NGĀ PAE O TE MĀRAMATANGA

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Highly qualified Māori and Pacific Peoples in Aotearoa

A study of Māori and Pacific Peoples PhD graduates (2002-2023) using administrative data in the Integrated Data Infrastructure

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Executive summary

Background

Higher education confers significant private benefits for graduates, such as higher earnings and rates of employment, and also generates wider social benefits for communities and society. Māori and Pacific Peoples (Pacific) are under-represented and underserved within Aotearoa New Zealand (Aotearoa) universities, and experience persistent and entrenched inequities across education, health, justice and other social domains. Gaining a higher education qualification has the potential to reduce disparities and has been a key government strategy for improving Māori and Pacific Peoples' wellbeing. Despite the growth in the number of Māori and Pacific Peoples gaining PhDs, little is known about these students' longer-term outcomes in terms of their employment, health and wider wellbeing.

Purpose

This study is the first in-depth examination, at the population level, of the education, economic, health and social outcomes of Māori and Pacific PhDs. Focusing on the period 2003–2022, it documents the outcomes of Māori and Pacific PhDs at the time of graduation, and at critical junctures following graduation. It also considers their outcomes relative to those of Māori and Pacific Peoples without a PhD, and PhD graduates who are neither Māori nor Pacific. Doing so helps us better understand the benefits to Māori and Pacific Peoples of having a PhD.

Our analysis uses linked individual-level data from the Integrated Data Infrastructure. Data were collected for all 996 Māori and 438 Pacific PhD graduates from 2003 to 2022. For comparative purposes, we also selected a propensity-matched sample of non-Māori non Pacific (nMnP) PhD graduates (n = 1386), and a sample of Māori and Pacific Peoples without a PhD from the residential population (n = 3210 and n = 1374, respectively) for "community" comparison.

Key findings

The economic and social outcomes of Māori and Pacific PhD graduates were broadly comparable with those of other PhD graduates (e.g., home ownership rates). For some indicators (e.g., annual earnings), the outcomes of Māori PhDs were significantly better.

Across most measures, Māori and Pacific PhD graduates had better outcomes than members of their communities without a PhD. They were more likely to be employed in professional roles, have higher earnings, and report higher levels of volunteerism. Health benefits were less clear, although Māori and Pacific PhD graduates were more likely to live in health-promoting areas and less likely to have serious health issues requiring hospital-level treatment than Māori and Pacific Peoples without a PhD.

Te Arotahi Paper_July 2025-FNL-corrected.indd 1 14/07/2025 5:58 PM

Implications

Our study indicates that attaining a PhD improves career and economic opportunities as well as social and health outcomes for Māori and Pacific graduates. Our findings highlight the need for the Aotearoa tertiary education system to promote and support behaviours, actions, services and resources to increase the numbers of Māori and Pacific students, and to reduce educational barriers, through to the highest level. Boosting higher education success for Māori and Pacific students not only has the potential to reduce disparities in Aotearoa across a range of outcomes but also create benefits for graduates' whānau and communities and for society in general.

Introduction

Gaining a higher education qualification is associated with increased rates of employment and income (Baum et al., 2013). In addition to these private benefits, pursuing higher education can also provide social benefits for communities, such as increased social capital and civic participation (Bradburn et al., 2006; Perna, 2005). Despite increasing rates of participation and completion worldwide, Indigenous and ethnic-minority students are less likely than non-Indigenous and non-ethnic-minority students to have access to higher education (Santiago et al., 2008). Yet international studies show that higher education can reduce employment and earnings gaps between Indigenous and non-Indigenous graduates. In Australia, Aboriginal and Torres Strait Islander graduates had similar incomes to their peers (Li, 2014). In Canada, Indigenous graduates had similar incomes to non-Indigenous graduates two years after study (Walters et al., 2004). Ethnic-minority graduates in the United States had similar incomes to their non-ethnic-minority peers (Thomas, 2000). Some studies suggest that Indigenous and ethnic-minority students who complete higher education may experience more private benefits than their counterparts (Bland & Xie, 2010). For example, Australian Aboriginal and Torres Strait Islander graduates experienced higher rates of employment than their non-Indigenous peers and were more positive about how their degree helped them progress their careers (Edwards & Coates, 2011). While there is limited research on the social benefits of higher education for Indigenous and ethnic-minority graduates, quantitative studies from the United States show similar rates of voting and higher rates of volunteering compared with their non-graduate peers (Bradburn et al., 2006; Perna, 2005). Furthermore, international qualitative research shows that Indigenous and ethnic-minority graduates want to contribute and build a better future for their communities (Barney, 2013; DiGregorio et al., 2000).

In Aotearoa New Zealand (Aotearoa), the Indigenous Māori people comprise 17.8% (Māori ethnicity) of the national population.* Pacific Peoples, a term referring to peoples who are Indigenous to more than 20 distinct countries and territories throughout the South Pacific, comprise 8.9% of the total population (Stats NZ, 2024). Māori and Pacific Peoples (Pacific) experience persistent and entrenched inequities across education, health, justice and other social domains, reflecting the impacts of colonisation and colonialism, intergenerational trauma and discrimination (Human Rights Commission, 2012). Documented inequities include higher rates of unemployment, lower incomes, fewer assets and poorer health compared with the rest of the population (Ministry of Health, 2015; Perry, 2013; Statistics New Zealand, 2002; Stats NZ, 2018; Statistics New Zealand and Ministry of Pacific Island Affairs, 2011). Several studies have described the history of higher education in Aotearoa that led to the widespread exclusion of Māori and Pacific students (e.g., Theodore et al., 2017) and their marginalisation within monocultural university systems (Naepi et al., 2019). Gaining a higher education qualification, however, has the potential to reduce these disparities and has been a key government strategy for increasing Māori and Pacific wellbeing (Ministry of Education, 2024; Ministry for Pacific Peoples, 2022).

The last two decades has seen substantial increases in Māori and Pacific Peoples' participation in higher education. The percentage of Māori adults with a bachelor's degree (or higher) rose from 6.4% in 2006 to 11.5% in 2018. For Pacific Peoples, the percentage rose from 5.0% to 9.5% within the same period (Stats NZ, 2018). Course completion rates are also increasing, with 80% of Māori and 71% of Pacific completing a bachelor's degree for courses ending in 2022. These figures are still lower, however, than the 88% completion rate for New Zealand European students.

Studies show that Māori and Pacific graduates have improved life outcomes, across a range of measures, compared with Māori and Pacific Peoples without a university degree, as well as having economic wellbeing outcomes that are similar to

* The share is 19.6% for the wider Māori-descent population (Stats NZ, 2024).

Te Arotahi Paper_July 2025-FNL-corrected.indd 2 14/07/2025 5:58 PM

those of non-Māori non-Pacific (nMnP) graduates. Theodore et al. (2017) analysed a sample of 8719 Aotearoa university students enrolled in a bachelor's degree or higher who were in their final year of study in 2011. The first follow-up survey (two years post-graduation) was conducted in 2014 with a 70% response, of which 7% of the sample were Māori and 4% Pacific. The study found that, two years after graduation, Māori and Pacific graduates' employment and income outcomes were comparable with nMnP graduates, suggesting that higher education may reduce ethnic disparities. Mahoney (2014a, 2014b) found that higher education was associated with a greater earnings premium (the difference or return on study) for Māori graduates at one year and five years post-graduation compared with non-Māori graduates when their incomes were compared with national median earnings for Māori and non-Māori, respectively (Mahoney, 2014a). This finding was similar for Pacific graduates (Mahoney, 2014b). Furthermore, in the first two years after graduation, Māori and non-Māori graduates had comparable employment rates and earnings. Compared with non-Māori graduates, Māori graduates had significantly lower (except for doctoral graduates) earnings at five years post-graduation. Pacific graduates, in contrast, generally earned more five years post-graduation than non-Pacific graduates.

