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Estimating the economic costs of ethnic health inequities: protocol for a prevalence-based cost-of-illness study in New Zealand (2003–2014)

Papaarangi Reid,[1] Sarah-Jane Paine,[1] Braden Te Ao,[2] Esther Willing,[1] Emma Wyeth,[3] Rhema Vaithianathan[4]

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[1]Te Kupenga Hauora Māori, Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand
[2]Health Systems, School of Population Health, Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand
[3]Ngāi Tahu Māori Health Research Unit, Department of Preventive and Social Medicine, University of Otago, Dunedin, New Zealand
[4]Centre for Social Data Analytics, AUT, Auckland, New Zealand

Correspondence to
Dr Sarah-Jane Paine;
sj.paine@auckland.ac.nz

ABSTRACT

Introduction There is significant international interest in the economic impacts of persistent inequities in morbidity and mortality. However, very few studies have quantified the costs associated with unfair and preventable ethnic/racial inequities in health. The proposed study will investigate inequities in health between the indigenous Māori and non-Māori adult population in New Zealand (15 years and older) and estimate the economic costs associated with these differences.

Methods and analysis The study will use national collections data that is held by government agencies in New Zealand including hospitalisations, mortality, outpatient consultations, laboratory and pharmaceutical claims, and accident compensation claims. Epidemiological methods will be used to calculate prevalences for Māori and non-Māori, by age-group, gender and socioeconomic deprivation (New Zealand Deprivation Index) where possible. Rates of 'potentially avoidable' hospitalisations and mortality as well as 'excess or under' utilisation of healthcare will be calculated as the difference between the actual rate and that expected if Māori were to have the same rates as non-Māori. A prevalence-based cost-of-illness approach will be used to estimate health inequities and the costs associated with treatment, as well as other financial and non-financial costs (such as years of life lost) over the person's lifetime.

Ethics and dissemination This analysis has been approved by the University of Auckland Human Participants Research Committee (Ref: 018621). Dissemination of findings will occur via published peer-reviewed articles, presentations to academic, policy and community-based stakeholder groups and via social media.

Strengths and limitations of this study

- This study will provide the first estimates of the direct and indirect costs associated with ethnic inequities in health for adults in New Zealand.
- The study is grounded in an indigenous research theory and exemplifies how Western research methods, including epidemiology and health economics, can be used to investigate health issues of importance to indigenous people.
- The study will involve the analysis of up to 12 years of national health data from administrative datasets.
- Although cost-of-illness studies can highlight areas that require health policy attention, they are limited in their ability to identify how resources should be allocated.
- The study will not capture the social and intangible costs associated with adult health inequities.

INTRODUCTION

Health inequities are defined as differences in health that are unnecessary unjust, preventable and amenable to policy intervention.[1] Inequities in health by race/ethnicity are well known, with indigenous and minoritised ethnic groups experiencing poorer health outcomes, lower access to healthcare and poorer quality of care.[2–5] In New Zealand (NZ), for example, Māori (the indigenous people, representing 16% of the total population of ~4.7 million) experience a higher burden of many serious health conditions, have higher rates of unmet health need and higher disease-specific mortality rates compared with non-Māori adults.[5 6] The existence of persistent and unfair health inequities has been described as '…a substantial loss of human potential, a loss of talent and productivity that might otherwise have contributed to the betterment of society'.[7] Many societies consider investment in actions to improve the health of vulnerable populations as being the right thing to do.[8] Public discourse and academic critique of health inequities therefore is typically focused on issues of ethics and fairness. As a result, equity is often framed as a high-level or aspirational goal for modern health systems, with policies shaped by the norms and beliefs of society.

