Major trauma in working-age adults in New Zealand

Monica F Judge, Bridget Kool, Ian Civil

ABSTRACT

AIM: To describe the demographic and injury profile of major trauma among 20–65-year-old New Zealanders.

METHODS: A retrospective analysis of routinely collected data from the New Zealand Major Trauma Registry for the period 1 July 2017 to 30 June 2020 was conducted. Sex, age and ethnicity-based rates were then calculated using census-based population estimates to compare the rates of injury across different demographic groups.

RESULTS: Of the 4,186 major trauma incidents among 20–65-year-olds in New Zealand during the 3-year period reviewed, 235 died (5.6%). Males accounted for 77% of those injured. Māori (New Zealand's Indigenous population) had significantly higher rates of major trauma (79.2 per 100,000; 95% confidence interval [CI] 74.4–84.3) compared to non-Māori (44.4 per 100,000; 95% CI 42.9–46.0). The most common cause of injury was transport-related incidents (63%; n=2,632/4,186), followed by falls (19%; n=788/4,186).

CONCLUSIONS: Demographic characteristics have a significant relationship with major trauma injuries among 20–65-year-old New Zealanders. Continued injury prevention efforts focussing on males, Māori and transport incidents are required. Interventions that improve the safety of roads, such as lane separators, speed limits and raised intersections, should be implemented in high-crash-risk areas to reduce risk.

Major trauma is one of the leading causes of death in New Zealand.[1,2] Injuries contribute to approximately 500,000 hospitalisations a year, resulting in a large burden on New Zealand's health system.[3–6] In 2012, the New Zealand Trauma Network (Te Hononga Whētuki ā-Motu) was formed and included the establishment of the New Zealand Trauma Registry (Te Rēhita Whētuki o Aotearoa) (NZTR). The registry enables the centralised collection of information about the characteristics and outcomes of major trauma in New Zealand.[7] Data on any patient admitted to hospital with an Injury Severity Score (ISS) of greater than 12, or any death following an injury, are captured by the registry; information gathered includes patient demographic characteristics, injury incident details, processes of care and outcomes.

Injury among working-age adults is common,[8–10] and carries with it significant impacts for society due to the productive contribution of this age group.[10] Studies from the United States of America (USA) have demonstrated the long-term adverse effects of work-related injuries,[10–12] and highlighted their contribution to income inequality.[11] Data from the European Union estimate that over one third of unintentional injuries among working-age adults (18–64 years) could be reduced.[13] There is limited published information available about the epidemiology of injury among working-age New Zealanders. Therefore, the aim of this research is to describe the patterns of major trauma in the 20–65-year-old population of New Zealand using data from the NZTR. While this age group excludes younger workers (16–19-year-olds), it hopes to describe the current state of injuries in the study population. This information can be used to inform future injury prevention interventions targeting the working-age population to reduce the morbidity and mortality associated with these injuries.

Methods

A retrospective analysis of routinely collected data from the NZTR for the period 1 July 2017 to 30 June 2020 was conducted. Patients aged between 20 and 65 years with major trauma who presented at any New Zealand public hospital were included in the study. This classification was used to exclude the youngest (18–20) and oldest workers, because major trauma injuries are often disproportionately present in these youngest and oldest groups.[14] Major trauma is identified in the NZTR using the Abbreviation Injury Scale (AIS, 2005/2008), to classify injury severity.[7] In the AIS, six distinct anatomical regions are used, and each injury is scored from 1 to 6, with a score of 6 denoting an unsurvivable injury. An ISS is then derived by squaring the scores from the three most severely injured anatomical regions. An ISS between 13 and 75 is considered major trauma; therefore, patients with an ISS greater than 12 were included in this study. Event episodes were the unit of study, such that trauma events resulting in a hospital visit were the cases used in the study.[15]

Variables of interest obtained from the NZTR included: demographic (age, sex, ethnicity—dichotomised as Māori [New Zealand's Indigenous population]: non-Māori), injury event information (mechanism, date, time and place of injury), type and severity of injury, length of hospital stay and discharge destination. Self-identified ethnicity data in the NZTR are obtained from a patient's National Health Index number (unique health identifier). As per the New Zealand Manatū Hauora – Ministry of Health's Ethnicity Data Protocol,[16] patients can list up to two ethnicities. For the purposes of this study, ethnicity data were then prioritised. For example, patients who identified as both Māori and European were recorded as Māori in the dataset. Differences in patterns of injury among Māori and non-Māori were investigated as this has been identified as a gap in current research.[17]

For the calculation of rates, population estimates were obtained using the 2018 New Zealand Census data.[18] Sex- and age-based rates used the 2018 population counts to create annualised rates across the 3 years of data. The ethnicity-based rates used the 2018 population estimates, as the most current estimates available. The statistical coding package R (version 4.0.3) was used for data analysis.[19] Descriptive analysis was carried out to produce Chi-squared tests, using categorical variables for ethnicity, ISS score, injury type (blunt force, penetrating or burn) and age group. Where Chi-squared analysis was unsuitable because of small sample sizes in subsets (between ISS score and injury type), Fisher's exact tests were instead carried out.