A major challenge for Māori and Pacific students is financial hardship, as they tend to begin their higher education studies in poorer financial circumstances. Theodore et al. (2017) found that Māori and Pacific graduates had significantly higher rates of student debt and experienced more financial strain over time, compared with nMnP graduates. This reflects wider societal inequities, with Māori and Pacific Peoples' incomes lower,* and rates of household poverty higher than the national average (Perry, 2013). Māori and Pacific graduates are more likely to take out student loans to pursue higher education and take longer to repay them (Chen et al., 2010). Thus, while higher education has the potential to reduce or eliminate employment and earnings disparities, other financial disparities – such as student debt – may persist.

A focus on Māori and Pacific PhD graduates

Doctoral graduates comprise a relatively small but important – and growing – part of the higher education market (Tertiary Education Commission, 2022). PhD graduates provide workforces with highly specialised skils and knowledge, along with critical contributions and leadership to education and innovation.

The last two decades has seen substantial increases in Māori and Pacific Peoples' participation in higher education.

The number of Māori and Pacific PhD graduates has been steadily increasing over the last two decades. For Māori, the rapid growth in PhDs is attributed in large part to the success of the programme Te Kupenga o MAI (Māori and Indigenous) (Pihama et al., 2018). The programme was developed by Professors Graham and Linda Smith and other Māori educators in the late 1990s, to provide mentoring and support for Māori postgraduate students. MAI was formalised with the establishment of Ngā Pae o te Māramatanga (NPM) Centre of Research Excellence in 2002, which set a goal of graduating 500 Māori PhDs. Prior to 2002, the highest annual number of Māori completing PhDs was just 20 (in 2001). The aim was not only to increase numbers but to "create spaces within which Māori cultural approaches and pedagogies could operate and be sustained in the academy" (Pihama et al., 2018). Between 2002 and 2015, 550 Māori obtained a PhD (Tertiary Education Commission 2022).† NPM subsequently set a new goal of graduating 1500 Māori PhDs.

Despite the growth in the number of Māori and Pacific Peoples gaining PhDs, relatively little is known about these students' post-graduation outcomes in terms of their employment, health and wider wellbeing. Qualitative research suggests that their contribution and impact extends beyond their individual wellbeing. For example, Pihama et al. (2018)

* Defined as incomes less than 60% of the national median income.
† The data are for domestic enrolments.

Te Arotahi Paper_July 2025-FNL-corrected.indd 3 14/07/2025 5:58 PM

found that Māori doctoral students often undertake research projects "that would be transformational, if not for the researchers personally, then for their families, their hapū, iwi or the communities they participate in" (p. 42). Accordingly, Māori graduates often have "a parallel set of priorities that are located in the web of significant relationships that exist outside the academy" and may carry significant community-centred responsibilities (Kidman et al., 2015, p. 11). Those findings are consistent with international qualitative research showing that Indigenous and ethnic-minority students generally undertake research that is transformational for the communities that they belong to (Barney, 2013; DiGregorio et al., 2000). Theodore et al. (2017; 2019) also examined the social benefits of completing higher education. They found that Māori and Pacific graduates were significantly more likely than nMnP graduates to report helping their families, friends and acquaintances, and participating in community organisations.

Studies have also highlighted the multiple barriers that impede the progression of doctoral students through to secure academic employment. In the international context, the number of permanent academic positions has not kept pace with the steadily rising number of PhD graduates. International scholars describe this phenomenon as a "leaky pipeline", where PhD graduates "leak" from the academic "pipeline" (Fradella, 2018; Sethna, 2011; van Anders, 2004; Ysseldyk et al., 2019; Zusi, 2016). In Aotearoa, recent studies show that the pipeline from doctoral study to an academic job is "pakaru" (broken) for Māori (Naepi et al., 2019) and non-exist for Pacific Peoples (Naepi, in press). The pakaru pipeline metaphor acknowledges the systemic processes and practices that prevent PhD graduates from progressing along the academic track (Pihama et al., 2018). Research shows that many Māori and Pacific graduates who hold academic positions experience institutional racism, sexism, isolation and disproportionate demands for excess labour (Baice et al., 2021; Haar & Martin, 2022; Naepi, 2018, 2020, 2021; Pihama et al., 2018). Furthermore, as Naepi et al. (2019) showed, very few Māori and Pacific PhD graduates climb the academic ladder, and most remain in precarious casual positions. Kidman et al. (2015, p. 91) cautioned that "if those graduates are unable to secure work that allows them to practise their disciplines and if universities are not actively committed to building and retaining a critical mass of Indigenous researchers, then the outcome will be a lot of very highly qualified unemployed or under-employed Māori graduates, many of whom have high levels of student debt to repay."

Using data from 2012 to 2017, McAllister et al. (2019) found that Māori academics were severely under-represented at universities, comprising approximately 5% of the total academic workforce. For those same years, Naepi et al. (2019) reported that Pacific Peoples represented only 1.7% of the academic workforce. Furthermore, under-representation rose as the level of academic seniority increased – at the highest level, Māori and Pacific academics made up fewer than 4% and 1%, respectively, of New Zealand professors. In a separate study, using Performance-Based Research Fund (PBRF) data (2003, 2012, 2018), McAllister et al. (2020) found that Māori and Pacific men and women academics, compared with non-Māori non-Pacific men academics, had significantly lower odds of being an associate professor or professor (professoriate) or of being promoted, and had lower earnings. Importantly, these inequities were not explained by research performance (measured by PBRF scores), age or field, and remained over time, particularly for women. Māori and Pacific women academics earned on average $7713 less in 2018 than non-Māori non-Pacific men academics and had 65% lower odds of being promoted into the professoriate from 2003 to 2018. These findings suggest that inequities for Māori and Pacific academics will persist without systemic change in universities.

They found that Māori and Pacific graduates were significantly more likely than nMnP graduates to report helping their families, friends and acquaintances, and participating in community organisations.

Given the significant efforts over the past two decades to increase the number of Māori and Pacific PhD graduates, it is important to better understand their career destinations (Kidman et al., 2015) and the impacts of higher education for themselves and their

Te Arotahi Paper_July 2025-FNL-corrected.indd 4 14/07/2025 5:58 PM

whānau. Accordingly, this study provides the first in-depth examination, at the population level, of the education, economic, health and social outcomes of Māori and Pacific PhDs. Focusing on the period 2003–2022, we explore the wellbeing outcomes of Māori and Pacific PhDs both at the time of graduation and at critical junctures following graduation. We also consider their outcomes relative to those of Māori without a PhD and to non-Māori, non-Pacific PhD graduates. Doing so enables us to better assess the relative advantages, for Māori, of having a PhD. Our analysis uses linked individual-level data from the Integrated Data Infrastructure – a world-leading research database of survey and administrative data (Milne et al., 2019; Stats NZ, 2017a). The data and methods used are described next.

Methods

Study design, participants and setting

This was a national retrospective propensity-matched cohort study using data from the Integrated Data Infrastructure (IDI) (Milne et al., 2019; Stats NZ, 2017a). The IDI holds microdata about people and households sourced from administrative data sets and surveys from government and non-governmental organisations. Data were linked using probabilistic linking at the individual level and were de-identified. Access to IDI data was approved by Stats NZ (Ref: MAA-2023-40). The University of Otago Human Ethics Committee approved this study (HD23/503).

The base population for this study, from which cohort denominator populations were determined, was the IDI-based Estimated Residential Population (IDI-ERP). The IDI-ERP for each year of the study was defined using an established method in the IDI and is made up of usually resident individuals living in Aotearoa who were also identified in Health, Accident Compensation Corporation (ACC) and Inland Revenue data sets (Gibb, 2016). Individual cohort denominator subpopulations were selected from the IDI-ERP for each year. The principal comparison PhD graduate cohort were those who completed a PhD qualification, defined as a New Zealand Qualifications Authority (NZQA) qualifications framework level 10 qualification, between 2003 and 2022. The first PhD degree completion was retained, and subsequent completions were excluded.