While social justice arguments for reducing health inequities are widely accepted, there is growing interest in understanding health inequities from an economic perspective,

with several prevalence-based cost-of-illness (COI) studies reporting on the annual economic burden associated with racial/ethnic inequities in health. For example, using 3 years of data from the Medical Expenditure Panel Survey and National Vital Statistics Reports (2003–2006), LaVeist and colleagues found that health inequities between African-American, Asian, Hispanic and white adults (18 years and over) conferred significant medical care costs and contributed to productivity losses and lower quality of life in the USA. The authors estimated that ethnic/racial health inequities cost the US health system US$229.4 billion in direct medial expenditure for the period 2003–2007, and of that almost two-thirds of the excess costs were attributable to health inequities experienced by African-Americans (ie, US$135.9 billion).[7] Further, more than US$1 trillion were spent on indirect costs associated with health inequities, and 95% of these indirect costs were due to premature mortality.[7] A COI study from the UK found that productivity losses associated with health inequalities were estimated to be £31 billion, with a further £28–£32 billion spent by government due to higher benefit payments and lost taxes.[9] Similarly, socioeconomic inequities in health, as measured by income level, were estimated to cost the Canadian health system $6.2 billion annually.[10] The costs associated with ethnic health inequities were not examined in that study. COI methodology was recently used to show that racial discrimination, a fundamental driver of ethnic health inequities, cost the Australian economy $AU44.9 billion per annum for the period 2001–2011.[11] Although the costs of reducing health inequities are often perceived of as being too high, growing evidence indicates that the cost of 'doing nothing' is itself significant.[10 12]

Although economic evidence can identify areas of high cost to the health system, framed alternatively it can be used to highlight potential savings to society if action was directed at eliminating health inequities. For example, it is estimated that the annual economic value of improving the health and longevity of disadvantaged adults in the USA (ie, those with less than a high school education) to the same level as that of college-educated adults would be US$1.02 trillion.[13] Similarly, it has been suggested that the National Health Service in the UK would have saved 15% in total treatment costs if everyone enjoyed the same level of health as that experienced by the richest 10% of their population.[9] Elimination of ethnic/racial health inequities would have saved the US economy US$1.24 trillion between 2003 and 2006.[7] Evidence from COI studies suggest that improving the health of those most disadvantaged in society will reduce health inequities and has the potential to generate significant economic returns for the whole of society.[10 14]

Equity is acknowledged within key health policy documents in Aotearoa NZ[15 16]; however, very little is known about the costs associated with the disproportionate burden of illness and premature death that are experienced by Māori. A previous COI study found that inequities in illness, injury and potentially avoidable deaths between Māori and non-Māori children aged 0–14 years saved the health sector $24.7 million per annum for the period 2003–2007.[17] In contrast, the costs to families from loss of wages due to avoidable hospital admissions alone were estimated to be $827,175 per annum. The paradoxical nature of those findings must be acknowledged as it suggests that with respect to Māori child health inequities, far from being a burden to society and the health system, Māori children are being underserved by the health system, and that any additional costs associated with these inequities were being met by families. Therefore, the health system alone has no financial incentive to redress the underutilisation of healthcare services by Māori.

Objectives

Eliminating ethnic/racial health inequities requires multisector approaches to policy and intervention. Quantifying the costs of health inequities is critical for priority-setting and health resource allocation, and for engaging policy areas outside of health to the benefits of health equity as a broader societal goal. Understanding health inequities from an economic perspective has received significant scholarly attention (see Farrer *et al*[18] for a review). However, it has been noted that many existing studies have focused on average health despite overwhelming evidence of significant health inequities across society.[12] Furthermore, there has been little attention paid to quantifying the costs of racial/ethnic inequities in health, particularly outside the USA.

The purpose of the *Cost of Doing Nothing Study* is to provide the first evidence about the costs associated with health inequities between Māori and non-Māori adults in NZ. It builds on a prior study that investigated the costs of Māori child health inequities and therefore benefits from the ability to use the models developed for child health as a starting point for estimating the costs of adult health inequities. The *Cost of Doing Nothing Study* has the potential to address a range of existing knowledge gaps and provide the first evidence for NZ adults. It will provide much needed information about the costs of health inequities with a focus on the experiences of indigenous people,[19] who have been overlooked in other studies. Although available evidence from the USA and UK are useful for understanding population health patterns, the provision of NZ data is critical given the differences in health systems and funding arrangements between countries. Furthermore, the location of the study will expand the conversation and help to frame issues of health inequities as a global health priority that requires whole of government attention and intervention.