Ethics approval for the research was granted by the The University of Auckland's Human Participant's Ethics Committee (Reference: 3459), and access to the data was granted by the NZTR Data Governance Group.

Results

There were 4,186 major trauma incidents among 20–65-year-olds in New Zealand during the 3-year data collection period (Table 1). In 76.6% (n=3,206/4,186) of these cases the patients were male. Māori had a significantly higher rate of major trauma (79.2 per 100,000; 95% confidence interval [CI] 74.4–84.3) compared to non-Māori (44.4 per 100,000; 95% CI 42.9–46.0). Māori had a higher rate of trauma than non-Māori in every age group studied, with significantly higher rates in the 25–30 year (91.7/100,000 cf. 43.7/100,000) and the 45–49-year age groups (74.7/100,000 cf. 40.5/100,000). Māori had significantly higher ISS scores on average (Chi-squared p<0.01) than non-Māori, and higher rates of injury for all injury mechanisms (Chi-squared p<0.01). This was most marked for penetrating trauma (Māori 5.90/100,000 cf. non-Māori 1.94/ 100,000).

The 60–65-year age group experienced the highest mortality rates (4.4 per 100,000; 95% CI: 3.2–6.1). However, the 30–34-year age group had the highest median ISS score (18; interquartile range [IQR] 14–25). The age groups with the highest annualised rate of major trauma caused by assault and self-harm were the younger age groups (25–29, 8.5/100,000, and 20–24 years, 8.0/100,000). Males had consistently higher rates of trauma across all age groups.

The most common cause of major trauma in 20–65-year-olds was traffic-related incidents (n=2,632/4,186; 62.9%), followed by falls (n=788/4,186; 18.8%) (Table 2). Fifty-four percent (n=2,254/4,186) of major traumas occurred on streets or highways, while 14.9% (n=624/4,186) occurred at home. Of note, home injuries accounted for 19.2% (n=45/235) of mortalities. The majority (n=3,904/4,186; 93.3%) of major traumas were blunt-force injuries, and unintentional (n=3,617/4,186; 86.4%). A greater proportion of patients with intentional injuries died than those with unintentional injuries (7.0% cf. 5.3%). Injuries that occurred on streets or highways had the highest median ISS (17; IQR 14–25) and the highest median length of stay in acute care (8 days, range 14 minutes–366 days). The median length of stay in acute care was 7.1 days (IQR 3.8–13.1). Nineteen percent of people had a length of stay of up to 3 days, 30.4% 5–7 days, and 50% stayed longer than a week. The median length of stay for those patients who died in hospital was 1.9 days (IQR 0.39–5.1 days, or between 9.4 hours and 5.1 days).

Seventy five percent of major traumas (n=3,219/4,186) had an ISS in the lower range of 13–24 (Table 3). Injuries scoring ISS >49 accounted for 1.6% of all injuries and 15.7% of all deaths. There was an association between ethnicity and injury severity (Chi-squared p<0.01), with

Table 1: Demographic profile of major trauma among 20–65-year-olds (1 July 2017 to 30 June 2020), n=4,186.*

