TE MANAWA TAKI TRAUMA SYSTEM

Pūrongo-ā-tau ANNUAL REPORT 2021

TE MANAWA TAKI

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Acknowledgements

The journey of trauma patients and whānau from injury to recovery can be long and complex, involving interactions with many service providers and craft groups. It is essential that services are coordinated and that the language and guidelines we use are contemporary, effective, and grounded in the needs of our people and the resources available. The people that ensure this is happens are the trauma service staff, supported by their departments, managers, and senior executives. The unsung heroes of the trauma services are:

Bay of Plenty: Clare Swanson, Kaywyn McKenzie Janette Caird, Jacques Marnwick, Paula Phillips

Lakes: Carolyn Duncum, Peter Freeman

Tairāwhiti: Karen Macdonald, Jaki Boyle, Steve Hudson, Annaleigh Stills, Bayleigh Morrison

Taranaki: Alex Keegan, Murray Cox, David Goodman

Waikato: Bronwyn Denize, Gina Marsden, Aleisha Sutherland, Maria Haynes, Damien Ah Yen, Grant Christey

The members of Te Manawa Taki Hub group supporting this work are: Alaina Campbell, Alastair Smith, Carol Hughes, Carol Munt, Janet Amey, Katrina O'Leary, Mary Jane Pacua, Pragya Singhal, Thilini Alwis, Grant Christey

To enable all this to happen we acknowledge the solid support from the Te Manawa Taki Trauma System Strategic Group, Te Manawa Taki executive leads, HealthShare and our hospital management and senior executive teams. They understand the complexity and value of our role and continue to support our efforts to reduce the burden of trauma in our communities.

Special mentions: We gratefully acknowledge Janet Amey and Rosemary Clements for their significant contributions to Te Manawa Taki Trauma System over the past few years. We gratefully acknowledge the work of Alaina Campbell and Alastair Smith in the preparation of this report.

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Tā mātou korou
Our vision

The health of our Te Manawa Taki communities will be improved by reducing the burden of trauma.

Tā mātou whāinga
Our mission

Te Manawa Taki Trauma System will improve clinical care, reduce incidence of injury and enable safer, more efficient systems along the trauma journey.

Ō mātou tikanga
Our values

Patients first
The needs of patients and whānau will guide our actions

Equity
All patients deserve equitable outcomes

Communication
Open, honest, direct

Collaboration
Mutual support – together we achieve more

Excellence
Quality care and information

Forward looking
Innovation, diversity, integrity, creativity

Tō mātou tohu
Our logo

TE MANAWA TAKI TRAUMA SYSTEM

A koru symbolises new life, growth, progress, strength and peace. The red koru in the centre represents the point of impact when trauma occurs and also the person directy impacted. The blue circles depict the ripple affect that trauma has not just on the person but their whānau, the community, the health system and society as a whole. Together the logo symbolises the trauma journey with multiple components impacted and working together for healing and progress.

Tā mātou mana taurite
Our equity statement

Across our Te Manawa Taki communities there is variation in trauma incidence, with Māori at higher risk of preventable injury. We view this as inequity. In response, our staff have begun to develop collaborative relationships at the regional, organisational, iwi and whānau level to identify solutions that will prevent injury. If an injury does occur our clinical services are focused on identifying any inequity in our delivery of healthcare through regular monitoring and auditing of our hospital processes and procedures to improve outcomes for Māori so that Māori will have at least the same outcomes as non-Māori.

Executive summary

As the characteristics of health presentations and system capacity have changed in response to COVID-19, the Waikato District Health Board (DHB) cyber-attack, and general staff shortages across the sector we have been challenged to ensure our facilities and clinical partners provide consistently high levels of care to trauma patients and whānau.

We will build a better, more equitable system that truly enables optimal recovery following injury. As a region we still have a number of challenges to strengthen vulnerable services and build essential infrastructure for training, education and trauma quality improvement. This will extend the collective knowledge base toward a common language of best practice and raise the bar for everyone across the region.

As an established clinical network we are well positioned to adapt and integrate into future health system changes in New Zealand as Te Whatu Ora and Te Aka Whai Ora take shape. We look forward to further colloborations with the National Trauma Network and ACC to improve delivery of care.

We remain fully committed to the national health strategy focused on people – on patients, on communities, and our kaimahi/healthcare workforce.

Ngā mihi nui

Associate Professor (Hon) Grant Christey
BSc(Hons), MBChB, FRACS, FACS
General Surgeon and Trauma Specialist
Clinical Director, Te Manawa Taki Trauma System and Head of Department, Trauma, Waikato Hospital

Key achievements for 2021

- Strategic Plan and prioritisation
- Strategic briefing document for incoming executives
- Regional guideline revision and roll out
- Review of data collection system
- Development of Trauma Quality Improvement Programme
- Regional case review programme
- Cyber-attack recovery and resilience
- National Road Safety Emergency Response and Healthcare Award
- Research centre publications

Future focus areas

- Regional equity assessments
- Locality and/or facility reporting
- Regional registry procurement
- Health system change integration
- Equitable resourcing for trauma teams
- Establish appropriate funding for trauma services

Our region –about Te Manawa Taki

21%

Te Manawa Taki covers an area of 56,728km^2, or 21 percent of New Zealand's land mass

Stretches from Cape Egmont in the west to East Cape and is located in the middle of the North Island

5 DHBs

Five DHBs: Bay of Plenty, Lakes, Hauora Tairāwhiti, Taranaki, and Waikato

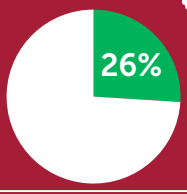
Includes major population centres of Tauranga, Rotorua, Gisborne, New Plymouth and Hamilton

1,007,405 people (2021/22 population projections), including 280,170 Māori (28 percent)

Te Manawa Taki iwi

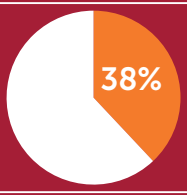
Bay of Plenty DHB

Ngai Te Rangi, Ngāti Ranginui, Te Whānau ā Te Ēhutu, Ngāti Rangitihi, Te Whānau ā Apanui, Ngāti Awa, Tūhoe, Ngāti Mākino, Ngāti Whakaue ki Maketū, Ngāti Manawa, Ngāti Whare, Waitahā, Tapuika, Whakatōhea, Ngāti Pūkenga, Ngai Tai, Ngāti Whakahemo, Tūwharetoa ki Kawerau



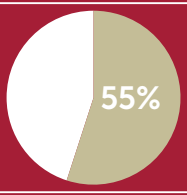
Lakes DHB

Te Arawa, Ngāti Tūwharetoa, Ngāti Kahungunu ki Wairarapa



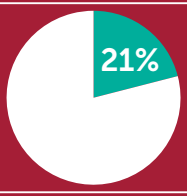
Hauora Tairāwhiti DHB

Ngāti Porou, Ngāi Tamanuhiri, Rongowhakaata, Te Aitanga-a-Mahaki, Ngāti Kahungunu, Ngā Ariki Kaiputahi, Te Aitanga-a-Hauiti



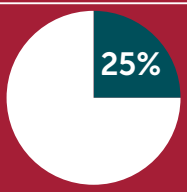
Taranaki DHB

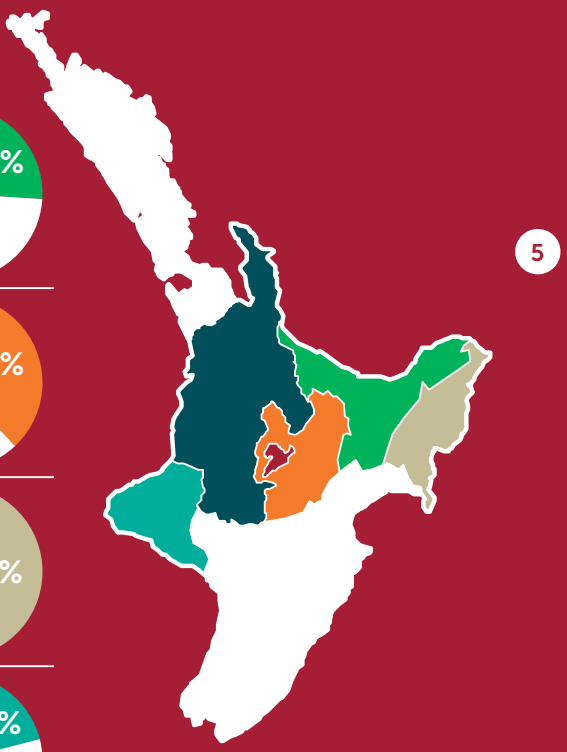
Ngāti Tama, Ngāti Mutunga, Te Atiawa, Ngāti Maru, Taranaki, Ngāruahine, Ngāti Ruanui, Ngā Rauru Kiitahi



Waikato DHB

Hauraki, Maniapoto, Raukawa, Waikato, Tūwharetoa,Whanganui, Maata Waka





TE MANAWA TAKI

Te Manawa Taki (the heart beat) is the name gifted and agreed upon to represent the region encompassing the five DHB regions of Bay of Plenty, Hauora Tairāwhiti, Lakes, Taranaki and Waikato.

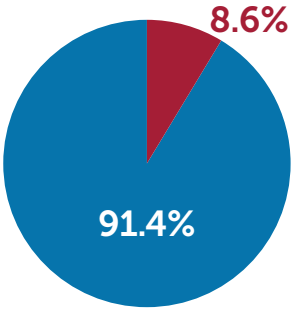
The name Te Manawa Taki in the context of the combined region represents: Always ready to go.

Trauma in Te Manawa Taki region 2021

Patients and admissions

7681
hospital admissions

6508 events



5945 Non-major events
563 Major events

Major events = ISS >12, non-major events = ISS <13,
ISS: Injury Severity Score

Causes

Road traffic crashes
145 major trauma events
excluding motorcycle

199 major trauma events
including motorcycle

Demography

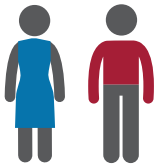
Ethnicity

Incidence per 100,000

806 Māori
524 Pacific
103 Asian
646 Other

Population ethnicity adjusted
(Ministry of Health 2021 projections)
Midland resident events only

Gender



61.7% Male
38.3% Female

Children and older persons

(events)

1278 0-14 years
1417 65+ years

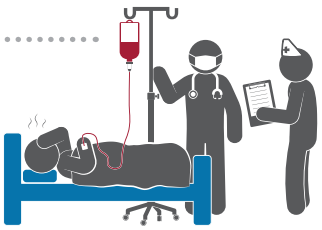
In hospital

Time in Emergency Department (ED)

(median)

0-14 years **227 mins**
15-64 years **277 mins**
65+ years **354 mins**

30,186 Total hospital days



Length of stay (mean)
1.8 days 0-14 years
3.9 days 15-64 years
5.9 days 65+ years

Outcomes

Final discharge destination

(top 5)

5696 Home
245 Rehabilitation
156 Hospital for convalescence
107 Residential aged care
96 Left against medical advice

Case Fatality Rate

(all events)

Non-major **0.4%**
Major **7.1%**

Excludes medical deaths

Our trauma system

Injury is preventable. But when prevention fails, those injured need a strong, cohesive system, with clinicians working together and applying best practice trauma care. People must receive the highest level of care no matter where they live or where their injury occurs.

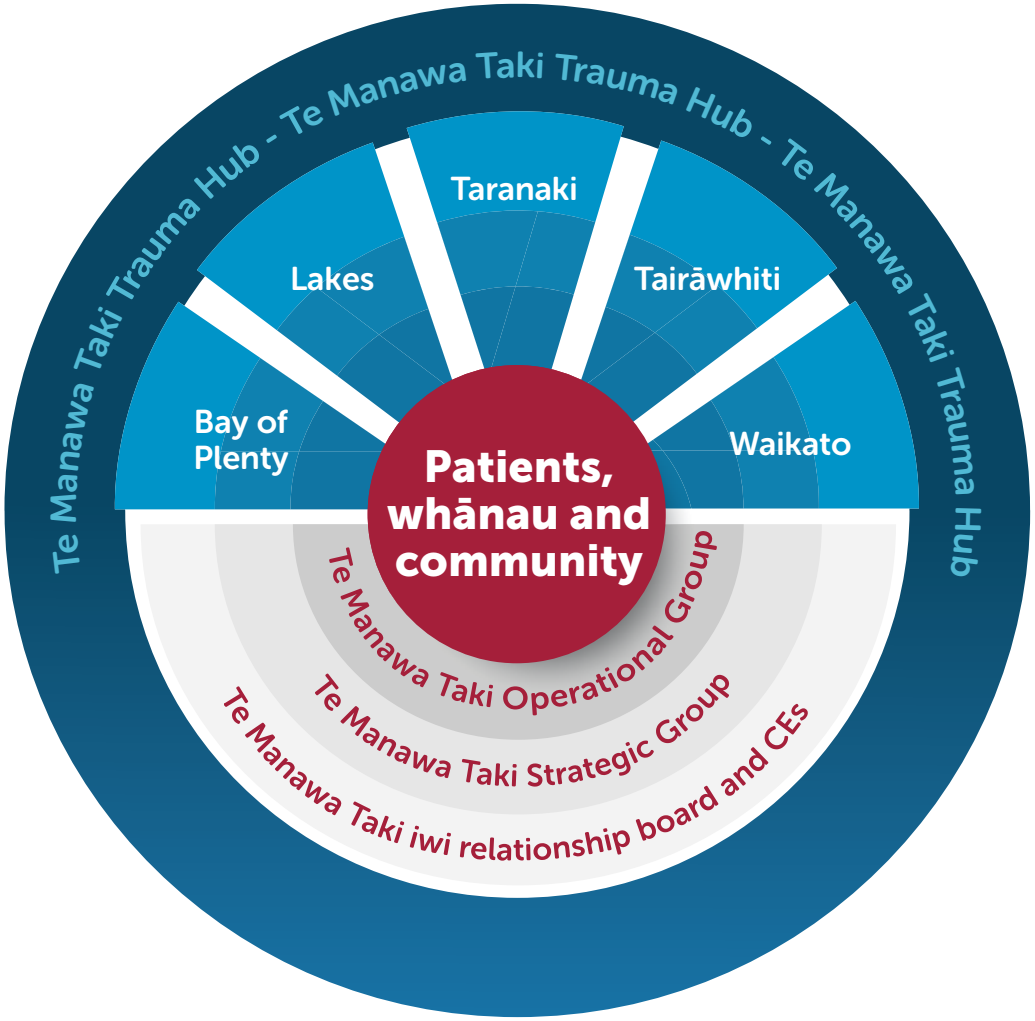
Since 2010, Te Manawa Taki Trauma System has worked collaboratively to build this capacity and capability across our region. It consists of a network of skilled clinical personnel in each of the five Te Manawa Taki DHBs who work with trauma patients and whānau to achieve optimal best outcomes and experience of quality care.

Our clinicians are supported by an experienced centralised hub group who maintain a registry, reporting, and quality assurance function. This model is used to ensure that evidence based change can be directly and appropriately translated to the care setting by staff and partners that live in, and understand the needs of, their communities.

Ā mātou tarenga
Our aims

1	Ensure patients and whānau in our region receive equitable, highest quality care
2	Develop, implement and maintain an integrated regional trauma system infrastructure including workforce and information
3	Support targeted injury prevention and awareness to address inequities
4	Inform evidenced based change through the Trauma Quality Improvement Programme and focused trauma research

Te mana kāwanatanga me te whakakhaere
Governance and operational model



Te Manawa Taki Trauma Registry (MTR)

The MTR has been operating continuously since 2012, and captures comprehensive patient data across all age groups and injury severities; this includes time and date stamping of transfer of patients to and between hospital facilities. This data set is unique in New Zealand. It captures interventions to allow detailed clinical outcome and process evaluation. The MTR now holds over 67,000 Te Manawa Taki trauma patient event journeys. This data provides an excellent platform for evidenced based system analysis and population based studies that form the mainstay of our Trauma Quality Improvement Programme (TQIP)/Te Manawa Taki Trauma Research Centre activities. Continuous monitoring and performance feedback enables improvements to service delivery and patient outcomes.

Te Manawa Taki Trauma Research Centre (MTRC)

The MTRC is embedded in Te Manawa Taki Trauma System and was established to translate data into meaningful information. The focus of the MTRC is to identify and monitor trauma issues which can then be addressed by the appropriate people in the wider team – whether the issues are clinical, systems infrastructure, injury awareness or prevention in nature. The ethos of the MTRC aligns with that of Te Manawa Taki Trauma System as a whole, in which research will be focused primarily on the needs of patients, their whānau and their communities. The MTRC is actively producing high quality information across a range of focused initiatives.

Trauma Quality Improvement Programme (TQIP)

Continuous measurement and performance feedback is important to raise awareness of service delivery gaps and opportunities to improve care for patients and whānau.

In 2018, Te Manawa Taki Trauma System formalised its TQIP programme to facilitate continuous monitoring and improvement of trauma clinical care and system efficiencies in Te Manawa Taki region. TQIP uses agreed guidelines and measures to benchmark system and process performance around our patient first philosophy. It utilises data directly from the MTR; information collected through clinical quality improvement processes and safety partners; and experience of care by patients and their whānau. The TQIP ensures issues are reported, actions are applied and that those actions are reviewed for resolution – often referred to as 'loop closure'.

Reports from our facilities

Bay of Plenty report

2021 has been another tumultuous year for Aotearoa New Zealand and the Bay of Plenty. Trauma appears to be exempt from lockdowns and we continued to deal with large numbers of moderately injured and a lesser number of severely injured individuals over the course of the year. Despite this workload and the ongoing resource restrictions, there are a number of very positive developments in Bay of Plenty and 2022 is looking promising.

Towards the end of the year, additional nursing FTE was approved and the appointment of a second trauma clinical nurse specialist has given our service newfound energy and the ability to re-focus on patient care and staff education, the two pillars we have built the service upon. Quality improvement initiatives, risk registry consolidation and regular in-person engagement with Whakatane are some of the areas we have been able to prioritise again.

Interservice trauma forums involving surgery, orthopaedics, ED, Intensive Care Unit (ICU) and St Johns continue with excellent case discussions and combined learning. Service improvement through loop closure and individual case investigations continue and allow us to identify systems that require attention. Early Management of Severe Trauma (EMST) courses are now a fixture on the annual calendar and we look to build on the faculty available to deliver this course here in the future.

Looking towards 2022, we are excited to expand the service further. A business case has been developed to add a 1.0 FTE Allied Health Trauma coordinator role to our service. This person would oversee both hospitals and all admitted trauma patients, enabling timely and safer discharge of patients into the community. Follow-up clinics and community outreach would be included in this role. We have engaged with our DHB psychology service, with the goal of providing trauma-specific assessment and intervention through the addition of an FTE-allocated role to our team.

In these difficult times, we must acknowledge the open dialogue we have established with our service managers and hospital executive committee. Informal catch-ups are easy to arrange and although change is slow, knowing we have their support has been encouraging.

Lakes report

In 2021, the challenges for Lakes DHB were the usual ones experienced by all Aotearoa New Zealand hospitals dealing with COVID-19. COVID-19 sickness presented staffing challenges in the hospital and difficulty sometimes discharging patients with a community care package in situ immediately. The use of motels for emergency housing brought with it a number of patients who were new to the area and had no whānau support and came with secondary issues around alcohol, drug use and mental health issues. As a result there was an increase in the number of cases presenting secondary to assault and self-harm.

Raising the profile of the Lakes Trauma team has been one of the biggest achievements in 2021.

Educationally the achievements for 2021 were being able to trial the Trauma Care After Resuscitation (TCAR) course and successfully place two staff candidates on the subsequent course which was highly valued by the candidates. Additionally Lakes DHB was able to put through a number of candidates for Trauma Nursing Core Course (TNCC) for the first time in two or three years at the course hosted here in Rotorua.

Throughout 2021 the trauma committee continued to meet monthly and feedback case review material. Involving both ED and ward/ICU staff in education has been a big plus and building relationships with allied healthcare workers has been very beneficial for the trauma patients.