The aims of the study are:

1. To investigate inequities in potentially avoidable illness, injury and deaths between Māori and non-Māori adults in NZ.
2. To estimate 'excess utilisation' or 'underutilisation' of healthcare associated with inequities in potentially avoidable illness, injury and deaths.

3. To quantify the costs associated with any 'inequity excess' observed.

METHODS AND ANALYSIS

A feature of this study is the use of Kaupapa Māori research methodology which is an approach to research driven by a Māori worldview and recognises the complexity of Māori historical and contemporary realities.[20] Our Kaupapa Māori approach purposely acknowledges and challenges the power dynamics that have created and maintain the unequal position of Māori within our society, including the role played by the unequal distribution of the social determinants of health and the health system factors in limiting Māori health outcomes.[21] In this study, quantitative epidemiological and health economic methods are used as tools for investigating questions and interpreting findings from this indigenous research position.[17 22]

The methods and analysis to be used in the *Cost of Doing Nothing* study are reported here based on the Strengthening the Reporting of Observational Studies in Epidemiology statement for reporting observational studies.[23]

Study design

This is a retrospective observational study involving the secondary analysis of several health-related registries and datasets held by the Ministry of Health, the Accident Compensation Corporation and Statistics New Zealand.

Study period

The *Cost of Doing Nothing* study will focus on health events that occurred between 1 January 2003 and 31 December 2014; the time period for which mortality data are available in NZ. Differences relating to when each dataset/registry was established, and the availability of data will require the use of different time periods for the analysis of individual datasets (see table 1).

Participants and setting

The focus is on adult health inequities; therefore, we will analyse health events for individuals aged 15 years and over, nationwide. Patients will be assigned to Māori and non-Māori ethnic groups using NZ Ministry of Health protocols such that anyone who identifies as Māori, either alone or as one of multiple ethnic groupings, will be considered Māori, with everyone else non-Māori.[24] The study population for each health indicator will be derived from the population within each respective dataset. The denominator will be based on population estimates for Māori and non-Māori available from the NZ Census. Quality of ethnicity data in hospitalisation and mortality datasets and analytical approaches to adjust for potential undercounting of Māori have been reported previously.[5 6] Ethnicity data quality in laboratory, pharmaceutical, outpatient and accident claims data will be explored.

Definition of health inequities

Health inequity is defined as 'differences which are unnecessary and avoidable, but in addition are considered unfair and unjust' (p431).[25] Our definition of health inequities also incorporates previously used methods for identifying 'potentially avoidable' hospitalisations and deaths in NZ[17 26]; that is, hospitalisations, deaths, illness and injury that are preventable via primary care intervention, injury prevention or health promotion approaches.

Table 1 Summary of key datasets to be analysed in *The Cost of Doing Nothing Study*

Dataset	Source	Time period	Outcome measure domains
National Minimum Dataset	New Zealand Health Information Service (NZHIS), Ministry of Health	1 January 2003–31 December 2014	Public and private hospital discharge information (inpatient and day patients).
Mortality Collection	NZHIS, Ministry of Health	1 January 2003–31 December 2014	Underlying causes of deaths.
Programme for the Integration of Mental Health Data database	NZHIS, Ministry of Health	1 January 2009–31 December 2014	Secondary mental health service use.
National Non-Admitted Patients Collection	NZHIS, Ministry of Health	1 July 2006–31 December 2014	Non-admitted (outpatient and emergency department) activity.
Pharmaceutical Collections	NZHIS, Ministry of Health	1 January 2006–31 December 2014	Claims and payment information for subsidised dispensing.
Laboratory Claims	NZHIS, Ministry of Health	1 January 2006–31 December 2014	Claims and payment information for laboratory testing.
Primary Care Enrolments	NZHIS, Ministry of Health	1 January 2006–31 December 2014	Primary healthcare enrolments.
Primary Care Utilisation	Primary Care Team, Ministry of Health	1 January 2003–31 December 2014	Primary healthcare utilisation.
Accidents and Injuries	Accident Compensation Corporation	1 January 2003 –31 December 2014	Injury claims for medical treatment, vocational rehabilitation and support for independence.