Variables	Total n (%)	Rate per 100,000 (95% CI)	Survived n (%)	Rate per 100,000 (95% CI)	Died n (%)	Rate per 100,000 (95% CI)
Total events	**4,186**	**49.5 (48.0–51.0)**	**3,951 (94.4%)**	**46.7 (45.3–48.2)**	**235 (5.6%)**	**2.8 (2.4–3.2)**
Sex						
Female	980 (23.4%)	22.8 (21.4–24.3)	922 (94.1%)	21.5 (20.1–22.9)	58 (5.9%)	1.3 (1.0–1.7)
Male	3,206 (76.6%)	77.0 (74.4–79.7)	3,029 (94.5%)	72.7 (70.2–75.4)	177 (5.5%)	4.3 (3.7–4.9)
Ethnicity						
Māori	971 (23.2%)	79.2 (74.4–84.3)	904 (93.1%)	73.7 (69.1–78.7)	68 (7.0%)	5.5 (4.4–7.0)
Non-Māori	3,215 (76.8%)	44.4 (42.9-46.0)	3,047 (94.8%)	42.1 (40.6–43.6)	167 (5.2%)	2.3 (2.0–2.7)
Age group (in years)						
20–24	547 (13.1%)	55.7 (51.3–60.6)	518 (94.7%)	52.8 (48.4–57.5)	31 (5.7%)	3.2 (2.2–4.5)
25–29	536 (12.8%)	50.4 (46.3–54.8)	510 (95.1%)	47.9 (43.9–52.3)	27 (5.0%)	2.5 (1.7–3.7)
30–34	436 (10.4%)	44.8 (40.8–49.2)	411 (94.3%)	42.2 (38.3–46.5)	25 (5.7%)	2.6 (1.7–3.8)
35–39	319 (7.6%)	35.5 (31.8–39.6)	307 (96.2%)	34.1 (30.5–38.2)	12 (3.8%)	1.3 (0.8–2.3)
40–44	386 (9.2%)	43.7 (39.5–48.2)	363 (94.0%)	41.1 (37.0–45.5)	23 (6.0%)	2.6 (1.7–3.9)
45–49	437 (10.4%)	44.8 (40.8–49.2)	404 (92.4%)	41.4 (37.6–45.7)	33 (7.6%)	3.4 (2.4–4.8)
50–54	490 (11.7%)	52.1 (47.7–56.9)	475 (96.9%)	50.5 (46.2–55.3)	15 (3.1%)	1.6 (1.0–2.6)
55–59	543 (13.0%)	58.4 (53.7–63.5)	507 (93.4%)	54.5 (50.0–59.5)	36 (6.6%)	3.9 (2.8–5.4)
60–65	492 (11.8%)	60.5 (55.4–66.1)	456 (92.7%)	56.1 (51.1–61.4)	36 (7.3%)	4.4 (3.2–6.1)

CI = confidence interval.
* Rates are annualised across the 3 years of data, using the New Zealand Census population counts for the 2018 population of adults aged 20–65 years.

Table 2: Characteristics and outcomes of major trauma among 20–65-year-olds (1 July 2017 to 30 June 2020), n=4,186.

Variables	Total n (%)	Rate per 100,000 (95% CI)	Survived n (%)	Rate per 100,000 (95% CI)	Died n (%)	Rate per 100,000 (95% CI)
Mechanism of injury						
Transport incident	2,591 (61.9%)	30.6 (29.5–31.8)	2,468 (95.3%)	29.2 (28.0–30.3)	123 (4.7%)	1.5 (1.2–1.7)
Car occupant	1,032 (24.7%)	12.1 (11.4–12.9)	973 (94.3%)	11.5 (10.8–12.2)	59 (5.7%)	0.7 (0.5–0.9)
Motorcyclist	645 (15.4%)	7.6 (7.1–8.2)	613 (95.0%)	7.2 (6.7–7.8)	32 (5.0%)	0.4 (0.3–0.5)
Bicyclist	359 (8.6%)	4.2 (3.8–4.7)	351 (97.8%)	4.2 (3.7–4.6)	8 (2.2%)	0.09 (0.04–0.2)
Pedestrian	147 (3.5%)	1.7 (1.5–2.0)	135 (91.8%)	1.6 (1.3–1.9)	12 (8.2%)	0.14 (0.07–0.2)
Fall	762 (18.2%)	9.0 (8.4–9.7)	713 (93.5%)	8.4 (7.8–9.1)	49 (6.5%)	0.6 (0.4–0.8)
Fall from building	133 (3.2%)	1.6 (1.3–1.9)	125 (94.0%)	1.5 (1.2–1.8)	8 (6.0%)	0.1 (0.05–0.2)
Fall via slipping	102 (2.4%)	1.2 (1.1–1.5)	94 (92.2%)	1.1 (0.9–1.4)	8 (7.8%)	0.1 (0.05–0.2)
Fall from ladder	92 (2.2%)	1.1 (0.9–1.3)	87 (94.6%)	1.1 (0.8–1.3)	5 (5.4%)	0.07 (0.03–0.2)
Fall involving a pedestrian conveyance.*	65 (1.6%)	0.8 (0.6–1.0)	62 (95.4%)	0.7 (0.6–0.9)	3 (4.6%)	0.03 (0.01–0.1)
Assault	423 (10.1%)	5.0 (4.5–5.5)	399 (94.3%)	4.7 (4.3–5.2)	24 (5.7%)	0.3 (0.2–0.4)
Self-harm	107 (2.6%)	1.3 (1.0–1.5)	94 (87.9%)	1.1 (0.9–1.4)	13 (12.1%)	0.2 (0.1–0.3)
Other**	303 (7.2%)	3.6 (3.2–4.0)	277 (91.4%)	3.3 (2.9–3.7)	26 (8.6%)	0.3 (0.2–0.5)
Place of injury occurrence						
Street and highway	2,254 (53.9%)	26.6 (25.6–27.8)	2,126 (94.3%)	25.1 (24.1–26.2)	128 (5.7%)	1.5 (1.3–1.8)
Home	624 (14.9%)	7.4 (6.8–8.0)	579 (92.8%)	6.8 (6.3–7.4)	45 (7.2%)	0.5 (0.4–0.7)
Sports/athletics area	277 (6.6%)	3.3 (2.9–3.7)	270 (97.5%)	3.2 (2.8–3.6)	7 (2.5%)	0.1 (0.04–0.2)

Table 2 (continued): Characteristics and outcomes of major trauma among 20–65-year-olds (1 July 2017 to 30 June 2020), n=4,186.