Hauora Tairāwhiti report

The trauma team in Tairāwhiti has like many other regions been creative in managing trauma amongst our community in a pandemic. COVID-19 trauma guidelines and pathways were created and tested, sadly on many occasions as our trauma events continue to increase. We continue to strive to develop and improve our trauma process locally in conjunction with Te Manawa Taki Trauma System. Several multi-casualty accidents has tested our Major Incident Plan with good effect.

In recognition of the importance of trauma education, a local programme is being rolled out over the next year designed to improve our knowledge and skills. Led by our new ED clinical trauma lead Dr Erica Douglass we commenced with two evenings where we covered trauma calls and presented the Tairāwhiti trauma data which highlights the significance of trauma response in the region.

A further presentation was made to the national trauma group that portrayed the "splendid isolation" and primary industries that are high contributors to trauma and our unfortunate experience in managing large scale multi-casualty trauma. Testament to this is our organisational response to such events.

2022 sees the return of Rhythm & Vines where 25,000 party goers arrive in our district, the challenge lies ahead.

Willows' story

In July 2021 a 14 year old girl "Willow Stone" lost her life in a tragic accident. This beautiful young teenager was a free spirit with a bubbly fun loving and empathetic personality whose life touched many in the Tairāwhiti community. Her gift of life to three others was an incredibly selfless act and a reflection of how tragedy can provide hope via organ donation.

Her mother told the Gisborne Herald that "she wanted the community conversations to be about the legacy of organ donation and not the accident that claimed Willow's life". One of the recipients was a teenager like herself.

In a press article Willow's mother said "We watched the humanity of their grief, alongside ours, as we journeyed through this together. Everyone worked so incredibly hard, and we are forever grateful.

"I need to mention a message that was sent to me from a nurse who cared for Willow up at the hospital. She expressed that after 22 years of nursing and seeing so many tragedies in her career, Willow has given her back the passion to keep caring for others (NZ Herald, 26/07/2021).

The trauma team are indebted to Willow's family for sharing their story. Willow's story continues to resonate with the Tairāwhiti community, her story lives on in the lessons we learned, the impact on the trauma team and wider hospital and how we respond to major trauma and the effect it can have on our team.

Managing the impact post-trauma on small teams is a lesson that we have taken from this tragic accident. The influence of trauma on staff has led to quality improvement that encompasses the psychological and clinical aspects of trauma through debriefing and creating debriefing pathways for staff to express themselves either as individuals or a collective in a safe environment. This work continues and will be led out through the entire hospital by the Tairāwhiti quality team.

Whakawhetai koe Willow.

Taranaki report

2021 was a busy year in Taranaki with challenges and achievements along the way. The NetworkZ team came from Auckland to facilitate trauma simulation for the ED staff, which the staff enjoyed and we look forward to welcoming them back in 2022/23.

Code Red protocol and Chest Trauma Guidelines were implemented, to help streamline processes for trauma patients. Taranaki felt impacts from COVID-19 causing some challenges, especially for simulations for Code Red post roll out due to staffing and general business of the hospital. In addition to this, the Waikato DHB cyber-attack caused some disruption which we managed to bounce back from swiftly.

We said goodbye to Lauren Miller (one of the Trauma clinical nurse specialists) at the end of 2021, she has gone into role of nurse educator for the ED, however she still stays involved with the trauma committee and we are glad to still have her input.

Waikato report

2021 was another challenging year complicated by further COVID-19 alert level restrictions and the cyber-attack. We continued as a team to flex and adapt to these challenges.

The cyber attack was especially difficult as we lost all digital systems including laboratory and patient identification systems. With the systems going down opportunities for direct contact increased with both patients and our colleagues which was an unexpected bonus.

The ongoing COVID-19 alert level restrictions and associated visiting restrictions reduced whānau ability to support their loved ones. We recognise how important whānau are to the process of recovery and tried to mitigate this with online whānau meetings and the use of online video calling. Our Virtual Trauma Reach clinic is appreciated by patients and whānau and continues to provide an important link following discharge. We hope to extend this service in the future.

We implemented the Code Red resuscitation protocol which has transformed early management of our severly injured patients at risk of death by exangination or severe traumatic brain injury. This has shortened the time for resuscitation and definitive intervention for those facilities that have adopted it. This has formed the basis of the Waikato trauma team training course and highlighted the importance teamwork within the resuscitation team and across deparments.

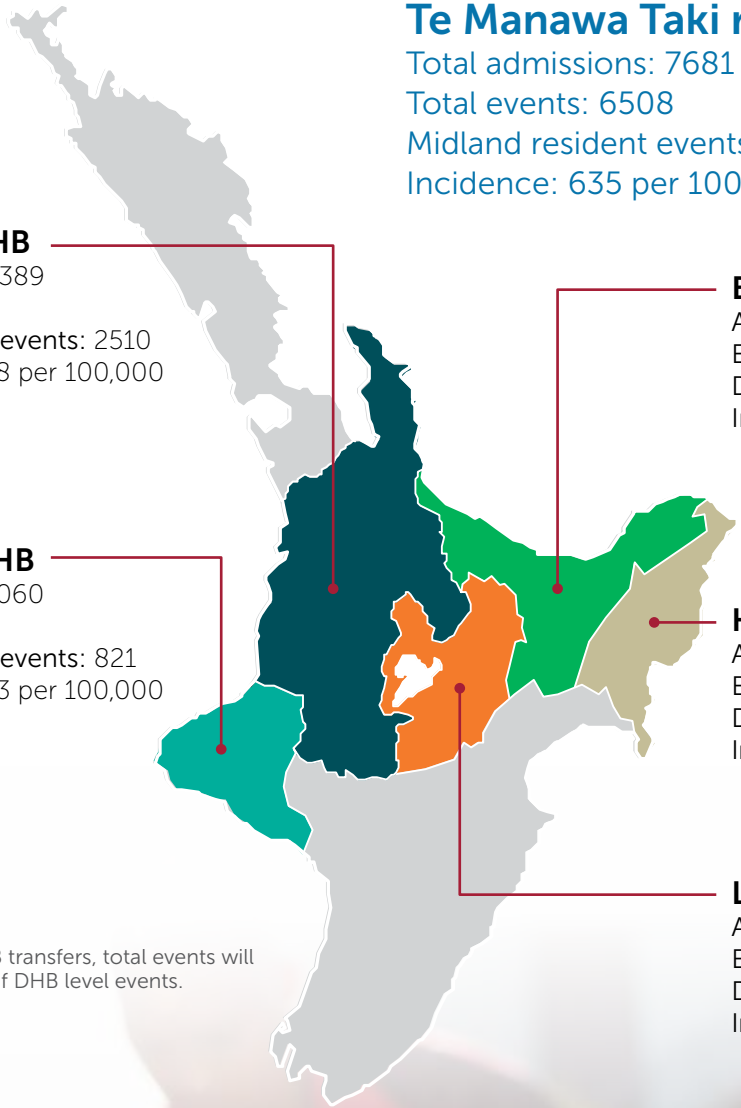
The Patient Diary project and the Critical Care Transfer form were also deleveloped and implemented to support patients and their whānau. This has been much appreciated by all involved helping to lessen stress and improve the critical care experience for those involved.

From an education perspective we ran two Right Track sessions, a Trauma Study Day for the nurses and two online TCAR courses. We also had a steady stream of students attached to the trauma department and produced a number of trauma presentations as grand rounds and specific craft groups.

A number of articles were published focusing on clinical dilemmas in trauma management that will influence practice here and elsewhere. We continued to build linkages with local council and organisations involved in public safety.

Trauma admissions and incidence

During 2021, there were a total of 7681 trauma patient admissions to Te Manawa Taki region facilities (figure 1). These admissions involved 6508 events, with 6143 of these patients being resident within Te Manawa Taki region catchment giving rise to an incidence of 635/100,000 population for all ISS (Injury Severity Score). At a DHB level, incidence ranged from 578/100,000 (Waikato) to 926/100,000 (Hauora Tairāwhiti).



Te Manawa Taki region 2021

Total admissions: 7681
Total events: 6508
Midland resident events: 6143
Incidence: 635 per 100,000 population

Waikato DHB
Admissions: 3389
Events: 2989
DHB resident events: 2510
Incidence: 578 per 100,000 population

Bay of Plenty DHB
Admissions: 1679
Events: 1621
DHB resident events: 1709
Incidence: 654 per 100,000 population

Taranaki DHB
Admissions: 1060
Events: 849
DHB resident events: 821
Incidence: 673 per 100,000 population

Hauora Tairāwhiti DHB
Admissions: 508
Events: 497
DHB resident events: 463
Incidence: 926 per 100,000 population

Lakes DHB
Admissions: 1005
Events: 849
DHB resident events: 702
Incidence: 626 per 100,000 population

Due to inter-DHB transfers, total events will differ from sum of DHB level events.

Figure 1: Te Manawa Taki region admissions and incidence 2021 by DHB

Annual admissions of trauma patients (all ISS) to individual Te Manawa Taki DHBs have fluctuated somewhat since 2014. Admissions to Waikato DHB facilities (all ISS) have increased by 20.9% during 2014 to 2021 (figure 2) and Major trauma admissions to Waikato have increased 45.5% over the same period partly as a result of increased inward transfers from other DHBs. During 2021, 263 patients (63 Major, 200 Non-major) were transferred to Waikato Hospital from other DHBs. Non-major trauma admissions to Waikato DHB have increased 16.9% since 2014 from 2591 to 3031.

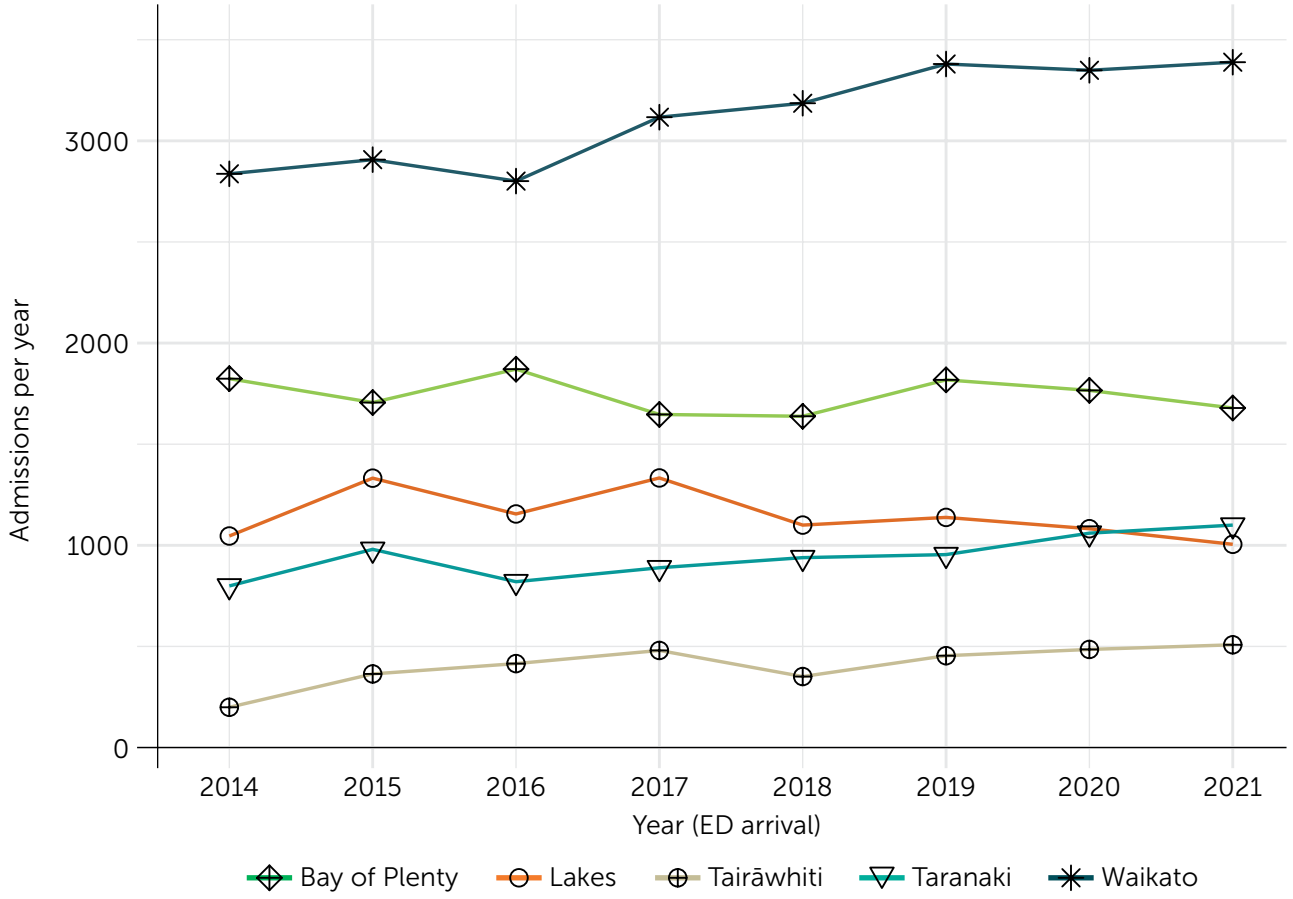


Figure 2: Annual trauma patient admissions (all ISS) 2014-2021 by DHB

Trauma admissions (all ISS) to Taranaki DHB facilities have steadily increased by 34.1% since 2016 (2016 n = 820, 2021 n = 1100), with a 127% increase in Major trauma (ISS > 12) admissions in Taranaki DHB since 2016 (2016 n = 41, 2021 n = 93).

Severity

Te Manawa Taki Trauma System trauma registry is unique in New Zealand, collecting comprehensive data for both Major and Non-major trauma patients. Major trauma includes patients whose ISS is greater than 12, Non-major trauma patients are those with an ISS less than or equal to 12.

Figure 3 below shows that the effect of COVID-19 alert level restrictions during 2020 and 2021 had a minimal effect on overall admission volumes among both Major and Non-major trauma compared to the previous year. Major trauma admissions to Te Manawa Taki facilities decreased by 5.6% during 2020 to 2021, while Non-major trauma admissions declined by 0.3% during the same period.

Longer term, there continues to be an upward trend with Major trauma admission volumes up 39% since 2014, and Non-major trauma admissions up 12.6% over the same period.

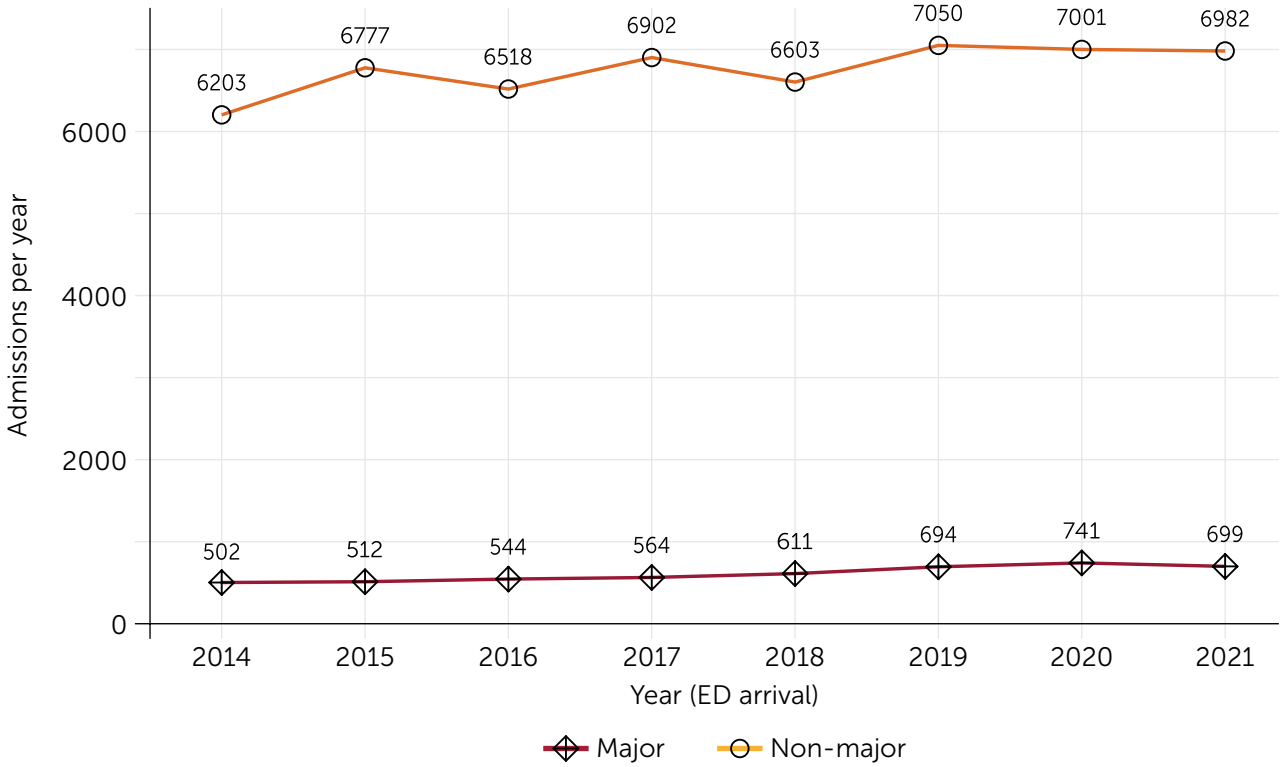


Figure 3. Te Manawa Taki region annual trauma admissions 2014-2021 by severity


Photo: Waikato Westpac Rescue Helicopter

Incidence by severity

During 2021, across Te Manawa Taki region, Non-major trauma (ISS < 13) incidence (581 per 100,000) (534-629 95% CI) was approximately 10.9 times higher than for Major trauma (ISS > 12) (53 per 100,000) (39-68 95% CI).

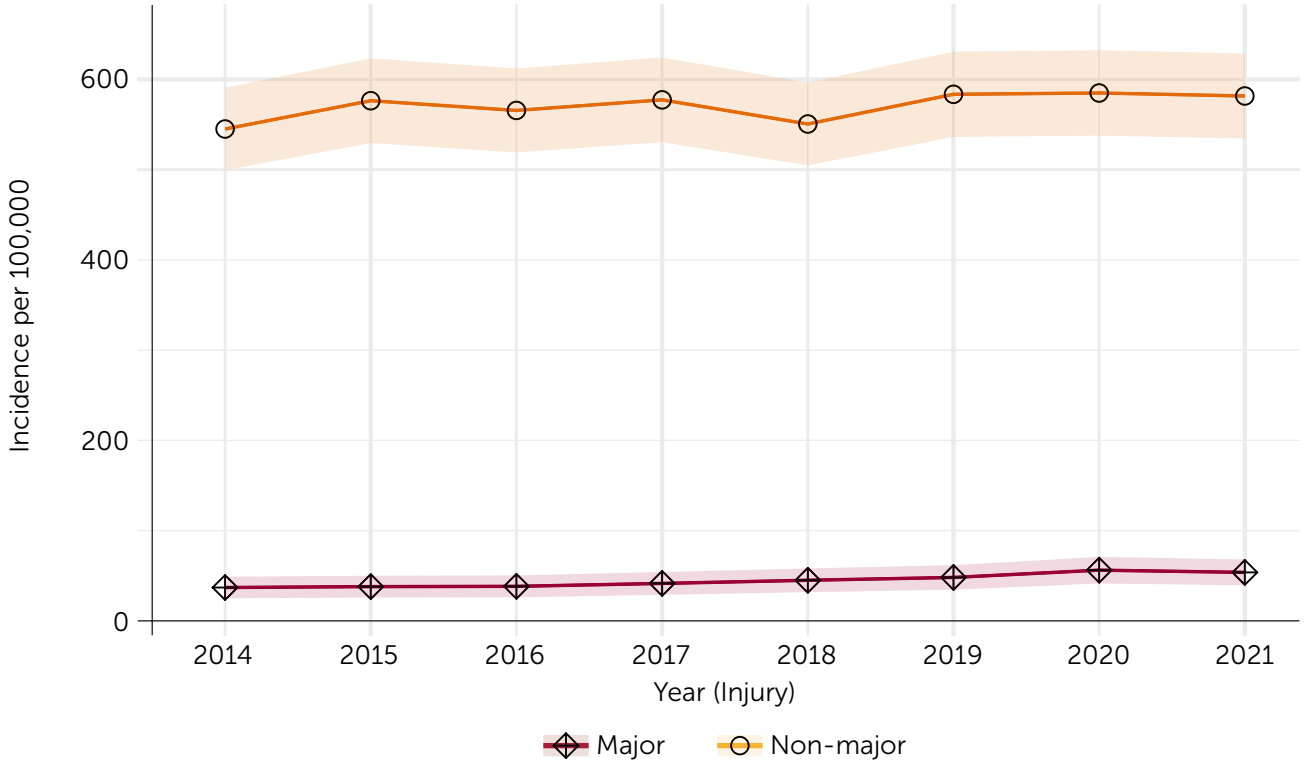


Figure 4. Annual incidence of trauma per 100,000 population 2014-2021 by severity (Te Manawa Taki resident trauma events only, population annually adjusted, shading = 95% CI)

During 2021, the incidence of Major trauma ranged from 46/100,000 population (Lakes DHB) to 69/100,000 population (Waikato DHB), the incidence of Non-major trauma ranged from 575/100,000 population (Bay of Plenty DHB) to 880/100,000 population (Tairāwhiti DHB) (figure 5).

