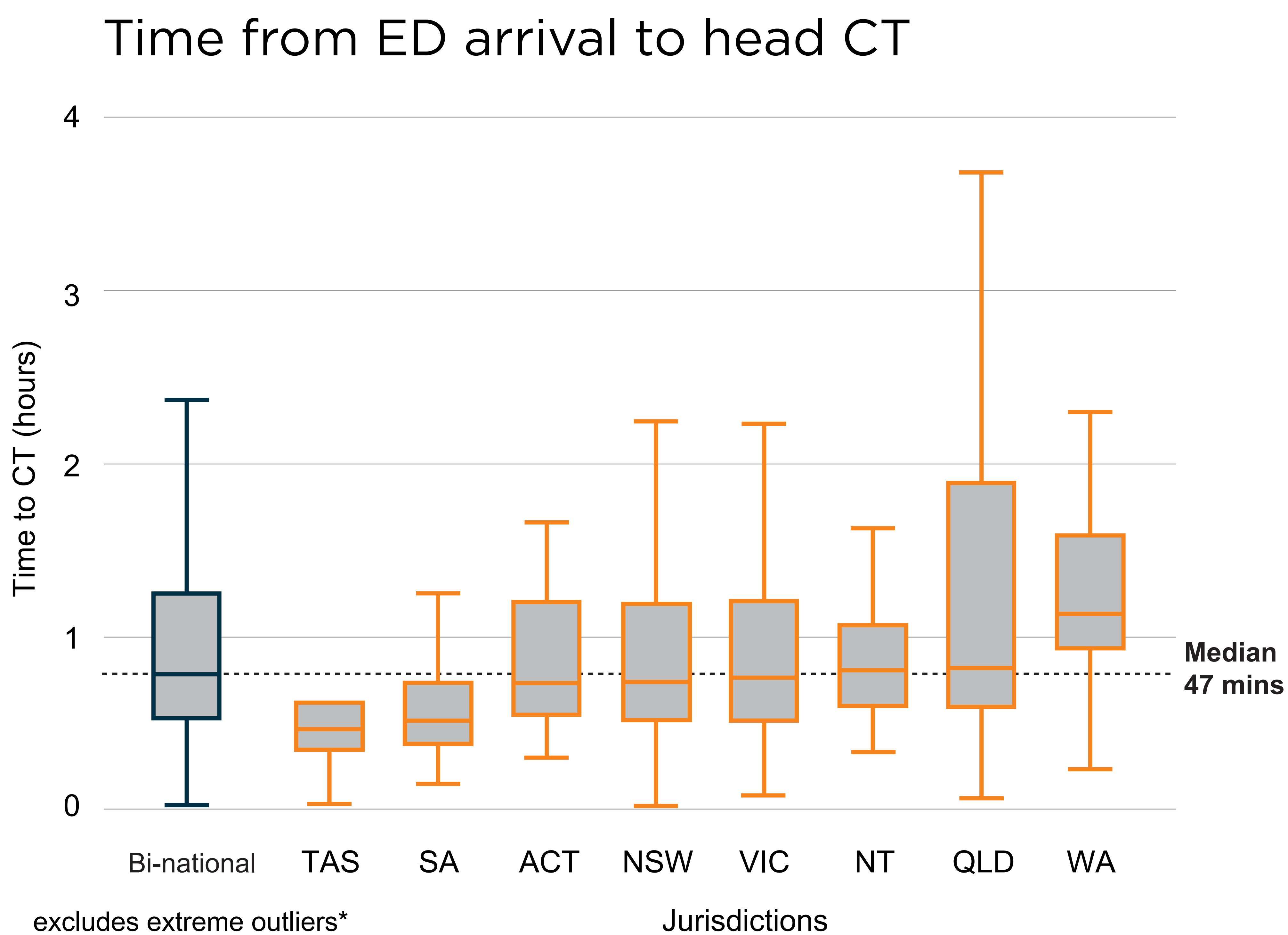
* Extreme outliers are values smaller than the lower quartile minus 1.5 times the interquartile range (IQR) or values larger than the upper quartile plus 1.5 times the IQR (Tukey, 1977)

TRAUMA CENTRE CARE

TIME FROM ED ARRIVAL TO HEAD COMPUTED TOMOGRAPHY (CT)

The time to first head CT for patients with a total Glasgow Coma Scale (GCS) less than 13, was analysed by jurisdiction. Just under fifty per cent of all severely injured patients received a head CT. Of those that received a head CT, 3,863 were direct transfers from the scene to definitive care, receiving no prior hospital treatment. Of those, 858 (22.2%) arrived at the Emergency Department with a known total GCS less than 13. The bi-national median time from arrival at the definitive hospital to time of head CT for patients with a total GCS less than 13 was **47 minutes** (IQR 0.53-1.27 hours). New Zealand does not provide CT type so is missing from the boxplot.

Time to Head CT has increased slightly over the previous three years, from 44 minutes to 47 minutes.



* Extreme outliers are values smaller than the lower quartile minus 1.5 times the interquartile range (IQR) or values larger than the upper quartile plus 1.5 times the IQR (Tukey, 1977)

HOSPITAL LENGTH OF STAY BY HOSPITAL (LOS)

Hospital Length of Stay was compared between hospitals, before and after risk adjustment. The following risk factors were included in the model as they were found to be significant predictors: restricted cubic splines for age with 4 knots, cause of injury, arrival Glasgow Coma Scale (GCS) - motor, shock-index grouped in quartiles, highest and second highest AIS scores. The relationship between age and mortality among trauma patients is nonlinear. There are several options to dealing with non-linearity, including categorising based on arbitrary cut-offs, including a quadratic term or including cubic splines. In a recent publication, we compared the various methods and found that cubic splines to be the most appropriate. The model assumes that the relationship is polynomial between the knots, locations set by the model at 18, 52 and 82 years.

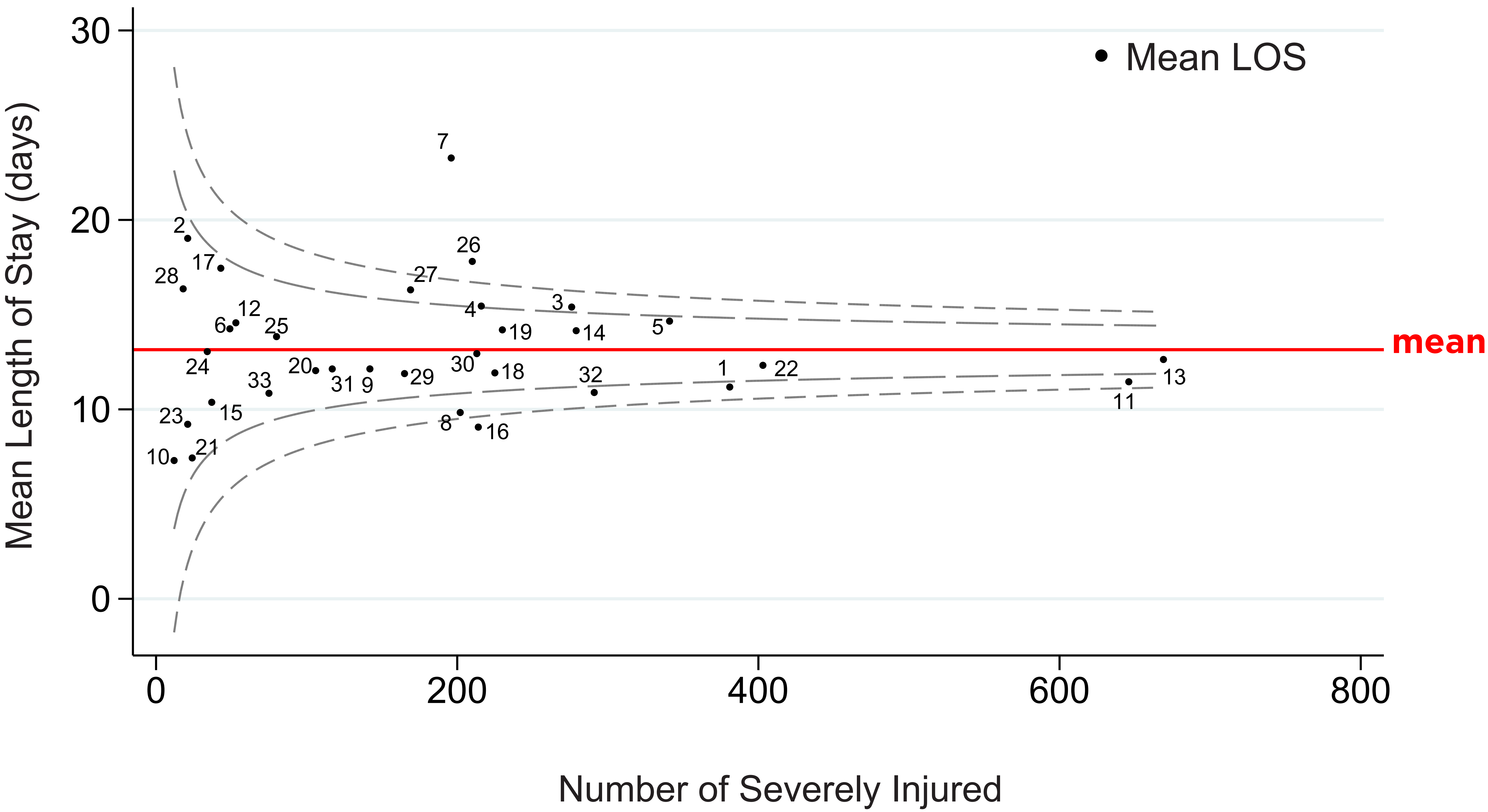
The mean LOS was calculated from the robust linear regression model, which accounted for the right skewness in the data. Only survivors were included in the LOS analysis. No significant differences were noted after risk adjustment. Please refer to Appendix A for detailed data analysis.

Each numbered dot represents one hospital in the funnel plots on the following pages. The funnel plots, where the aim is to identify outliers, show contours which represent two standard deviations (95% control limits) and three standard deviations (99.8% control limits) from the mean. Those outside these lines are considered outliers, with a 5% and 0.2% chance of a false positive respectively.

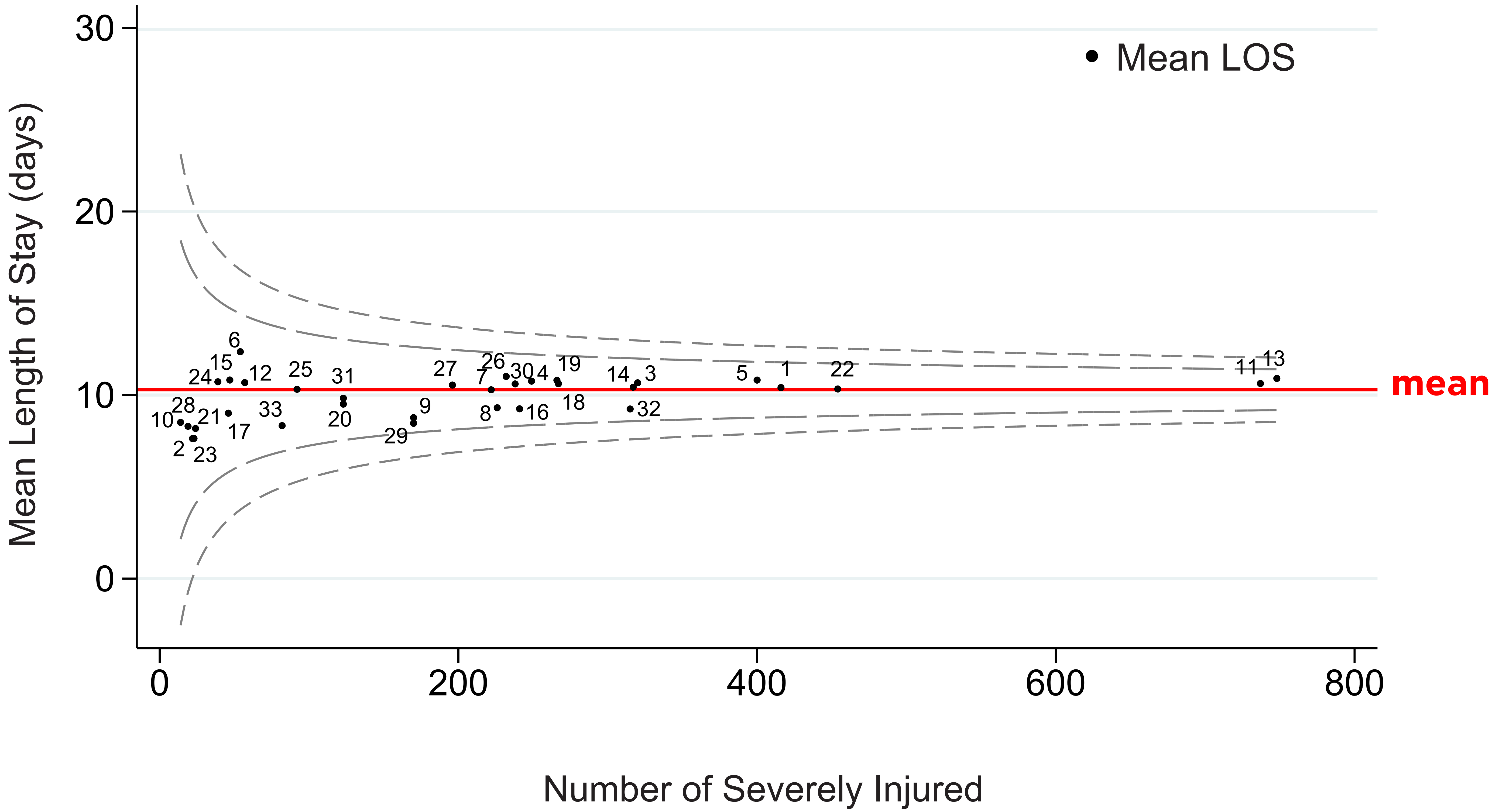
Total numbers for risk adjustment have been reduced because the transferred group of patients has been excluded. This resulted in a 30% reduction in numbers. A further reduction in numbers was the exclusion of non-blunt cases such as burns and penetrating as they are a heterogenous group (5%).