Variables	Total n (%)	Rate per 100,000 (95% CI)	Survived n (%)	Rate per 100,000 (95% CI)	Died n (%)	Rate per 100,000 (95% CI)
Beach/forest/country	242 (5.8%)	2.9 (2.5–3.2)	233 (96.3%)	2.8 (2.4–3.1)	9 (3.7%)	0.1 (0.1–0.2)
Farm	231 (5.5%)	2.7 (2.4–3.1)	226 (97.8%)	2.7 (2.3–3.0)	5 (2.2%)	0.1 (0.02–0.1)
Industrial/construction	102 (2.4%)	1.2 (1.0–1.5)	90 (88.2%)	1.0 (0.9–1.3)	12 (11.8%)	0.1 (0.1–0.2)
Trade/service area	90 (2.2%)	1.0 (0.9–1.3)	87 (96.7%)	1.0 (0.8–1.3)	3 (3.3%)	0.03 (0.01–0.1)
Other***	366 (8.7%)	4.3 (3.9–4.8)	340 (92.9%)	4.0 (3.6–4.5)	26 (7.1%)	0.3 (0.2–0.4)
Dominant injury type						
Blunt force	3,904 (93.26%)	46.1 (44.7–47.6)	3,704 (94.9%)	43.8 (42.4–45.2)	200 (5.1%)	2.4 (2.1–2.7)
Burn	64 (1.53%)	0.8 (0.6–1.0)	48 (75%)	0.6 (0.4–8)	16 (25.0%)	0.2 (0.1–0.3)
Penetrating	218 (5.21%)	2.6 (2.3–2.9)	199 (91.3%)	2.3 (2.0–2.6)	19 (8.7%)	0.2 (0.1–0.4)
Intent						
Unintentional	3,617 (86.4%)	42.7 (41.4–44.2)	3,426 (94.7%)	40.5 (39.2–41.9)	191 (5.3%)	2.3 (2.0–2.6)
Intentional	540 (12.9%)	6.4 (5.9–6.9)	503 (93.1%)	5.8 (5.4–6.4)	37 (6.9%)	0.43 (0.3–0.6)

CI = confidence interval.
*Pedestrian conveyances including and not limited to roller skates, skateboards, scooters, skis and ice skates.
**Other = animate mechanical forces (e.g., being bitten by a horse), inanimate mechanical forces (e.g., being crushed between objects, being struck by a falling object), injury by fire, smoke, forces of nature, electrocutions, injuries of undetermined intent, accidents while engaged in sport, accidental poisoning and accidents unspecified.
***Other = areas of water in a natural environment (e.g., lakes, rivers), residential institutions, schools and other educational institutions, public administration buildings and unspecified places of occurrence.

Table 3: Demographic profile by Injury Severity Score among 20–65-year-olds (1 July 2017 to 30 June 2020), n=4,186.

	Low (ISS 13–24) n (%)	**Medium (ISS 25–48) n (%)**	**High (ISS >49) n (%)**
Total	**3,158 (75.4%)**	**960 (22.9%)**	**68 (1.6%)**
Died	42 (17.9%)	156 (66.4%)	37 (15.7%)
Sex			
Female	724 (73.9%)	242 (24.7%)	14 (1.4%)
Male	2,434 (75.9%)	718 (22.4%)	54 (1.7%)
Ethnicity			
Māori	698 (71.0%)	255 (26.3%)	18 (2.8%)
Non-Māori	2,460 (76.5%)	705 (21.9%)	50 (1.6%)
Age group (in years)			
20–24	400 (73.1%)	138 (25.2%)	9 (1.6%)
25–29	385 (71.8%)	146 (27.2%)	5 (0.9%)
30–34	315 (72.2%)	111 (25.5%)	10 (2.3%)
35–39	236 (74.0%)	79 (24.8%)	4 (1.3%)
40–44	286 (74.1%)	89 (23.1%)	11 (2.8%)
45–49	332 (76.0%)	97 (22.2%)	8 (1.8%)
50–54	397 (81.0%)	90 (18.4%)	3 (0.6%)
55–59	416 (76.6%)	115 (21.2%)	12 (2.2%)
60–64	391 (79.5%)	95 (19.3%)	6 (1.2%)
Length of stay			
<1 day	99 (57.2%)	51 (29.5%)	23 (13.3%)
1–3 days	508 (83.8%)	94 (15.5%)	4 (0.7%)
4–7 days	755 (83.9%)	142 (15.8%)	3 (0.3%)
>7 days	1,478 (69.5%)	612 (28.8%)	37 (1.7%)
Mechanism of injury			
Transport incident	1,989 (76.8%)	559 (21.6%)	43 (1.6%)
Fall	569 (74.7%)	184 (24.1%)	9 (1.1%)
Assault	319 (75.4%)	101 (23.9%)	3 (0.7%)
Self-harm	65 (60.7%)	35 (32.7%)	7 (6.6%)