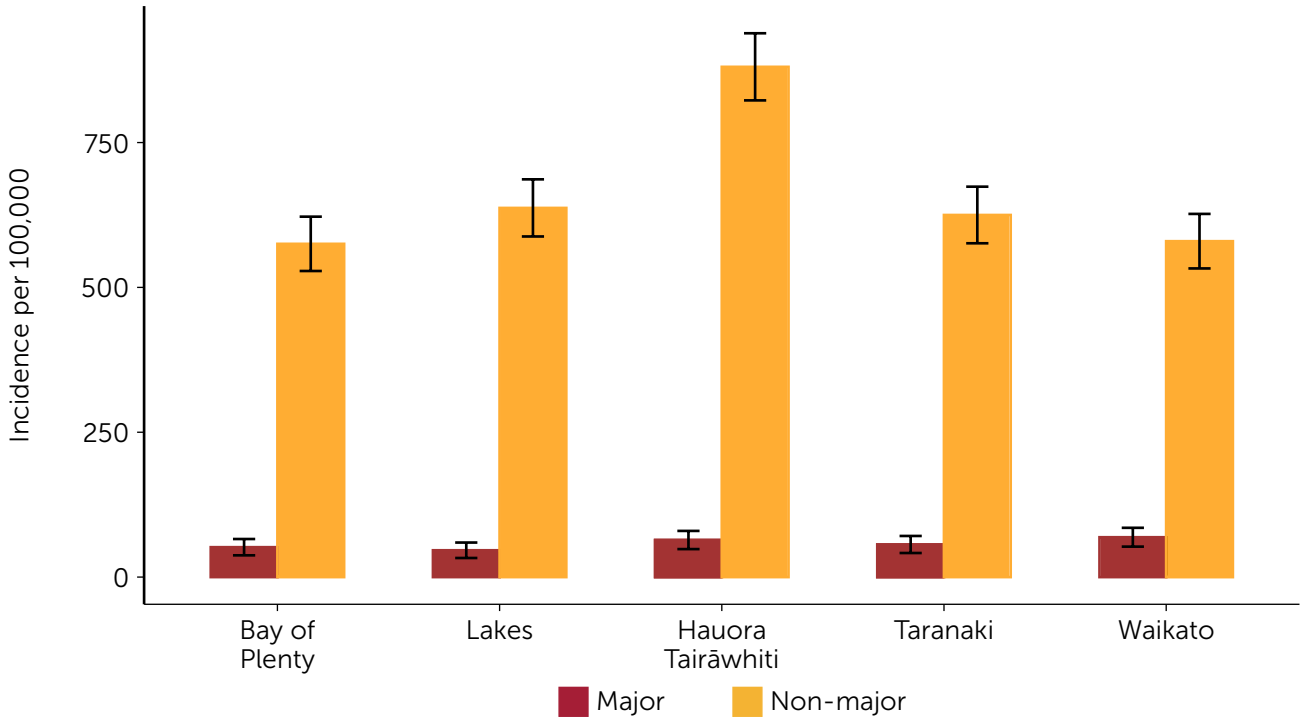


Figure 5. Incidence of trauma per 100,000 population 2021 by DHB and severity (bars = 95% CI) (incidence calculated using DHB resident events only)

Age adjusted incidence shows Major trauma is low among 0-14 year olds but increases rapidly from age 15 years with a peak at 20-24 years before declining to age 30-34 years and then increasing steadily (figure 6). Non-major trauma shows two more distinct peaks at age 15-29 and those aged 75 years and older (figure 6).

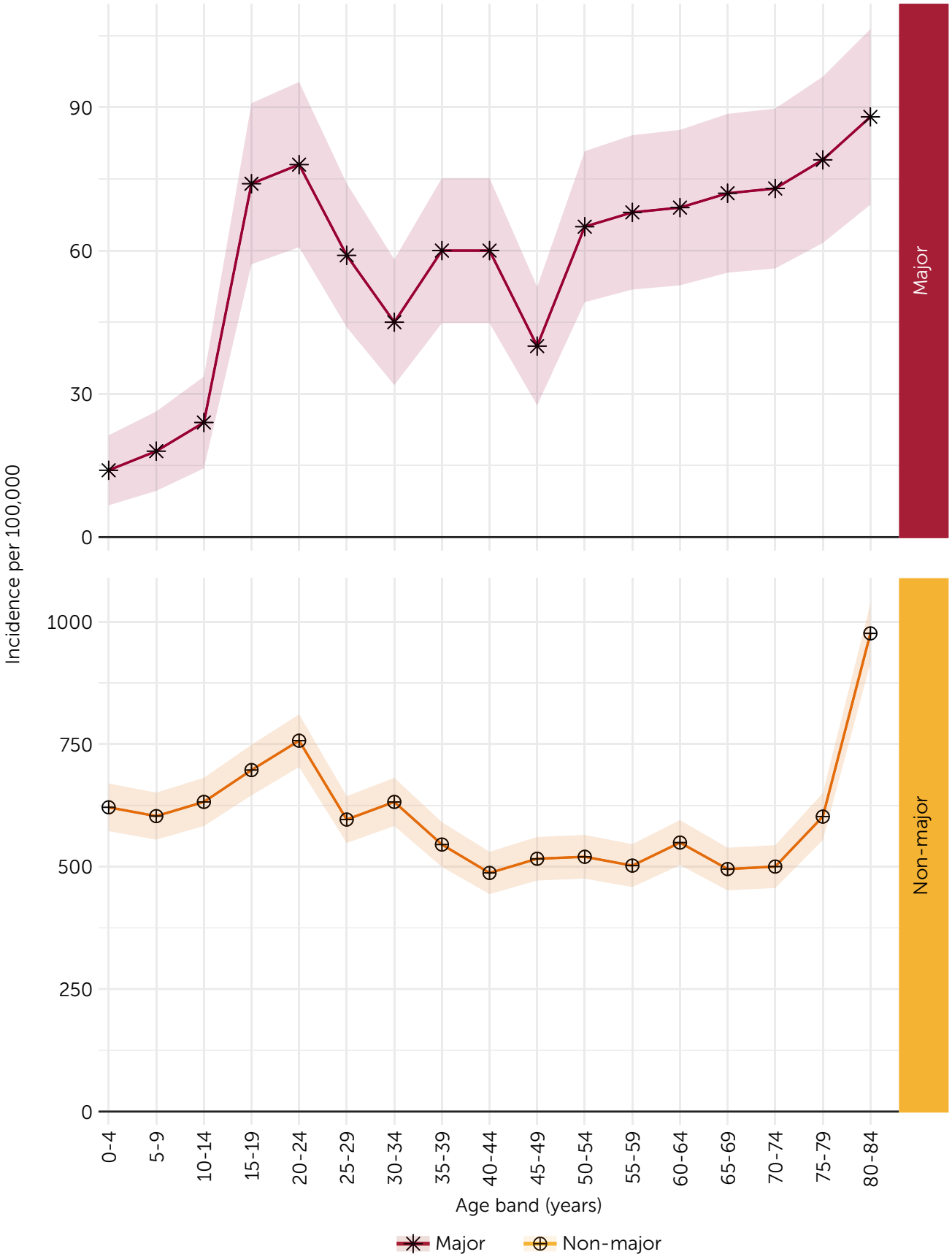


Figure 6. Age adjusted incidence per 100,000 population by injury severity 2021

Note: Independent y-axis, 85+ years excluded. (Population source – Ministry of Health DHB population projections 2018 update).

Age, gender, ethnicity, and severity

Age, gender, and ethnicity are major factors affecting trauma admissions to Te Manawa Taki facilities (figure 7). Among both female and male Māori, Major and Non-major trauma admissions are highly skewed to younger age groups with a strong peak in their mid-twenties.

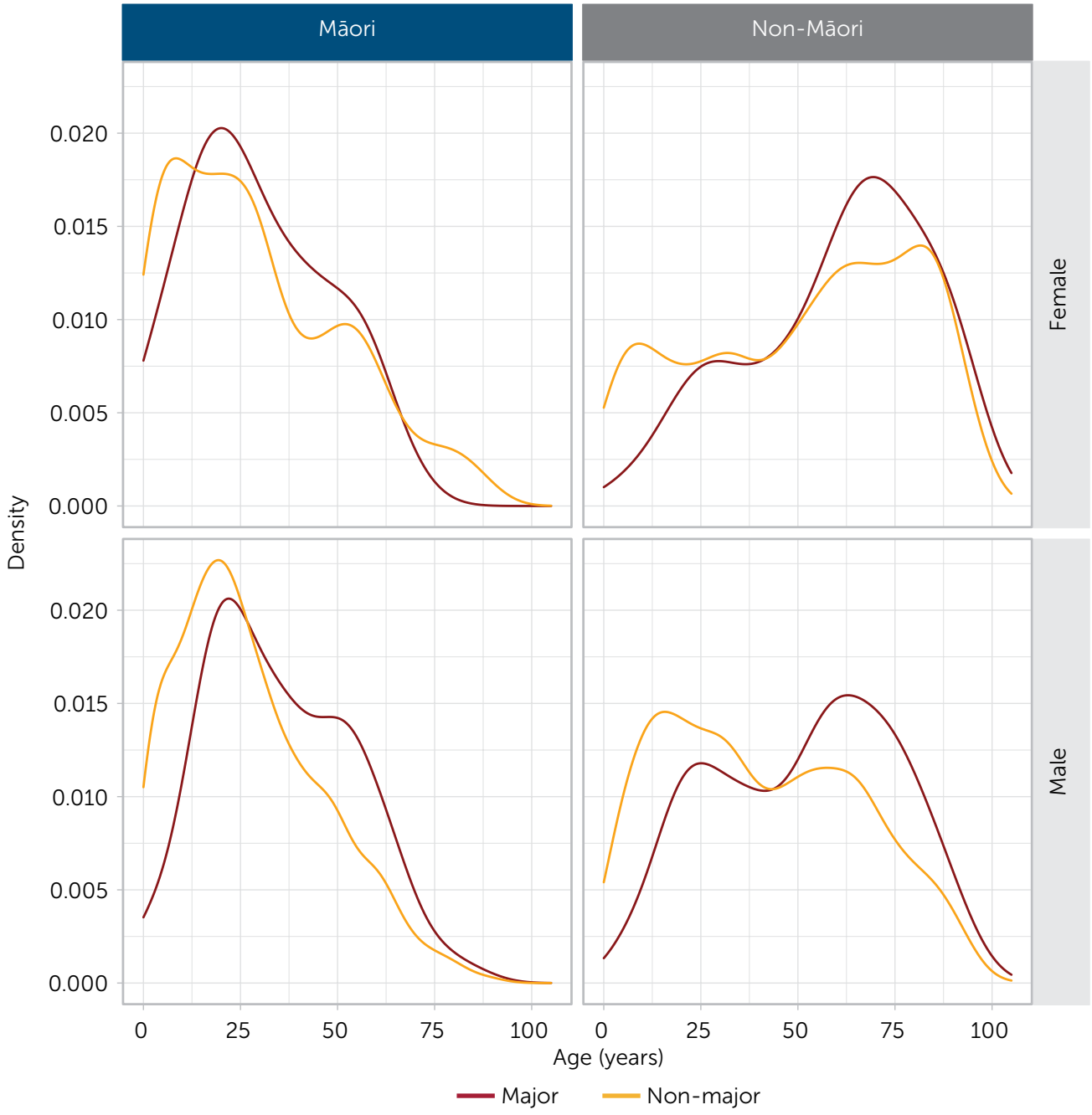


Figure 7. Density plot of trauma admissions to Te Manawa Taki facilities 2021 by age, gender, and severity, n = 6508 events

Female non-Māori trauma admissions, both Major and Non-major, are significantly more skewed to older ages with one small peak during their teenage years, and one strong peak during their mid-to-late sixties.

Longitudinal changes in demographic profiles

During 2012 to 2021 there have been significant changes in the demographic profiles of trauma admissions. These longitudinal changes are best understood when age, gender, ethnicity, and injury severity are all examined multidimensionally.

Among Māori, both Major and Non-major trauma admissions have been heavily skewed towards younger age groups compared to non-Māori. These differences are not however static, with increases in median age and broadening of age peaks over time noted among both Māori and non-Māori (figure 8).

The bimodal distribution of trauma events based on age and the presence of peaks within peaks, particularly among non-Māori, makes reliance on mean or median age for a direct comparison problematic. However, further separation based on gender reveals notable differences in age profiles among both Māori and non-Māori. Such differences are particularly noticeable among Non-major trauma admissions (figure 9).

Among Non-major trauma admissions, during 2012 to 2021 there has been an increasing proportion of older youth among female Māori, resulting in a broadening peak under the age of 30 years (figure 9). The median age of female Māori has increased from 19 years during 2012, to 25 years during 2021. Among male Māori Non-major trauma admissions, the median age has increased from 22 during 2012 to 24 during 2021.

Among non-Māori, the median age of Non-major has similarly increased from 43 to 57 years among females during 2012 to 2021, while the median age of non-Māori males has increased from 31 to 38 during the same period. This may reflect a higher number of road traffic crash related injuries among males aged 25 to 35, while falls predominate among females particularly aged over 65 years.

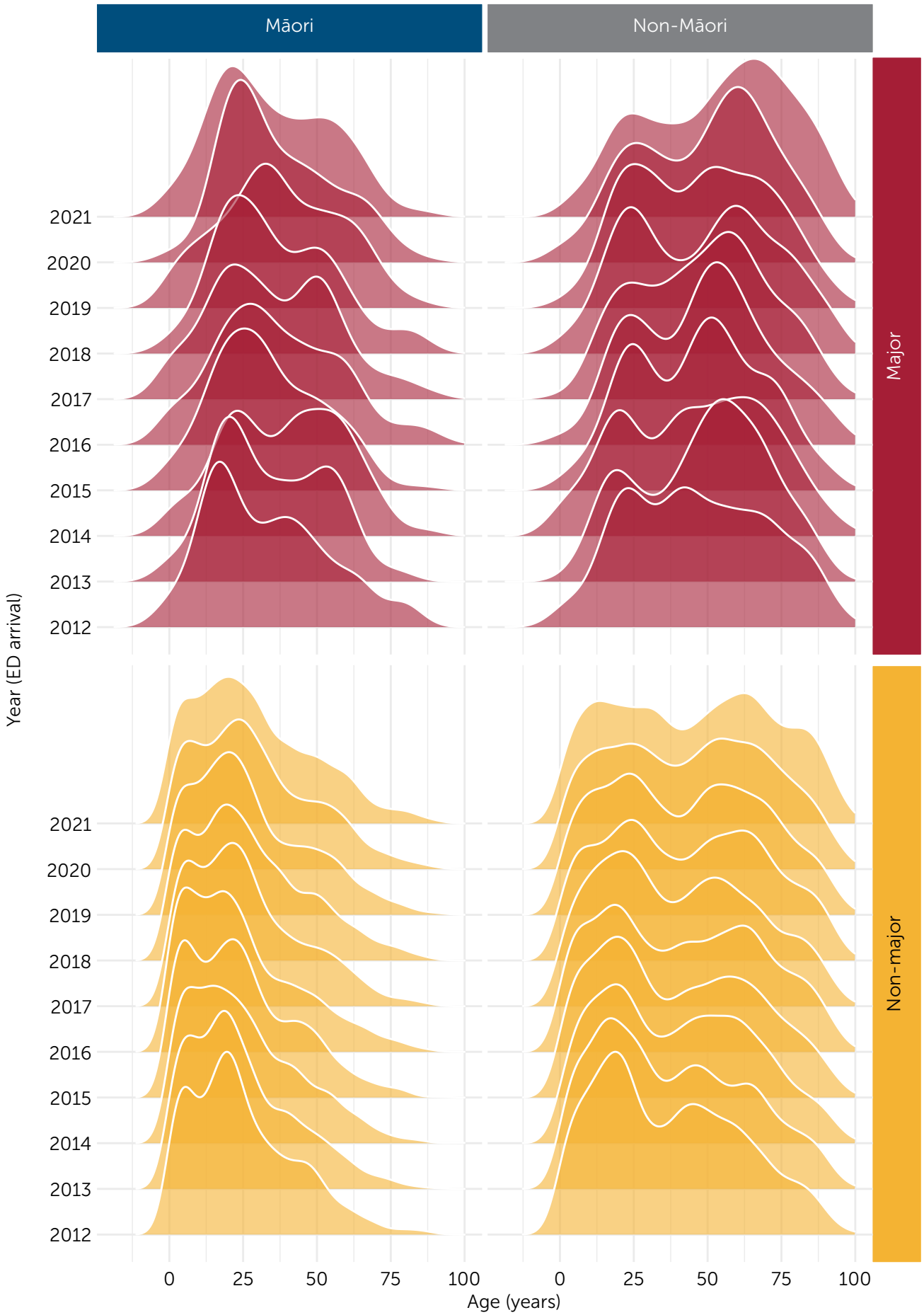


Figure 8. Density plot of trauma admissions to Te Manawa Taki facilities 2021 by age, gender, and severity, n = 6508 events

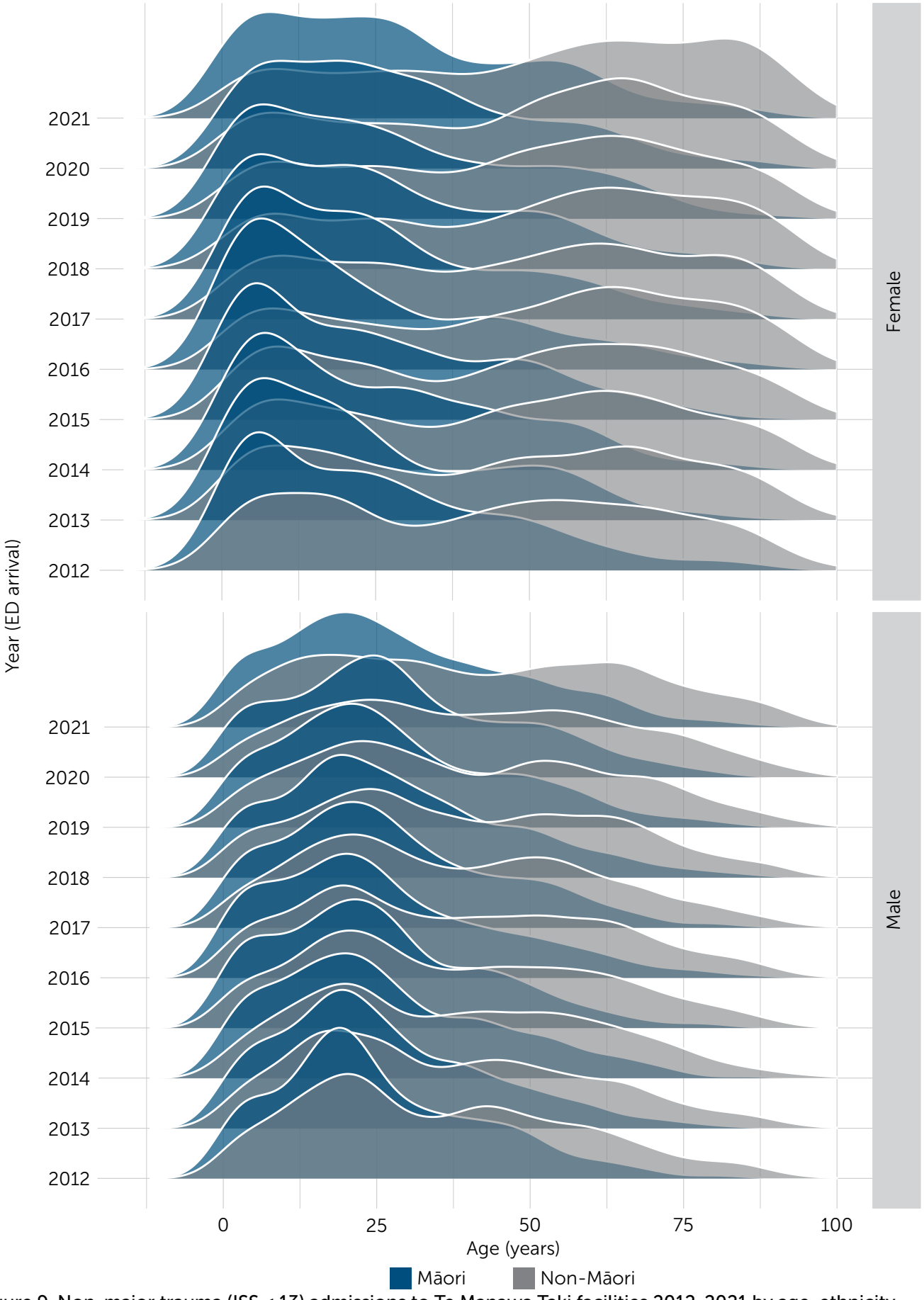


Figure 9. Non-major trauma (ISS < 13) admissions to Te Manawa Taki facilities 2012-2021 by age, ethnicity, gender, and year of ED arrival (n = 55,158 ISS)

Process indicators

Time in Emergency Department (ED)

Major trauma (ISS > 12) patients in all Te Manawa Taki DHB facilities continue to spend longer in the ED than the Te Manawa Taki benchmark of 60 minutes (Te Manawa Taki benchmark for Major trauma) (figure 10). During 2021, the median time in Te Manawa Taki ED for Major trauma patients was 280 minutes, ranging from 202 minutes (Tairāwhiti) to 327 minutes (Lakes). This disparity among Te Manawa Taki DHBs suggests there continues to be room for improvement in this area.

