



## ORIGINAL RESEARCH

## Examining emergency department inequities: Do they exist?

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## Abstract

**Objectives:** Ethnic inequities in health outcomes have been well documented with Indigenous peoples experiencing a high level of healthcare need, yet low access to, and through, high-quality healthcare services. Despite Māori having a high ED use, few studies have explored the potential for ethnic inequities in emergency care within New Zealand (NZ). Healthcare delivery within an ED context is characterised by time-pressured, relatively brief, complex and demanding environments. When clinical decision-making occurs in this context, provider prejudice, stereotyping and bias are more likely. The examining emergency department inequities (EEDI) research project aims to investigate whether clinically important ethnic inequities between Māori and non-Māori exist.

**Methods:** EEDI is a retrospective observational study examining ED admissions in NZ between 2006 and 2012 (5 976 126 ED events). EEDI has been designed from a Kaupapa Māori Research position.

**Results:** The primary data source is the existing Shorter Stays in Emergency Department National

Research Project (SSED) dataset that will be combined with clinical information extracted from NZ's National Minimum Dataset. The key predictor variable is patient ethnicity with other covariates including: sex, age-group, area deprivation, mode of presentation, referral method, Australasian Triage Scale and the Multimorbidity Measure (M3 Index) for co-morbidities. Generalised linear regression models will be used to investigate the associations between pre-admission variables and the measures of ED care, and to examine the contribution of each measure of ED care on ethnic inequities in mortality.

**Conclusion:** The present study will provide the largest, most comprehensive investigation of ED outcomes by ethnicity to date in NZ.

**Key words:** *access, emergency department, ethnic inequity, healthcare delivery, indigenous, mortality.*

## Introduction

Ethnic inequities in health outcomes are well documented internationally<sup>1</sup> and in Aotearoa New Zealand (NZ).<sup>2</sup> In NZ, Māori receive less

## Key findings

- Despite Māori having a high ED use, few studies have explored the potential for ethnic inequities in emergency care within NZ.
- This study is designed from a Kaupapa Māori Research position to examine whether ethnic inequities exist within ED care in NZ between 2006 and 2012 (5 976 126 ED events).
- This study will provide the largest, most comprehensive investigation of ED outcomes by ethnicity to date in NZ.

access to, and through, high-quality healthcare despite higher health need compared to non-Māori.<sup>3</sup> This suggests inequities in health service delivery, where inequities are defined as 'differences which are unnecessary and avoidable, but in addition are considered unfair and unjust'<sup>4</sup> (Whitehead, p. 431).

Internationally, inequities within ED care have been highlighted. Challenges reflect whole of hospital performance (e.g. overcrowding) and poorer outcomes for patients including increased mortality.<sup>5</sup> International studies identify ethnic inequities within children's ED wait times,<sup>6</sup> differential pain management by ethnicity<sup>7</sup> and Indigenous patients being more likely to leave ED before being seen.<sup>8</sup> In general, 'ethnic minority' and Indigenous patients receive less evaluation and treatment

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for acute conditions and experience longer wait times within emergency care.<sup>9</sup>

Despite an increasing, high rate of ED use for Māori, only a few NZ studies have investigated for emergency care inequities.<sup>10</sup> Prisk *et al.* undertook a retrospective cohort study within one provincial NZ ED investigating the drivers of ED length of stay (LOS) as an important measure of healthcare quality.<sup>10</sup> They found that Māori were less likely to receive bloodwork or radiographs, go to observation areas, have a general practitioner (GP) and more likely to be discharged or to self-discharge from ED compared with European patients.<sup>9</sup> Patient demographics had a small impact on ED LOS, while clinical, temporal and workload variables had much greater influence. They acknowledge the need for further studies to be undertaken that can investigate the potential role of co-morbidities and for a multicentre review to include similar-sized EDs within a NZ context.<sup>9</sup>