Data sources

Data will be provided to the research team in a deidentified format by the government agencies that are responsible for the collection of that information. Each dataset will include (where possible) diagnostic coding (The International Statistical Classification of Diseases and Related Health Problems, Ninth or Tenth Revision, Australian Modification, ICD-9-CMA or ICD-10-AM), patient demographics (ie, self-identified ethnicity, date of birth and NZ Deprivation Index which is an area-based measure of socioeconomic deprivation[27]), in addition to the type of healthcare used and costs data associated with admissions and/or treatment. Table 1 summarises the data sources, time periods and outcome measure domains for each dataset/registry. Most datasets will be obtained from the Ministry of Health which is responsible for the collection of clinical information reported by the 20 District Health Boards across NZ. National Minimum Dataset (NMDS) is a national collection of public and private hospital discharge information, including clinical information, for inpatients and day patients. The Mortality Collection dataset classifies the underlying cause of death for all deaths registered in NZ, and all registerable stillbirths (fetal deaths). The Programme for the Integration of Mental Health Data dataset is a single national mental health and addiction information collection of service activity and outcomes data for health consumers. The National Non-Admitted Patients Collection includes event-based purchase units that relate to medical and surgical outpatient events and emergency department events, including information on the type of service provided and the health specialty involved. Laboratory Claims (LABS) collects claim and payment information for community laboratory tests, whereas Pharmaceutical Collections (PHARM) claim and payment information from pharmacists for subsidised dispensing. Information on Primary Healthcare System enrolment and utilisation are collected and held in two separate datasets. Data on accidents and injuries will be provided by the Accident Compensation Corporation which is a government entity responsible for providing NZ's no-fault accident compensation scheme.

Study size

All events contained within each dataset will be included in the analysis.

Key indicators

The indicators of interest in this study are: potentially avoidable hospitalisations, potentially avoidable mortality, excess utilisation or underutilisation of outpatient consultations, excess utilisation or underutilisation of mental health consultations, excess utilisation or underutilisation of primary care services, excess utilisation or underutilisation of injury claims, excess utilisation or underutilisation of laboratory claims, excess utilisation or underutilisation of pharmaceutical claims.

Statistical methods

This study will use a prevalence-based COI approach to estimate the economic burden associated with ethnic health inequities in NZ. Although COI studies are considered to be primarily descriptive, they can be used to identify the direct, indirect and intangible costs associated with the problem under investigation and to provide an estimate of the dollar amount that could be saved, or gained, if inequities in health were to be eliminated.[28] The analyses will be informed by the previously published method for investigating child health inequities in NZ.[17] In line with the Kaupapa Māori positioning of this study, numbers and rates will be produced for Māori and non-Māori adults separately, with Māori:non-Māori rate ratios enabling comparisons to be made between the two populations. Methods such as direct standardisation will be explored to account for the relatively younger age structure of the Māori population.[5 29] We propose using a complete case analysis.