Table 3 (continued): Demographic profile by Injury Severity Score among 20–65-year-olds (1 July 2017 to 30 June 2020), n=4,186.

	Low (ISS 13–24) n (%)	**Medium (ISS 25–48) n (%)**	**High (ISS >49) n (%)**
Total	**3,158 (75.4%)**	**960 (22.9%)**	**68 (1.6%)**
Other*	216 (71.3%)	81 (26.7%)	6 (2.0%)
Dominant injury type			
Blunt force	2,983 (76.4%)	864 (22.1%)	57 (1.5%)
Burn	25 (39.1%)	31 (48.4%)	8 (12.5%)
Penetrating	150 (68.8%)	65 (29.8%)	3 (1.4%)

*Other = animate mechanical forces (e.g., being bitten by a horse), inanimate mechanical forces (e.g., being crushed between objects, being struck by a falling object), injury by fire, smoke, forces of nature, electrocutions, injuries of undetermined intent, accidents while engaged in sport, accidental poisoning and accidents unspecified.

a greater portion of Māori having injuries with medium and high ISS scores (28.3%) compared to non-Māori (23.3%). Overall, there was a significant difference in ISS score between Māori and non-Māori (Chi-squared p<0.01). There was also an association between age group and ISS score (Chi-squared p<0.01).

There was an association between injury severity and the dominant injury type (Fisher's exact test p<0.01) with high ISS scores having a larger portion of burn injuries than other score groups.

Of note, there was a decreased rate of major traumas in the first 6 months of 2020, which may potentially be linked to the COVID-19 pandemic and the related quarantine behaviours.[20] The rate of major traumas in January to June 2020 was 13.9 per 100,000 compared to 15.4 per 100,000 in the same period of 2019. Particularly noticeable was a decrease in April 2020, with 87 major traumas compared to 131 in April 2019.

Discussion

This study aimed to describe the patterns of major trauma among 20–65-year-olds in New Zealand based on analysis of routinely collected data. The excess risk of males compared to females was consistent across all age groups, ethnicity and injury causes. Younger and older age groups within the 20–65-year group also faced excess risk, but from different causes of injury. The findings have highlighted the excess injury risk Māori are exposed to compared to non-Māori, with significantly higher rates of major trauma, more severe trauma and higher mortality rates.

The strengths of this study include the use of population-level routinely collected data, with injury mechanism codes present for over 99% of patients. However, the findings need to be considered in light of several limitations. The absence of information about patient disability and other factors such as comorbidities that may place individuals at increased risk of injury/complicate the treatment of injuries was unable to be assessed. The aggregation of non-Māori ethnicity data into one group obscures the exploration of any trends that may be present in other ethnicities.[17] The NZTR records binary sex definitions but not gender identity, which restricts the investigation of patterns of major trauma among the LGBTQ+ community. This is a complicated problem for a number of reasons, with issues of privacy and transparency meaning that the collection of gender information in any healthcare context can be difficult,[21,22] and more so in an urgent care setting. Future efforts to integrate gender information into electronic health records may improve visibility of LGBTQ+ patients and enable future research into major trauma trends in this community.[23] Research into injury among people identifying as LGBTQ+

patients in New Zealand is required given emerging trends internationally.[24] Without the data on patient gender identity in New Zealand, emerging trends are difficult to identify. Giordano et al. suggests that in the context of traumatic brain injuries, binary sex definitions are not sufficient to guide clinical decisions and that a broader model of gender identity is essential in trauma care for the recovery of patients.[25] Our study looked at 20–65-year-olds, and therefore excluded younger adults or those over 65 years of age who may be working. This means that the study population falls short of encapsulating the full working-age population and cannot be used to describe this population. Additionally, we did not have data on whether the injuries were work-related, what the patient employment status was or blood alcohol levels. These are important potential areas for future study.