Comparisons were made with outcomes for a matched cohort of people who did not complete a level 10 NZQA qualification, nor had reported a qualification gained in the 2018 Census. Propensity matching is a common statistical method used to reduce confounding bias from observational cohorts when randomisation is not possible (Caliendo & Kopeinig, 2008). The propensity matching involved selecting a cohort of individuals from the IDI-ERP in the years of graduation matched to graduates' demographic characteristics (age, gender, area-level deprivation; see details below). Using propensity matching allows us to make robust comparisons between Māori or Pacific PhD graduates and the much larger comparator groups (Māori or Pacific without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates) because we have selected individuals from those comparison groups with similar age, gender and residential profiles.

Our analysis focused on three time periods: 1) baseline, defined as the year of graduation, 2) the 2018 Census – which was the most recent census at the time of our analysis, and 3) the entire period following graduation (which varied by graduate).

Study variables

Ethnicity

Ethnicity was indicated in the IDI "personal details" table and reported for the six most common groups of people in Aotearoa: European; Māori; Pacific Peoples; Asian; a composite measure of Middle Eastern, Latin American and African (MELAA) ethnicities; and a residual group of Other ethnicities. In the personal details table, ethnicity is classified using the New Zealand Standard Classification 2005 V2.1.0 (Statistics New Zealand, 2005). Ethnicity is source ranked, meaning information is drawn from multiple IDI collections, ranked according to data quality, and combined. Māori ethnicity was determined in the personal details table. Pacific ethnicity was also determined, if identified as such, in the personal details table. Total Māori and Pacific populations are not mutually exclusive in that those who identified as both Māori and Pacific were included in both. Those who did not identify as either Māori or Pacific were classified as non-Māori non-Pacific (nMnP).

Graduates

Doctoral or PhD graduates were identified in "tertiary completion" tables in the IDI, for the years 2003–2022.

Main strata variables

Our analyses have been stratified into Māori and Pacific, for which the study cohort was divided into five comparison groups:

1. Māori doctoral graduates (Māori PhD graduates)

Te Arotahi Paper_July 2025-FNL-corrected.indd 5 14/07/2025 5:58 PM

2. A propensity-matched cohort of Māori without a PhD extracted from the Māori resident population for each year, for comparison with Group #1 (Māori PhD graduates)
3. Pacific Peoples doctoral graduates (Pacific PhD graduates)
4. A propensity-matched cohort of Pacific without a PhD extracted from the Pacific resident population for each year, for comparison with Group #3 (Pacific PhD graduates), and
5. Non-Māori non-Pacific Peoples doctoral graduates (nMnP PhD graduates), for comparisons with Groups #1 and #3.

These cohorts result in four separate comparative analyses for each outcome:

1. Māori PhD graduates versus matched Māori without a PhD
2. Māori PhD graduates versus matched nMnP PhD graduates
3. Pacific PhD graduates versus matched Pacific without a PhD, and
4. Pacific PhD graduates versus matched nMnP PhD graduates.

For each two-way comparison, each subpopulation pair are mutually exclusive.

Descriptive variables

Baseline (year of graduation)

A categorical variable was defined to indicate the year of study completion, grouped into five-year periods: 2003–2007, 2008–2012, 2013–2017 and 2018–2022. A separate variable measured the proportion of years since graduation spent in Aotearoa, calculated by removing the number of days spent overseas, with 0 equalling the whole year spent overseas and 1 the whole year in Aotearoa.

Gender (male/female) and age at time of graduation (grouped into 20–24 years, 25–29 years, 30–34 years, 35–44 years, and 45–65 years) were determined using data from the personal details table. We have used gender in our analyses because, while many data collections have moved to include the option to respond as non-binary or gender diverse, in practice, too few participants had indicated that as an option in relation to the data we accessed. Thus, because we used historical data, we were unable to analyse specifically for outcomes for non-binary and gender-diverse people.

A proxy indicator of socioeconomic status at graduation was estimated using the New Zealand Deprivation Index 2018 (NZDep) (Atkinson et al., 2019). This is an area-based measure of deprivation based on the residential address of the individual. An individual's most recently updated residential address at the time of the 2018 Census was drawn from the "address notification" table. For this study, NZDep was collapsed into quintiles with quintile 1 representing areas of least deprivation.

A binary indicator of rurality was also established from residential address information in the IDI and assigned to the address where individuals lived (Stats NZ, 2017b, 2020).

Study load was indicated by full-time study for a full year, full-time study for part of the year, part-time study for a full year, or part-time study for part of the year. The New Zealand Standard Classification of Education field of study was summarised by: Mixed Field Programmes; Society and Culture; Natural/Physical Science; Education; Health/Vet Sciences; Creative Arts; and Management and Commerce. Too few graduates were seen in the last two fields of study to exceed Stats NZ's confidentiality threshold (5 or less).

Longitudinal outcome variables

A range of outcomes over the follow-up period (from the date of graduation) were included. These were grouped into health, social and economic domains. Individuals who were overseas for three months or more were excluded from those years.

Longitudinal social outcomes

Each year, the number of children was reported for those in the study cohort who were listed as parents.

Annual indicators of people identified in the Ministry of Justice (MOJ), Minisitry of Social Development (MSD), Housing New Zealand Corporation (HNZ), and New Zealand Police data were used to follow longitudinal patterns of benefit receipt, social housing and crime. Tier 1 working-age benefits (Jobseeker Support, Supported Living Payment, and Sole Parent Support) were extracted from the MSD Benefit Dynamics Dataset; HNZ data were used to identify individuals who were an applicant on a social housing tenancy agreement; and New Zealand Police data were used to identify individuals who had police proceedings initiated against them (including warrants, arrests and charges, but excluding infringement notices). MOJ data were used to identify individuals who were convicted of a crime.

Longitudinal economic outcomes

Inland Revenue (IR) data were used to calculate the total taxable income from wages and salaries, withholding payments, grouped government benefits

Te Arotahi Paper_July 2025-FNL-corrected.indd 6 14/07/2025 5:58 PM

(including Jobseeker Support, Supported Living Payment, Sole Parent Support, and New Zealand Superannuation), student allowances, paid parental leave, ACC, and declared self-employment income (payments to company directors, shareholders, partners and sole traders). Income estimates did not include investment income, cash income or income earned overseas, as these sources of income are not reliably recorded in IR records. Income was calculated across the full study period and annualised.

In addition to total income, we also calculated annualised income from wages, salaries and related payments. This was calculated in the same way as total income but was restricted to the following income types: wages and salaries; withholding payments; paid parental leave; and self-employed income paid to a company director, shareholder, partner or sole trader. A binary variable indicating any income derived from wages and salaries was also created.

Ministry of Education enrolment data were used to determine enrolment in a tertiary institution at any time during the study follow-up window.

Longitudinal health outcomes

All-cause hospitalisations to an inpatient facility were determined using the National Minimum Dataset (NMDS), a national collection of all publicly funded hospital admissions, either overnight or day stays of three hours or more (but not overnight). People who spent time in a mental health inpatient facility were determined using the Programme for the Integration of Mental Health Data (PRIMHD), a national collection of all publicly funded specialist mental health service use. Outpatient contacts with secondary specialist mental health services were identified from PRIMHD. Contacts that were not face-to-face (e.g., phone, letter, email) or where the consumer was not present (e.g., whānau support) were excluded. All-cause emergency department visits were determined using the National NonAdmitted Patient Collection (NNPAC), a national collection of all non-admitted patient (outpatient and emergency department) activity. ACC data were used to identify individuals who had received ACC support through either income compensation or having their medical expenses paid for by ACC. Most of these health outcome variables were created for an earlier study (Gibb et al., 2021). Additionally, residential address information in the IDI was used to describe if people lived in areas with access to health-constraining or health- promoting environmental features (Hobbs et al., 2023; Marek et al., 2021).

2018 Census outcome variables

Descriptive variables

Variables from the 2018 Census, from 2018 Census individual tables, were linked to the study cohort in the IDI. These linked variables were: number of affiliated ethnic groups (one, two, or three or more); age at immigration, born in Aotearoa, preschool-aged migrant, school age, or adult; and an indicator of disability ("Yes", "No", "Not elsewhere included"). The disability indicator is a summary measure of individuals who had some limitation or inability to do any of six activities: communicating, hearing, remembering/concentrating, seeing, walking, and washing. It is not designed to identify disability (disability prevalence) but can be used to compare those with and without some degree of limitation (Te Rourou Tātaritanga, 2024).