The first stage of analysis will focus on the epidemiology of health inequities in NZ, with numbers and rates (crude and age-specific) for each indicator estimated for Māori and non-Māori adults, including by age-group, gender and socioeconomic deprivation (as measured by the NZ Deprivation Index) where possible. Census data (and intercensal estimates) for the national population available from Statistics NZ will provide the population denominator for the estimate of rates for Māori and non-Māori adults. In this study, 'potentially-avoidable' hospitalisations and deaths and 'excess utilisation/underutilisation' of healthcare will be viewed as the difference in actual rates for Māori and the rates we would expect if Māori had the same health utilisation as non-Māori.[26] For example, we will calculate the rate of hospitalisations for Māori and non-Māori using data obtained from the NMDS, Ministry of Health (see table 1). Next, we will estimate the number of avoidable hospitalisations that would have occurred if Māori had the same rate as non-Māori in each age band and diagnostic grouping (ICD-10-AM chapter). The difference between the actual number of hospitalisations and the estimated hospitalisations will represent any excess avoidable hospitalisations. Similar methods will be used to estimate numbers, rates and Māori:non-Māori rate ratios for injuries, mental health and outpatient consultations, primary care utilisation in addition to pharmaceutical and laboratory claims, with a focus on estimating the excess utilisation or underutilisation for total claims and/or visits.

For mortality data, avoidable deaths will be identified by assignment of the primary ICD-10-AM code into ICD-10-AM chapter groupings. Avoidable deaths will be defined as the number of avoidable deaths that would have occurred had Māori had the same rate as non-Māori in each age band, with the difference between the actual number of deaths and the estimated deaths representing excess avoidable deaths. The resulting number of years of life lost (YLL) by Māori adults will be computed, assuming

the same life expectancy of their non-Māori same-sex counterparts.

The second stage of analysis will use a prevalence-based COI approach to estimate the costs associated with treatment, as well as other financial and non-financial costs (such as YLL) over the person's lifetime. Healthcare and community service utilisation will be assessed using medical records and national collection data (see table 1). Unit costs for resources utilised will be sourced from the NZ Ministry of Health, Pharmaceutical Management Agency (PHARMAC); the government entity that decides on the funding of medicines and treatments in NZ) and Accident Compensation Corporation (ACC). Costs will be measured in real prices for the reference year.

Hospital inpatient costs

Identifying the cost of hospitalisation will be done in two steps. First, we will identify those admissions primarily due to 'potentially avoidable' hospitalisations. Second, the average costs of hospitalisations relating to the condition will be estimated by multiplying the percentage of individuals hospitalised for potentially avoidable admissions by the average cost per person hospitalised. Potentially avoidable hospitalisations will be confirmed by ICD-10 codes. The cost will be taken from assessed hospital charges. Hospitalisation costs will be determined using weighted discharge value known as the Weighted Inlier Equivalent Separations (WIES) for all NMDS events by the Ministry of Health. The national price for financial year 2016/2017 per WIES was $NZ4824.67.[30]

Community and outpatient costs

To estimate the cost of these services, a resource-based costing approach will be used where a common price is applied to each resource (eg, cost per hour per therapist). Number of visits to therapists (ie, visiting nurses, physiotherapists, medical specialists, occupational therapist, speech therapist, counsellors, psychologists and social workers) will be assessed via National Non-Admitted Patients Collection and Accidents and Injuries claims database. The cost of laboratory test visits will be estimated by multiplying visit numbers by the resource unit cost. Similarly, the frequency and dosage of prescribed pharmaceutical dispensing will be estimated using PHARM claims data with the cost estimated by multiplying the number of dosages provided by the current cost of treatment for the drug (in $NZ, 2017). Third, the cost of general practitioners visits resulting from health inequities will be estimated by combining the information provided from the Primary Care Enrolments database with current market prices.

The cost estimates will be presented in terms of direct costs (eg, healthcare and community services), indirect costs (eg, value of a statistical life) and out-of-pocket expenses for prevalent cases (per person and total for NZ) for a given year. Descriptive analyses, including means and 95% CI, will be used to determine the economic profile of health inequities in NZ. Potential savings will be calculated using a 'case-averted' approach which estimates the direct and indirect cost savings if inequities results in a reduction of premature death or the number of people developing long-term consequences. The costs of YLL will be estimated using mean life expectancy at birth of 78 years, a 3.5% discount rate (PHARMAC recommended),[31] and value of a statistical life (VoSL) estimates which are an economic estimate for how much society is willing to pay to reduce their risk of death or ill health, to inform policies to reduce health risks. VoSL estimates are available from the NZ Ministry of Transport.[32] Sensitivity analyses will be used to examine the impact of different discount rates.