The findings of this study are consistent with findings from international studies. Cameron et al. examined the epidemiology of major trauma in Victoria, Australia, looking at 2,944 trauma admissions over a 1-year period from 1992–1993, where 1,076 of these cases were major trauma admissions with ISS scores greater than 15.[26] Cameron et al. found similar sex ratios, blunt force was the most common cause of major trauma accounting for 87.5% of injuries, and that streets/highways were the most common place of occurrence of major trauma, accounting for 56% of cases.[26] In the Cameron et al. study, 7.5% of the cases died, compared to 5.8% in the present study. However, the Cameron et al. study used ISS >15 to define major trauma,[26] whereas the present study used ISS >12. Previous research by Palmer et al., in an epidemiological study looking at 37,760 major trauma patients from the Victoria State Trauma Registry, found an ISS >12 functions similarly to an ISS >15 when mortality is a primary outcome.[27] The decreased rate of injuries in this population during the COVID-19 lockdown periods is consistent with other New Zealand and international studies that have noted declines in injury rates during the pandemic.[20]

The difference in trauma rates between Māori and non-Māori populations in this study mirrors international evidence of elevated trauma rates in Indigenous populations. In the present study, Māori had 1.67 times the rate of major trauma injuries resulting in hospitalisation compared to non-Māori. Similar findings have been found in Australia, the USA and Canada.[28–31] A study that jointly looked at routinely collected mortality data from the National Center of Health Statistics in the USA and the Australian Bureau of Statistics from 1990–1992 looked at 3,731 Native American and 540 Aboriginal injury-related deaths and compared them to non-Indigenous population injury death rates, finding that Indigenous people had approximately 2–3 times the injury mortality rates of the non-Indigenous populations of their countries.[28] An Australian descriptive analysis of hospitalisation data from the Health Outcomes Information and Statistical Toolkit (HOIST) database from 1999 to 2003 also showed that the Indigenous population had a higher rate of injury-related death across all ages younger than 65.[29] Additionally, compared to their non-Indigenous counterparts, Indigenous people aged 25–44 years were twice as likely to be hospitalised, and five times as likely to be hospitalised for assault. A 2004 study using hospital discharge data on injuries resulting in hospitalisation among First Nation communities (n=211,834) compared to non-First Nation communities (n=861,836) in Ontario reported a 2.5 times higher incidence rate of injury among First Nation communities.[30] Many of these studies cite factors such as socio-economic inequalities and pre-existing comorbidities resulting in elevated risk of injury, and risk of complications from injury resulting in poorer health outcomes.[28] Interventions to improve these disparities need to be culturally appropriate and target these underlying causes of injury by improving socio-economic disparities and inequities. Specific, targeted interventions have been used, for example, in Australia to reduce barriers to care for Indigenous women with violence-related head injuries.[31] More research into barriers to accessing hospital care is an important step towards reducing inequities in trauma rates.

Isles et al. analysed the first year of the NZTR data, which included 1,300 patient admissions from the North Island of New Zealand, and found similar findings to the present study in regard to the elevated incidence of major trauma among Māori, with a rate of 69 major traumas per 100,000 people among Māori of all ages (cf. 971/4,186 in the present study, where only 20–65 year olds were considered), and 31 per 100,000 in non-Māori.[8]

The pre-dominance of blunt trauma in the present study is consistent with the findings of a review of major trauma in Australasia that found 90% of major trauma in the general New Zealand population was a result of blunt-force trauma, slightly less than the 93% in this study, which only looked at 20–65 year olds.[1] Cameron et al.[26] reported 56% of major traumas were road transport incidents, Isles et al.[8] reported 50%, while the present study was slightly higher at 61.4%.

Published literature highlights the prevalence of major trauma death prior to arrival at hospital. Lilley et al. examined 7,522 injury-related deaths that occurred in New Zealand between 2008 and 2012, and found that 80% of these deaths occurred in a pre-hospital setting.[32] The burden of pre-hospital deaths in the Lilley study was highest among males, and those aged 25–54 years, suggesting the current study will be an underestimation of the true burden of young adult injury, in particular among males.

Curtis et al. provides an in-depth discussion on the economic cost of injury, highlighting that injuries incur many indirect costs, such as the cost of time off work, loss of production, equipment damage and insurance costs.[1] These costs are not insignificant; in 2008 the estimated economic and social cost of injury in New Zealand was estimated to be NZ$6 billion a year.[33] Beyond these monetary costs, it is the much harder to measure human costs, such as loss of life, loss of health, disability and impacts on family structures.[1] Adults frequently perform caregiving roles for the older and younger generation, so injury in this population has a flow-on effect in a community setting—the impact of grief on families also leads to secondary healthcare interactions to deal with the repercussions on mental health.[1]

Given the pre-dominance of traffic-related injury in this study, continued research efforts into evidence-based prevention initiatives are required. New Zealand research by Hosking et al. highlighted that it is essential for road safety interventions to prioritise vulnerable groups, such as Māori and younger adults.[34] A systematic review by Bunn et al. showed that traffic calming measures such as speed bumps and lane separators had the potential to reduce road traffic injuries, especially in urban areas.[35] Interventions to reduce falls would also reduce major trauma injuries; 237 out of 589 fall injuries were caused by falls from buildings or from ladders and so may be preventable with safer infrastructure.