The time spent by trauma patients in ED reflects the ability of a facility to diagnose a patient, institute early treatment, and transfer a patient internally within a facility or elsewhere. A range of factors can affect time spent in ED such as heavy workloads in EDs and issues finding available beds within the hospital.

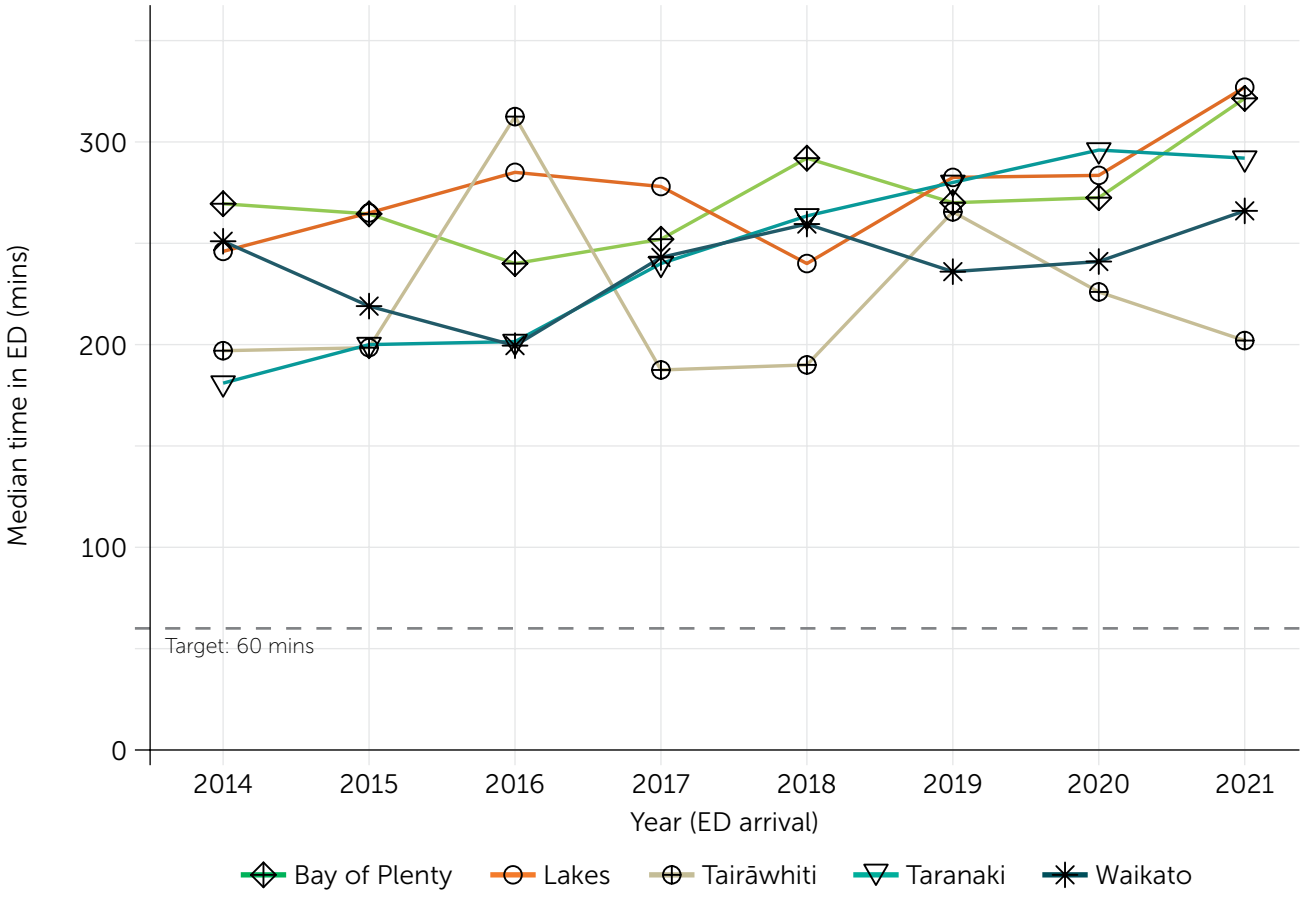


Figure 10. Median time in ED for Major trauma (ISS > 12) patients 2014-2021 by DHB

During 2021, the median time spent in EDs for Major trauma patients ranged from 202 to 327 minutes and median times in ED for Non-major traumas ranged from 223 to 306 minutes (figure 11).

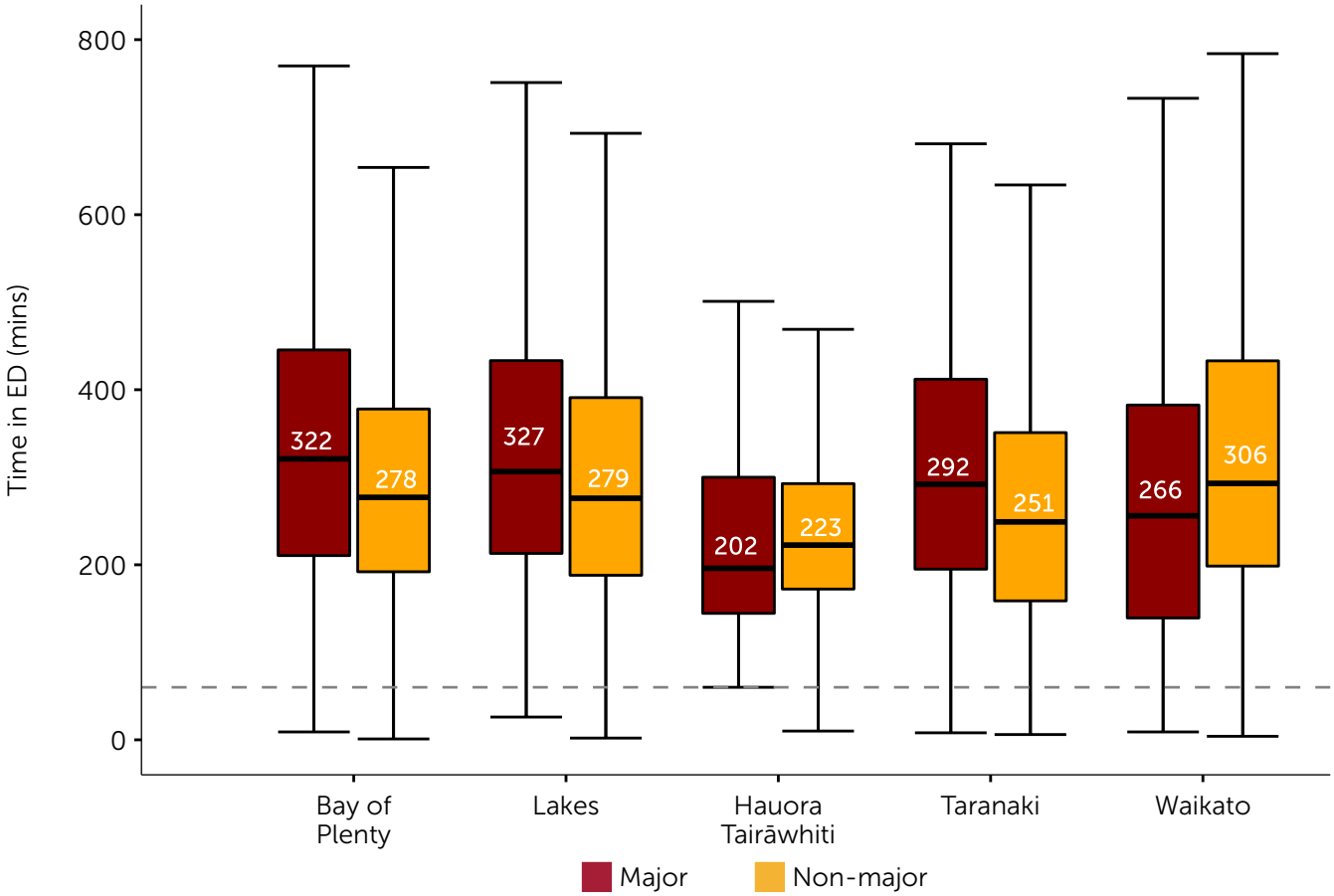


Figure 11. Time in ED (minutes) by severity and DHB 2021

Trauma team activation

Severely injured trauma patients require a rapid, thorough, and systematic, assessment and resuscitation. The trauma team is a multidisciplinary group of individuals drawn from the specialties of emergency medicine, intensive care, surgery, nursing, allied health and support staff, who work together as a team to assess and manage major trauma patients. The percentage of Major trauma (ISS > 12) patients receiving a trauma team activation continues to remain below the Te Manawa Taki regional target of 80%. During 2021, across the region, 55.8% of Major trauma patients received a trauma team activation on their first admission direct from scene. With team activation ranging from 31% to 67% at a DHB level there continues to be a need for improvement in this area (figure 12).

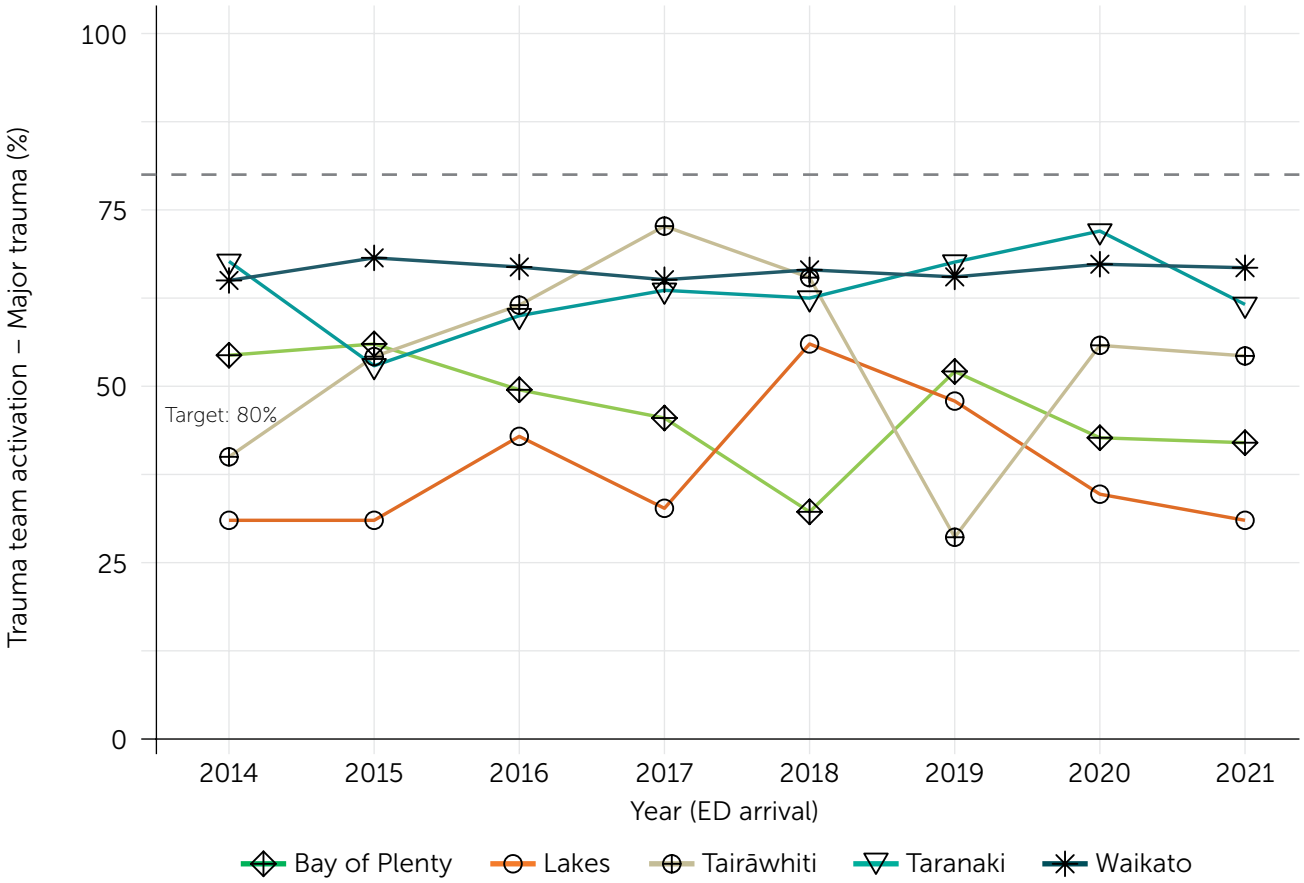


Figure 12. Percentage annual major trauma admissions with a trauma team activation by arrival facility DHB

Where a trauma team response is activated, the time spent in each Te Manawa Taki ED is significantly reduced (figure 13). Region-wide, trauma team activation resulted in a reduction of 94 minutes (30.1% reduction) spent in ED, with reductions among individual Te Manawa Taki DHBs ranging from 51 to 189 minutes accompanying trauma team activation. However, even with activation of a trauma team response, time in ED remains longer than the Te Manawa Taki benchmark of 60 minutes.

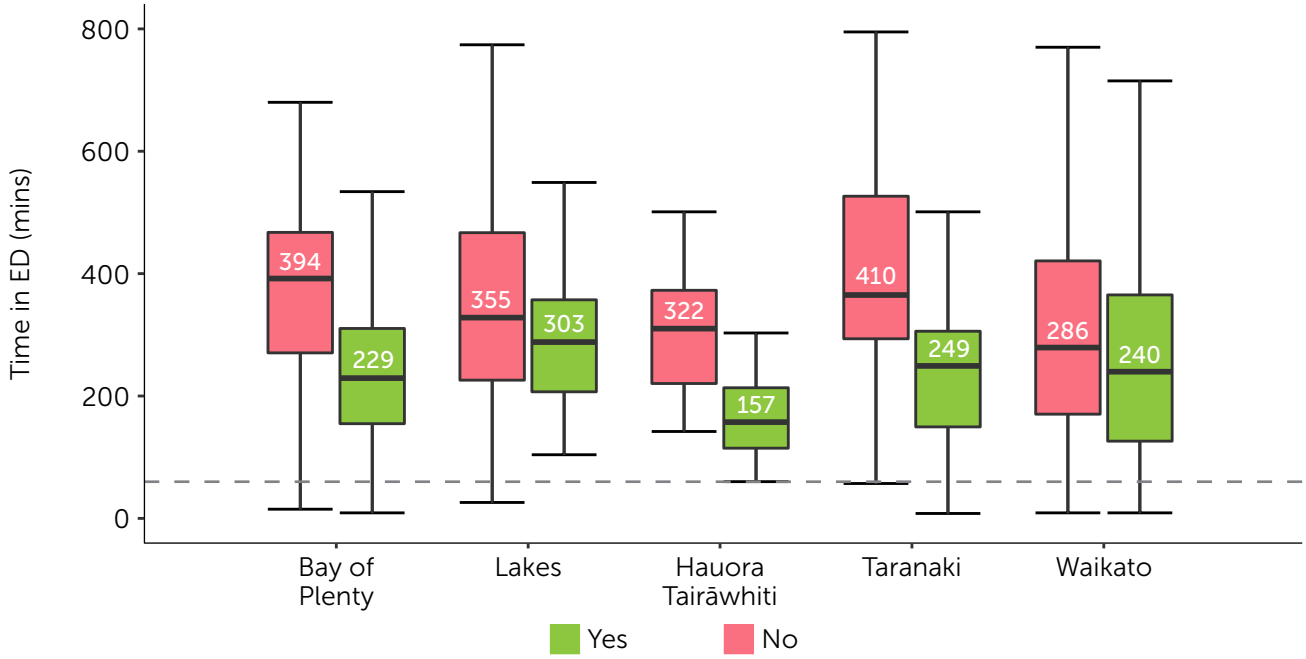


Figure 13. Time in ED, Major trauma patients (ISS >12), by trauma team activation status (Yes/No) and DHB

While Te Manawa Taki Trauma System is improving in this area, trauma team activation rates and time in ED are both still some way from achieving our targets. A monthly trauma team activation monitoring report has been developed to assist our understanding of trends in trauma team activation rates and time in ED.

Average time to index CT

24

An index computed tomography (CT) scan is the first CT scan a trauma patient receives after arrival at hospital. The time taken from patient arrival to receiving an Index CT provides a measure of how rapidly a facility and its staff mobilise to assess and acquire diagnostic imaging information for severely injured patients. During 2021, the average time to index CT decreased in three Te Manawa Taki DHBs, compared to the previous year. Te Manawa Taki region-wide average time to Index CT of 71 minutes remained above the Te Manawa Taki Trauma System benchmark target of 60 minutes in all but one Te Manawa Taki DHB (figure 14).