Family and household indicators used in the analysis were: Family type – defined as "living alone", "living with partner and no children", "in a one-parent family with children" or "in a two-parent family with dependent children" – and Number of dependent children in the household. A measure of crowding was also reported in the 2018 Census, categorised as: "severe crowding", "some crowding", no overcrowding", "crowding with no spare rooms", "no crowding with one spare room" or "no crowding with two or more spare rooms".

Economic outcomes

Labour force status was defined as "employed full-time", "employed part-time", "unemployed", "not in labour force", or "not elsewhere included". Employment status was categorised as "paid employee", "employer", "self-employed and without employees", "unpaid family worker", or "not elsewhere included".

Occupations were defined by the Australian and New Zealand Standard Classification of Occupations (ANZSCO) and industry by the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006. The working industries that we report are Education and Training; Professional, Scientific and Technical Services; Health Care and Social Assistance; Public Administration and Safety; Retail Trade; Accommodation or Food; Manufacturing; Admin/Support Services; Agriculture, Forest or Fisheries; Arts and Recreation, and Other areas. The top five occupations were: university lecturers and tutors; social professionals; general practitioners and resident medical officers; psychologists; and chief executives and managing directors. A residual "other occupations" category consisted of occupations with too few participants to exceed Stats NZ's confidentiality thresholds.

Te Arotahi Paper_July 2025-FNL-corrected.indd 7 14/07/2025 5:58 PM

Home ownership status was defined as "do not own or hold in family trust", "hold in family trust (owned or partly owned)", and "other". Tenure describes the living arrangement of the home where they live, including renting or ownership.

Statistical analyses

Data for the analyses in this study were compiled using SAS enterprise v8.3 (SAS Institute, 2018). All statistical analyses were conducted using Stata version 16.1 (StataCorp, 2019). For each of the outcomes, we calculated observed rates/means. For comparison of census variables, adjusted estimated rates (ARR) or adjusted odds ratios (AOR) with binary or multiple responses were calculated using logistic or multinomial logistic regressions. For variables with repeated measures over time, multilevel model logistic regressions for binary outcomes or multilevel log-linear regressions for incomes were applied to account for repeated measures from the year of graduation (or baseline). All ARR or AOR were from models that included gender, age at graduation, NZDep 2018 and, where applicable, urban/rural indicators, with associated 95% confidence intervals calculated and significance stated if p values < 0.05.

Relative comparisons between predicted margins were tested using odds or rate ratios or coefficients dependent on each outcome. Four regression models were run to test comparisons between the groups:

1. A regression model to test differences between Māori PhD and matched Māori individuals without a PhD with a coefficient to indicate PhD graduate and other confounding variables.
2. A regression model to test differences between Pacific PhD and matched Pacific individuals without a PhD with a coefficient to indicate PhD graduate and other confounding variables.
3. A graduate model comparing Māori PhD and nMnP PhD individuals with a coefficient to indicate Māori graduates and other confounding variables.
4. A graduate model comparing Pacific PhD and nMnP PhD individuals with a coefficient to indicate Pacific graduates and other confounding variables.

Sensitivity analyses were performed for comparisons with propensity-matched nMnP graduates income results using alternative standardised result comparisons with all nMnP graduates.

Section 1:
Results for Māori PhD graduates

Māori PhDs at graduation

Socio-demographic profile at graduation

Nine hundred and ninety-six Māori, usually resident in Aotearoa, completed a PhD degree in Aotearoa between 2003 and 2022. Table 1 describes their socio-demographic characteristics at graduation (grouped into five-year periods), as well as for a cohort of 3210 Māori without a PhD, selected from the IDI-ERP. This comparison cohort represents less than 1% of the Māori ethnic population aged between 25 and 64 years (n = 404,349) in the 2023 Census. Table 1 also describes a cohort of 1386 non-Māori non-Pacific (nMnP) PhD graduates (representing 7% of all nMnP PhD graduates over the study period). The two comparison cohorts were chosen so their demographic characteristics were like those of the Māori PhD graduates.

While the two comparison cohorts – Māori without a PhD and nMnP PhD graduates – were selected by matching on age, gender and level of deprivation, Table 1 shows that some demographic differences remained. The age-gender profile and local-area deprivation of Māori PhD graduates was more like that of nMnP graduates than Māori without a PhD. Both graduate populations had a much higher proportion of women, reflecting a broader "gender" transition towards female-dominated participation in higher education in many developed countries (Whiting, 2018). Māori PhD graduates were twice as likely as Māori without a PhD to live in the least deprived areas (NZDep1 and 2) (41% versus 21%) but were similar to nMnP PhD graduates (38%). The circumstances of Māori without a PhD reflect ethnic inequities at a whole-of-population level, with Māori households more likely to be situated in areas of higher socioeconomic deprivation.

The majority of PhD graduates in both groups were enrolled in programmes with mixed fields (54% of Māori and 64% of nMnP). Māori graduates were more likely to have obtained degrees in social and cultural studies than nMnP graduates, while the latter were more likely to have graduated in sciences. Though small numbers, Māori graduate numbers were slightly higher than nMnP in education, health and veterinary sciences.

Wellbeing outcomes at or since graduation

This section explores the social, employment (including income) and health outcomes of Māori PhDs at graduation, and up to 5, 10 and 15 years since their graduation. We note that the majority (68%)

Te Arotahi Paper_July 2025-FNL-corrected.indd 8 14/07/2025 5:58 PM

TABLE 1. Descriptive analysis of Māori PhD graduates, Māori without a PhD, and non Māori non-Pacific (nMnP) PhD graduates at baseline/graduation

	Māori				nMnP	
	PhD graduates		Without a PhD		PhD graduates	
	N	%	N	%	N	%
Total	**996**	**100.0%**	**3210**	**100.0%**	**1386**	**100.0%**
Baseline year[1]						
2003–2007	153	15.4%	498	15.5%	204	14.7%
2008–2012	222	22.3%	708	22.1%	300	21.6%
2013–2017	291	29.2%	948	29.5%	432	31.2%
2018–2022	330	33.1%	1056	32.9%	450	32.5%
Months in Aotearoa[2]						
< 3 months	48	4.8%	81	2.5%	228	16.5%
3–6 months	24	2.4%	21	0.7%	102	7.4%
7–11 months	78	7.8%	84	2.6%	189	13.6%
Full year	840	84.3%	3018	94.0%	858	61.9%
Gender						
Male	384	38.6%	1716	53.5%	534	38.5%
Female	612	61.4%	1494	46.5%	849	61.3%
Age group						
25–34 years	345	34.6%	960	29.9%	453	32.7%
35–44 years	273	27.4%	858	26.7%	402	29.0%
45–54 years	240	24.1%	828	25.8%	336	24.2%
55–64 years	135	13.6%	564	17.6%	198	14.3%
Deprivation[3]						
Quintile 1	207	20.8%	291	9.1%	270	19.5%
Quintile 2	198	19.9%	384	12.0%	252	18.2%
Quintile 3	207	20.8%	501	15.6%	294	21.2%
Quintile 4	219	22.0%	711	22.1%	300	21.6%
Quintile 5	162	16.3%	1317	41.0%	273	19.7%
Field of study[4]						
Mixed Field Programmes	534	53.6%	n/a	—	882	63.6%
Society and Culture	261	26.2%	n/a	—	201	14.5%
Natural/Physical Science	150	15.1%	n/a	—	255	18.4%
Education	27	2.7%	n/a	—	21	1.5%
Health/Vet Sciences	18	1.8%	n/a	—	18	1.3%
No qualification	na	—	3210	100.0%	na	—

Notes

1 The baseline year is the year of graduation for Māori PhD graduates and a matched sample from Māori without a PhD or nMnP PhD graduates.
2 "Months in Aotearoa" is the average number of months per year spent in Aotearoa.
3 Deprivation is defined as the New Zealand Deprivation (NZDep) quintiles.
4 "Field of Study" is taken from the faculty of the PhD study.