Examining whether ethnic inequities exist within NZ EDs aligns with the growing evidence that provider bias contributes to health inequities.<sup>1,11</sup> The ED context is characterised by healthcare delivery to a diverse population of patients within time-pressured, relatively brief, complex and demanding environments.<sup>12</sup> This context may foster prejudice (i.e. 'a general negative evaluation or orientation to a group or a member of a group') and stereotyping (i.e. 'the association or attribution of specific characteristics to a group and its members')<sup>13</sup> (Dovidio *et al.*, p. 479). Dovidio *et al.* note that both prejudice and stereotyping can lead to discrimination or bias representing 'unfair or unjustified group-based difference in behaviour that systematically disadvantages members of another group'<sup>13</sup> (Dovidio *et al.*, p. 480). Inequitable treatment decisions include differential: timing and intensity of ED therapy; patterns of referral; prescription choices; and priority for

hospital admission and bed assignment.<sup>12</sup>

van Ryn and Saha (p. 995) describe the 'paradox of well-intentioned physicians providing inequitable care' as being rooted in systems of human cognition associated with explicit and implicit beliefs and attitudes.<sup>14</sup> They note that implicit bias is not entirely under conscious control and can worsen in contexts of cognitive fatigue (common to ED contexts). Implicit bias may affect the clinical encounter via unconscious verbal and non-verbal behaviours (i.e. blinking, eye contact and friendliness), which in turn can reduce effective communication and patient satisfaction leading to differential clinical outcomes.<sup>15</sup> NZ evidence of clinician stereotyping has been reported within general practice,<sup>16</sup> psychiatry<sup>17</sup> and self-reported higher rates of unfair treatment by a health professional for Māori compared to Europeans.<sup>18</sup>

This article presents the study protocol for the examining emergency department inequities (EEDI) research project funded by the Health Research Council of New Zealand (HRC) to investigate whether clinically important ethnic inequities between Māori and non-Māori exist within EDs across NZ.

## Study design/methods

EEDI is a retrospective observational study using secondary data examining ED admissions in NZ between 2006–2012.

## Study hypotheses

The present study hypothesises that:

1. There are inequities in ED practice and outcomes between Māori and non-Māori within NZ.
2. Any inequities between Māori and non-Māori are unlikely to be fully explained by pre-admission/patient demographic variables.
3. Any inequities in ED markers of care between Māori and non-Māori are likely to contribute to differences in clinically important outcomes including mortality.

## Study aims and objectives

The aim of the present study is to investigate whether clinically important ethnic inequities between Māori and non-Māori exist within EDs across NZ.

Research objectives investigate ED inequities within:

1. Patient-centred markers of care (e.g. whether patients waited to be seen by a physician, the time from presentation to ED and assessment by an ED physician, readmission or re-presentation post-ED visit).
2. System-centred markers of care (e.g. LOS in the ED, admission to hospital and indicators of access block as a marker of overcrowding).
3. Mortality (e.g. within ED or within 10 days of ED assessment, 30 days post discharge).

## Kaupapa Māori Research positioning

The present study incorporates a Kaupapa Māori Research (KMR) position.<sup>19</sup> KMR places Māori at the centre of enquiry in order to make a positive difference to Māori communities.<sup>20</sup>

The EEDI project reflects KMR positioning via: Māori-led research expertise that maintains Māori control of the research process; investigation of Māori areas of health with potential to transform Māori health gain; Māori : non-Māori comparison consistent with the Indigenous rights of Māori; maximisation of statistical power to quantitatively examine Māori : non-Māori inequities; a conceptual framework that incorporates a structural determinants approach to critique issues of power, racism and privilege.<sup>21</sup> In addition, EEDI is housed within a Māori research unit committed to developing a highly skilled Māori health research workforce.

The research team will act in accordance with the Tōmaiora (Māori Health Research Unit) protocols,<sup>20</sup> Te Ara Tika Guidelines for Māori research ethics,<sup>22</sup> HRC guidelines for Māori research<sup>23</sup> and recommendations on how research should include a responsiveness to

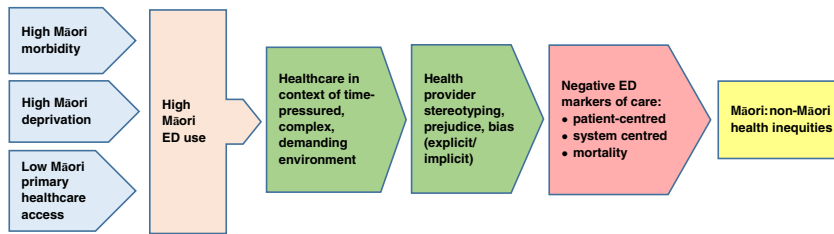


Figure 1. Examining ED inequities conceptual framework.

Māori approach to improve Māori health and eliminate health inequities.<sup>24</sup>

### Ethical approval

Ethical approval was obtained from the NZ Health and Disability Ethics Committee (HDEC 17/NTB/185).