ID#	Hospital Name	Jurisdiction
1	John Hunter Hospital	NSW
2	John Hunter Children's Hospital	NSW
3	Liverpool Hospital	NSW
4	St George Hospital	NSW
5	Westmead Hospital	NSW
6	Children's Hospital, Westmead	NSW
7	Royal North Shore Hospital	NSW
8	Royal Prince Alfred Hospital	NSW
9	St Vincent's Hospital	NSW
10	Sydney Children's Hospital	NSW
11	Royal Melbourne Hospital	VIC
12	Royal Children's Hospital	VIC
13	Alfred Hospital	VIC
14	Royal Brisbane and Women's Hospital	QLD
15	Townsville Hospital	QLD
16	Sunshine Coast University Hospital	QLD
17	Queensland Children's Hospital/Lady Cilento Children's Hospital	QLD
18	Gold Coast Hospital	QLD
19	Royal Adelaide Hospital	SA
20	Flinders' Medical Centre	SA
21	Women's and Children's Hospital	SA
22	Royal Perth Hospital	WA
23	Perth Children's Hospital/Princess Margaret Hospital	WA
24	Royal Hobart Hospital	TAS
25	Royal Darwin Hospital	NT
26	Canberra Hospital	ACT
27	Auckland City Hospital	NZ
28	Starship Hospital	NZ
29	Middlemore Hospital	NZ
30	Waikato Hospital	NZ
31	Wellington Hospital	NZ
32	Christchurch Hospital	NZ
33	Dunedin Hospital	NZ

Unadjusted Hospital Length of Stay By Hospital



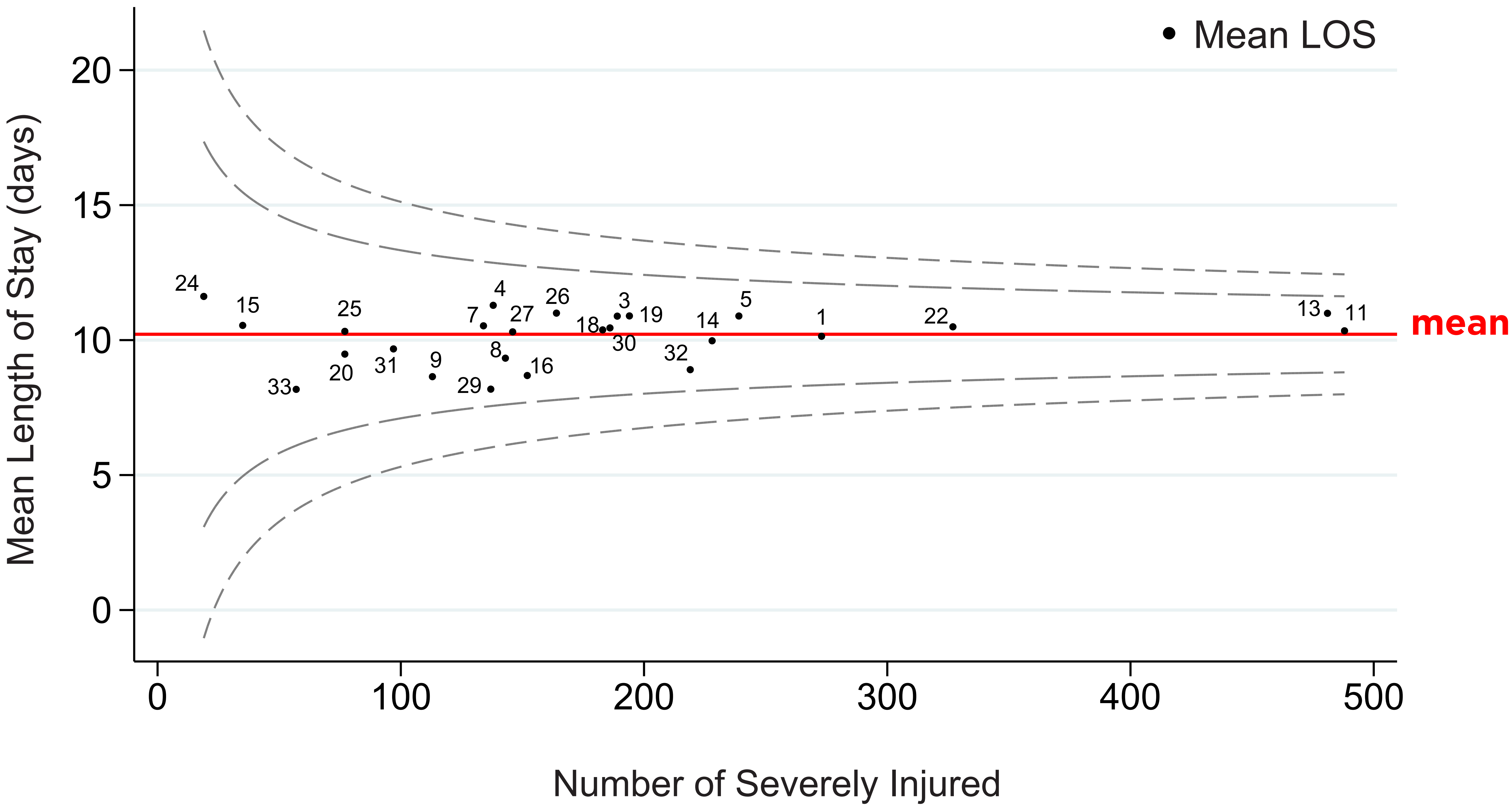
Risk-Adjusted Hospital Length of Stay By Hospital



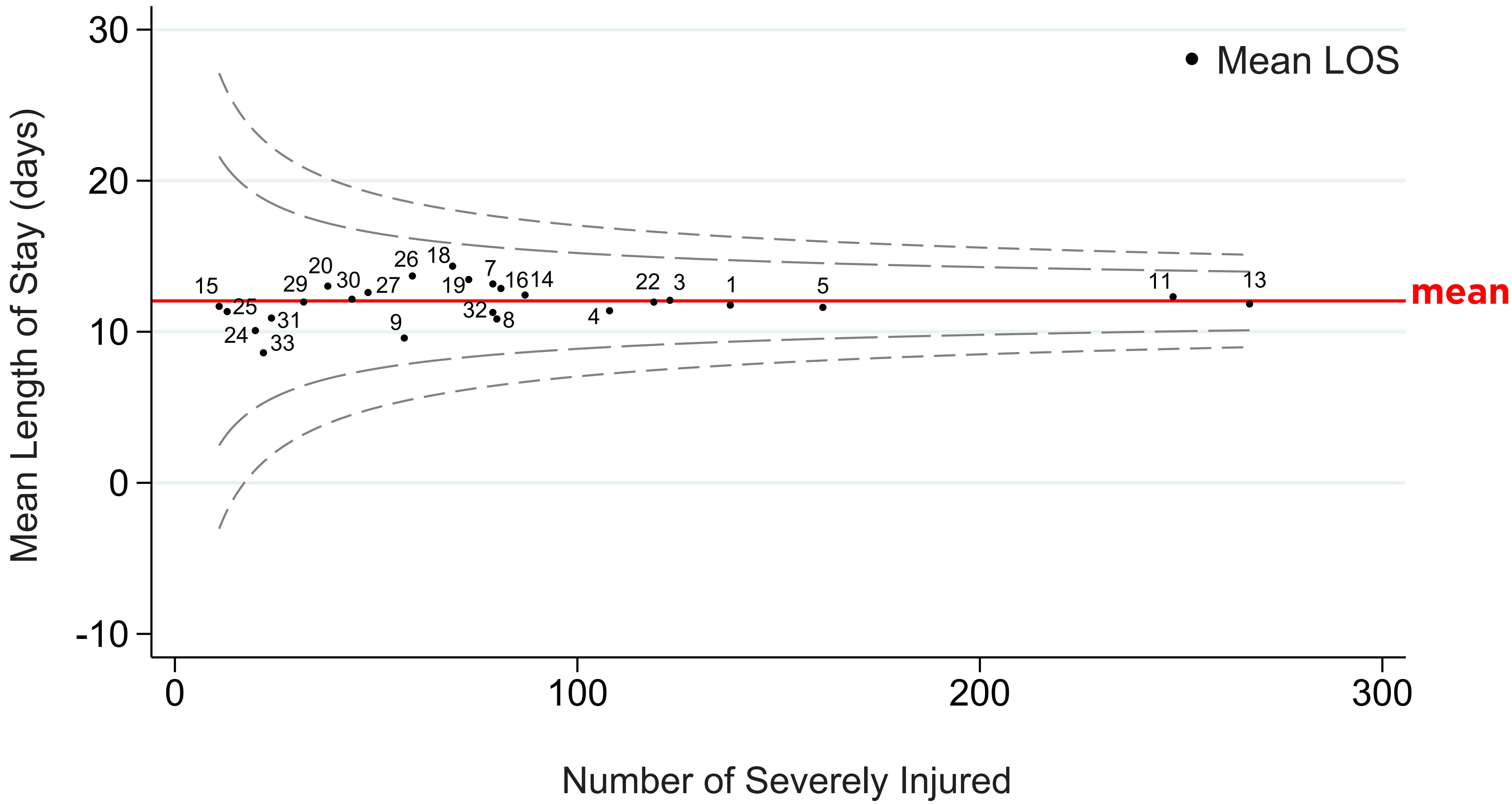
RISK-ADJUSTED HOSPITAL LENGTH OF STAY (LOS) BY AGE GROUPS

The **unadjusted bi-national median (IQR) hospital LOS was 7.0 (3.5-13.8) days**. When hospitals were risk adjusted there was no difference between hospitals for children (aged <16 years), adults (>=16 and <65 years) and older adults (>=65 years). Each numbered dot represents one hospital in the funnel plots below. The funnel plots, where the aim is to identify outliers, show contours which represent two standard deviations (95% control limits) and three standard deviations (99.8% control limits) from the mean. Those outside these lines are considered outliers, with a 5% and 0.2% chance of a false positive respectively.

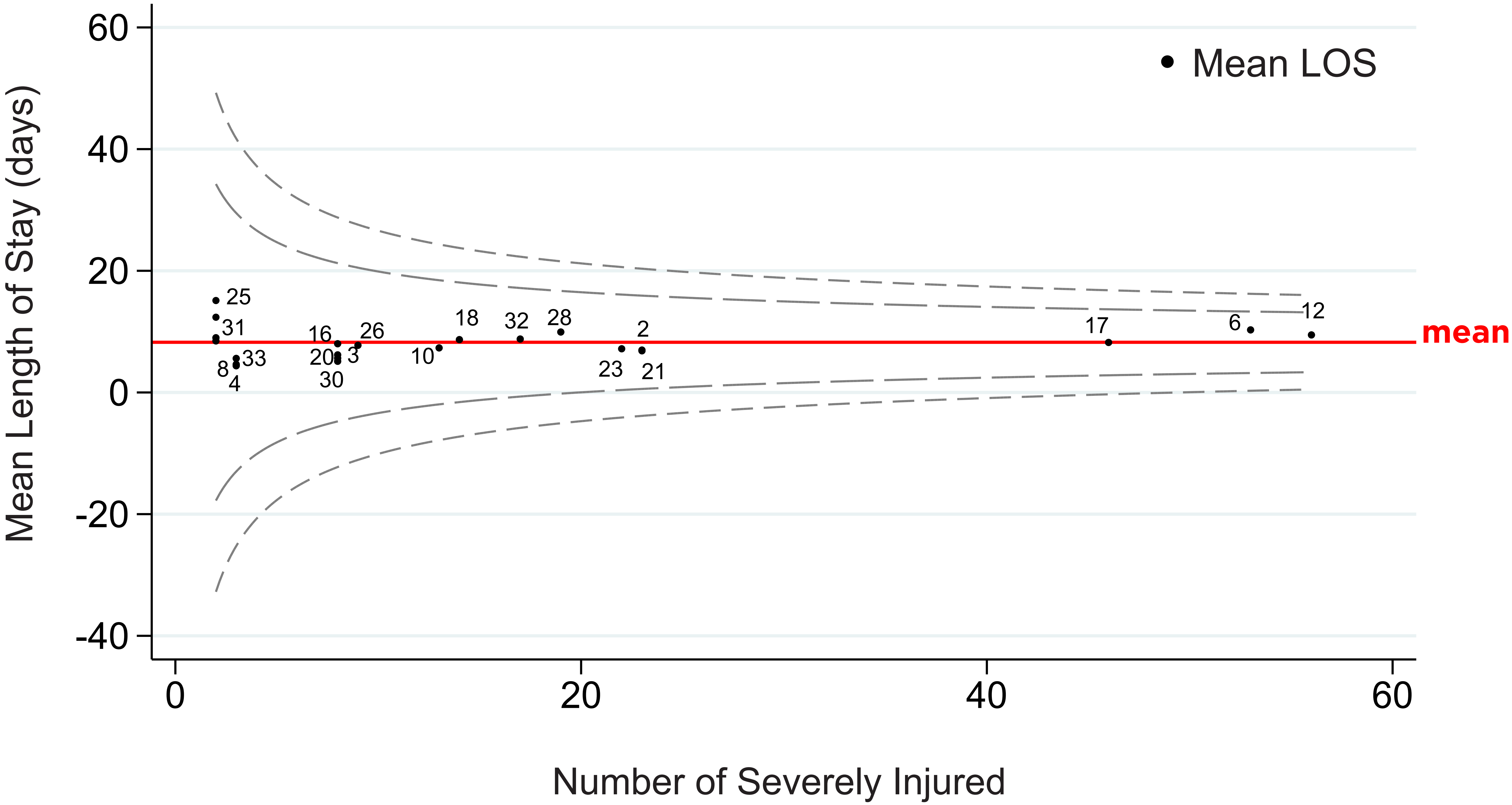
Mean Length of Stay Adults (Aged >=16 and <65 years)



Mean Length of Stay Older Adults (Aged >=65 years)