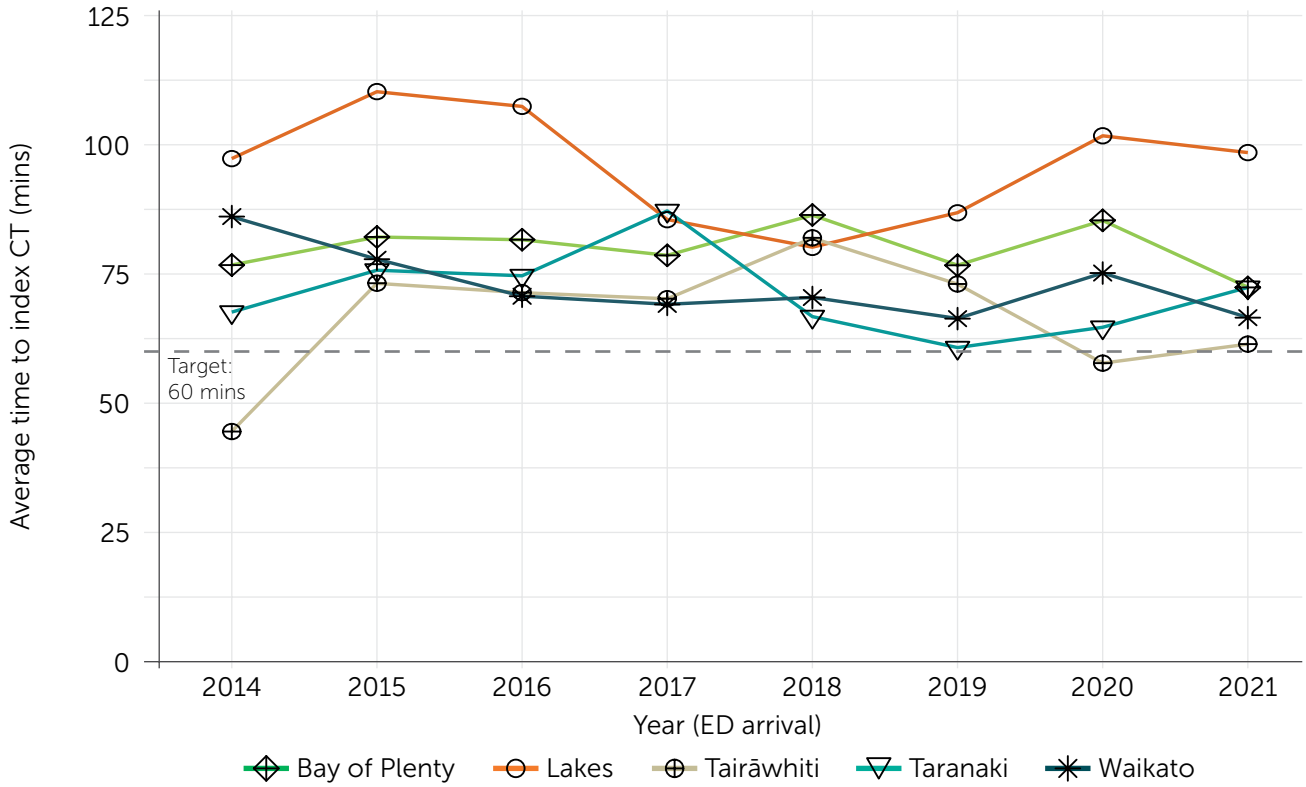


Figure 14. Average time to index CT for Major trauma (ISS > 12) patients by arrival year and DHB

Trauma team activations can significantly reduce the time delay to index CT scan. For Major trauma patients with a Total GCS in ED, trauma team activations have progressively reduced the time to index CT (figure 15).

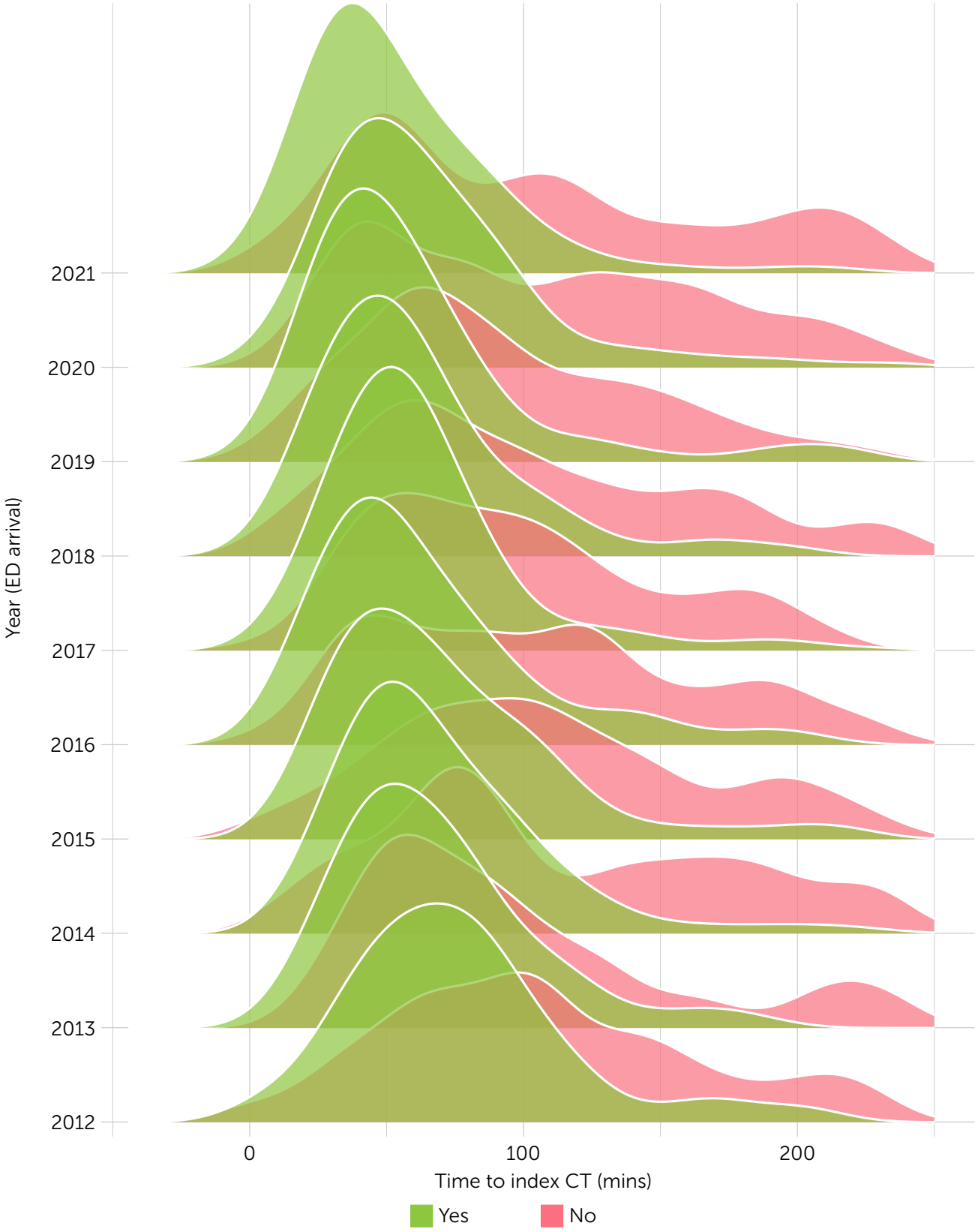


Figure 15. Average time to index CT for Major trauma (ISS > 12) patients where Total GCS < 13, by trauma team activation and arrival year

Blood alcohol testing

The percentage of Major trauma patients (aged 15 years and over) whose blood alcohol was tested on their first facility admission continues to lie below the national benchmark of 100%. Te Manawa Taki wide testing rate was 72.9% for 2021, with individual DHB testing rates ranging from 61.5% to 87.5% (figure 16).

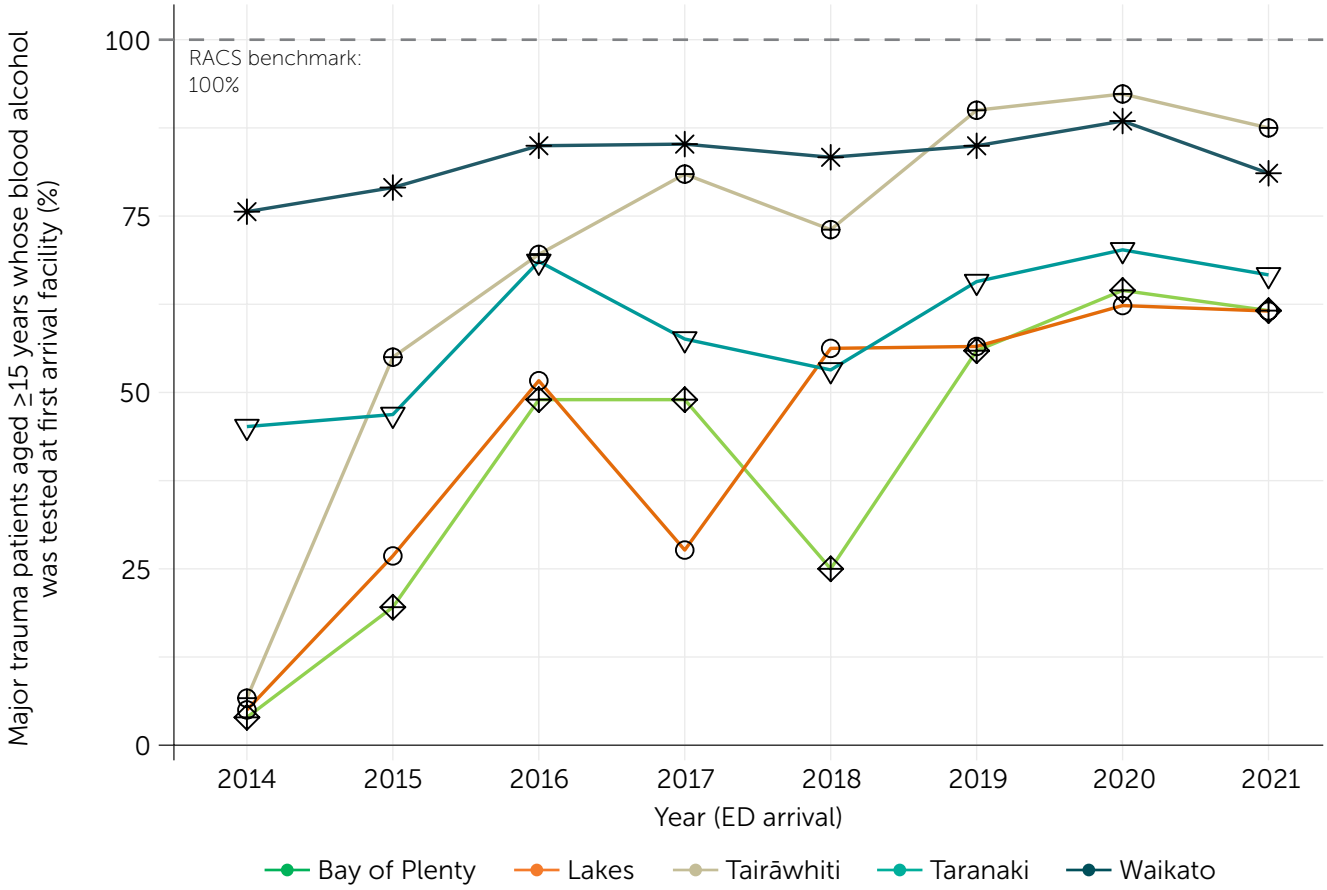


Figure 16. Percentage of Major trauma patients whose blood alcohol was tested at their first arrival facility (aged 15 and over)

Of the 380 of Major trauma patients aged ≥15 years whose blood alcohol was recorded during their first admission, 5.8% (all mechanisms) were at or above the legal limit for driving of 50 milligrams (mg) per 100 millilitres (ml) of blood (blood alcohol limit for those aged ≥ 20 years). This is up from 3.9% during 2020. For Major trauma patients injured due to a road traffic crash (driver or passenger), 2.9% of those aged ≥ 20 years whose blood alcohol was tested on arrival at first facility (n = 104) were at or above the legal blood alcohol limit for driving. However, this may be an under-estimate since time from injury to facility arrival is highly variable. Of 32 Major trauma patients injured due to assault and whose blood alcohol was tested, 15.6% had a blood alcohol level over 50 mmg/100mml blood.

Cause of injury

The vast majority of both Major and Non-major trauma during 2021 was caused by blunt injuries (93.9% all severity) (table 1) with a majority being caused unintentionally (table 2).

Type of injury	Major trauma events (col %)	Non-major trauma events (col %)	Total events (col %)
Blunt	539 (95.7)	5572 (93.7)	6111 (93.9)
Penetrating	19 (3.4)	194 (3.3)	213 (3.3)
Burn	5 (<1.0)	179 (3.0)	184 (2.8)
Total	**563 (100)**	**5945 (100)**	**6508 (100)**

Table 1. Primary injury type by severity 2021 (n = 6508)

Injury intent	Major trauma events (col %)	Non-major trauma events (col %)	Total events (col %)
Unintentional	504 (89.5)	5508 (92.6)	6012 (92.4)
By other	42 (7.5)	363 (6.1)	405 (6.2)
Self-inflicted	9 (1.6)	62 (1.0)	71 (1.1)
Unknown	8 (1.4)	12 (< 1.0)	20 (< 1.0)
Total	**563 (100)**	**5945 (100)**	**6508 (100)**

Table 2. Injury intent by severity 2021 (n = 6508)

Across all trauma events (all ISS), the top five causes of injury were falls (40.4%, n = 2632), road traffic crash (9.7%, n = 629), motorcycle (6.7%, n = 437), assault (6.1%, n = 397) and pedal cycle (5.1%, n = 333) (figure 17).
Among Major trauma events, falls (28.2%, n = 159) followed by road traffic crash (25.7%, n = 145), and motorcycle (12.7%, n = 72), were the top three causes of injury.

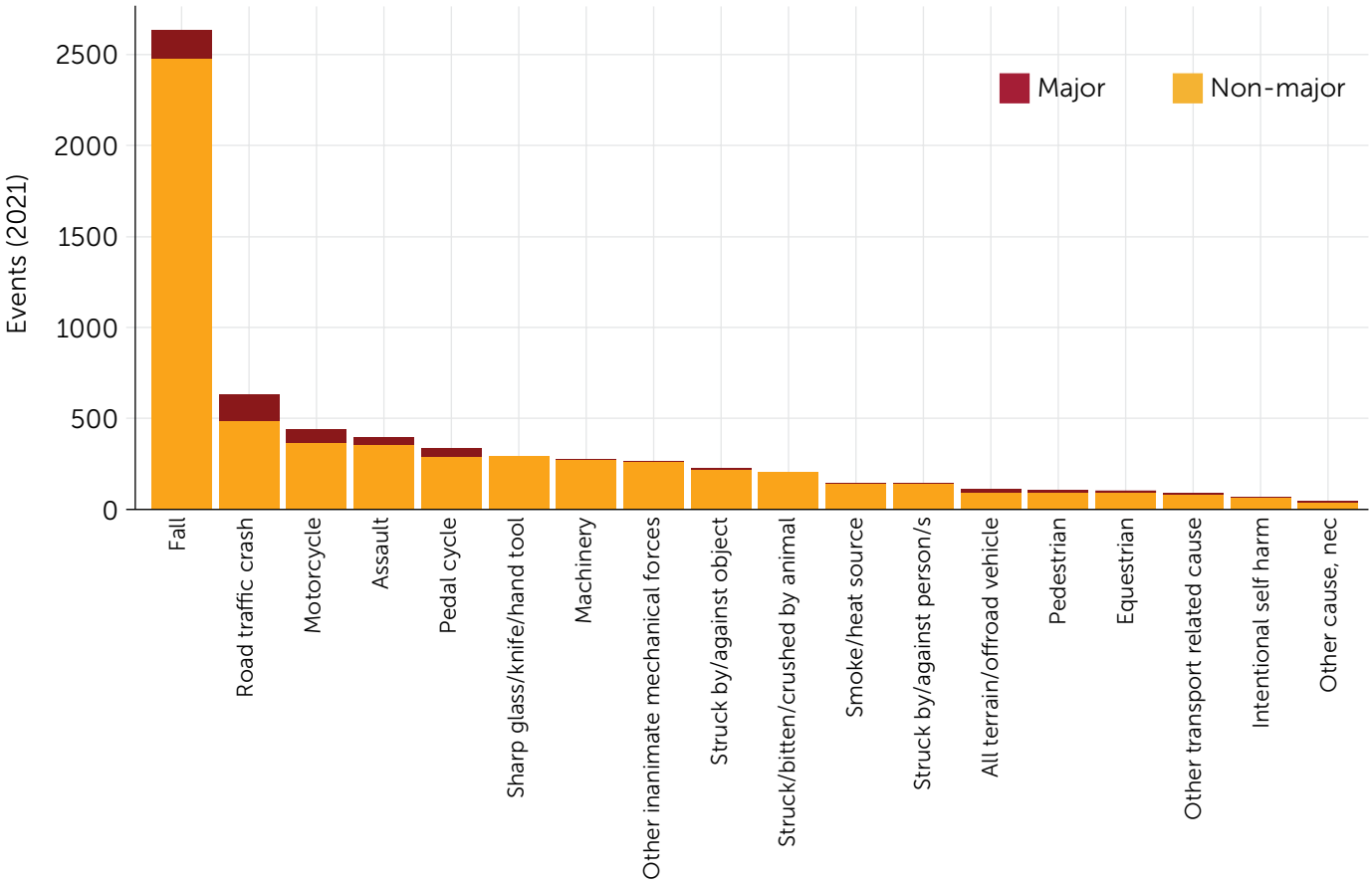


Figure 17. Cause of injury by severity

Falls among Major trauma patients are strongly skewed towards older age groups with a pronounced peak in the 60-75 year age band (Median age 73 years) (figure 18). Among Non-major trauma events there is an additional peak of injury due to falls among children and teenagers.

Both Major and Non-major trauma due to road traffic crashes have a peak among those aged 20-25 years, with an additional smaller peak among Major trauma events aged in their mid-to-late sixties.

Where injury was due to motorcycle crash, there were distinct differences in an age peaks between Major and Non-major trauma. Major trauma due to motorcycle crashes have a pronounced peak among those aged 50-60. Many of these tend to occur on rural open roads at higher speeds and more often during the weekend, usually more related to recreational riding. Motorcycle crash patients with Non-major trauma patients tended to be younger with a distinct peak among those in their early twenties. These often tend to involve lower speed crashes in urban areas, occurring more often during weekdays and are often more related to commuting to work.

Trauma due to assault display a peak among those aged between 20-30 years (Major trauma – median age 32 years; Non-major trauma – median age 31 years among).

Major trauma due to pedal cycle injuries display a peak among those aged 50-60 years with additional volumes during teenage to those aged in their thirties. Non-major trauma due to pedal cycle injuries are significantly more bimodal with clear peaks among those.