### Conceptual framework

Figure 1 presents the basic conceptual framework for EEDI that highlights high Māori ED use and the complex ED environment as precursors for potential provider bias leading to ethnic inequities in ED outcomes.

### Data sources

#### The SSED dataset

The primary EEDI data source is the existing Shorter Stays in Emergency Department National Research Project (SSED) that investigated the effect of the 6 h time target policy introduced into NZ EDs in 2009.<sup>25</sup> Although the study period does not extend beyond 2012, the SSED data provides the most comprehensive and robust ED administrative database available within NZ.

A total of 18 (out of 20) District Health Boards (DHBs) were included in the SSED dataset (two DHBs were not included in the SSED project because of Information Technology [IT] restrictions). The SSED dataset was compiled in two stages: (1) all ED visits and non-emergency (elective) hospital presentations during 2006–2012 were identified from the National Minimum Dataset (NMDS), the national collection of public and private hospital discharge and clinical coded information held by the NZ Health Information Service at the Ministry of Health (MoH)<sup>26</sup> with data from 35 hospitals

excluded because they did not have an ED; and (2) the visit date, patient demographic data and date of death (if applicable) extracted from the NMDS and linked via unique patient identifiers (NHI number) to the databases held by DHBs to extract holding times for the patient journey (presentation, triage, assessment, admission and discharge times) in each hospital for each event. The observations within the SSED dataset represent individual events rather than individual people consisting of 1 120 673 Māori events and 4 604 395 non-Māori events (Fig. 2). The SSED project leadership team approved the use of SSED data for the EEDI study.

#### The MoH NMDS

The SSED dataset does not contain clinical information (e.g. diagnoses or procedures undertaken during the

admission) for any ED events. However, clinical information is important for the identification of co-morbidities (which may act as confounders in EEDI models) and for a closer examination of specific conditions (e.g. long bone fractures or analgesia use). Therefore, the EEDI dataset will include time-based data from SSED and clinical information extracted from NMDS. The MoH defines an ED admission as events with an assessment and/or treatment of 3 h or more duration.<sup>27</sup> Given this, each event will be categorised into two major groupings: presentations <3 h or presentations ≥3 h (Fig. 2). We expect that there will be limited capacity to link MoH data to the <3 h presentation sub-group because of coding variations associated with the different timeframes (however, some presentations <3 h may be coded by some DHBs).

### Outcome variables

Key outcome variables include patient-centred markers of care, system-centred markers of care, and mortality (Table 1).

### Predictor variables

The key predictor variable is *patient ethnicity* classified as Māori, Pacific,

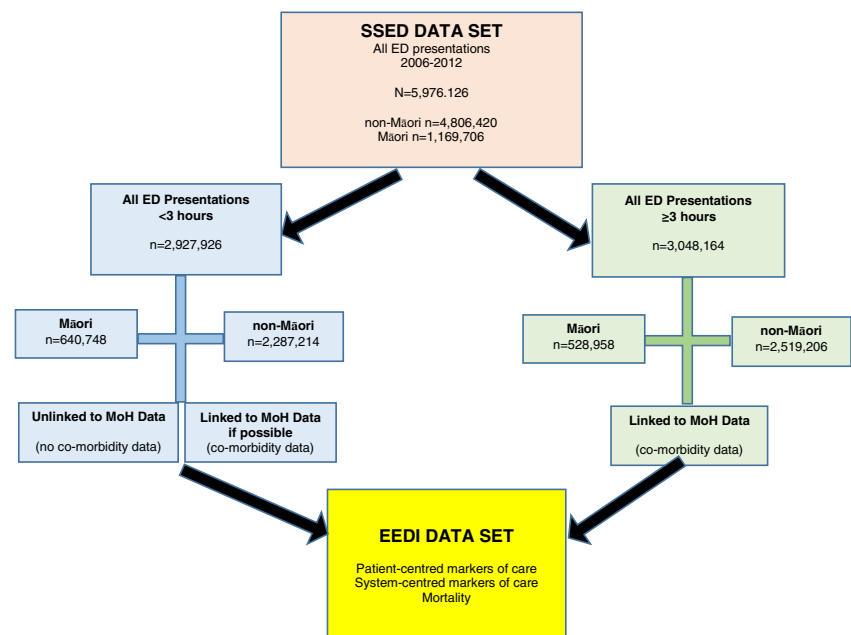


Figure 2. Examining ED inequities dataset.