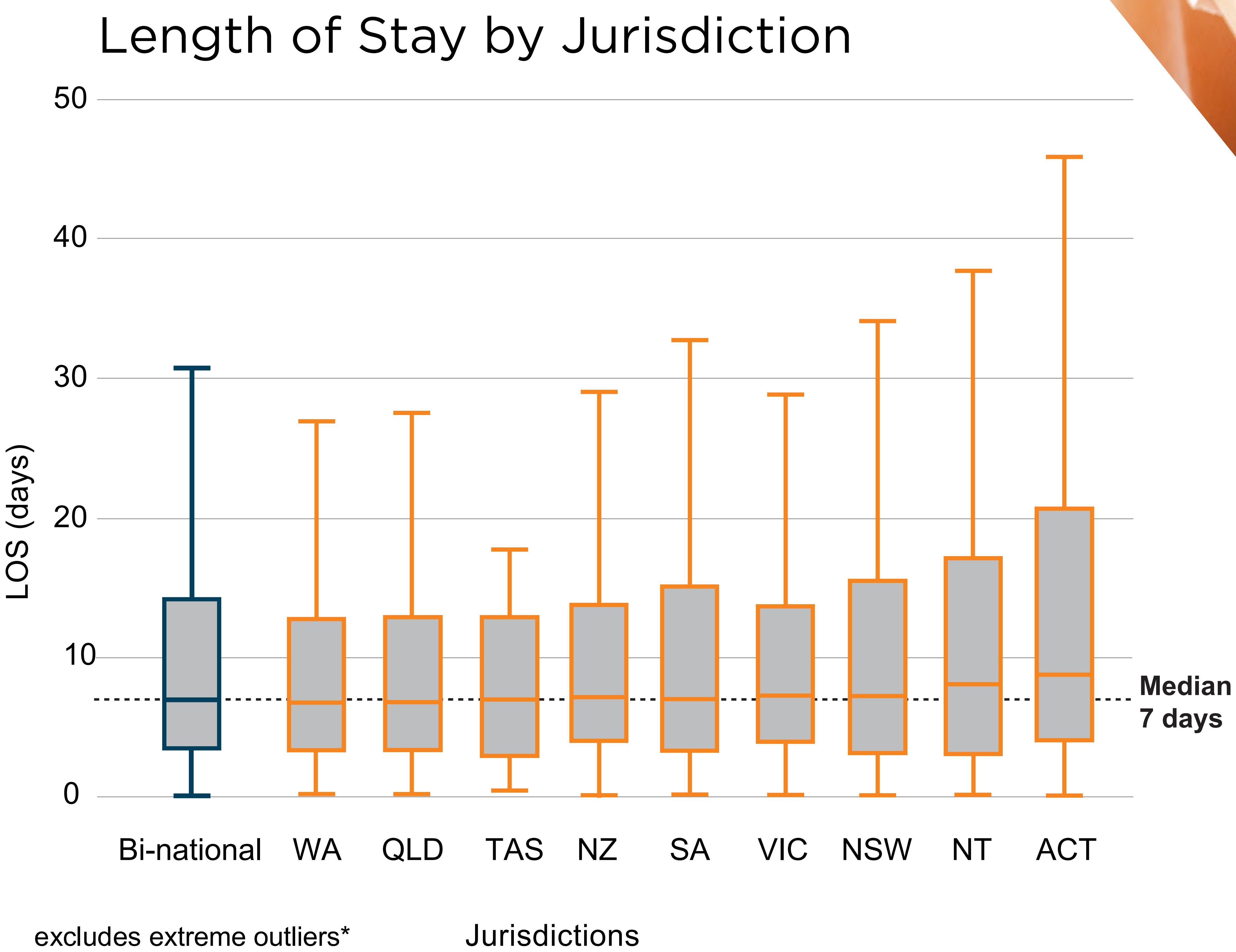


Mean Length of Stay Paediatrics (Aged <16 years)



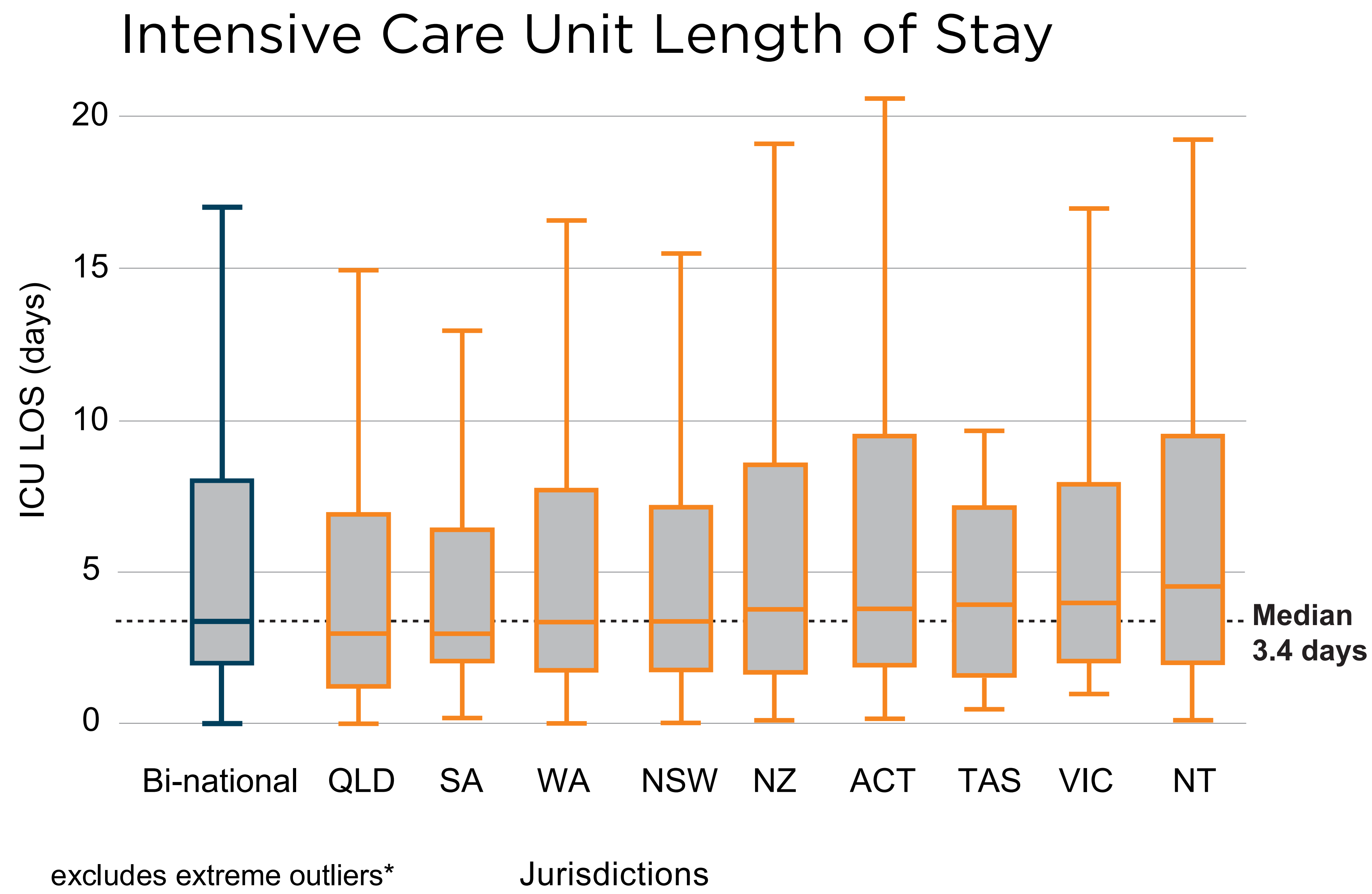
LENGTH OF STAY (LOS) BY JURISDICTION

The **unadjusted bi-national median (IQR) hospital LOS was 7.0 (3.5-13.8) days.**



INTENSIVE CARE UNIT (ICU) LENGTH OF STAY (LOS)

The bi-national median (IQR) hospital ICU LOS was **3.4 (1.9-8.0) days.**

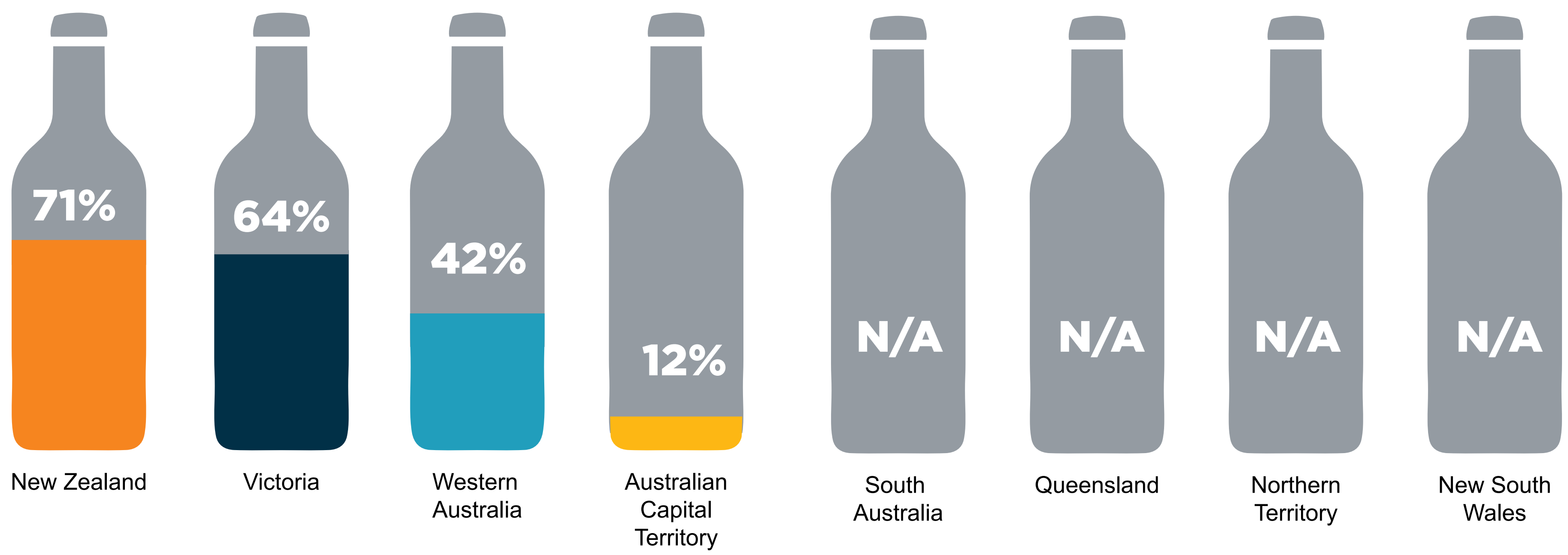


* Extreme outliers are values smaller than the lower quartile minus 1.5 times the interquartile range (IQR) or values larger than the upper quartile plus 1.5 times the IQR (Tukey, 1977)

BLOOD ALCOHOL CONCENTRATION COLLECTION RATE

Blood alcohol collection is one of the eight RACS process indicators and is recommended in patients with severe injuries, defined as an ISS>12.

The ATR does not currently receive blood alcohol concentration from all jurisdictions, and continues to work with registries and sites to improved data capture. The below figure demonstrates the proportion of severely injured cases where a blood alcohol test was performed and recorded for transport related injuries aged 15 years and older.



OUTCOMES FROM INJURY

The primary outcome collected by the ATR is discharge destination (including deaths). Discharge destination was provided for over 99.7 per cent of patients.

MORTALITY

One thousand and fifty three severely injured people died in-hospital with a bi-national mortality rate of 10.4 per cent, up from 9.8 per cent in the previous year.

Categorising by age-group identified further mortality trends in the severely injured.

Mortality Over Past Three Years

Year	Severe Injuries (n)	Deaths (n)	Deaths (%)
17/18	10,084	1,002	9.9
18/19	10,312	1,007	9.8
19/20	10,167	1,053	10.3

10.4% MORTALITY

13.5% OF DEATHS OCCURRED IN ED

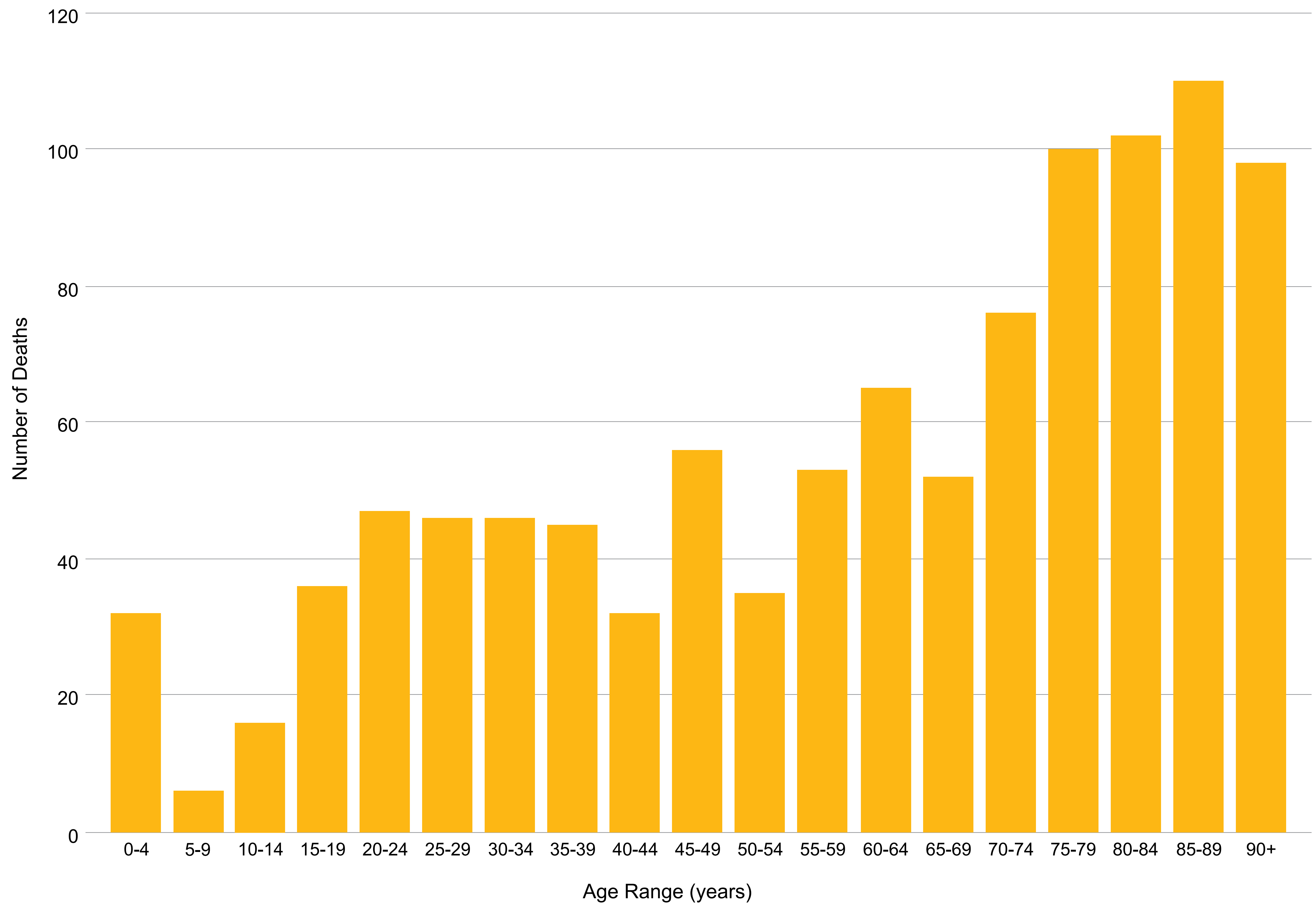
66.5% MALE

67.5% ISS>24

38.9% OF DEATHS AGED 75+

22.6% of 75+ YEAR OLDS DIED IN-HOSPITAL

Mortality by Age Range (years)