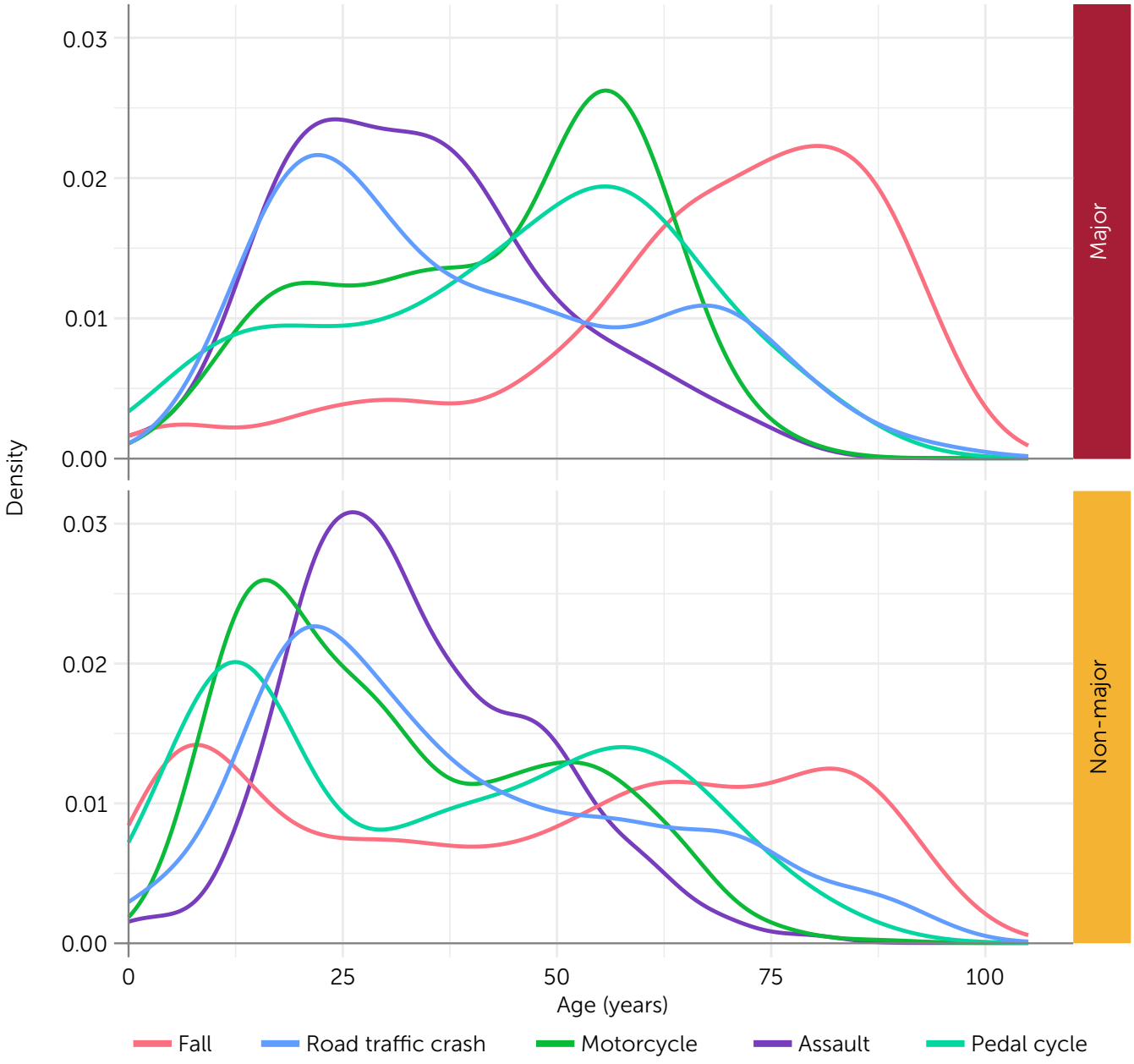


Figure 18. Age density plot by cause of injury (top 5) and Major or Non-major severity, n = 5156

Month, day and time of injury

December and January are the predominant months for injury, coinciding with the summer holidays for many living in New Zealand (figure 19). There was a marked drop in trauma admissions during April of 2020 with 330 patients injured (all ISS), compared with an average of 462 during April for all other years 2014-2021 excluding 2020 (Figure 19). At 11:59pm on 25 March 2020, New Zealand moved to Alert Level 4 as part of its COVID-19 response, with the entire nation going into self-isolation and a State of National Emergency declared at 12:21pm.

Saturday and Sunday are the predominant days for injury, with 36.6 percent of all injuries occurring during the weekend, and 21.0% occurring Saturdays alone. For Major trauma, a similar 36.0% of injuries were incurred during the weekend (figure 19) and 40.1% of Non-major trauma injuries occurred during the weekend (figure 20).

A majority of Major trauma injuries occurring during the weekend take place between 11am and 4pm on Saturday, Non-major trauma occurring at the weekend begins to increase from 9am, reaching a peak between 2pm to 4pm, and then steadily declining until 7pm (figure 20). Taken together, Te Manawa Taki hospitals experience a peak in activity during weekends, particularly during early to mid-afternoon.

34.9% of all road traffic crash injuries occurred during the weekend, and 43.1% of assault related injuries occurred during the weekend. 19.6% of falls related injuries occurred during a Saturday, with most weekdays averaging 12% equally of falls injuries. 33.2% of motorcycle injuries occurred on Saturdays, followed by 23.1% on Sundays, and most weekdays ranging between 4.8% (Wednesdays) to 11.5% (Fridays), suggesting that 56% of motorcycle related injuries occurring during the weekend may be more recreational in nature than related to commuting to work. 51.3% of all Major motorcycle trauma also occurred during the weekend. A larger proportion of pedal cyclists had injuries during Saturdays (24.6% of total pedal cycle injury events), followed by Sundays (17.1%), and the lowest numbers of pedal cyclists injured were on Mondays (7.8% of total pedal cycle injuries).

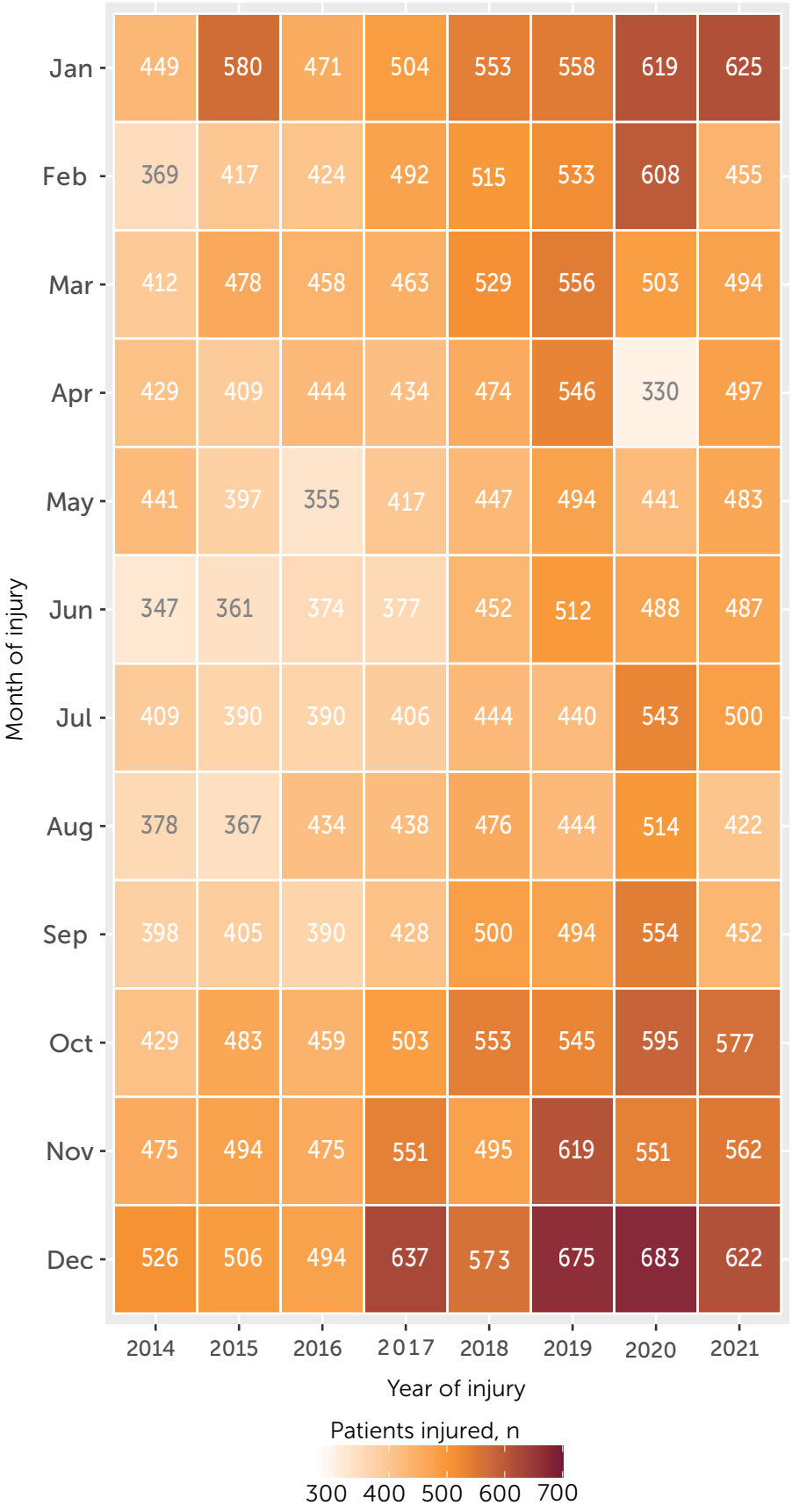


Figure 19. Trauma admissions (all ISS) to Te Manawa Taki facilities by year and month of injury, n = 49,454 events

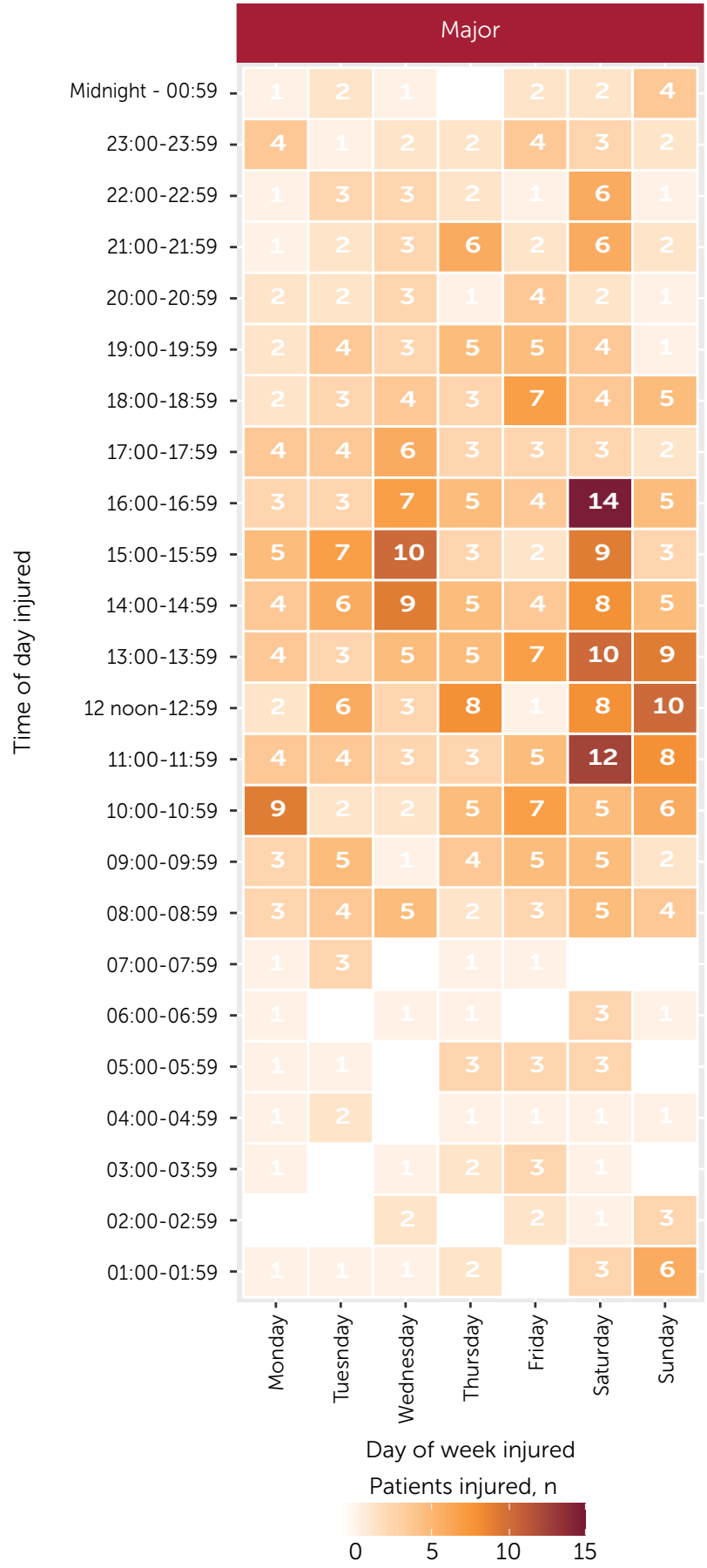


Figure 20. Major (ISS > 12) trauma admission to Te Manawa Taki by day of week and time of injury (2021), n = 550 events (excludes admissions where date or time of injury unknown)

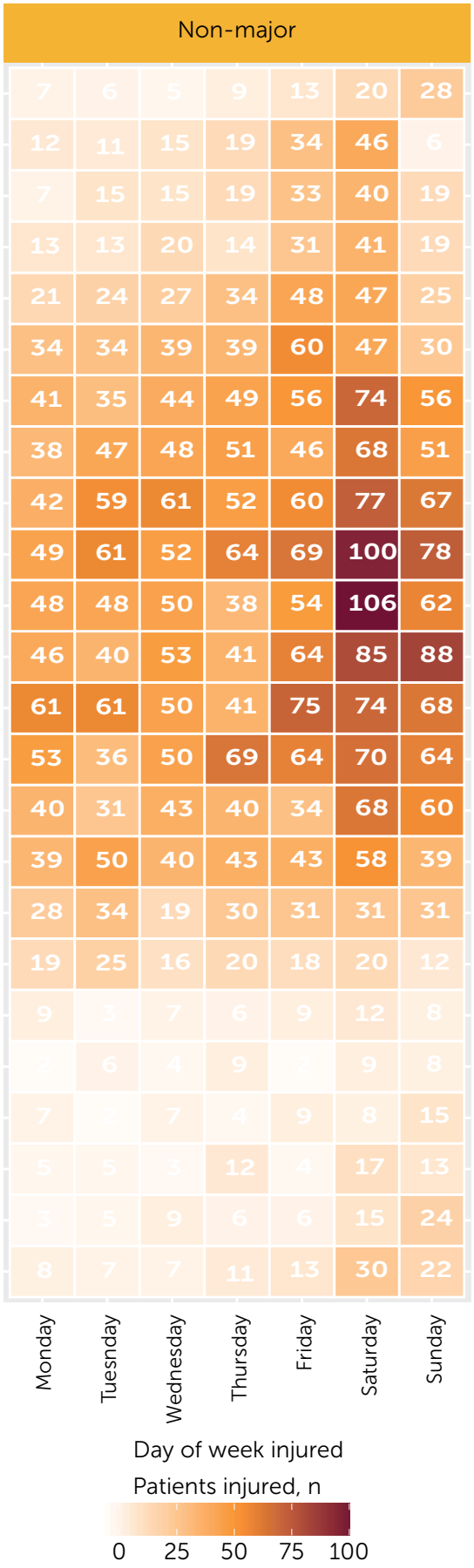


Figure 21. Non-major (ISS < 13) trauma admissions to Te Manawa Taki by day of week and time of injury (2021), n = 5626 events (excludes admissions where date or time of injury unknown)

Injuries

The trauma patient can have many individual injuries. During 2021, 15,699 individually coded injuries were entered into the Te Manawa Taki Trauma System trauma registry with an average of 2.4 injuries per patient (figure 22). Major trauma (ISS > 12) patients had an average of 6.3 injuries recorded, and Non-major trauma (ISS < 13) patients had 2.0 injuries recorded.

Among Major trauma patients, the highest number of individual recorded injuries were to the abdomen and pelvic contents (25.0%, n = 897 recorded injuries), among Non-major trauma patients there were high numbers of injuries to the face (43.7%, n = 5292 individually coded injuries).

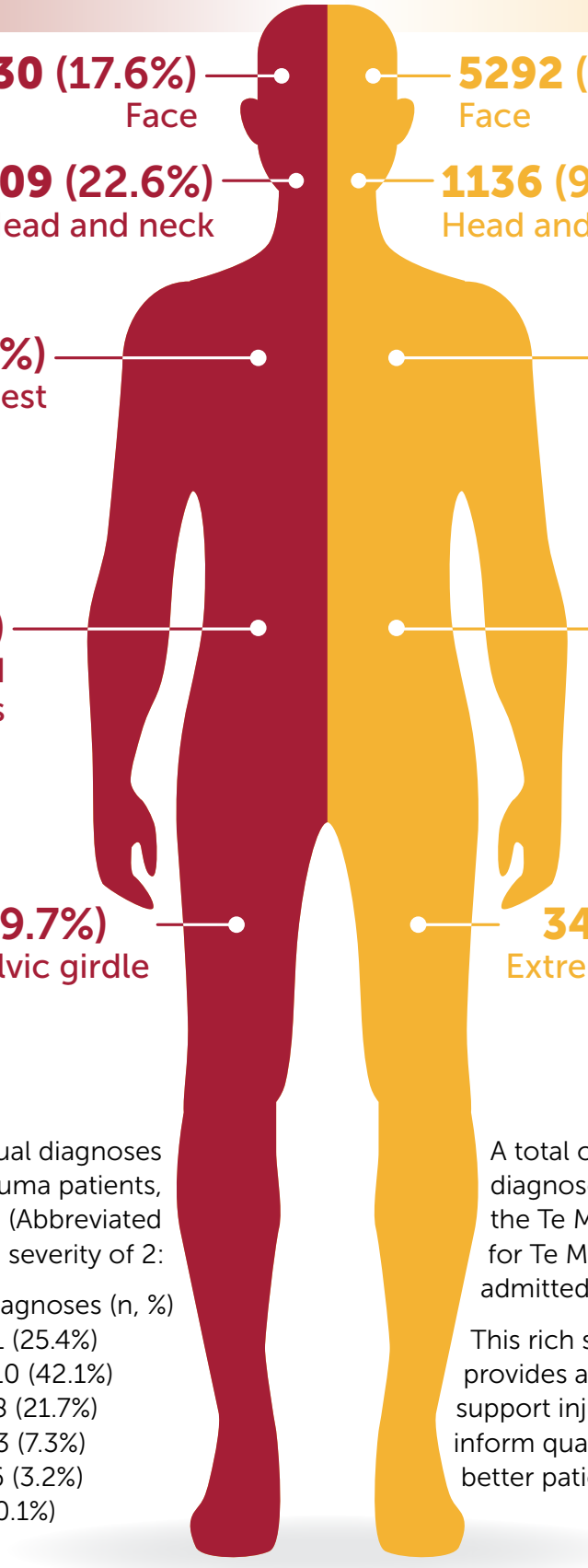
All individually coded injuries entered into the Te Manawa Taki Trauma System trauma registry includes a severity score on a six point scale of AIS 1 = Minor to AIS to AIS 6 = Maximal (currently untreatable). An algorithm employs these individual injury scores to derive a total ISS which ranges from 1 to 75 (if any individual injury has an AIS of 6, the ISS score is automatically assigned 75. Among Major trauma patients (where total ISS > 12), a majority of individual injuries had a AIS severity of 2 (42.1%, n = 1510 individual coded injuries).

15,699 individual patient injuries

recorded in Te Manawa Taki Trauma Registry 2021

Major trauma injuries
563 events
3583 diagnoses

Non-major trauma injuries
5945 events
12,116 diagnoses



630 (17.6%) Face

809 (22.6%) Head and neck

225 (6.3%) Chest

897 (25%) Abdomen and pelvic contents

346 (9.7%) Extremities and pelvic girdle

676 (18.9%) External

5292 (43.7%) Face

1136 (9.4%) Head and neck

594 (4.9%) Chest

750 (6.2%) Abdomen and pelvic contents

346 (2.9%) Extremities and pelvic girdle

3998 (33%) External

Among the 3583 individual diagnoses among the Major trauma patients, most (44.5%) had an AIS (Abbreviated Injury Score) severity of 2:

AIS severity diagnoses (n, %)

1	911 (25.4%)
2	1510 (42.1%)
3	778 (21.7%)
4	263 (7.3%)
5	116 (3.2%)
6	5 (0.1%)

A total of 134,810 individual diagnoses have been entered into the Te Manawa Taki Trauma Registry for Te Manawa Taki trauma patients admitted during 2012-2021.

This rich source of information provides an invaluable resource to support injury prevention research, inform quality improvement and, drive better patient outcomes.