Conclusion

This study has highlighted the patterns of major trauma in the New Zealand among 20–65-year-olds. Injury occurred more commonly in males, Māori, and the younger and older people within the 20–65-year span. Future research is needed to investigate the patterns of major trauma among the working-age population in minority groups in New Zealand, including multivariate analyses to investigate the relationship between age, mechanism of injury and socio-economic status. The findings of this study confirm the necessity for continued injury prevention efforts in New Zealand, with a particular emphasis on developing initiatives for Māori by Māori.

©PMA

COMPETING INTERESTS

The authors declare no conflicts of interest.

The University of Auckland funded this study through a summer studentship scholarship under the Faculty of Medical and Health Sciences.

AUTHOR INFORMATION

Monica F Judge: Waipapa Taumata Rau – The University of Auckland, Auckland, New Zealand.

Bridget Kool: Section of Epidemiology and Biostatistics, School of Population Health, Faculty of Medical and Health Sciences, Waipapa Taumata Rau – The University of Auckland, Auckland, New Zealand.

Ian Civil: Trauma Services, Auckland, Te Toka Tumai – Te Whatu Ora, New Zealand.

CORRESPONDING AUTHOR

Bridget Kool: Section of Epidemiology and Biostatistics, School of Population Health, Faculty of Medical and Health Sciences, Waipapa Taumata Rau – The University of Auckland, Auckland, New Zealand. E: b.kool@auckland.ac.nz

URL

https://nzmj.org.nz/journal/vol-137-no-1590/major-trauma-in-working-age-adults-in-new-zealand

REFERENCES

1. Curtis K, Caldwell E, Delprado A, Munroe B. Traumatic injury in Australia and New Zealand. Australas Emerg Nurs J. 2012;15(1):45-54. doi: 10.1016/j.aenj.2011.12.001.
2. Civil I. Trauma: still a problem in New Zealand. N Z Med J. 2004;117(1201):U1042.
3. Montoya L, Kool B, Dicker B, Davie G. Epidemiology of major trauma in New Zealand: a systematic review. N Z Med J. 2022;135(1550):86-110.
4. Kool B, Chelimo C, Ameratunga S. Head injury incidence and mortality in New Zealand over 10 Years. Neuroepidemiology. 2013;41(3-4):189-97. doi: 10.1159/000354782.
5. Paice R. An overview of New Zealand's trauma system. J Trauma Nurs. 2007;14(4):211-3. doi: 10.1097/01.jtn.0000318926.13498.a8.
6. Feigin VL, Theadom A, Barker-Collo S, et al. Incidence of traumatic brain injury in New Zealand: a population-based study. Lancet Neurol. 2013;12(1):53-64. doi: 10.1016/S1474-4422(12)70262-4.
7. New Zealand Major Trauma Network. Strategic Plan 2023-2027 [Internet]. Wellington; 2022 [cited 2022 Jul 13]. Available from: https://www.majortrauma.nz/assets/National-Trauma-Network-StrategicPlan-23-27-FINAL.pdf.
8. Isles S, Christey G, Civil I, Hicks P. The New Zealand Major Trauma Registry: the foundation for a data-driven approach in a contemporary trauma system. N Z Med J. 2017;130(1463):19-27.
9. Kool B, Ameratunga S, Scott N, et al. The epidemiology of work-related injury admissions to hospitals in the Midland region of New Zealand. Injury. 2017;48(11):2478-2484. doi: 10.1016/j.injury.2017.09.018.
10. Smith GS, Wellman HM, Sorock GS, et al. Injuries at work in the US adult population: contributions to the total injury burden. Am J Public Health. 2005 Jul;95(7):1213-9. doi: 10.2105/AJPH.2004.049338.
11. Leigh JP. Economic burden of occupational injury and illness in the United States. Milbank Q. 2011 Dec;89(4):728-72. doi: 10.1111/j.1468-0009.2011.00648.x.
12. Dembe AE. The social consequences of occupational injuries and illnesses. Am J Ind Med. 2001 Oct;40(4):403-17. doi: 10.1002/ajim.1113.
13. Petridou ET, Kyllekidis S, Jeffrey S, et al. Unintentional injury mortality in the European Union: how many more lives could be saved? Scand J Public Health. 2007;35(3):278-87. doi: 10.1080/14034940600996662.
14. Peng Lu, Chan HS A. A meta-analysis of the relationship between ageing and occupational safety and health. Saf Sci. 2019;112(4): 162-172. Doi:10.1016/j.ssci.2018.10.030.
15. O'Leary K, Kool B, Christey G. Characteristics of older adults hospitalised following trauma in the Midland region of New Zealand. N Z Med J. 2017;130(1463):45-53.
16. Te Whatu Ora – Health New Zealand. Identity standards: HISO 10001:2017 Ethnicity Data Protocols [Internet]. 2021 [cited 2022 Nov 11]. Available from: https://www.health.govt.nz/publication/hiso-100012017-ethnicity-data-protocols.
17. Hosking JE, Ameratunga SN, Bramley DM, Crengle SM. Reducing ethnic disparities in the quality of trauma care: an important research gap. Ann Surg. 2011;253(2):233-7. doi: 10.1097/SLA.0b013e3182075553.
18. Stats NZ. 2018 Census: Population and migration [Internet]. Wellington, New Zealand; [cited 2021 Jan 15]. Available: http://nzdotstat.stats.govt.nz/wbos/index.aspx.
19. R Core Team. R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing; 2013.
20. Hamill JK, Sawyer MC. Reduction of childhood trauma during the COVID-19 Level 4 lockdown in New Zealand. ANZ J Surg. 2020;90(7-8):1242-1243.