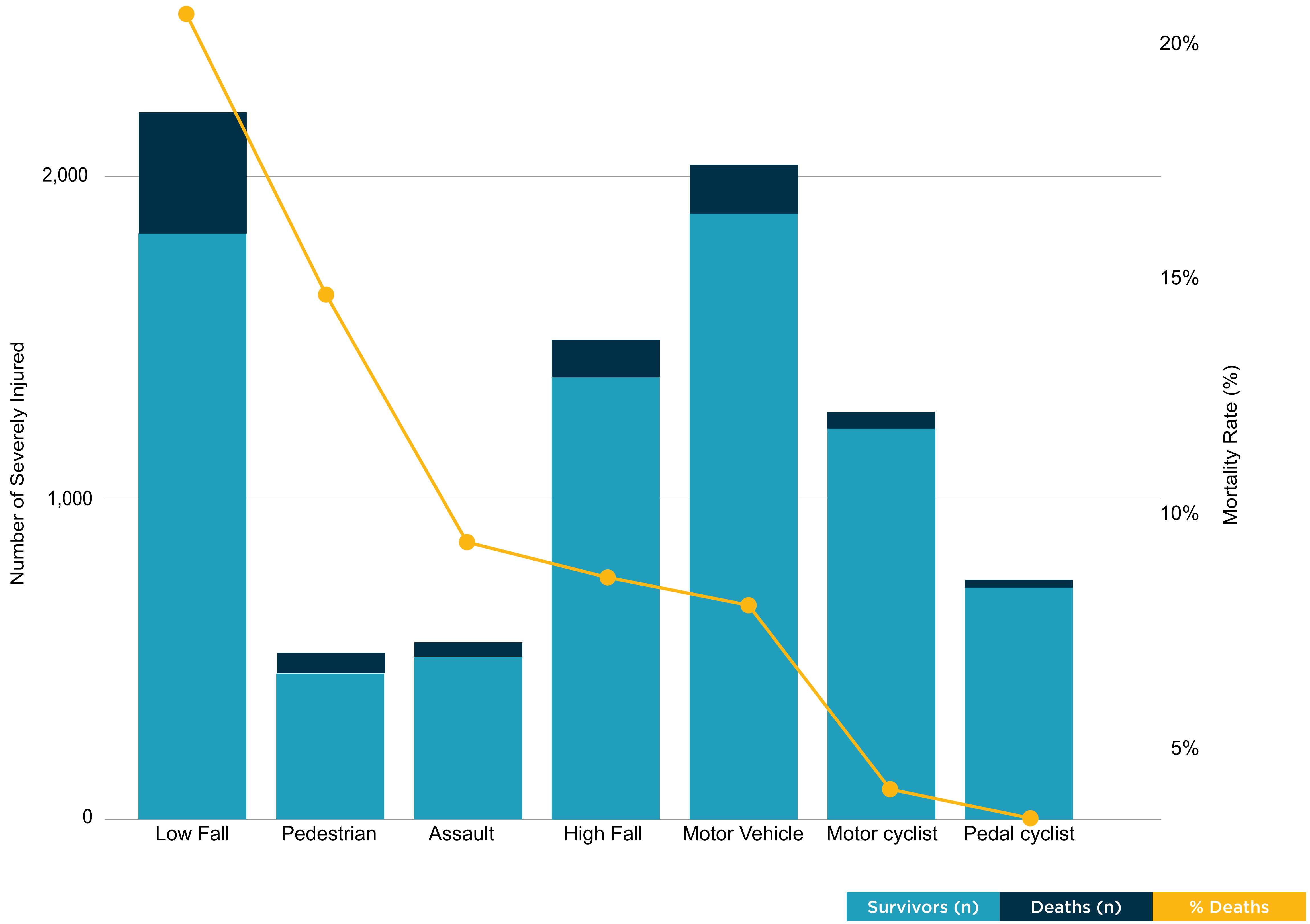
MORTALITY BY MECHANISM OF INJURY

As a proportion of total deaths, low falls accounted for the highest number of deaths (35.6 per cent) and transport-related accounted for 29.2 per cent. The graph below shows the total incidence, including survivors and deaths as well as the proportion of deaths for each injury cause from highest mortality rate to lowest. Low falls had the highest proportion of deaths, 21 per cent, followed by pedestrians with 15 per cent mortality. Pedal cyclist had the lowest mortality rate (3 per cent).

35.6% DEATHS
LOW FALLS

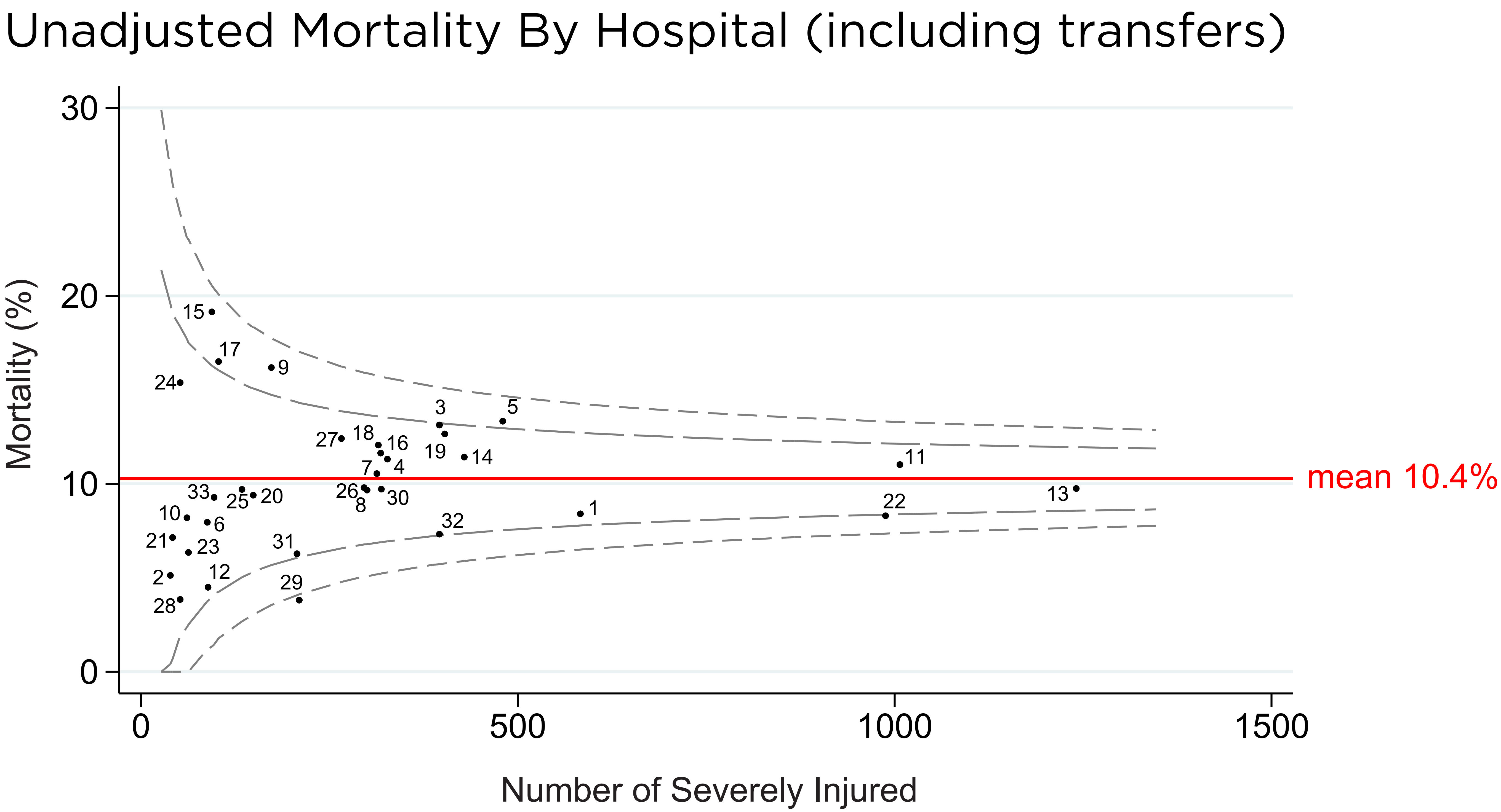
29.2% DEATHS **TRANSPORT** RELATED

Survivors, Deaths and Mortality Rate by Injury Mechanism



UNADJUSTED MORTALITY BY HOSPITAL (INCLUDING TRANSFERS)

Unadjusted plots do not help explain the variations which occur between hospitals, such as patient proximity to hospital, number of transfers and prior treatment, and severity of injuries. The below plot represents unadjusted mortality by hospital, including all transfers. It allows the reader to identify the total number of severely injured patients admitted for severe injuries. The following pages will exclude transfers to ensure the group being analysed is homogenous. Unadjusted mortality for patients that were transfered to one or more hospitals are represented on page 28, by jurisdiction.



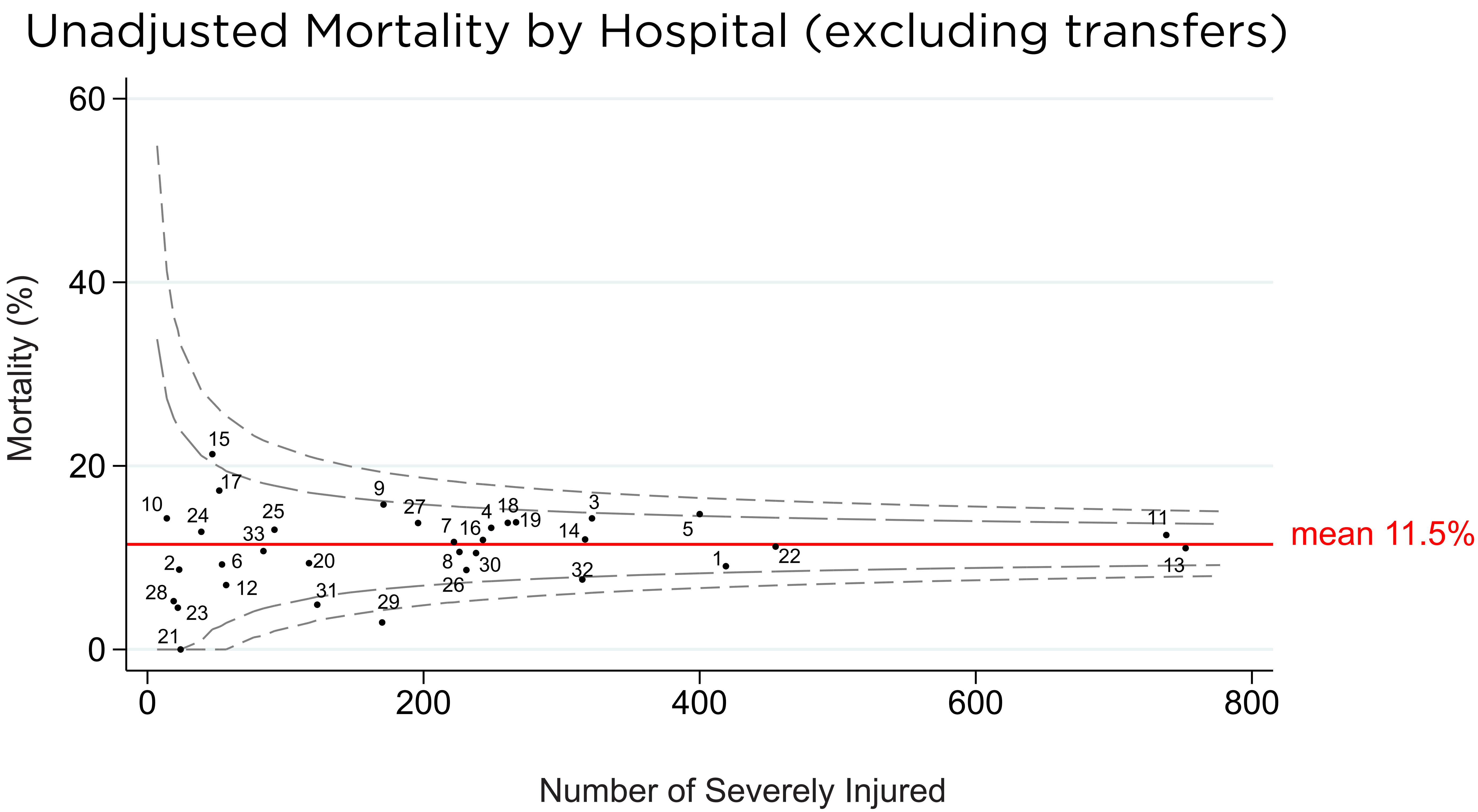
The use of these funnelplots to identify outliers needs to be interpreted with caution due to small numbers

MORTALITY BY HOSPITAL (EXCLUDING TRANSFERS)

Mortality was compared between hospitals, before and after risk adjustment. The following risk factors were included in the model as they were found to be significant predictors: restricted cubic splines for age with 4 knots, cause of injury, arrival Glasgow Coma Scale (GCS) - motor, shock-index grouped in quartiles, highest and second highest AIS scores. The mean mortality was calculated from the binary firth logistic regression model, which accounted for the skewness in the data. No significant differences were noted after risk adjustment. Please refer to Appendix A for detailed data analysis.