**TABLE 1.** Examining ED inequities outcome variables

Focus area	Outcome variable	Definition
Patient-centred markers of care	Did not wait	The proportion of patients who left prior to completion of their assessment in the ED
	Time to assessment	The interval between ED presentation and first assessment by a treating clinician (doctor or nurse practitioner)
	Readmission	The proportion of patients who were admitted to any hospital within 30 days of discharge from a hospital ward
System-centred markers of care	Re-presentation	The proportion of patients who presented to any ED within 48 h of discharge from either an ED or a hospital ward, excluding arranged inter-hospital transfers
	ED LOS	The interval between ED presentation time and ED departure time
	Admission to hospital	The proportion of patients who were admitted to an inpatient ward
	Access block	The proportion of patients who require hospital admission to an in-patient ward from the ED who have a total ED LOS >8 h. Provides a measure of ED crowding <sup>5</sup>
Mortality	ED patients	The proportion of patients that died either in the ED or within 10 days of ED discharge
	Admitted patients	The proportion of patients that died on the ward or within 30 days of ward discharge

LOS, length of stay.

Asian, Other and European, according to MoH guidelines for prioritised ethnicity.<sup>28</sup> EEDI will primarily explore inequities between Māori and non-Māori (Pacific, Asian, Other and European combined). Until recently, hospitalisation statistics have been shown to undercount Māori.<sup>29,30</sup> However, current analysis suggests that there is no longer an undercount of Māori within public hospital event records.<sup>2</sup> This will be explored as the project progresses.

Other important covariates and confounders include: *sex* (male, female), *age-group* (years), *area deprivation* (NZ Deprivation Index 2006 in quintiles from 1 = least deprived to 5 = most deprived),<sup>31</sup> *Mode of Presentation* (ambulance, self, other, unknown), *Referral method* (self, health provider, unknown) and *Australasian Triage Scale* (1 = immediately life-threatening to 5 = less urgent, or dealing with administrative issues only, unknown).<sup>32</sup>

The recently developed Multimorbidity Measure (M3 Index) will control for co-morbidities on ED outcomes.<sup>33</sup> A strength of the M3 Index includes validation for use in NZ using national health registries including the NMDS and findings that the M3 Index performed better than either the Charlson or Elixhauser indices in predicting 1 year mortality risk.<sup>33</sup> This will be explored as the project progresses.

### Data linkage

The EEDI project team will provide the MoH with a list of unique National Health Index (NHI) numbers for each event in the EEDI dataset and request extraction of associated patient demographics (e.g. ethnicity, date of birth, NZ Deprivation 06 Index) and diagnostic coding (The International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification, ICD-10-AM). The diagnostic codes will be used by the EEDI project team to create the M3 Index for use in the present study.

### Data management and governance

The EEDI project aligns to the SSED project Policy Statement and Code of Practice for Investigators to keep any collected data in strict confidence, to use data only for the purposes specified by the EEDI project and to not distribute, disclose or reveal individual or group identifiable data to any outside party. De-identified EEDI data will be available from the corresponding author on reasonable request. All data and documentation will be stored in a secure environment protected from access by any unauthorised person(s) and ethical guidelines will be followed for data usage.

An EEDI Project Advisory Group will meet quarterly to ensure research rigour, quality and consistency with emergency medicine and Māori health sector's expectations. Membership includes representatives of the Australasian College for Emergency Medicine, College of

Emergency Medicine Nurses, New Zealand Emergency Medicine Network members, MoH expertise and Emergency Medicine clinical specialists.

## Data analysis

The KMR positioning of EEDI necessitates analytic approaches that will produce useful outcomes for Māori. The first phase of analysis will summarise patient demographics and clinical outcomes by year for Māori and non-Māori. Continuous variables will be presented as numbers of observed and missing values, mean, standard deviation, median and interquartile range as appropriate. Categorical variables will be presented as frequencies and percentages. Incidence rates will be calculated on mortality. Statistical tests appropriate to the distribution of variables will be used to first identify their univariate associations with the ethnic grouping between Māori and non-Māori ED patients. The analysis of variance or Kruskal–Wallis test will be used on continuous variables, and the  $\chi^2$ -test or Fisher's exact test will be used on categorical variables.