Te Arotahi Paper_July 2025-FNL-corrected.indd 9 14/07/2025 5:58 PM

TABLE 2. Longitudinal family and social outcomes for Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates since baseline/graduation (2003–2022)

	Māori PhD graduates				Māori without a PhD				nMnP PhD graduates			
	Graduation	**5 years**	**10 years**	**15 years**	**Baseline**	**5 years**	**10 years**	**15 years**	**Graduation**	**5 years**	**10 years**	**15 years**
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Total	**942**	**645**	**375**	**165**	**3123**	**2259**	**1320**	**570**	**1158**	**648**	**393**	**180**
No children	450 (47.8%)	234 (36.3%)	126 (33.6%)	60 (36.4%)	867 (27.8%)	549 (24.3%)	291 (22%)	141 (24.7%)	762 (65.8%)	318 (49.1%)	159 (40.5%)	72 (40%)
1 child1	180 (19.1%)	147 (22.8%)	87 (23.2%)	39 (23.6%)	597 (19.1%)	414 (18.3%)	243 (18.4%)	93 (16.3%)	162 (14%)	126 (19.4%)	72 (18.3%)	33 (18.3%)
2 children[1]	162 (17.2%)	138 (21.4%)	93 (24.8%)	36 (21.8%)	747 (23.9%)	546 (24.2%)	321 (24.3%)	147 (25.8%)	162 (14%)	147 (22.7%)	120 (30.5%)	54 (30%)
3 children[1]	90 (9.6%)	81 (12.6%)	48 (12.8%)	24 (14.5%)	471 (15.1%)	372 (16.5%)	225 (17%)	87 (15.3%)	63 (5.4%)	48 (7.4%)	36 (9.2%)	15 (8.3%)
4+ children[1]	63 (6.7%)	36 (5.6%)	21 (5.6%)	12 (7.3%)	429 (13.7%)	366 (16.2%)	249 (18.9%)	108 (18.9%)	9 (0.8%)	12 (1.9%)	6 (1.5%)	s
Social housing	9 (1%)	s	s	s	201 (6.4%)	150 (6.6%)	102 (7.7%)	42 (7.4%)	9 (0.8%)	s	s	s
Any benefit	108 (11.5%)	60 (9.3%)	51 (13.6%)	39 (23.6%)	1047 (33.5%)	783 (34.7%)	498 (37.7%)	204 (35.8%)	96 (8.3%)	63 (9.7%)	72 (18.3%)	54 (30%)

Notes

Entries denoted with "s" mean fewer than six people were identified and numbers have been suppressed for confidentiality.

1 The number of children each year for whom the study cohort are parents.

Te Arotahi Paper_July 2025-FNL-corrected.indd 10 14/07/2025 5:58 PM

could only be observed within the first five years of graduation, allowing sufficient time to elapse to observe outcomes for the most recent graduates.

Social outcomes

Comparisons of family and social outcomes for Māori PhD graduates with others are shown in Table 2. At graduation, Māori PhDs were far less likely than their nMnP counterparts to be living in a family with no dependent children (47.8% versus 65.8%) but were far more likely than Māori without a PhD (27.8%) to be in a childless living arrangement. Māori PhD graduates were also more likely to be living in households with dependent children at graduation than nMnP PhD graduates. However, after 15 years, the family living arrangements of Māori and nMnP PhD graduates were more alike, with 64% and 60%, respectively, living with dependent children. While most graduates, Māori and nMnP, had one or two children, Māori PhD graduates were more likely than nMnP PhD graduates to live with three or more children.

Taking account of time since graduation, as well as other demographic factors (see Figure 1 and the Supplementary Table 3), Māori PhD graduates were significantly less likely (AOR: 0.05, 95% CI: 0.0–0.07, $p < 0.001$) than Māori without a PhD to receive a benefit from any source at graduation. Benefits included Jobseeker Support, Supported Living Payment, and Sole Parent Support. There were no significant differences in benefit receipt between Māori and nMnP graduates at graduation, or in subsequent years.

Employment

Table 3 shows the employment outcomes of Māori PhD graduates at graduation, and in the period following graduation. Nearly nine out of ten Māori PhD graduates were employed at some time during their graduation year, compared with 68% of Māori without a PhD and 87% of nMnP PhD graduates. At graduation, most Māori and nMnP PhD graduates worked in education-related jobs (35% and 48%, respectively) followed by public administration and safety (24% and 15%, respectively). As a proportion of those who were employed, 45% of Māori and 65% of nMnP PhD graduates worked in the education sector.

Māori PhD graduates were much more likely to still be enrolled in a tertiary institution in their first year of graduation (29%) than either nMnP graduates (19%) or Māori without a PhD (9%). Fifteen years after graduation, proportions still enrolled in tertiary institutions had reduced to a quarter. For Māori PhD graduates, employment had fallen to 73%, compared with 50% of Māori without a PhD and 63% of nMnP PhD graduates. The proportion of Māori PhD graduates working in education and professional or science industries had increased while those working in health-related jobs had halved.

Taking account for time since graduation as well as other demographic factors (see Figure 1 and the Supplementary Table 3), Māori PhD graduates had 11-fold greater odds of employment compared with Māori without a PhD (AOR: 10.6, 95% CI: 7.7–14.6, $p < 0.001$) and two times greater odds compared with nMnP PhD graduates (AOR: 2.2, 95% CI: 1.5–3.1, $p < 0.001$).

Income since graduation

In terms of earnings and incomes, Table 4 shows that in their year of graduation, very few PhD graduates – fewer than 2% of Māori PhD graduates and fewer than 1% of nMnP PhD graduates – received an unemployment benefit. Most had registered an income with Inland Revenue: 93% of Māori PhD graduates, 92% of Māori without a PhD, and 89% of nMnP graduates.