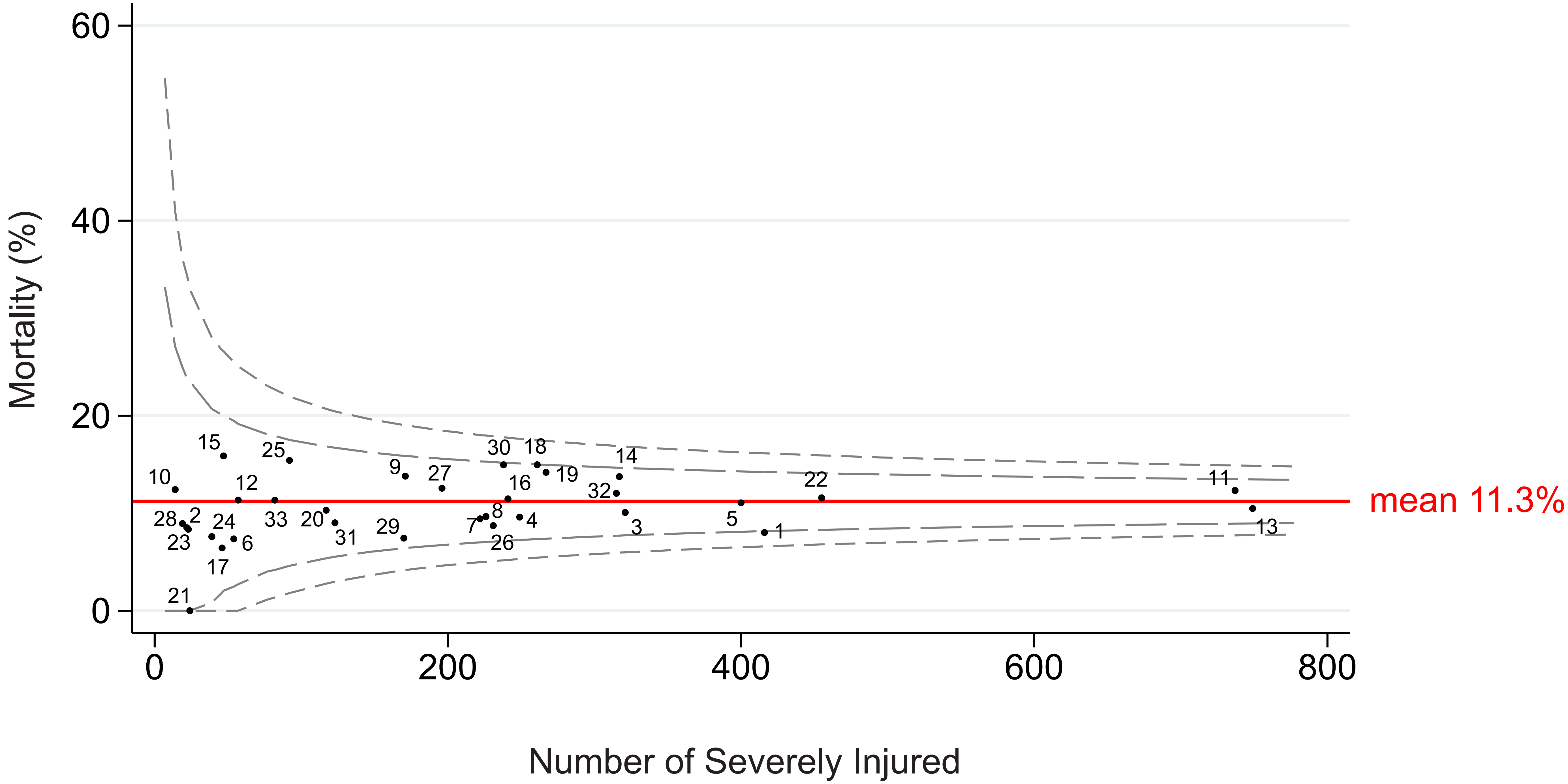
Each numbered dot represents one hospital in the funnel plots below. The funnel plots, where the aim is to identify outliers, show contours which represent two standard deviations (95% control limits) and three standard deviations (99.8% control limits) from the mean. Those outside these lines are considered outliers, with a 5% and 0.2% chance of a false positive respectively.

Total numbers for risk adjustment have been reduced because the transferred group of patients has been excluded. This resulted in a 30% reduction in numbers. A further reduction in numbers was the exclusion of non-blunt cases such as burns and penetrating as they are a heterogenous group (5%).



The use of these funnelplots to identify outliers needs to be interpreted with caution due to small numbers

Risk-adjusted Mortality by Hospital

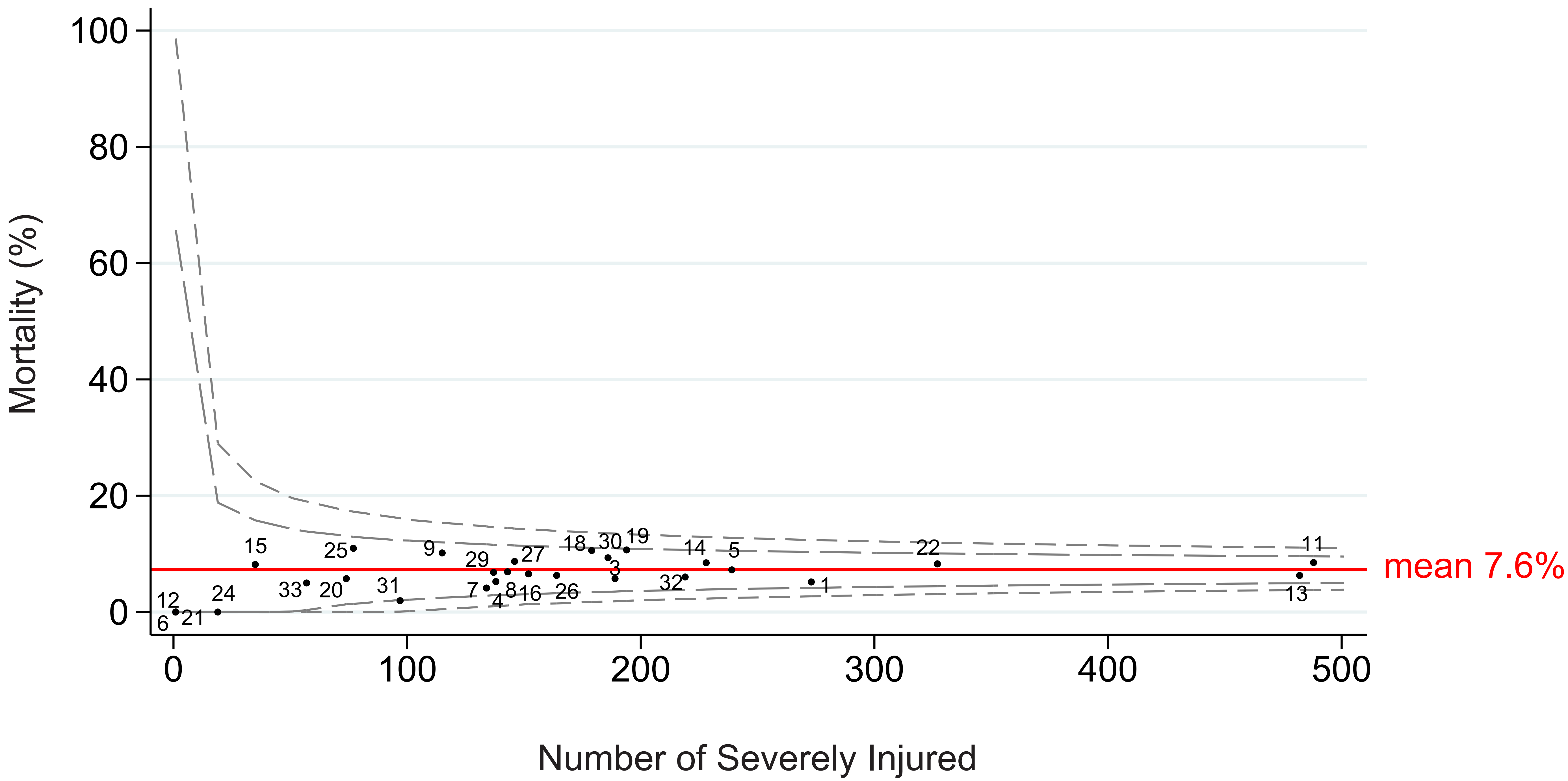


The use of these funnelplots to identify outliers needs to be interpreted with caution due to small numbers

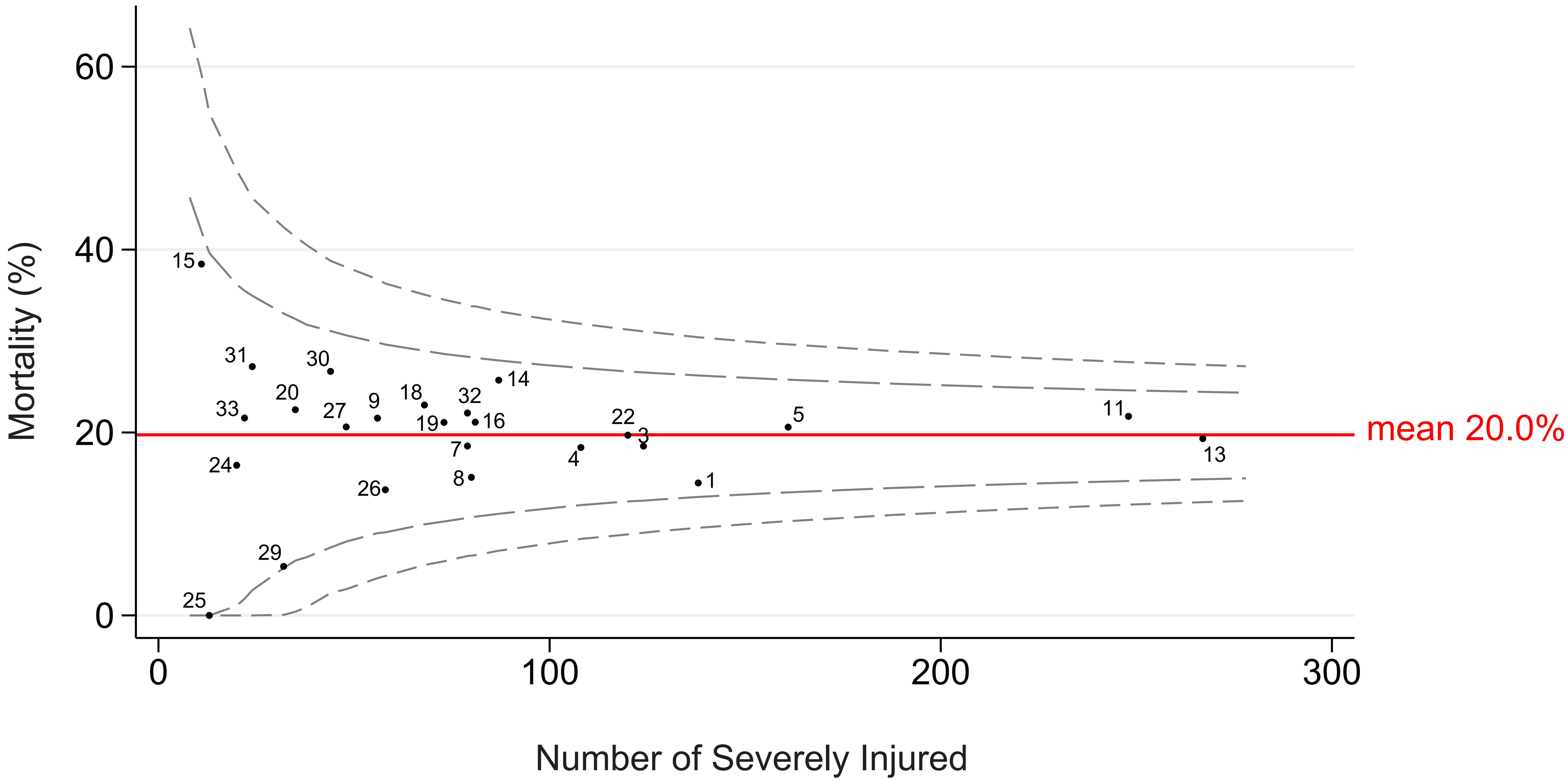
RISK ADJUSTED MORTALITY BY HOSPITAL AND AGE GROUP (EXCLUDING TRANSFERS)

Mortality was compared between hospitals using funnel plots and risk adjusted. Patients were categorised into three age groups: children (aged <16 years), adults (>=16 and <65 years) and older adults (>=65 years). In all three populations there were no significant differences between sites.

