

Atlas of Healthcare Variation Methodology | Trauma

General points:

- Data are not presented where the number of people was less than 5. This is to preserve confidentiality and can be identified by 'NP', not presented.
- 'NA' indicates data were not available for this indicator.
- Ethnicity data are presented as prioritised ethnic group (Māori and Pacific peoples). All other ethnic groups were put into a non-Māori/non-Pacific group. For people reporting multiple ethnic groups, the most recent value was selected.
- People with unknown ethnicity, age or gender were excluded from the respective group analysis but included in all other analyses.

Standard deviation

Data are presented as standard deviation from the mean.

Standard deviation is a statistical measure of variation from a mean. We assume that the data are normally distributed (ie, the data values fall in the usual 'bell-shaped curve'). Under this assumption, we expect 68 percent of data values to fall within one standard deviation of the mean (the middle shades of the colour range). We expect 95 percent of the values to fall within two standard deviations.

Confidence intervals

Data for each DHB is presented as rate per 1,000 population, a percentage or a count. Upper and lower confidence intervals were calculated to 95 percent level of confidence for the rates and percentages.

Physical injury indicators from the National Minimum Dataset (all District Health Boards)

Indicator #1:	Admissions due to physical injury, by DHB of domicile (NMDS), rate per 1,000 population
Numerator	Number of first hospital admissions with a principal diagnosis of injury by DHB of domicile, 2012–14
Denominator	Statistics New Zealand population estimates (2012–13) and population projections (2014)
Data source	NMDS, Ministry of Health
Analysis	By individual year (2012–2014), by ethnicity (Māori, Pacific, non-Māori/non-Pacific), by age group (0–14, 15–24, 25–44, 45–64, 65+) and by gender.
Codes	<ul style="list-style-type: none"> - First admission* to hospital with a principal diagnosis of injury, principal diagnosis in range S00-T35 - Exclude transfers - Exclude readmissions for the same injury - Exclude those LOS<1 day - Include all deaths including on the first day - Exclude poisoning, drowning and hangings - Exclude fracture neck of femur - Exclude DRG I79A Pathological Fracture W Catastrophic CC and I79B Pathological Fracture W/O Catastrophic CC <p>*First admission = date of injury is day of or day before admission to hospital</p>

Indicator #2:	Mortality following admission for physical injury, by DHB of domicile (NMDS), percentage of admissions
Numerator	Number of in-hospital deaths following first admission with a principal diagnosis of injury by DHB of domicile
Denominator	Number of first admissions with a principal diagnosis of injury, 2012–14
Data source	NMDS, Ministry of Health
Analysis	By individual year and three year average (2012–2014). See Table 1 in Appendix 1 for age group analysis.
Codes	<ul style="list-style-type: none"> - First admission* to hospital with a principal diagnosis of injury, principal diagnosis in range S00-T35 - Exclude transfers - Exclude readmissions for the same injury - Exclude those LOS<1 day - Include all deaths including on the first day - Exclude poisoning, drowning and hangings - Exclude fracture neck of femur - Exclude DRG I79A Pathological Fracture W Catastrophic CC and I79B Pathological Fracture W/O Catastrophic CC <p>*First admission = date of injury is day of or day before admission to hospital</p>

Indicator #3:	Admissions due to physical injury, by DHB of service (NMDS), count
Variable	Number of first hospital admissions with a principal diagnosis of injury by DHB of service, 2012–14
Data source	NMDS, Ministry of Health
Codes	<ul style="list-style-type: none"> - First admission* to hospital with a principal diagnosis of injury, principal diagnosis in range S00-T35 - Exclude transfers - Exclude readmissions for the same injury - Exclude those LOS<1 day - Include all deaths including on the first day - Exclude poisoning, drowning and hangings - Exclude fracture neck of femur - Exclude DRG I79A Pathological Fracture W Catastrophic CC and I79B Pathological Fracture W/O Catastrophic CC <p>*First admission = date of injury is day of or day before admission to hospital</p>

Major trauma indicators from the New Zealand Major Trauma Registers (NZMTR):

Indicators 4–6 are presented only for the DHBs and hospitals with a major trauma register. Each DHB is shown in Table 1 along with the injury coding standard in use and the injury Severity Score (ISS) criteria used to extract data. All registries provided data from 2012 to 2014.

Table 1: DHBs and hospitals in New Zealand with major trauma registries, 2012–2014

DHB	Region	Hospital registries	AIS Coding ¹	Injury Severity Score
Auckland ²	Northern	Auckland City Hospital, Starship Children's Hospital	AIS 1998	>15
Bay of Plenty	Midland	Tauranga Hospital, Whakatane Hospital	AIS 2008	>12
Counties Manukau	Northern	Middlemore Hospital	AIS 1998	>15
Lakes	Midland	Rotorua Hospital	AIS 2008	>12
Taranaki	Midland	Taranaki Base Hospital	AIS 2008	>12
Waikato	Midland	Waikato Hospital	AIS 2008	>12

¹Abbreviated Injury Scale (AIS) is an anatomical-based coding system to classify and describe the severity of injuries.