Percentage values represent percentage for injuries/severity

Figure 22. Injuries recorded among Major and Non-major trauma patients admitted during 2021 in Te Manawa Taki Trauma Registry

1006 events with traumatic brain injuries (TBI)

Based on 112 select brain parenchyma AIS diagnosis codes

71.6% Male

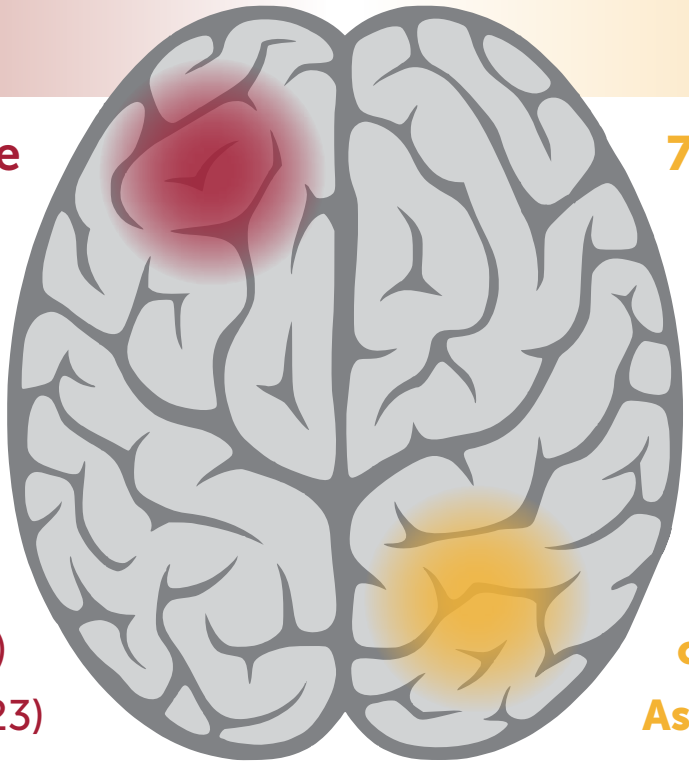
37.4% Māori

22.2% Children (0-14 years)

Top three causes: **Falls** (353), **Road traffic crash** (210), **Assault** (113)

282 patients with a brain injury diagnosis with AIS Severity*≥ 3

Major trauma injuries	**Non-major trauma injuries**
289 events (28.7%)	717 events (71.3%)
73.0% Male	**73.0%** Male
31.8% Māori	**31.8%** Māori
9.3% Child	**9.3%** Child
Top three causes:	Top three causes:
Falls (102)	**Falls** (251)
Road traffic crash (69)	**Road traffic crash** (141)
Assault (23)	**Assault** (90)
200 Events AIS Sev ≥ 3	**82** Events AIS Sev ≥ 3



119 (11.8%) had a GCS < 13 in ED (87 Major, 32 Non-major)

127 (12.6%) spent time in ICU (100 Major, 27 Non-major)

91 Non-Major trauma patients had a brain hematoma

58 Non-Major trauma patients had a brain hemorrhage

71% of TBI events admitted to Te Manawa Taki facilities during 2021 were Non-major trauma patients

41% of TBI patients with a serious brain parenchymal insult (AIS Severity score ≥ 3) were also Non-major trauma patients

*AIS Severity – patients selected where any individual brain injury diagnoses has AIS severity score 3+)

Figure 23. Injuries recorded among Major and Non-major trauma patients admitted during 2021 in Te Manawa Taki Trauma Registry

Brook's story

On 8 October 2021 I was working what I thought was just another ordinary day. I was called out into the yard to assess a job (a leak within a hydraulic system) when within minutes a very heavy, hydraulically controlled, mechanical linkage, pivoted over in free fall (due to a safety latch failure) and struck me in the head.

I don't recall anything; I was unconscious for a considerable amount of time but some quick thinking from a few of my staff had emergency services alerted and I was soon flown by the Greenlea Rescue Helicopter to Waikato Hospital for medical care.

I sustained multiple injuries which included a fractured skull, a severe brain injury, fractured and compressed vertebrae, multiple broken ribs, a broken scapula, and slither puncture to my lung. I was in Waikato Hospital's ICU for about four days and had surgery to stabilise my spine and repair my skull fracture.

I do not remember much from my stay but have flashback memories occasionally of staff and my room.

The early days were hard on my family as Hamilton was in COVID-19 alert level 4. This meant I was unable to have visitor's once I had entered ICU and my wife could only communicate with hospital staff via phone.

After two weeks in Waikato Hospital, I was flown by Life Flight to Wellington for rehabilitation at ABI. I spent four weeks to the day in ABI Wellington. Our family requested Wellington over Auckland as although further from home, my wife and dad had support from family and friends there. I was very lucky to have a family member visit for a few hours every single day in Wellington.

Three weeks into my ABI rehab stay, I ended up with an infection in my skull. This resulted in surgery to remove the infected bone that the surgeon in Waikato had worked so hard to save. Three days after this surgery I was discharged to head back home to Taupō rather than ABI. This was a surprise and such an amazing feeling.

Three months on, once the infection had well and truly cleared, I headed back to Waikato Hospital to have a titanium mesh placed over the area of missing skull. This was a quick overnight stay.

I often say my time in hospital was not hard for me as I was well looked after by all the amazing staff. I know my family did their best to keep everything as normal as possible at the time, especially for my two children aged 2 and 5. My business partner was also under pressure dealing with what had happened, the Worksafe investigation as well as ensuring our business was still under control.

I am currently in an ACC rehabilitation programme and have been told by specialists and my rehab therapists that I have come a long way, and that I am making a miraculous recovery. I am also back working 20 hours a week at the workshop and some admin from home.

I have not suffered bad headaches or pain in my skull since my accident which is surprising. I do still deal with pain in my back and shoulder daily as well as battle with fatigue and other brain injury related issues.

All in all, I consider myself extremely lucky and am thankful for all the amazing care I received, especially in those first critical hours and days.

Traumatic brain injuries

During 2021 there were 1006 events admitted to Te Manawa Taki facilities with a traumatic brain injury (TBI). This an increase of 90.2% from the 529 TBI events admitted during 2014. This upward trend has been present among both Major and Non-major trauma (figure 24). Of the 1006 TBI events admitted during 2021, 289 (28.7%) were Major trauma patients, and 717 (71.3%) were Non-major trauma patients. Among Major trauma patients, this is a 43.3% increase since 2012, and among Non-major trauma patients an increase of 96.4% since 2014.

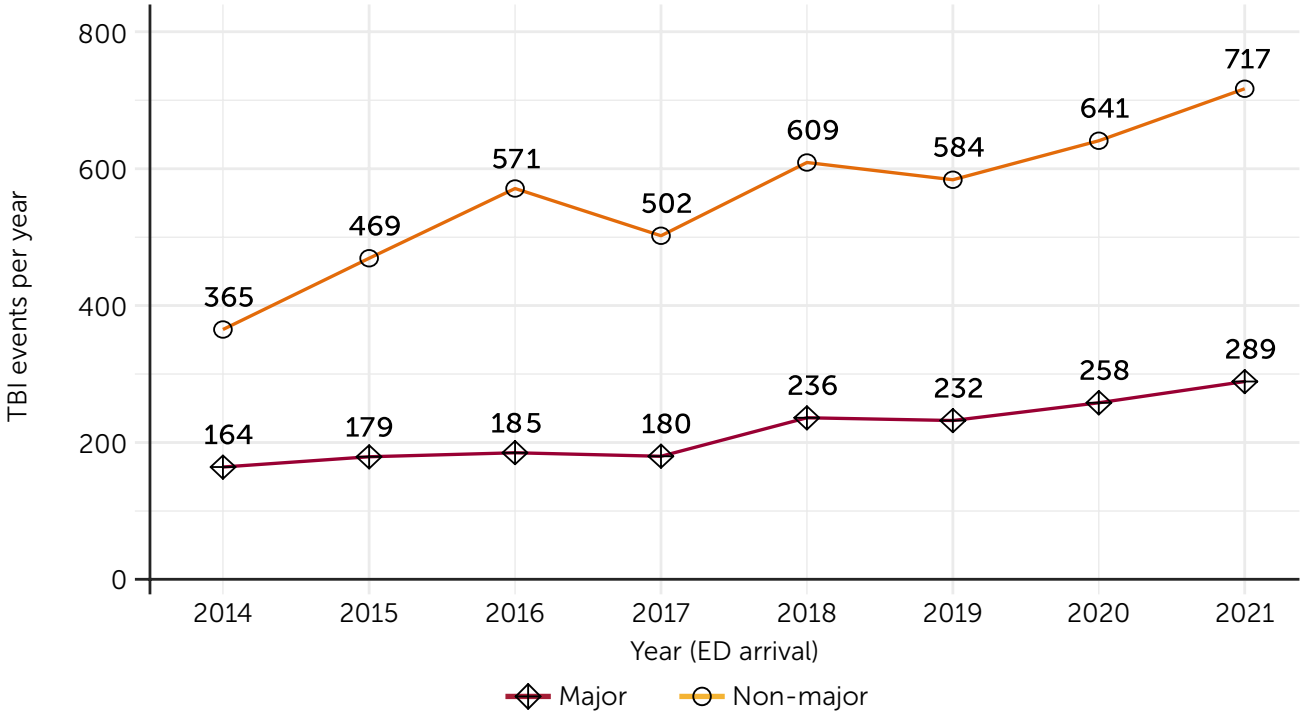


Figure 24. Te Manawa Taki region annual trauma admissions with a TBI (all AIS Severity scores), by overall severity

During 2021 there were 282 patients who had a traumatic brain injury with a TBI-specific diagnosis with AIS Severity score of 3 or more. Of these, 82 (41.0%) were Non-major trauma (ISS < 13) patients with a more serious TBI diagnosis also requiring additional care or support (figure 25). TBI (AIS Severity ≥ 3) admissions have increased by 61.3% during 2014 to 2021, and have increased by 70.8% among Non-major trauma patients.

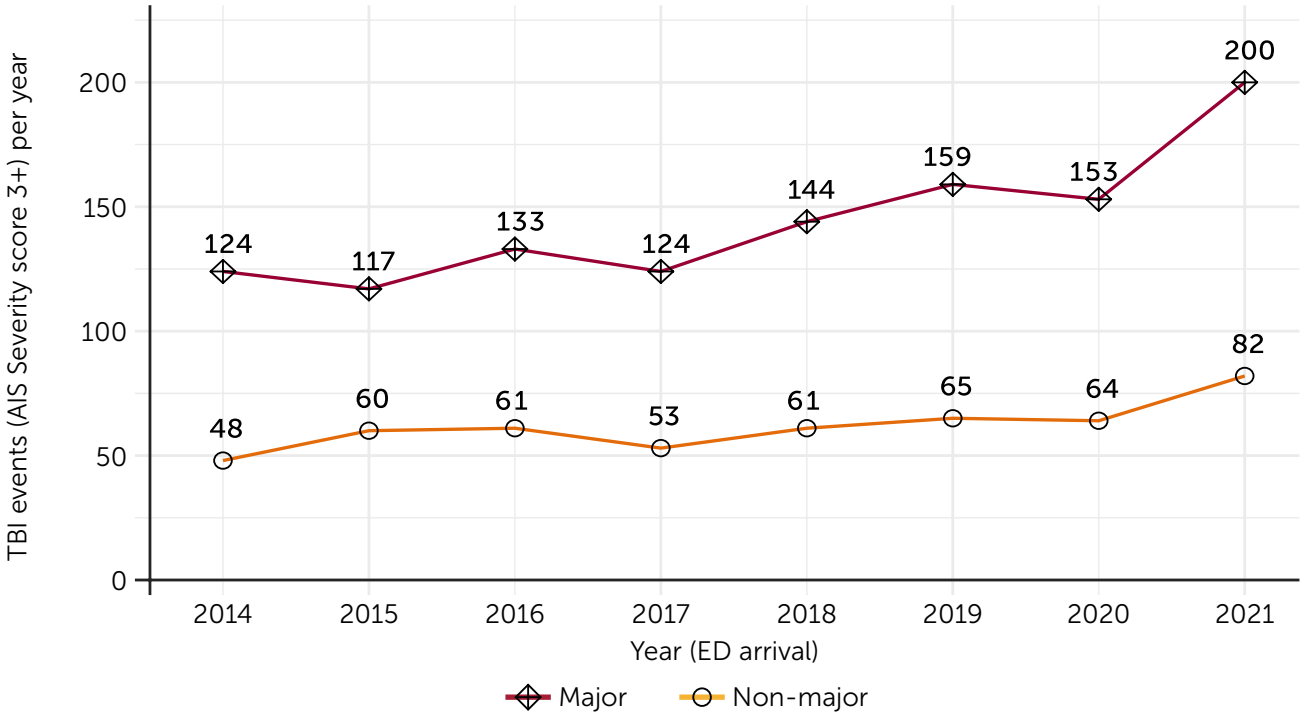


Figure 25. Te Manawa Taki region annual trauma admissions with a TBI where one or more TBI injuries were AIS Severity ≥ 3 by overall severity

A total of 38 TBI patients died. Of these, 26 Major trauma patients died due to central nervous system (CNS) injury, an additional 3 Non-major trauma patients with a TBI also died due to CNS injury.

Of the 968 who survived, 783 (80.9%) were discharged to home at the end of their Te Manawa Taki facility stay (table 3). An additional 82 were discharged to rehabilitation and a further 25 transferred to acute care facilities out-with the Te Manawa Taki region. Of the 82 TBI patients sent to rehabilitation, 30.5% (n = 25) were Non-major trauma patients, and of the 25 transferred to acute care facilities out-with the Te Manawa Taki region, 24.0% were Non-major trauma patients.

Discharged to	Major trauma	Non-major trauma	Total
Home	142 (18.1)	641 (81.9)	783 (100)
Rehabilitation	57 (69.5)	25 (30.5)	82 (100)
Hospital for convalescence	16 (61.5)	10 (38.5)	26 (100)
Acute care facility out-with Te Manawa Taki	19 (76.0)	6 (24.0)	25 (100)
Left against medical advice	11 (44.0)	14 (56.0)	25 (100)
Residential aged care facility not usual residence	5 (27.8)	13 (72.2)	18 (100)
Other	4 (80.0)	1 (20.0)	5 (100)
Special accommodation	1 (25.0)	3 (75.0)	4 (100)
Total	**255 (26.3)**	**713 (73.7)**	**968 (100)**

Table 3. Te Manawa Taki TBI patient final discharge destination (excludes 38 events who died), n Events (%)

Discharged to rehabilitation / acute care facility out-with Te Manawa Taki	Major trauma	Non-major trauma	Total
ABI Rehab Auckland	29 (80.6)	7 (19.4)	36 (100)
Starship Children's Hospital	9 (90.0)	1 (10.0)	10 (100)
ABI Rehab Wellington	6 (85.7)	1 (14.3)	7 (100)
Wellington Hospital	5 (83.3)	1 (16.7)	6 (100)
Middlemore Hospital	4 (80.0)	1 (20.0)	5 (100)
Auckland City Hospital	2 (66.7)	1 (33.3)	3 (100)
Wilson Centre	3 (100)	0 (0)	3 (100)
Christchurch Hospital	1 (100)	0 (0)	1 (100)
Palmerston North Hospital	1 (100)	0 (0)	1 (100)
Hawkes Bay Hospital	0 (0)	1 (100)	1 (100)
Total	**60 (82.2)**	**13 (17.8)**	**73 (100)**
Rehabilitation in Te Manawa Taki facilities	**Major trauma**	**Non-major trauma**	**Total**
Waikato Hospital	7 (38.9)	11 (61.1)	18 (100)
Tauranga Hospital	4 (75.0)	1 (25.0)	5 (100)
Hawera Hospital	1 (50.0)	1 (50.0)	2 (100)
Rotorua Hospital	1 (50.0)	1 (50.0)	2 (100)
Thames Hospital	0 (0)	2 (100)	2 (100)
Whakatane Hospital	1 (50.0)	1 (50.0)	2 (100)
Gisborne Hospital	1 (100)	0 (0)	1 (100)
Matariki Hospital	0 (0)	1 (100)	1 (100)
Taranaki Base Hospital	1 (100)	0 (0)	1 (100)
Total	**16 (47.0)**	**18 (53.0)**	**34 (100)**
Grand total	**76 (71.0)**	**31 (29.0)**	**107 (100)**

Table 4. Te Manawa Taki TBI patient final discharge destination where rehabilitation or other acute care facility out-with Te Manawa Taki region (excludes 38 events who died), n Events (%)

Outcomes

Mortality

During 2021, 81 trauma patients died while in Te Manawa Taki facilities, 65 trauma patients died as a result of their injuries, and a further 16 trauma patients died of medical causes. Of the 65 non-medical deaths, 40 were Major trauma (ISS > 12) and 25 Non-major trauma (ISS < 13) patients.

The most common cause of death among both Major and Non-major trauma patients was due to CNS injury. 39 patients died due to CNS injury (60% of deaths due to non-medical causes) while 11 patients died due to hemorrhage (figure 26). Among Major trauma patients, 65% (26/40 non-medical deaths) of patients died due to CNS injury, and 22.5% (9/40 non-medical deaths) died due to hemorrhage.

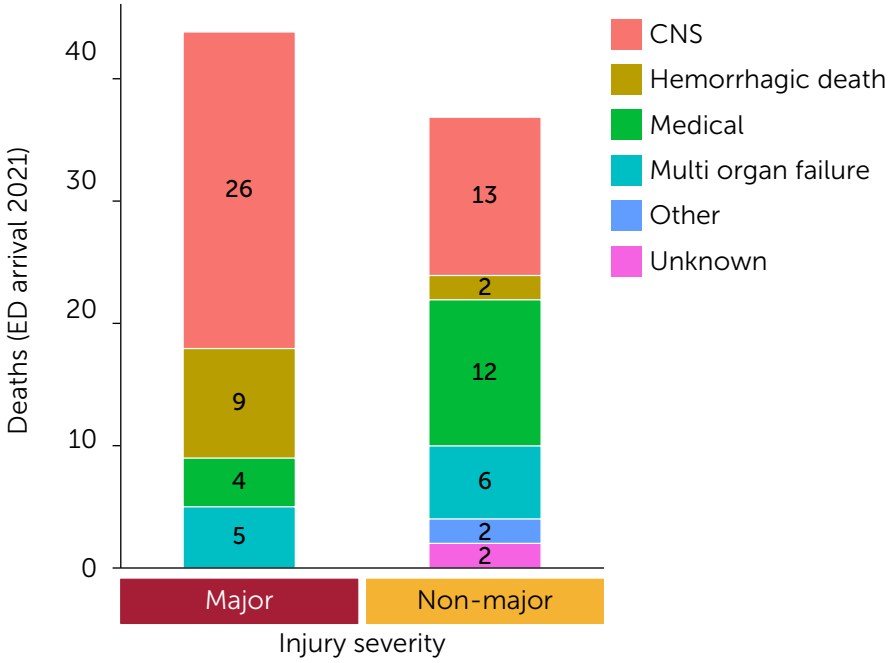


Figure 26. Cause of death among trauma patients while in Te Manawa Taki facilities (CNS – Central Nervous System injury)

Case Fatality Rate (CFR)

The case fatality rate (CFR) is the percentage of patients admitted due to trauma who died as a result of their injuries. While the CFR for all Major (ISS > 12) trauma patients who died of non-medical causes increased from 6.0% during 2020 to 7.2% during 2021, this remains well below the international best practice benchmark of 10% (figure 26).