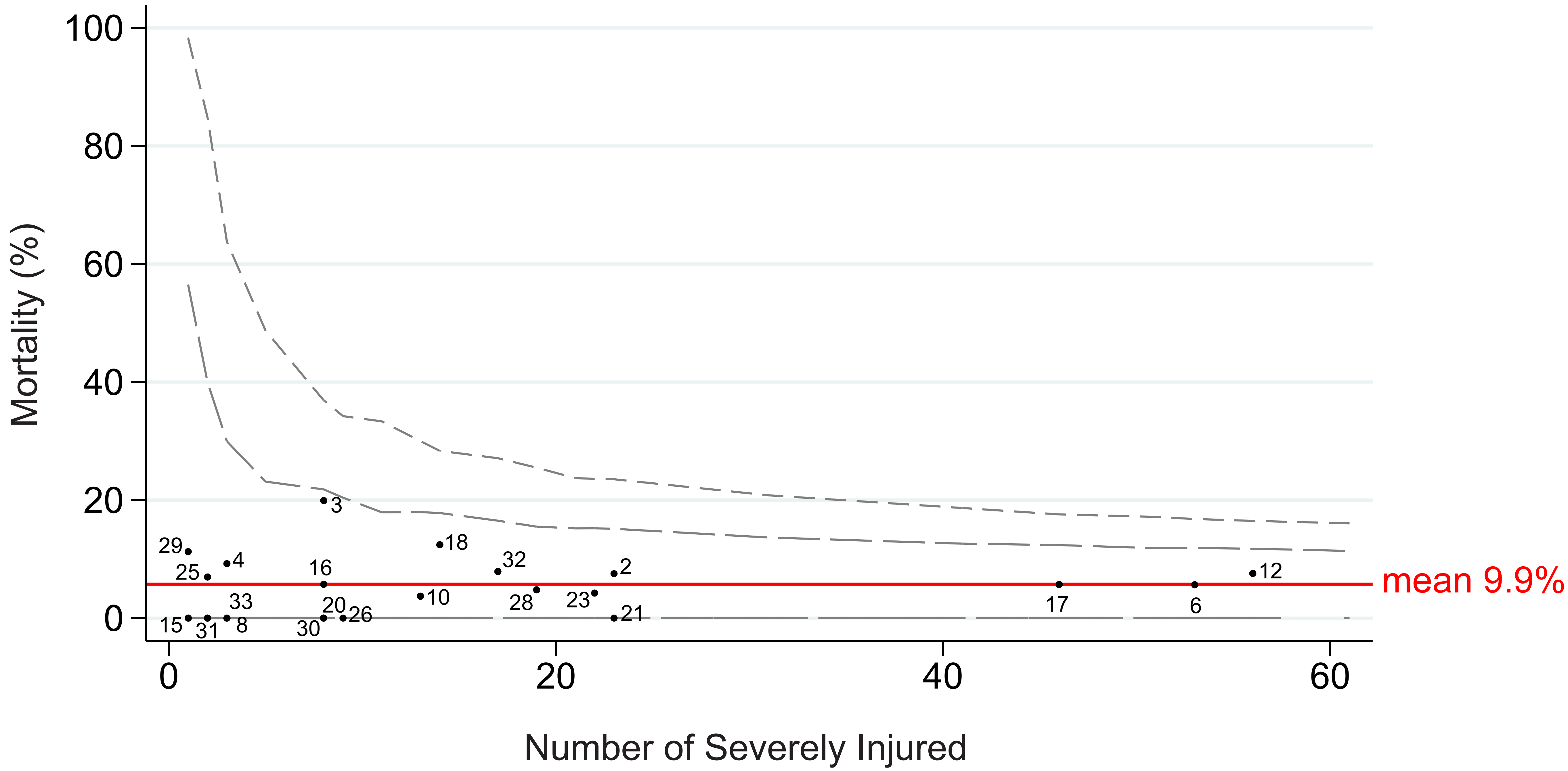
Risk Adjusted Mortality Adults (Aged >=16 and <65 years)



Risk Adjusted Mortality Older Adults (Aged >=65 years)



Risk Adjusted Mortality Paediatrics (Aged <16 years)

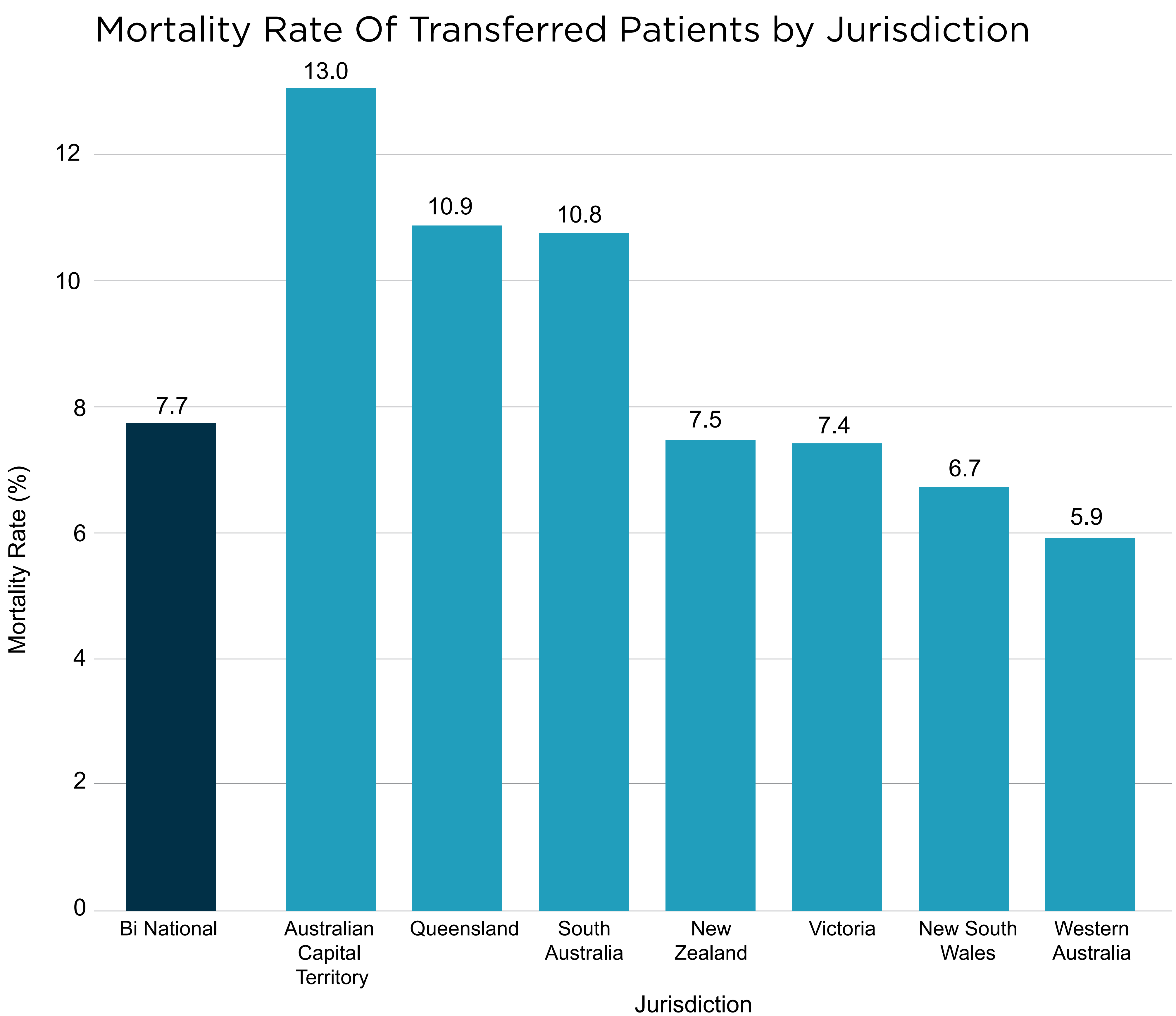


The use of these funnelplots to identify outliers needs to be interpreted with caution due to small numbers

TRANSFER OUTCOMES

Transfers make up 30.1 per cent of all major trauma patients and they are an important group of patients to consider, when assessing trauma outcomes. Approximately 7.7 per cent die even after transfer to a major trauma service which is an increase from 6.4 per cent in the previous year. Thirty-nine per cent of transferred patients were treated in the ICU. The median LOS was 6.7 (3.7-12.5) days. Unfortunately, this is an extremely heterogenous group which makes interfacility comparison of outcomes difficult. To reliably compare outcomes for this group, we will need to link with geospatial information on location of injury and with identification of prehospital and regional hospital deaths, prior to transfer. The ATR is developing processes to allow for this over coming years.

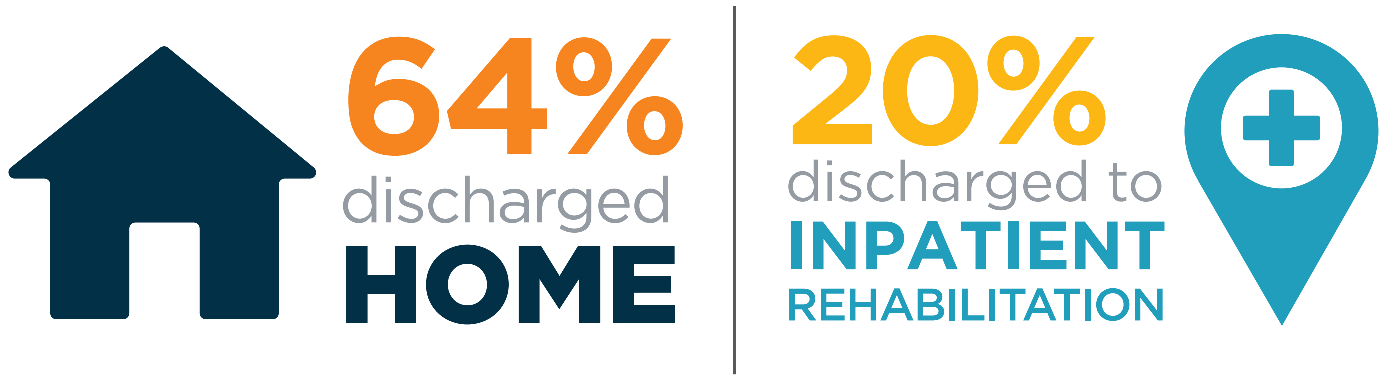
Mortality rates for patients transferred to one or more hospitals prior to arrival at definitive care is shown in the below graph. The Northern Territory and Tasmania were excluded as their total number of transfers was less than fifty.

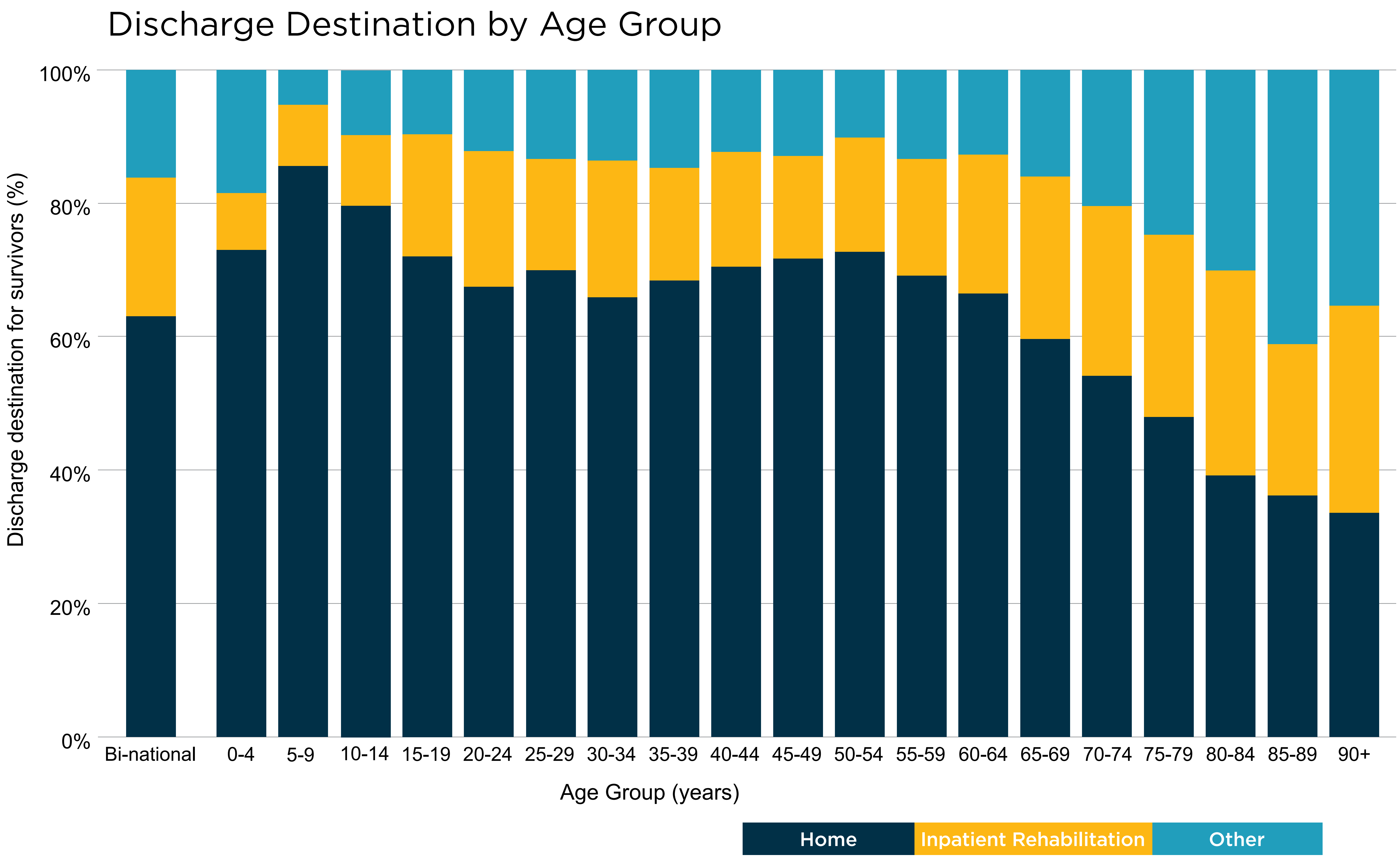


Jurisdiction	Total Transfers (n)	Deaths (n)	Mortality (%)
Victoria	797	59	7.4
New South Wales	655	44	6.7
Western Australia	576	34	5.9
New Zealand	429	32	7.5
Queensland	349	38	10.9
South Australia	195	21	10.8
Australian Capital Territory	69	9	13.0
Northern Territory	42	1	2.4
Tasmania	13	3	23.1
Total	**3125**	**241**	**7.7%**