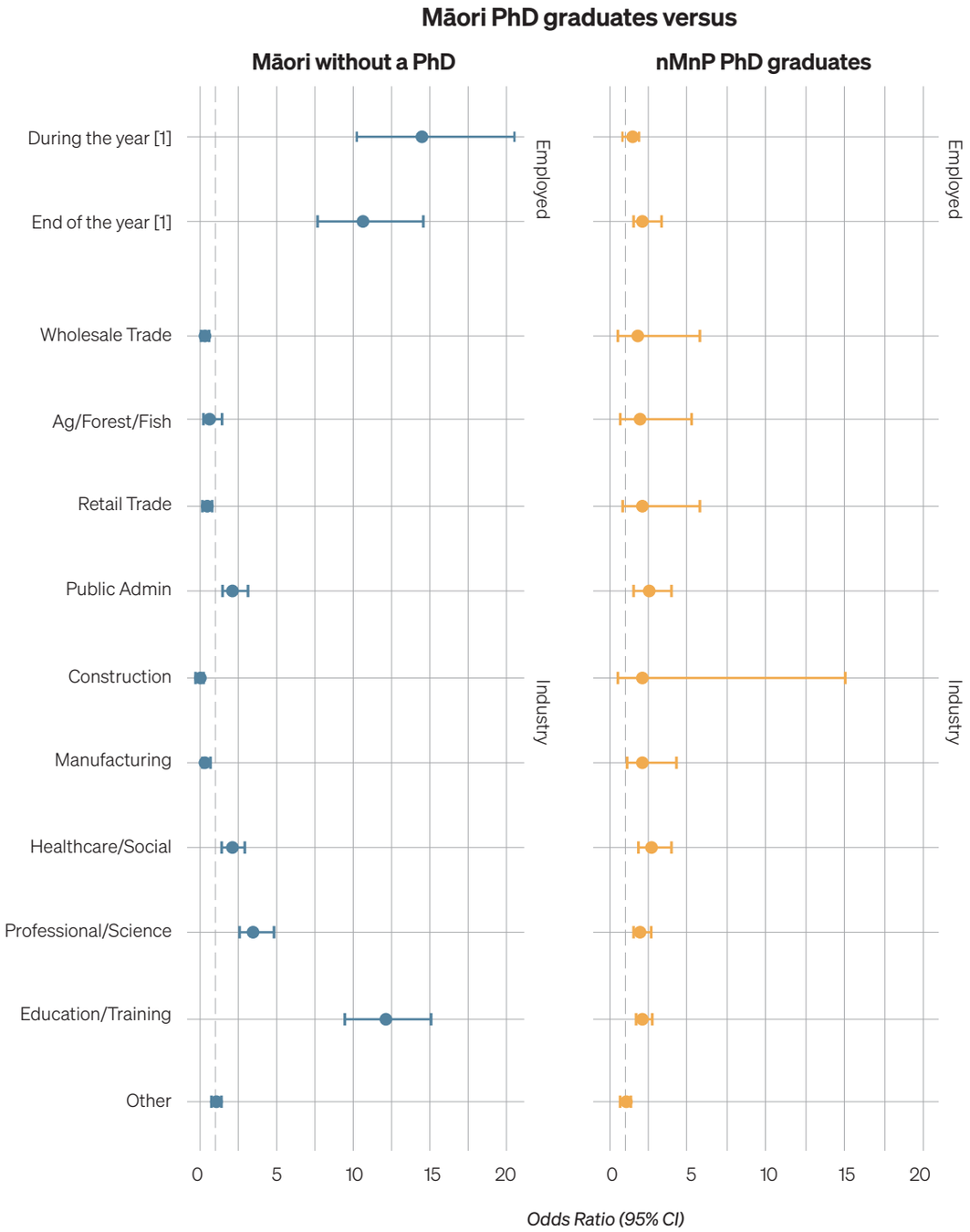
Figure 2 (see the Supplementary Table 4), shows that compared with Māori without a PhD, adjusting for time since graduation as well as other demographic factors, Māori PhD graduates had significantly lower odds of receiving an unemployment (U/E) benefit (AOR: 0.16, 95% CI: 0.09–0.29, $p < 0.001$) and higher odds of earning taxable incomes (AOR: 1.88, 95% CI: 1.83–1.94, $p < 0.001$). And compared with nMnP PhD graduates, although there were no significant differences in terms of being on an unemployment benefit, Māori PhD graduates had significantly higher odds of earning a wage or salary (AOR: 2.0, 95% CI: 1.4–3.0, $p < 0.001$).

Table 4 also shows that 15 years after graduation, the proportion of Māori PhD graduates earning incomes remained above 92%, while the same proportions for Māori without a PhD and nMnP PhD graduates had fallen slightly, to 83% in both groups.

Figure 3 displays mean annual incomes for each group in the study, with all incomes adjusted to the dollar value in 2018. It shows Māori PhD graduate earnings at graduation were nearly 50% higher than nMnP PhD graduates and almost double that of Māori without a PhD. The figure also shows a marked increase in both Māori and nMnP PhD graduate incomes in their first year in the workforce and a general increase over the first 10 years. After 10 years, however, while Māori PhD incomes continued to climb, nMnP PhD incomes plateaued or dropped slightly. Most noticeable, too, in Figure 3 is the flat trajectory of earnings for Māori without a PhD. Thus, 15 years post-graduation, incomes of Māori PhD graduates

Te Arotahi Paper_July 2025-FNL-corrected.indd 11 14/07/2025 5:58 PM

FIGURE 1. Employment-related outcomes: Adjusted odds ratio comparisons between Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates



Notes

Odds ratios are adjusted for year of and age at graduation, gender, urban/rural and NZDep in year of graduation. Multinomial logistic models were used to test the multiple response industry outcome variable categories and binomial logistic regression to test binary variables (indicated with [1])

Te Arotahi Paper_July 2025-FNL-corrected.indd 12 14/07/2025 5:58 PM

TABLE 3. Longitudinal employment outcomes for Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates since baseline/graduation (2003–2022)

	Māori PhD graduates				Māori without a PhD				nMnP PhD graduates			
	Graduation	**5 years**	**10 years**	**15 years**	**Baseline**	**5 years**	**10 years**	**15 years**	**Graduation**	**5 years**	**10 years**	**15 years**
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	
Total	**942**	**645**	**375**	**165**	**3123**	**2259**	**1320**	**570**	**1158**	**648**	**393**	**180**
Tertiary enrolment	276 (29.3%)	129 (20%)	54 (14.4%)	12 (7.3%)	282 (9%)	153 (6.8%)	57 (4.3%)	9 (1.6%)	222 (19.2%)	96 (14.8%)	42 (10.7%)	s
Employed (EOY)	762 (80.9%)	540 (83.7%)	291 (77.6%)	120 (72.7%)	1878 (60.1%)	1251 (55.4%)	675 (51.1%)	288 (50.5%)	867 (74.9%)	525 (81%)	282 (71.8%)	114 (63.3%)
Ever employed	828 (87.9%)	567 (87.9%)	306 (81.6%)	126 (76.4%)	2133 (68.3%)	1434 (63.5%)	765 (58%)	321 (56.3%)	1002 (86.5%)	546 (84.3%)	303 (77.1%)	120 (66.7%)
Industry[1]												
Education/Training	327 (34.7%)	240 (37.2%)	147 (39.2%)	66 (40%)	132 (4.2%)	102 (4.5%)	60 (4.5%)	36 (6.3%)	561 (48.4%)	294 (45.4%)	171 (43.5%)	75 (41.7%)
Public Admin/Safety	228 (24.2%)	162 (25.1%)	99 (26.4%)	36 (21.8%)	990 (31.7%)	729 (32.3%)	447 (33.9%)	180 (31.6%)	174 (15%)	123 (19%)	99 (25.2%)	45 (25%)
Healthcare/Social Assistance	69 (7.3%)	39 (6%)	18 (4.8%)	6 (3.6%)	165 (5.3%)	135 (6%)	90 (6.8%)	42 (7.4%)	51 (4.4%)	33 (5.1%)	24 (6.1%)	6 (3.3%)
Professional/Science/ Tech	54 (5.7%)	42 (6.5%)	27 (7.2%)	15 (9.1%)	63 (2%)	48 (2.1%)	36 (2.7%)	18 (3.2%)	105 (9.1%)	57 (8.8%)	33 (8.4%)	18 (10%)
Retail Trade	36 (3.8%)	18 (2.8%)	s	s	180 (5.8%)	117 (5.2%)	69 (5.2%)	27 (4.7%)	30 (2.6%)	18 (2.8%)	s	s
Accommodation /Food	27 (2.9%)	9 (1.4%)	s	s	153 (4.9%)	102 (4.5%)	48 (3.6%)	18 (3.2%)	30 (2.6%)	12 (1.9%)	s	s
Admin/Support Services	18 (1.9%)	6 (0.9%)	s	s	159 (5.1%)	108 (4.8%)	69 (5.2%)	27 (4.7%)	24 (2.1%)	9 (1.4%)	s	s
Agriculture/Forest/Fish	15 (1.6%)	s	s	s	213 (6.8%)	132 (5.8%)	75 (5.7%)	36 (6.3%)	9 (0.8%)	9 (1.4%)	s	s
Manufacturing	12 (1.3%)	s	s	s	315 (10.1%)	231 (10.2%)	120 (9.1%)	54 (9.5%)	33 (2.8%)	12 (1.9%)	s	s
Arts/Recreation	12 (1.3%)	6 (0.9%)	6 (1.6%)	s	42 (1.3%)	30 (1.3%)	15 (1.1%)	6 (1.1%)	12 (1%)	9 (1.4%)	s	s
Other areas	15 (1.6%)	12 (1.9%)	9 (2.4%)	s	69 (2.2%)	54 (2.4%)	24 (1.8%)	12 (2.1%)	9 (0.8%)	9 (1.4%)	s	s

Notes

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1 The Industry categories were defined by the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006.