²Auckland City and Starship Children's Hospital registers also include complex major trauma patient care data for people from Waitemata DHB.

Inclusion criteria

All patients of any age admitted to hospital with either

- death following injury (including deaths in an Emergency Department) or
- an ISS >15 (AIS 1998) or ISS >12 (AIS 2008).

Exclusion criteria

- Patients with delayed admissions greater than 7 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
- Elderly (≥65 years of age) patients 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).
- Hangings
- Drownings

Indicator #4:	Major trauma admissions, DHB of service (NZMTR), count
Numerator	Count of first major trauma admissions to hospital
Data source	NZMTR
Analysis	Analyse over 3 years, by ethnicity (Māori, Pacific, non-Māori/non-Pacific), age group (0–14, 15–24, 25–44, 45–64, 65+), by gender, 2012–2014. See Table 2 in Appendix 1 for major trauma population rates for registries.
Comments	Indicator includes only major trauma admissions (ISS >15 for Northern region registries and ISS >12 for Midland region registries). Excludes patients transferred <i>in</i> from another hospital.

Indicator #5:	Mortality following admission with major trauma, DHB of service (NZMTR), percentage
Numerator	Number of deaths following first major trauma hospital admissions with a principal diagnosis of major trauma
Denominator	Number of first major trauma admissions by DHB of service (indicator 5 numerator)
Data source	NZMTR
Analysis	Analyse over 3 years, 2012–2014. See Table 3 in Appendix 1 for age group analysis.
Comments	Indicator includes only major trauma admissions (ISS >15 for Northern region registries and ISS >12 for Midland region registries). Excludes patients transferred <i>in</i> from another hospital. Deaths were identified using either discharge state or discharge destination.

Indicator #6:	Time from injury to first hospital capable of managing major trauma, DHB of service (NZMTR) (%)
Numerator	Number of patients seen at a hospital capable of managing major trauma within a defined time period (< 1 hour; ≤ 3 hours; ≤ 6 hours; ≤ 9 hours; ≤ 24 hours) of their injury.
Denominator	Number of patients arriving at a hospital capable of managing major trauma within ≤ 48 hours of their injury.
Data source	NZMTR
Analysis	Time from injury to arrival at hospital calculated as <i>Date/time of arrival at hospital capable of managing major trauma – date/time of injury</i>
Comments	Indicator represents the cumulative percentage of patients arriving at a hospital capable of managing major trauma within 48 hours. Indicator includes only major trauma admissions (ISS >15 for Northern region registries) and excludes patients transferred <i>in</i> from another hospital. Data from Midland region registries is not included here.

Appendix 1

Age group specific mortality rates for physical injury hospital admissions (Indicator 2) are presented in Table 1.

Table 1. Number and percentage of physical injury hospital admissions, deaths and mortality (%) with 95% confidence intervals by age group, 2012-2014

Age group (years)	No of admissions (%)	Number of deaths (%)	Mortality ¹ (95% CI)
0-14	15,168 (19.0)	20 (2.5)	0.1 (0.1–0.2)
15-24	12,040 (15.1)	41 (5.1)	0.3 (0.3–0.5)
25-44	15,749 (19.8)	53 (6.6)	0.3 (0.3–0.4)
45-64	15,161 (19.0)	69 (8.5)	0.5 (0.4–0.6)
65 and over	21,557 (27.1)	626 (77.4)	2.9 (2.7–3.1)
Total	79,675	809	1.0 (0.9–1.1)

¹Deaths per 100 physical injury admissions

Major trauma admission population rates are presented in Table 2. Note that these population rates include patients who live outside the major trauma registry region.

Table 2. Number and rate per 100,000 population of major trauma hospital admissions by Major Trauma Registry, 2012-2014

Registry	No of admissions	Admissions per 100,000 population
Midland	938	38.5
Northern	1127	24.8

Age group specific mortality rates for major trauma injury hospital admissions (indicator 5) are presented in Table 3. Note that this table only includes data from DHBs with major trauma injury registries.

Table 3. Number and percentage of major trauma injury hospital admissions, deaths and mortality (%) with 95% confidence intervals by age group, 2012-2014

Age group (years)	No of admissions (%)	Number of deaths (%)	Mortality ¹ (95% CI)
0-14	165 (8.0)	12 (6.6)	7.3 (4.2–12.3)
15-24	390 (18.9)	27 (14.8)	6.9 (4.8–9.9)
25-44	567 (27.5)	29 (15.9)	5.1 (3.6–7.2)
45-64	531 (25.7)	39 (21.4)	7.3 (5.4–9.9)
65 and over	412 (20.0)	75 (41.4)	18.2 (14.8–22.2)
Total	2,065	182	8.8 (7.7–10.1)

¹Deaths per 100 major trauma admissions