	Major and non-major	Major trauma	Non-major trauma
Events (n)	6427	519	5908
Non-medical death (n)	65	40	25
CFR (%)	10.1%	7.16%	0.42%
Medical deaths (n)	16	4	12

Table 5. Case fatality rate 2021 by severity (excludes deaths due to medical causes)

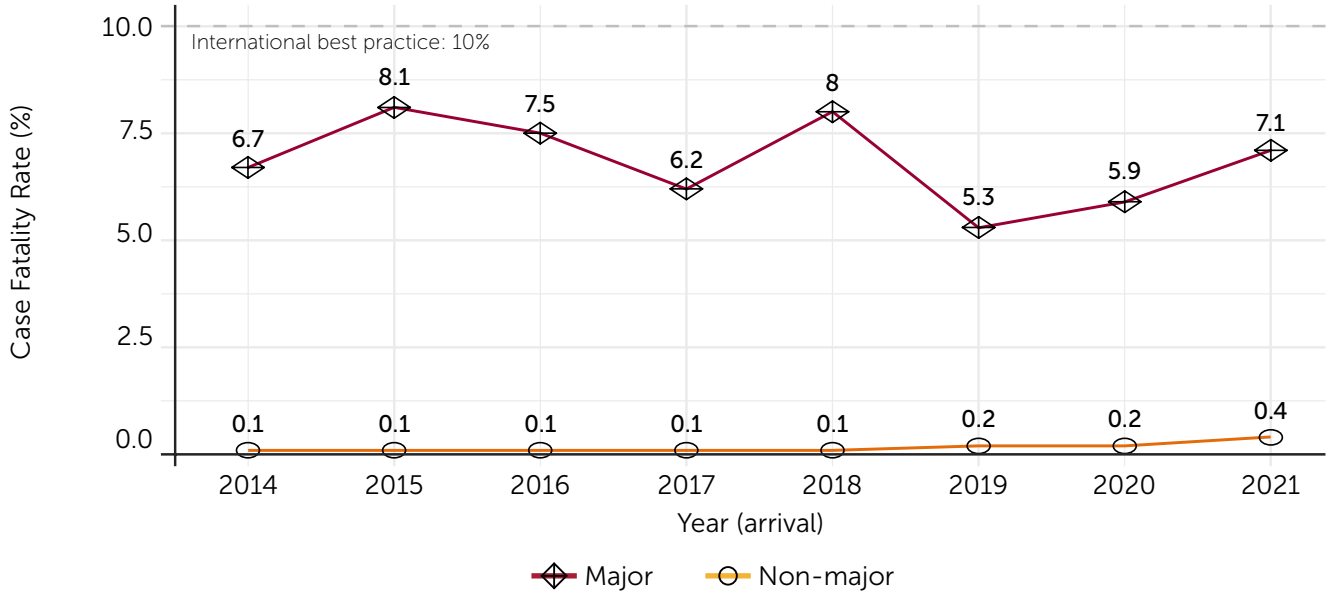


Figure 27. Annual case fatality rate (CFR, %) by severity (excludes medical deaths)

Among Major trauma patients who died, elderly 65+ years, those with a burn injury, and those injured due to intentional self-harm, and pedestrians, have high case fatality rates (table 6).

		Died	Survived	Total	CFR %
Total (non-medical)		40	519	559	7.1
Gender	Female	15	138	153	9.8
	Male	25	381	406	6.2
Ethnicity	Māori	11	165	176	6.2
	Non-Māori	29	354	383	7.6
Lifestage (years)	0-14	3	35	38	7.9
	15-64	10	353	363	2.8
	65+	27	131	158	17.0
Primary injury type	Blunt	37	498	535	6.9
	Penetrating	2	17	19	10.5
	Burn	1	4	5	20.0
Cause of injury	Fall	24	135	159	15.1
	Road traffic crash	7	135	142	4.9
	Assault	2	40	42	4.8
	Intentional self-harm	2	6	8	25.0
	Motorcycle	1	71	72	1.4
	Pedal cycle	1	43	44	2.3
	Other transport related	1	10	11	0.9
	Smoke/heat source	1	2	3	33.3
	Struck by/against object	1	9	10	10.0

Table 6. CFR among major trauma (ISS > 12) patients by demography and cause of injury (excludes 4 medical deaths, excludes any deaths following transfer out of region) 2021

During 2021, 89% of all trauma patients, and 63% of Major trauma patients, admitted to Te Manawa Taki facilities were discharged home at the end of their stay (table 7).

Te Manawa Taki final discharge disposition	Major trauma events (col %)	Non-major trauma events (col %)	Total events (col %)
Home	326 (62.8)	5370 (90.9)	5696 (88.6)
Rehabilitation	85 (16.3)	160 (2.7)	245 (3.8)
Hospital for convalescence	35 (6.7)	121 (2.0)	156 (2.4)
Residential aged care*	5 (<1)	102 (1.7)	107 (1.7)
Other**	13 (2.5)	27 (<1)	40 (<1)
Left against medical advice	15 (2.9)	81 (1.4)	96 (1.5)
Other acute care facility	38 (7.3)	33 (<1)	71 (1.1)
Special accommodation	2 (<1)	12 (<1)	14 (<1)
International medical facility	0	2 (<1)	2 (<1)
Total	519 (100)	5908 (100)	6427 (100)

Table 7. Final discharge disposition (where survived – 6508 Events – 81 died = 6427) patients admitted 2021

*Not normally resident, **Includes prison

Cost of trauma

The annual total cost of trauma admissions across Te Manawa Taki DHBs continues to climb (figure 28). During 2021, the cost of trauma admissions is estimated to have been NZ$76.4 million, an increase of 2.5% (NZ$1.88M) on the previous year.

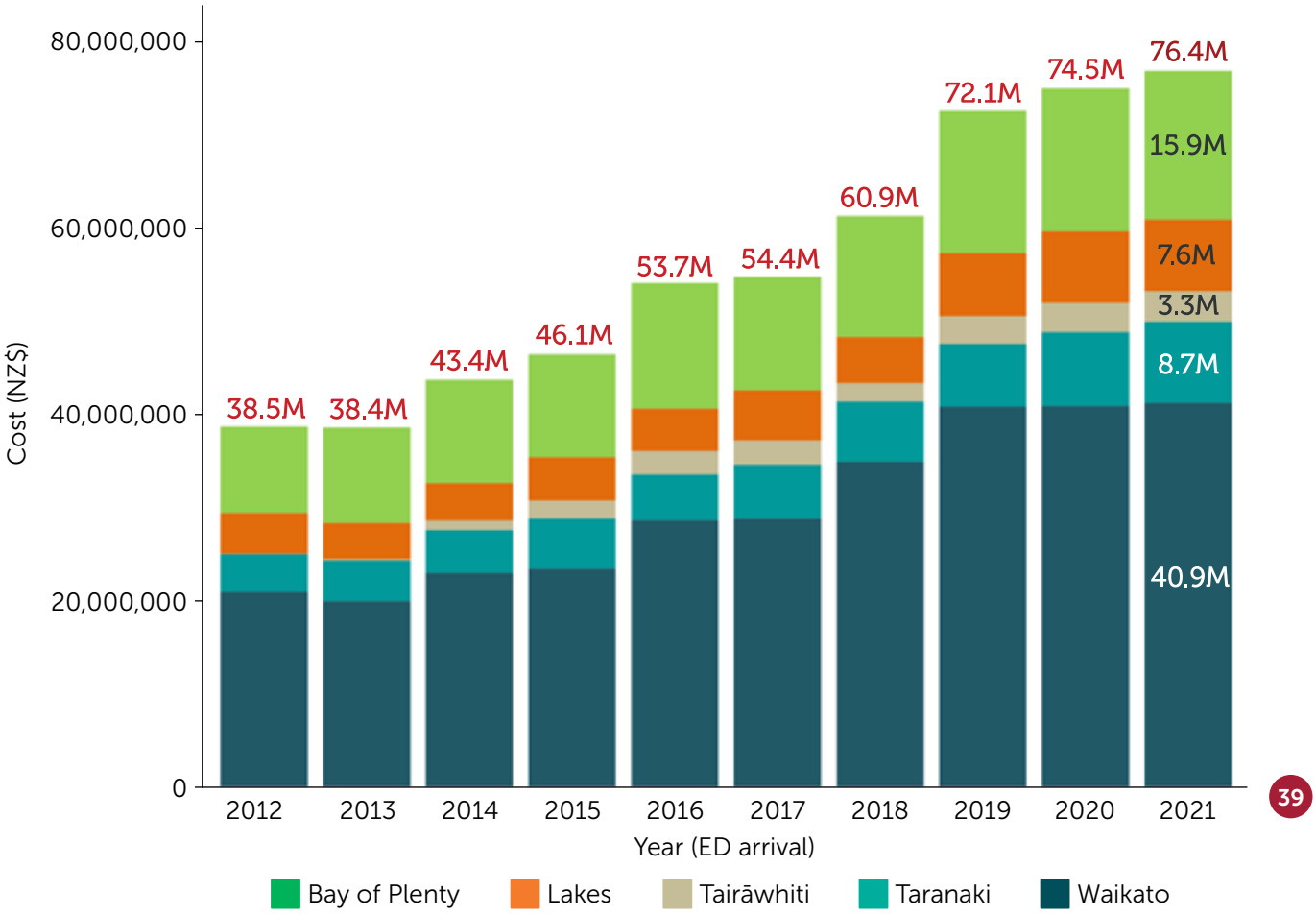


Figure 28. Annual cost of inpatient costs of trauma by DHB (cost values based on ~95% admissions costed)

During 2021, 40.9% (NZ$31.3M) of total in-hospital trauma costs were attributable to falls related injuries, followed by road traffic crashes 15.3% (NZ$11.7M). Among Major trauma admissions, road traffic crashes accounted for NZ$7.0 million (9.1% of total cost), while among Non-major trauma, admissions due to falls cost NZ$27.9 million alone during 2021.

During 2021, approximately $NZ17.2 (22.5%) of the total cost of trauma care accompanied Major trauma admissions, and NZ$59.2 million (77.5%) accompanied Non-major trauma admissions (figure 29).

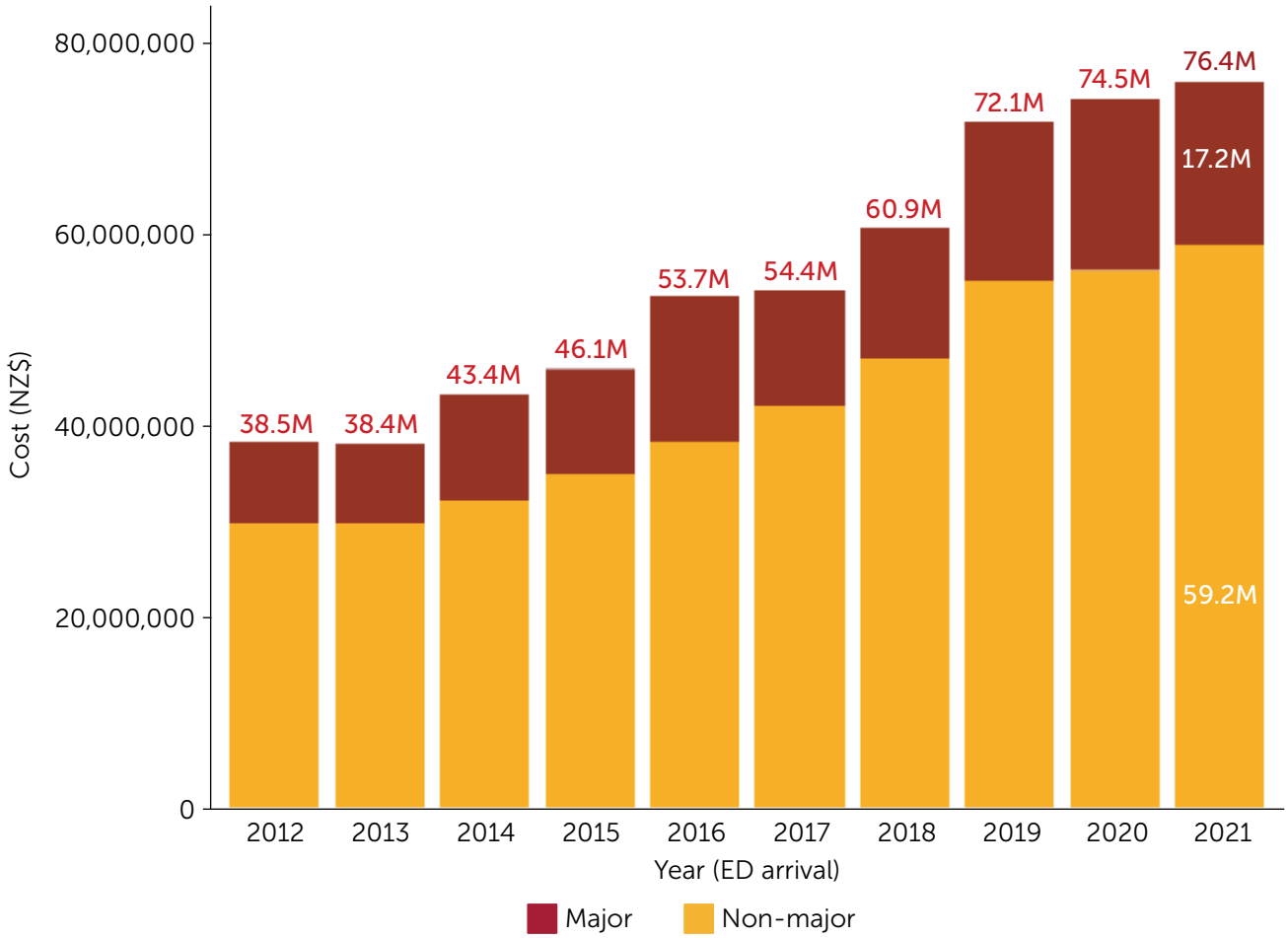


Figure 29. Annual cost of inpatient costs of trauma by severity (cost values based on ~95% admissions costed)

For Major trauma admissions, there was a decrease in costs of 4.4% (NZ$0.78M) over the previous year, while for Non-major trauma admissions, there was an increase of 4.7% (NZ$2.66M). The median in-patient facility costs while in Te Manawa Taki facilities was $16,682 for Major trauma patients and $7,005 for Non-major trauma patients.

The cost due to fall related trauma admissions (all ISS) was NZ$31.30M, followed by road traffic crash trauma (all ISS) costing NZ$11.67M and motorcycle related trauma costing NZ$6.7M. Among Major trauma admissions, road traffic crash patient admissions cost NZ$7.05M, followed by falls at NZ$3.36M, and motorcycle related trauma cost NZ$2.55M.

Key achievements

Strategic Briefing Document

In light of the Health New Zealand, Māori Health Authority governance changes, Te Manawa Taki Trauma System developed overview document in anticipation of potential governance changes. This document provided insight to governance partners regarding our structure and function, challenges, and achievements.

Strategic Plan

This was restructured in partnership with Ngā Toka Hauora Māori (Māori General Managers for Te Manawa Taki) in alignment with national and regional prioirities on improving equity and quality. This plan forms the basis of the Te Manawa Taki Trauma System workplans and is reviewed regulalry as our partnerships grow.

Guideline revision

After extensive consulation, the 2021 guidelines were completed and disseminated regionally. They are consistent with National programmes on haemorrhage, traumatic brain injury, spinal injury, and pre-hospital destination policy. These are available as mobile apps and updated as new information and best practice evidence evolve.

Trauma team training

To optimise care and outcomes for trauma Work on maturing clinical audit and quality improvement infrastructure and activities. Including M&M, MDT meetings, mortality audits, performance evaluation, regional process inter-hospital and pre-hospital process evaluation case reviews with loop closure, and the national clinical audit.

Regional clinical case review series

In addition to the review of actual trauma cases throughout our region, we have introduced a series of educational cases for discussion on decision making, destination policy, and clinical care. These reviews have been open and well attended by trauma-treating groups across the region.

Further development of TQIP

Te Manawa Taki Trauma System continues to strengthen service delivery and support consistency in trauma management; notably the establishment of trauma services, the regional guidelines, pre hospital and inter-hospital transfer matrices. In 2020, a programme of regional case reviews was commenced designed to stimulate discussion, test our responses to challenging patients and reveal opportunities for improvement. These are anonymised, interactive regional case discussions inclusive of all phases of care including prehospital, admission and inter-facility transfer and have been well attended by clinicians directly involved in trauma care including external agencies such as St John and FENZ.

Snapshots

These are detailed reviews of specific issues related to trauma in our region that are condensed into infographics for wide dissemination. They are designed to stimulate interest and promote action on problems affecting our communities.

National Road Safety Emergency Response and Healthcare Award

This recognised the ongoing work of the regional team to improve the care of people injured through road traffic crashes.

Cyber attack impacts and network resilience

The attack on Waikato DHB had reverberations around Te Manawa Taki region particularly regarding transfer of seriously injured patients. The Te Manawa Taki destination policy was updated and disseminated within hours of the cyber attack, keeping patients safe and services informed.

The cyber attack also rendered the registry temporarily out of action. This caused a backlog of data work in each region, which was promptly cleared with regional collaboration.

Future focus areas

- Regional equity assessments
- Locality and/or facility reporting
- Regional registry procurement
- Health system change integration
- Equitable resourcing for trauma teams
- Establish appropriate funding for trauma services
- Continue to capture and improve patient and whānau experience

Research

BIONIC2 Study – Trial of clinical safety net

The Waikato Trauma Service has trialled the provision of a clinically focused patient safety net for a sub-set of trauma patients who met the criteria for an Health Research Council funded project on TBI. The trial revealed significant unmet need in a group of TBI patients following discharge and showed the viability of applying a clinical safety net to vulnerable patients involved in research.

PATCH Trial – Pre-hospital Anti-fibrinolytics for Traumatic Coagulpathy and Haemorrhage Study

Waikato Hospital completed its recruitment and participation in the international mulitcentred PATCH trial, commenced in 2017 to determine the effect of early administration of transexamic acid on mortality and recovery at six months on severely injured patients. This trial was a cpollaborstion between services which included pre-hospital, emergency department, Intensive care and the trauma department. The trial has now closed and the results are due for publication in 2023.

A huge thanks to Katy Cryer for coordinating the trial on site.

Review of data collection processes

AWe analysed the time and resources required to collect, enter and manage trauma registry data. The insights gained have helped us to understand the skills and resources required to do this efficitnely. Although it was clear that administrative data could be collected efficiently, the study also underscored the value of clinical contact with patients with all severities. This information will be used to determine equitable workforce resouring across the region.

Published articles

Articles involving Te Manawa Taki-Midland Trauma System

2021

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4. Bentley M, Singhal P, Christey G. **Characteristics of patients hospitalised with traumatic brain injury in health region of New Zealand, 2012-2019.** NZMJ (5318) June 2021.
5. Christey G, Amey J, Singh N, Denize B, Campbell A. **Admission to hospital for injury during COVID-19 alert level restriction.** N Z Med J. 2021 Mar 26;134(1531):50-58. PMID: 33767476.

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6. Cameron PA, Fitzgerald MC, Curtis K, et al. **Over view of major traumatic injury in Australia – Implications for trauma system design.** Injury 2020; 51: 114-121. DOI: 10.1016/j.injury.2019.09.036.
7. Christey G, Amey J, Campbell A and Smith A. **Variation in volumes and characteristics of trauma patients admitted to a level one trauma centre during national level 4 lockdown for COVID-19 in New Zealand.** NZMJ 2020; 133(1513):81-88.
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9. Curtis K, Gabbe B, Vallmuur K, et al. **Challenges to trauma care delivery for Australian and New Zealand trauma clinicians.** Injury 2020; 51: 1183-1188.
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13. Amey J and Christey G. **Farm injury resulting in hospital admission: A review of farm work and non-farm work related injury.** J PRIM HEALTH CARE 2019; 11: 342-350. DOI: 10.1071/HC19049.
14. Beaton A, O'Leary K, Thorburn J, Campbell A and Christey G. **Improving patient experience and outcomes following serious injury.** NZMJ 2019; 132(1494):15-25.
15. Singh N, Joe N, Amey J, Smith, A and Christey, G. **Cycling-related injuries and cycling promotion: A trauma service perspective.** NZMJ 2019; 132 (1494):41-48.

2018

16. Jones AR, Smith A and Christey G. **Equine-related injuries requiring hospitalisation in the Midland Region of New Zealand: A continuous five-year review.** NZMJ 2018; 131:50-58.
17. Scott N, Clark H, Kool B, Ameratunga S, Christey, G and Cormack D. **Audit of ethnicity data in the Waikato Hospital Patient Management System and Trauma Registry: Pilot of the Hospital Ethnicity Data Audit Toolkit.** NZMJ 2018; 131(1483): 21-29.
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