Te Arotahi Paper_July 2025-FNL-corrected.indd 13 14/07/2025 5:58 PM

Te Arotahi Paper_July 2025-FNL-corrected.indd 14

TABLE 4. Longitudinal earnings and income outcomes for Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates since baseline/graduation (2003–2022)

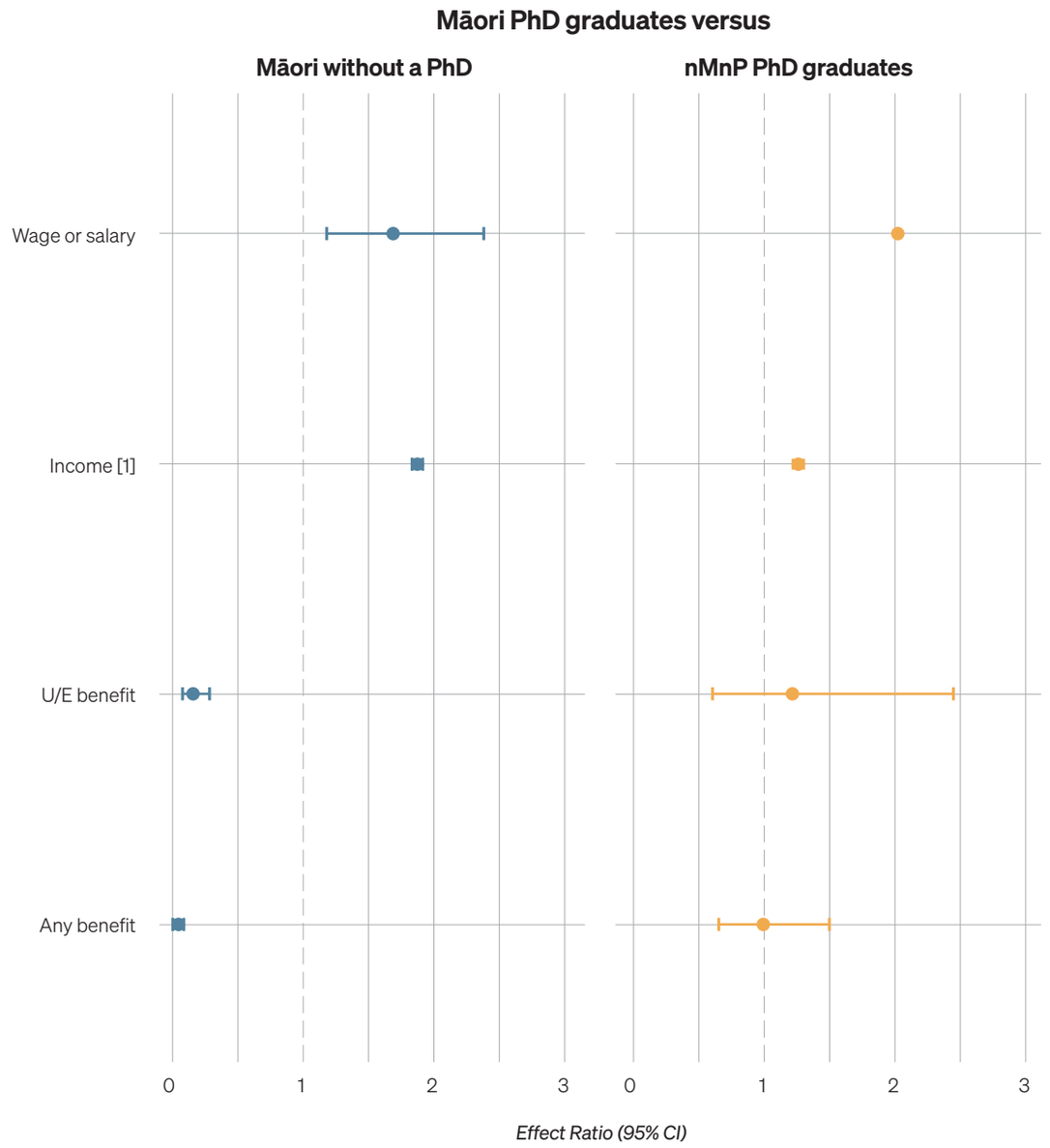
	Māori PhD graduates				Māori without a PhD				nMnP PhD graduates			
	Graduation	**5 years**	**10 years**	**15 years**	**Baseline**	**5 years**	**10 years**	**15 years**	**Graduation**	**5 years**	**10 years**	**15 years**
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Total	**942**	**645**	**375**	**165**	**3123**	**2259**	**1320**	**570**	**1158**	**648**	**393**	**180**
UE benefit (EOY)	18 (1.9%)	6 (0.9%)	s	s	168 (5.4%)	111 (4.9%)	60 (4.5%)	15 (2.6%)	12 (1%)	6 (0.9%)	s	s
Any income earned	873 (92.7%)	606 (94%)	348 (92.8%)	153 (92.7%)	2859 (91.5%)	1983 (87.8%)	1128 (85.5%)	474 (83.2%)	1035 (89.4%)	585 (90.3%)	333 (84.7%)	150 (83.3%)
Average annual income (SE)	$62,151	$82,862	$89,172	$90,481	$39,806	$40,600	$39,654	$40,148	$46,131	$69,595	$66,631	$61,181
	($2,510)	($3,748)	($5,452)	($9,043)	($933)	($1,154)	($1,483)	($2,280)	($1,819)	($3,255)	($4,273)	($6,231)

Note

Entries denoted with “s” mean fewer than six people were identified and numbers have been suppressed for confidentiality.

14/07/2025 5:58 PM

FIGURE 2. Income and welfare outcomes: Adjusted odds ratio comparisons between Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates

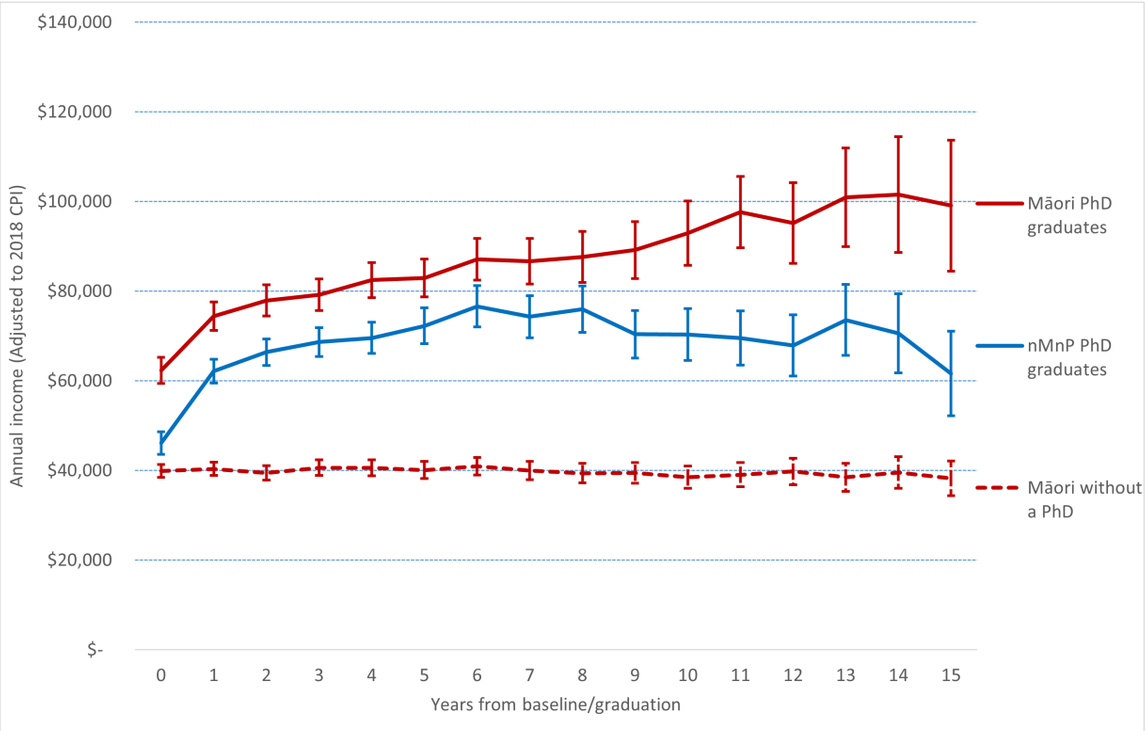


Note

Odds ratios are adjusted for year of and age at graduation, gender, urban/rural and NZDep in year of graduation. Binomial logistic models were used to test outcome variables with binary response categories and log-linear regression to test the continuous income variables (indicated with [1]).