The second phase of analysis will use generalised linear regression models to investigate the associations between pre-admission variables and the measures of ED care, and to examine the contribution of each measure of ED care on ethnic inequities in mortality. The construction of the multivariable models and selection of confounders will be based on the EEDI conceptual framework and team expert knowledge of ethnic inequity causation. Ethnic-specific estimates on each outcome will be presented as the mean difference for continuous variables, and relative risk or odds ratio for categorical variables, with associated 95% confidence intervals and *P*-values. All statistical tests will be two-sided at the significance level of *P* = 0.05.

Results will be compared between 2006 and 2012 to explore the change over time. All individual patients' data will be maintained in confidence and stored securely in The University of Auckland IT

database. Data linkage and analysis will be conducted using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).

A full statistical analysis plan will be developed at the start of the study and reviewed by the research team on creation of the EEDI database.

## Dissemination

Dissemination plans include consultation with the EEDI Advisory Group and other stakeholders, conference presentations and expected journal publications. At least four project-led research seminars will be convened across NZ to share the findings with key stakeholders. A demand from key stakeholders for both national and DHB-specific or regional outcomes is expected. Therefore, we will produce easy to interpret, key findings at a glance, snapshot datasheets that will be available via web-based access points to ensure that findings are accessible and appropriate for non-clinical stakeholders, time-poor clinicians, Māori communities and health service policy and delivery planners.

## Discussion

The present study will provide the largest, most comprehensive investigation of ED outcomes by ethnicity to date in NZ. As noted earlier, the time period of the EEDI study reflects the original SSED data collection period (2006–2012). Although more recent data would be ideal, the SSED dataset provides the most robust administrative dataset of ED variables available nationally. In addition, it is unlikely that there have been major shifts in our hypothesised drivers of Māori : non-Māori ED inequities since the completion of the SSED study (i.e. health provider stereotyping, prejudice and bias). Given this context, we believe that our findings will present the most comprehensive analysis currently possible and are likely to maintain relevance to the emergency medicine sector.

The present study will determine the extent, if at all, emergency medicine plays in Māori : non-Māori

healthcare inequities. If inequities are identified, health policy and planning will be encouraged to enhance ED healthcare to eliminate ethnic inequities. Understanding whether inequities are associated with patient or system centred markers of care will provide a focus for ED improvements. Alternatively, if ethnic inequities are not identified, healthcare policy and planning can re-prioritise focus to other areas of healthcare delivery.

This research is Māori-led, by senior Māori quantitative and KMR experts, housed within a Māori research unit committed to developing a highly skilled Māori health research workforce. The application of KMR frameworks to the design and delivery of quantitative analyses using large, nationally representative datasets, responds to national and international calls for research of this nature.<sup>34,35</sup> Therefore, the EEDI project has significant potential to contribute to a highly skilled Māori health research workforce with advanced quantitative, analytical and statistical skills.

The present study is expected to impact on Māori health gain. The collaboration of Māori public health and ED clinical expertise is expected to aid knowledge transfer. Similarly, the project design incorporates a comprehensive dissemination plan targeted towards the academic and clinical emergency healthcare delivery planning communities.

If successful, the EEDI project has the potential to positively contribute to the growing sector concern regarding Māori inequities in emergency care outcomes.

## Acknowledgements

We acknowledge the governance input of the EEDI Advisory Group to the EEDI project design: Kate Anson, John Bonning, Marama Tauranga, Michael Geraghty and Li-Chia. The EEDI project was funded as a national research project by the Health Research Council of New Zealand (17/251). The funding agency did not have any role in: the design of the study; collection,

analysis and interpretation of data; or writing of this manuscript.

### Availability of data and materials

The datasets generated and/or analysed during the present study are not publicly available because of pre-existing guidelines associated with the source dataset under SSED project policy guidelines and code of practice. EEDI policy guidelines and code of practice align to the SSED project, therefore EEDI data will be available from the corresponding author on reasonable request.

### Author contributions

EC is the lead investigator for the EEDI project including study design, funding ethics applications; and was responsible for manuscript design, primary drafting of manuscript and coordination of feedback and amendments. SJP, YJ, PR, PJ and IT are named investigators for the EEDI project. SJP contributed to overall study design and has a lead role in the development of the statistical analytical plan and data collection for the EEDI project; and contributed to the design and drafting of this manuscript. YJ contributed to overall study design with particular focus on providing senior statistical advice for data collection and analysis. PR, PJ and IT contributed to overall study design. IR is the research assistant for the EEDI project. SJP, YJ, PR, PJ, IT and IR contributed to the drafting of this manuscript. All authors have read and approved the manuscript.

### Competing interests

None declared.

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