DISCHARGE DESTINATION

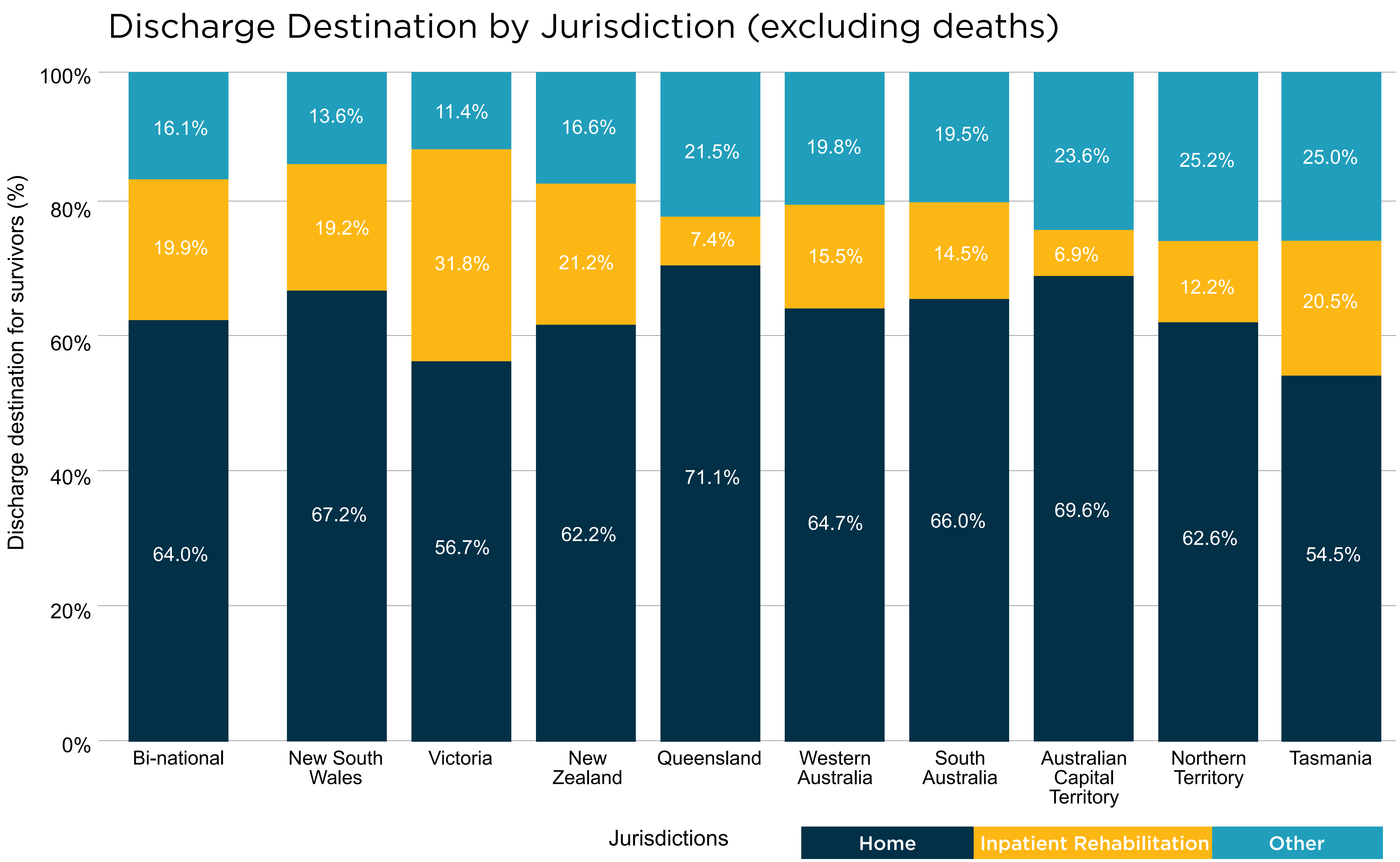
A known discharge destination was collected for 99.7 per cent of patients. For patients discharged alive, the proportion of patients discharged home decreased as injury severity increased and patients discharge to inpatient rehabilitation increased with injury severity. A similar trend occurred with age. As age increased, the likelihood of being discharged home decreased and being discharge to inpatient rehabilitation increased.





DISCHARGE DESTINATION

When looking at discharge destination by jurisdiction, proportions of patients discharged to home and to inpatient rehabilitation vary greatly.



PAEDIATRICS (0-15 YEARS OLD)

More than 65,000 children aged 0-14 were hospitalised following injury in Australia in 2017-18, according to the Australian Institute of Health and Welfare[3]. The Australia New Zealand Trauma Registry collects trauma data on only the most severe injuries - those who are hospitalised with an Injury Severity Score (ISS) greater than 12 or death after injury.

Seven hundred and five severely injured children aged zero to 15 years were reported across Australia and New Zealand for the period 1 July 2019 to 30 June 2020, accounting for 6.9% of all severe injuries. This group of children represent the most severely injured trauma survivors in what is the most common cause of death and disability in children and young people.

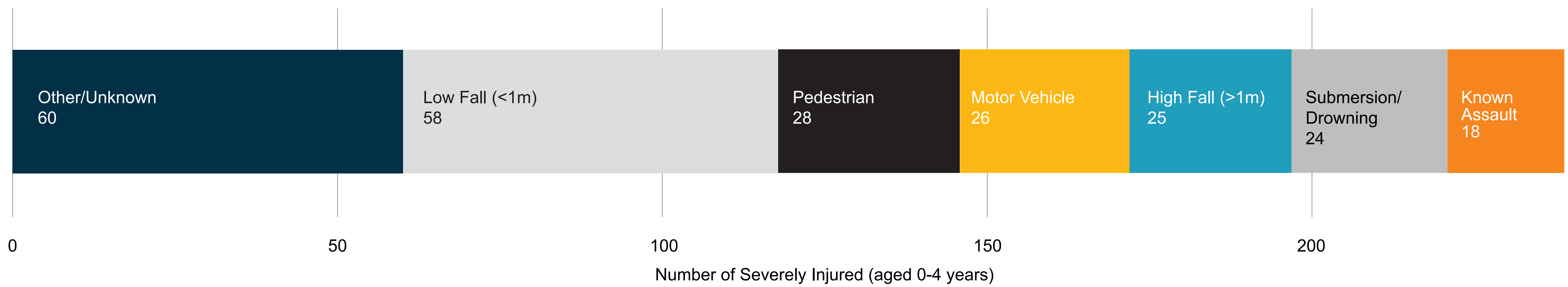
705 SEVERELY INJURED | **8.5%** mortality

52% 0-15 yo deaths were AGED 0-3

CHILDREN AGED 0-4 YEARS

Children aged zero to four years accounted for one-third of all paediatric severe injuries (n=243). The most common known mechanism was low fall (n=58). Sixty children were classified with a mechanism of other or unknown, the largest group (see graph below). Of these, 36 had an intent of unintentional, 3 maltreatment by parent and 21 had unknown intent. Cases in this age group that have unknown cause or intent are often classified as non-accidental injuries (NAI). The other threat to breathing category in this age group (n=5), includes suffocation/strangulation or object inhalation. Injury severity was greatest in the ISS 16-24 range (n=107) followed by the 25-40 range (n=87).

Mechanism of Injury (aged 0-4 years)



75% occurred in **HOME** | **13%** occurred on **THE ROAD**

OUTCOME

In-hospital mortality accounted for 13 per cent (n=32) of the cohort, above the bi-national mortality (10.4 per cent). Of the deaths, 19 per cent died in the emergency department (also well above the bi-national ED mortality of 13.5 per cent). The most common cause of death was submersion or Drowning (n=8) and Other/Unknown (n=8), followed by Accidental suffocation/strangulation or object inhalation (n=4). The categories 'other' and 'unknown' is often how non-accidental injuries (NAI) are recorded. 73 per cent of children aged 0-4 years were discharged home and 8.5 per cent to inpatient rehabilitation.

The global Covid-19 pandemic may have affected the number of severe injuries as well the cause and place of injury due to lock-downs that occurred across both Australia and New Zealand in 2020. Injuries occurring in the home increased by 25 per cent since 2017/18, and injuries occurring on the road decreased by 38 per cent.

PAEDIATRICS (0-15 YEARS OLD)

CHILDREN AGED 5-15 YEARS

Children aged five to 15 years accounted for two-thirds of paediatric severe injuries (n= 462) similar to previous three years. The most common mechanism was transport related (n=259) followed by falls (n=96). Injury severity was greatest in the ISS 16-24 range (n=226, 49%) followed by the 25-40 range (n=141, 31%).

CAUSE OF INJURY

56% TRANSPORT RELATED

21% FALLS related

4% HORSE RELATED
2% CAUSED BY **HANGING**

PLACE OF INJURY

36% ROAD

23% HOME

13% sports & ATHLETICS AREA

OUTCOME

6.1% DIED in-hospital

25% deaths HANGING RELATED

OUTCOME

In-hospital mortality accounted for 6.1 per cent (n=28) of the cohort, well below the bi-national mortality (10.4 per cent). Of those deaths, 28.6 per cent died in the emergency department (well above the bi-national ED mortality of 13.5 per cent). A quarter of in-hospital deaths were caused by hangings. Just under eighty per cent were discharged home and 11.5% to inpatient rehabilitation.

The global Covid-19 pandemic may have affected the number of severe injuries as well the cause and place of injury due to lock-downs that occurred across both Australia and New Zealand in 2020.

ELDERLY (AGED 65 YEARS AND ABOVE)

In the 2019-21 financial year 3,051 (30 per cent) of all severely injured were aged 65 years or older. Low falls was the most common cause of injury (47.2 per cent) with an overall mortality rate of 17.7 per cent.

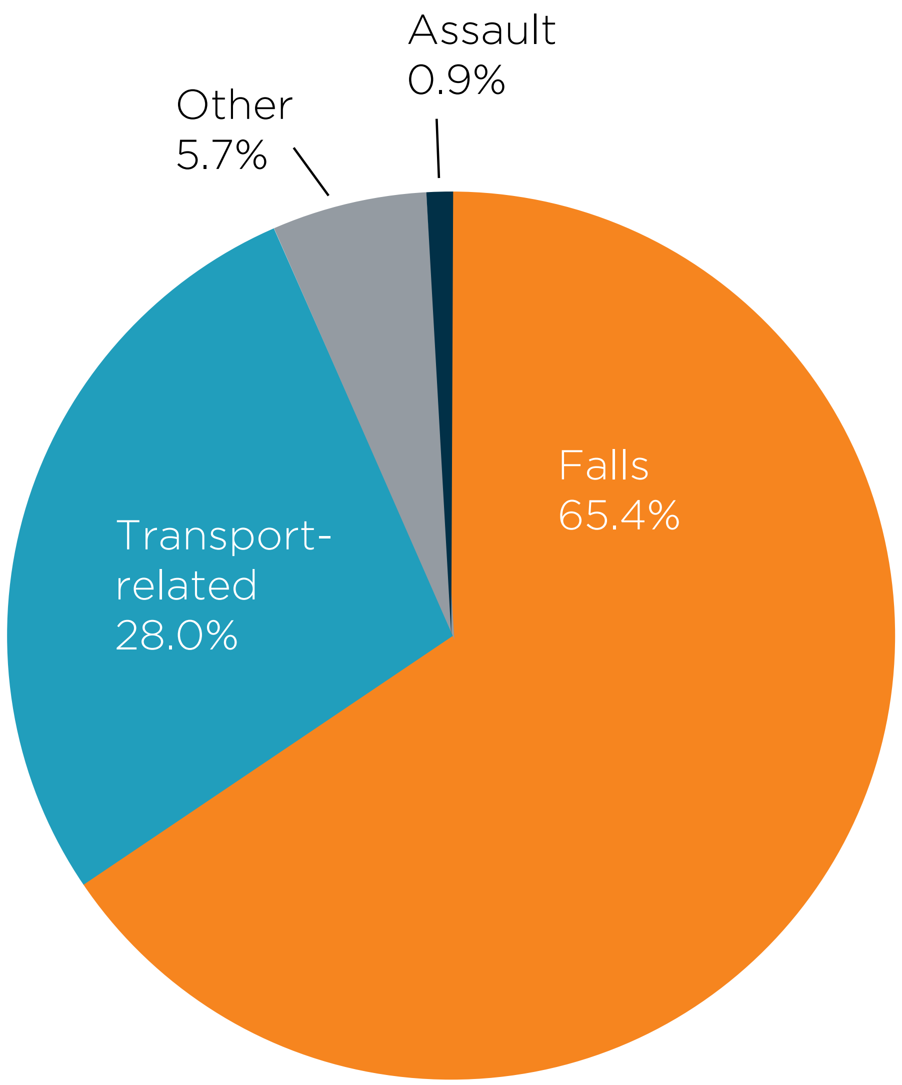
30% of all SEVERE INJURIES AGED 65+

4.6% INCREASE over 3 years

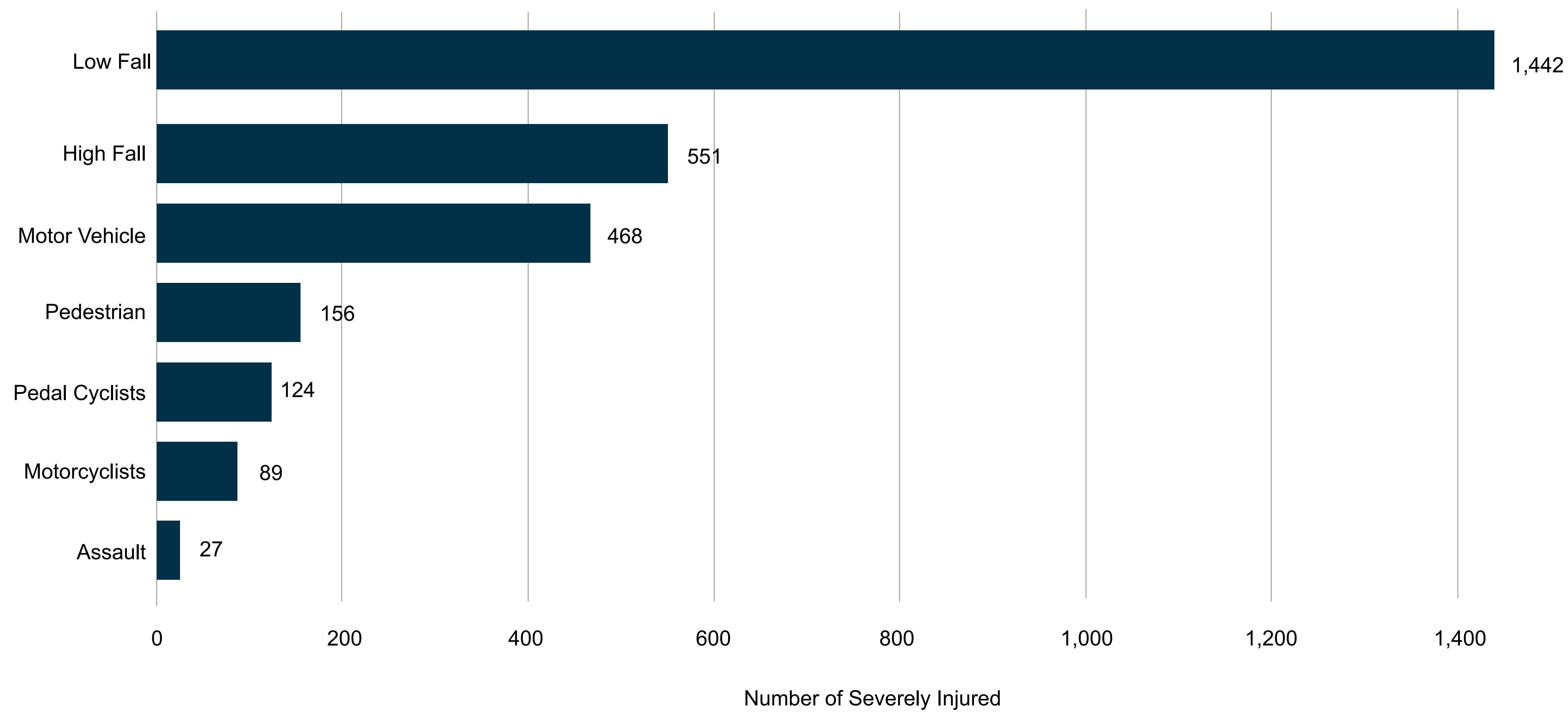
60.2% MALE

CAUSE OF INJURY

Falls were the most prominent injury cause within this age group, followed by transport-related causes. When falls and transport-related causes were further broken down, low falls were identified as the most common injury cause for this age cohort, 47.2 per cent (n=1,442), compared with the 21.7 per cent low falls rate for all severely injured.