Patient and public involvement

The idea for the proposed study protocol is based on a similar project conducted by some members of the research team who investigated the cost of child health inequities in NZ.[17] Although patients and the public were not consulted with regard to the development of the proposed study design or selection of measures, the research privileges indigenous voice and experiences through the strong leadership and involvement of Māori as members of the research team and of the study advisory group. The research is funded by Ngā Pae o te Māramatanga, NZ's Māori Centre of Research Excellence, which is a collaboration of 21 partner entities from across NZ, including universities and Māori tertiary institutions. The funder is committed to supporting transformative research that is of relevance to Māori and that provides multiple opportunities for community engagement and knowledge sharing.

DISCUSSION

The *Cost of Doing Nothing Study* has the potential to address a range of existing knowledge gaps. First, it will provide much needed information about the costs of health inequities with a focus on the experiences of indigenous people[19] who have been overlooked in other studies. Moreover, the location of the study will expand the conversation beyond experiences in the USA and UK and help to frame issues of health inequities as a global health priority that requires whole of government attention and intervention. The proposed project also has the potential to facilitate positive change by bringing issues of indigenous health inequities to the consciousness of a greater number of public health professionals, community advocates and health service providers. Transformation may also occur through shifting the discourse about the existence of Māori health inequities from a moral to an economic viewpoint. This in turn will enable a critique of health inequities in terms of the economic benefits that are accrued to the health system, and the costs borne by individuals, families and indigenous communities, through policies that seek to control health sector spending. Finally, the proposed project will also provide documentation of a breach of indigenous rights to health.

Strengths and limitations

The study is grounded in an indigenous research theory and exemplifies how western research methods, including epidemiology and health economics, can be used to investigate health issues of importance to indigenous people. The study will involve the analysis of up to 12 years of national health data from administrative datasets and provide the first estimates of the direct and indirect costs associated with ethnic inequities in health for adults in NZ. Although COI studies can highlight areas that require health research and policy attention,[33] they are limited in their ability to identify how resources should be allocated. The study will not capture the social and intangible costs associated with adult health inequities.

ETHICS AND DISSEMINATION

The study will be conducted in accordance with the principles of the Declaration of Helsinki. The study involves quantitative analysis of routinely collected administrative health datasets which will be deidentified by the agencies supplying the data. Therefore, we do not anticipate any additional risks to individuals or collectives as part of this research. The Kaupapa Māori positioning of this study provides an explicit view of what constitutes ethical research, including (1) the acknowledgement of Māori values and principles,[34] (2) the rejection of deficit-oriented theories in the interpretation of health inequities[21] and (3) broad responsibilities for indigenous data sovereignty.[35]

A broad dissemination plan is being codeveloped by the research team and the study advisory group. At a minimum, we will seek to share our research findings via publication in academic journals (including open-access journals), presentations at national and international conferences/symposia (including those hosted by our academic institutions and facilitated by the funding organisation) and meetings with key stakeholders including community advocates, policy-makers and those interested in eliminating inequities. Dissemination to indigenous individuals/communities will be a key focus for this study.

Contributors PR is the principal investigator. She conceived the idea for this study, led the development of the conceptual framework and wrote the first draft of this manuscript. S-JP explored the available data, led the ethics application and Ministry of Health data application processes, wrote the epidemiological analysis section and co-ordinated the submission process. BTA wrote the cost analysis section, advised on the selection of cost variables and co-ordinated the data application process to the Accident Compensation Corporation of New Zealand. EsW contributed to the ethics application process and advised on the potential health policy impact of the project. EmW contributed to the ethics application process and the writing of the epidemiological analysis section. RV contributed to the writing of the cost analysis section and advised on selection of datasets and variables for this project. She also contributed to the ethics application process. All authors contributed to the protocol and have critically reviewed and approved the manuscript.

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Patient consent Not required.

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