doi: 10.1111/ans.16108

21. Pinto AD, Aratangy T, Abramovich A, et al. Routine collection of sexual orientation and gender identity data: a mixed-methods study. CMAJ. 2019 Jan 21;191(3):E63-E68. doi: 10.1503/cmaj.180839.
22. Institute of Medicine (US) Board on the Health of Select Populations. Collecting Sexual Orientation and Gender Identity Data in Electronic Health Records: Workshop Summary. Washington (DC), USA: National Academies Press (US); 2013.
23. Thompson HM. Stakeholder Experiences With Gender Identity Data Capture in Electronic Health Records: Implementation Effectiveness and a Visibility Paradox. Health Educ Behav. 2021 Feb;48(1):93-101. doi: 10.1177/1090198120963102.
24. Morrison SD, Kolnik SM, Massie JP, et al. Injury in the transgender population: What the trauma surgeon needs to know. J Trauma Acute Care Surg. 2018 Oct;85(4):799-809. doi: 10.1097/TA.0000000000001859.
25. Giordano KR, Rojas-Valencia LM, Bhargava V, Lifshitz J. Beyond Binary: Influence of Sex and Gender on Outcome after Traumatic Brain Injury. J Neurotrauma. 2020 Dec 1;37(23):2454-2459. doi: 10.1089/neu.2020.7230.
26. Cameron P, Dziukas L, Hadj A, et al. Major trauma in Australia: a regional analysis. J Trauma. 1995;39(3):545-52. doi: 10.1097/00005373-199509000-00024.
27. Palmer CS, Gabbe BJ, Cameron PA. Defining major trauma using the 2008 Abbreviated Injury Scale. Injury. 2016 Jan;47(1):109-15. doi: 10.1016/j.injury.2015.07.003.
28. Stevenson MR, Wallace LJ, Harrison J, et al. At risk in two worlds: injury mortality among indigenous people in the US and Australia, 1990-92. Aust N Z J Public Health. 1998 Oct;22(6):641-4. doi: 10.1111/j.1467-842x.1998.tb01461.x.
29. Clapham KF, Stevenson MR, Lo SK. Injury profiles of Indigenous and non-Indigenous people in New South Wales. Med J Aust. 2006 Mar 6;184(5):217-20. doi: 10.5694/j.1326-5377.2006.tb00205.x.
30. Fantus D, Shah BR, Qiu F, et al. Injury in First Nations communities in Ontario. Can J Public Health. 2009 Jul-Aug;100(4):258-62. doi: 10.1007/BF03403943.
31. Fitts M, Cullen J, Barney J. (2023). Barriers Preventing Indigenous Women with Violence-related Head Injuries from Accessing Services in Australia. Aust Soc Work. 2023;76(3):406-419. https://doi.org/10.1080/0312407X.2023.2210115.
32. Lilley R, Kool B, Davie G, et al. Opportunities to prevent fatalities due to injury: a cross-sectional comparison of prehospital and in-hospital fatal injury deaths in New Zealand. Aust N Z J Public Health. 2021;45(3):235-241. doi: 10.1111/1753-6405.
33. Langley J. New Zealand Injury Prevention Strategy: significant shortcomings after 5 years. N Z Med J. 2010;123(1327):114-2.
34. Hosking J, Ameratunga S, Exeter D, et al. Ethnic, socioeconomic and geographical inequalities in road traffic injury rates in the Auckland region. Aust N Z J Public Health. 2013 Apr;37(2):162-7. doi: 10.1111/1753-6405.12034.
35. Bunn F, Collier T, Frost C, et al. Traffic calming for the prevention of road traffic injuries: systematic review and meta-analysis. Inj Prev. 2003 Sep;9(3):200-4. doi: 10.1136/ip.9.3.200.