Further Breakdown of Cause of Injury, aged 65 years and above



ELDERLY (AGED 65 YEARS AND ABOVE)

PLACE OF INJURY

61.2% home

29.9% streets & highways

69% direct TRANSPORT FROM SCENE TO definitive care

median length of stay 7.7days

33% admitted to ICU

median ICU length of stay 3 DAYS

in-hospital MORTALITY 17.7%

LOW FALLS IN-HOSPITAL MORTALITY 21.5%

DISCHARGE DESTINATION

47.8% to HOME

26.5% to inpatient rehabilitation

ROYAL AUSTRALASIAN COLLEGE OF SURGEONS (RACS) TRAUMA QUALITY IMPROVEMENT COMMITTEE AND THE ATR

One of the aims of the Royal Australasian College of Surgeons (RACS) Trauma Quality Improvement (TQI) committee has been to support quality improvement for all trauma patients. This year RACS celebrates 26 years of supporting the development of the Australian Trauma Registry (ATR).

By using the ATR data to establish benchmarks, and providing cross-comparison feedback to each trauma centre, processes of care for improvement within the trauma system can be identified.

The RACS TQI committee developed a set of binational process indicators which allows for cross-comparison and benchmarking of key process indicators between sites and jurisdictions. There are eight process indicators, of which the ATR currently collects seven and reports on five. The ATR data working group is in the process of incorporating the remaining indicator into the bi-national data dictionary and is continuing to work with sites to improve data capture and completeness of the existing variables so reporting of all the process indictors is possible.

RACS TQI PROCESS INDICATORS

INDICATORS	1	2	3	4	5	6	7	8
INDICATOR NAME	Mortality	Pre-hospital transport times	Discharge Destination	Time to CT scan if GCS < 13	Trauma team activation for patients with ISS > 12	Blood alcohol collection in patients with ISS > 12.	Time in first facility, if transferred.	Time in the Emergency Department.
DEFINITION	The rate of in-hospital deaths that occur, either in the Emergency Department or after inpatient admission, in patients admitted following injury.	The mean and/or median times that elapse between the time of injury and the episodes of care that occur prior to arrival at the 1st receiving hospital.	The rate at which patients are discharged to the various destinations other than death, at the conclusion of their hospital admission	The mean and/or median time that elapses between arrival at the reporting hospital and the first head CT performed at that same hospital.	The per centage of patients with major injuries, defined as an ISS > 12, who had a trauma team activated at the time of presentation to the Emergency Department.	The per centage of patients with major injuries, defined as an ISS > 12, who had a blood alcohol level collected and documented within 6 hours of first hospital admission.	The mean and/or median length of time that is spent in the first facility, prior to the transfer to definitive care.	The mean and/or median length of time that is spent in the Emergency Department, prior to discharge to the ward, or other disposition from the ED that is not death.
RATIONALE	To understand the burden of death from injury in patients that are alive on presentation to hospital.	To understand the timeliness of prehospital encounters.	To quantify the varying outcomes of in hospital admissions, with a view to determining resource allocation.	To measure the timeliness of CT investigation of a patient with a suspected brain injury.	To determine the accuracy of trauma team activation.	To measure the recognition of major injury by compliance with blood alcohol collection practice.	To measure the timeliness of transfer to definitive care and evaluate compliance with transfer protocols.	To measure the timeliness and efficiency of the care delivered in the Emergency Department.

APPENDIX A - ATR METHODOLOGY

Governance

The National Trauma Research Institute (NTRI), founded in 2003, is a collaboration between Alfred Health, Monash University and Gold Coast University Hospital and Health Service. The NTRI collaborates with organisations nationally and internationally to integrate Research, Education, Medical Technologies and Trauma Systems Development to improve clinical care and outcomes.

In 2012, the NTRI established the Australian Trauma Quality Improvement Program (AusTQIP) including the Australian Trauma Registry (ATR) bringing together Australia's 26 designated trauma centres to form a collaboration to provide important data on the most severely injured. In 2018, New Zealand joined the collaboration, introducing a further seven designated trauma centres to the registry, bringing the total number of sites to 34. This is the first report for the bi-national collaboration, now known as the Australia New Zealand Trauma Registry (ATR).

AusTQIP was formed with an overarching Steering Committee comprised of representation from all jurisdictions, and other participating stakeholders (Appendix B). Reporting to the Steering Committee is the AusTQIP Management Committee (Appendix B).

The ATR is supported by the Department of Infrastructure, Regional Development and Cities (DIRDC) and the Department of Health (DOH), who have provided further funding for the period 1 July 2019 to 30 June 2022. The ATR is also supported by the New Zealand National Trauma Network and the NTRI, as well as by the large group of contributing sites.

Minimum Dataset

ATR data is defined by the Bi-National Trauma Minimum Dataset (BNTMDS). Data elements from existing hospital and state-based registries were mapped to the dataset according to standard definitions. If data elements were not already collected by existing data sources, they were not otherwise obtained by the ATR. The current version of the minimum dataset (Version 1.51) can be downloaded from the ATR website (www.atr.org.au).

Inclusion/ Exclusion Criteria

The ATR collects data on severely injured patients presenting to one of 33 major trauma centres across Australia and New Zealand.

Inclusion Criteria

Patients admitted to these centres who subsequently die after injury, or who sustain major trauma (defined as an Injury Severity Score greater than 12)[4] are included in ATR data.

Exclusion Criteria

Patients with delayed admissions greater than seven days after injury, poisoning or drug ingestion that do not cause injury, foreign bodies that do not cause injury, injuries secondary to medical procedures, isolated neck of femur fracture, pathology directly resulting in isolated injury, older adults (≥65 years of age) who die with superficial injury only (contusions, abrasions, or lacerations) and/or have co-existing disease that precipitates injury or is precipitant to death (e.g. stroke, renal failure, heart failure, malignancy).

Data Definitions

Emergency Department length of stay (ED LOS) is calculated by the ATR based on the date and time of arrival at the definitive care hospital to the emergency department discharge date and time. ED LOS is presented as hours.

Intensive Care Unit length of stay (ICU LOS) is based on values provided by the designated trauma centres or as reported by the state-based trauma registries. ICU LOS is presented as days.

Hospital length of stay (LOS) is from date and time of arrival at definitive care hospital to the date and time of discharge from definitive care hospital as reported. Hospital LOS is based on values provided by the designated trauma centres or as reported by the state-based registries. Hospital length of stay is presented as days.

External cause of injury International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification[5] (ICD-10-AM) codes were used to define causes/mechanisms of injury, injury type and injury intent. Causes of injury were based on the Center for Disease Control's External Cause of Injury and Mortality Matrix (www.cdc.gov/nchs/data/ice/icd10_transcode.pdf).

Type of injury was based on ICD-10-AM codes as previously reported[6]. Codes were mapped to injury types in the BNTMDS.

Data Analysis

Risk adjusted outcomes are provided in this report. The primary outcomes were inpatient mortality and length of stay (LOS). For both outcomes, funnel plots were created as a visual representation of how individual sites fare compared to their peers and the overall average; it also identifies those who are performing better or worse than the average. The funnel plot contours represent two standard deviations (95% control limits) and three standard deviations (99.8% control limits) from the mean, those above and below these lines are considered outliers, with a 5% and 0.2% chance of a false positive respectively. Both crude and risk-adjusted funnel plots were calculated. For inpatient mortality, the binary firth logistic regression model was used and the robust linear regression model for LOS, due to right skewness in the data. Only survivors were included in the LOS analysis. The following risk factors were included in the model as they were found to be significant predictors: restricted cubic splines for age with 4 knots, cause of injury, arrival Glasgow Coma Scale (GCS) - motor, shock-index grouped in quartiles, highest and second highest AIS scores. We ran separate analysis for paediatric (age <16 years), adult (15<age<65) and older adults (age>64). Data analysis was performed in Stata V16.0 (Stata Corp, College Station, Tx, USA) and level of significance set at 5%. The relationship between age and mortality among trauma patients is non-linear. There are several options to dealing with non-linearity, including categorising based on arbitrary cut-offs, including a quadratic term or including cubic splines. In a recent publication, we compared the various methods and found that cubic splines to be the most appropriate. The model assumes that the relationship is polynomial between the knots, locations set by the model at 18, 52 and 82 years. Although the splines are not easily interpretable, note that this is used in the context of benchmarking and not patient risk-stratification, which would probably require a different approach.

Data Confidentiality

In 2016, Monash University, Department of Epidemiology and Preventive Medicine, became the custodian of the ATR data and responsible for all reporting.

All jurisdictional data is de-identified in order to maintain hospital confidentiality as per the collaboration agreement.

Each hospital and jurisdiction has been allocated a unique identifier which is consistent throughout the report.

Data Quality

Data submitted to the ATR underwent various validity checks such as date and time formats and chronology, and correct classification as per the ICD-10-AM and Abbreviated Injury Scale 2005 (Updated 2008)[7] (AIS) codes prior to data processing. If data did not pass these validations, an error file was generated and a notification sent to sites submitting the data to address and correct the error, if possible.

Data contribution varies between hospitals as not all hospitals have all the BNTMDS data points available. However this continues to improve, along with data completeness as the hospitals update data systems and improved data quality processes are put in place.

Severity of Injury

Injury Severity Score (ISS) is an internationally-standardised approach to describing the overall severity of injury for each patient. The calculated value enables comparison between cohorts of injured patients, and can be used for inclusion into trauma registries. The higher the number the more severe the injury, ranging from one to 75.

Trauma patients are allocated an ISS after injury in order to determine their status as 'major trauma'. For this report major trauma is defined as an ISS > 12, which is derived from the Abbreviated Injury Scale (AIS) 2008. ISS is useful for predicting hospital length of stay, and associated morbidity and mortality.

APPENDIX B - GOVERNANCE COMMITTEES

ATR STEERING COMMITTEE MEMBERSHIP

Member	Committee Role
Professor Ian Civil	NZ National Trauma Network - Clinical Director
Ms Siobhan Isles	NZ National Trauma Network - Programme Director
Professor Kate Curtis	Co-chair/University representative
Professor Mark Fitzgerald	Co-chair/Alfred Health/NTRI representative
Professor Peter Cameron	University representative
Dr Don Campbell	Queensland representative
Associate Professor Grant Christey	RACS TQI Representative
Mr Chris Clarke	South Australia representative
Dr John Crozier	Royal Australasian College of Surgeons (RACS) representative
Associate Professor Michael Dinh	New South Wales representative
Associate Professor Daniel Ellis	Treasurer/South Australian Representative
Dr Yen Kim	AusTQIP Manager
Associate Professor Anthony Joseph	Australasian Trauma Society representative
Ms Bronte Martin	National Critical Care & Trauma Response Centre (NCCTRC) Executive Sponsor
Associate Professor Joseph Mathew	Australasian College of Emergency Medicine representative
Ms Kathleen McDermott	Northern Territory representative
Ms Emily McKie	Manager, Australia New Zealand Trauma Registry
Dr Rebekah Ogilvie	Australian Capital Territory representative
Dr Sudhakar Rao	Western Australia representative
Professor Michael Reade	Australian Defence Force representative
Mr Nick Rushworth	Consumer representative
Dr Adam Mahoney	Tasmania representative
Associate Professor Warwick Teague	Paediatric Specialist/ Victorian representative

Proxies, Adjuncts and Observers	
Ms Maxine Burrell	Western Australian representative
Mr Huat Lim	NCCTRC / Northern Territory

MANAGEMENT COMMITTEE MEMBERSHIP

Member	Committee Role
Professor Kate Curtis	Co-chair/University representative
Professor Mark Fitzgerald	Co-chair/Alfred Health/NTRI representative
Professor Peter Cameron	Monash University representative
Professor Belinda Gabbe	Monash University representative
Professor James Harrison	Consultant expert, Australian Institute of Health & Welfare
Ms Emily McKie	Australia New Zealand Trauma Registry representative
Ms Sue McLellan	Monash University representative
Ms Mimi Morgan	Monash University representative
Professor Cliff Pollard	State Trauma representative

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John Hunter Hospital
Liverpool Hospital
Royal North Shore Hospital
Royal Prince Alfred Hospital
St George Hospital
St Vincent's Hospital
Sydney Children's Hospital
Westmead Hospital

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Royal Darwin Hospital

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This report has been prepared by Ms Emily McKie, Manager, ATR.

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IMAGE SOURCES

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