Te Arotahi Paper_July 2025-FNL-corrected.indd 15 14/07/2025 5:58 PM

FIGURE 3. Mean incomes for Māori PhD graduates, Māori without a PhD, and non-Māori non Pacific (nMnP) PhD graduates since baseline/graduation (2003–2022)



remained 50% higher than those of nMnP PhD graduates but the margin had increased to more than twice those of Māori without a PhD.

The adjusted estimate rates (ARR) tell a similar story (see Supplementary Table 4): Māori PhD graduates had higher incomes than both Māori without a PhD (ARR: 1.88, 95% CI: 1.83–1.31, $p < 0.001$) and nMnP PhD graduates (ARR: 1.27, 95% CI: 1.23–1.31, ates, Māori without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates

Health outcomes since graduation

Table 5 shows that 15 years on, Māori PhD graduates were half as likely as Māori without a PhD to be admitted to a publicly funded hospital as an inpatient (4% versus 12%, respectively) but no more or less likely to be admitted than nMnP PhD graduates. However, more Māori PhD graduates had at least one ACC claim (33%) than either Māori without a PhD or nMnP PhD graduates (20% for both groups).

Figure 4 (see the Supplementary Table 5) shows that taking account for time since graduation and other demographic factors, Māori PhD graduates had significantly lower odds of inpatient (AOR: 0.71, 95% CI: 0.62–0.82, $p < 0.001$) and emergency department (ED) admissions (AOR: 0.46, 95% CI: 0.40–0.54, $p < 0.001$) and making an ACC claim (AOR: 0.83, 95% CI: 0.73–0.94, $p < 0.001$) compared with Māori without a PhD. Compared with nMnP PhD graduates, however, Māori PhD graduates had higher odds of both inpatient (AOR: 1.3, 95% CI: 1.1–1.6, $p = 0.001$) and emergency admissions (AOR: 1.8, 95% CI: 1.5–2.2, $p < 0.001$) and also higher odds of making an ACC claim (AOR: 1.8, 95% CI: 1.6–2.1, $p < 0.001$).

While proportionally similar numbers in each cohort remained in areas with health-promoting features, over time Māori graduates were more likely to move from areas with health-constraining features. However, after adjusting for time since graduation and other demographic factors, there were no significant differences (odds) that Māori PhD graduates lived in areas with health-promoting or health-constraining features compared with either Māori without a PhD or nMnP PhD graduates.

Māori PhD outcomes at 2018 Census

Socio-demographic outcomes

Using data from the 2018 Census provides us with a relatively recent snapshot of the characteristics and circumstances of Māori who had obtained a PhD at some point between 2003 and 2022. Several demographic differences existed between Māori

Te Arotahi Paper_July 2025-FNL-corrected.indd 16 14/07/2025 5:58 PM

Te Arotahi Paper_July 2025-FNL-corrected.indd 17

TABLE 5. Longitudinal health outcomes for Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates since baseline/graduation (2003–2022)

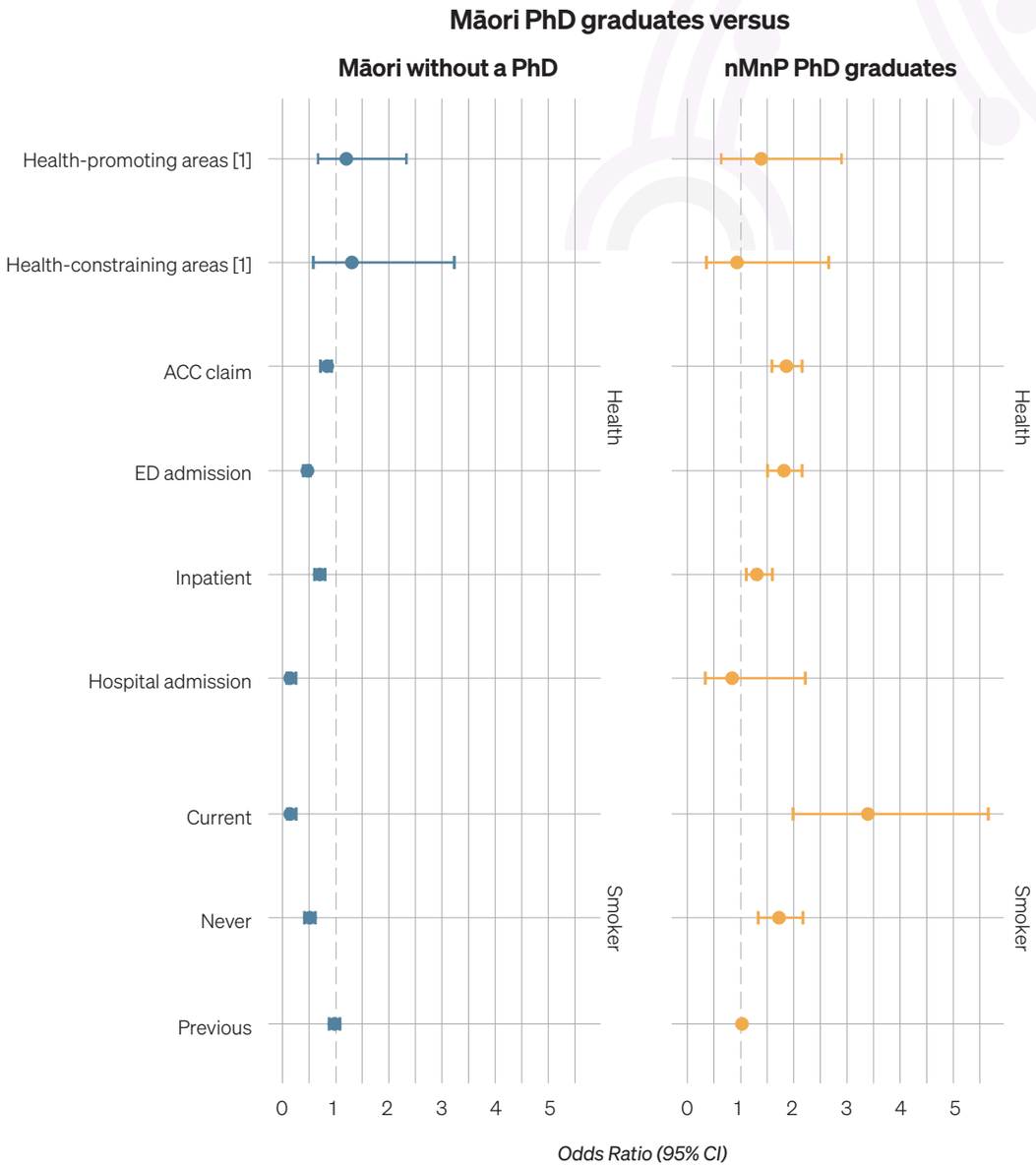
	Māori PhD graduates				Māori without a PhD				nMnP PhD graduates			
	Graduation	5 years	10 years	15 years	Baseline	5 years	10 years	15 years	Graduation	5 years	10 years	15 years
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Total	**942**	**645**	**375**	**165**	**3123**	**2259**	**1320**	**570**	**1158**	**648**	**393**	**180**
Sickness beneficiary	21 (2.2%)	18 (2.8%)	9 (2.4%)	s	402 (12.9%)	291 (12.9%)	183 (13.9%)	72 (12.6%)	6 (0.5%)	6 (0.9%)	s	s
Hospital admission	72 (7.6%)	42 (6.5%)	21 (5.6%)	6 (3.6%)	447 (14.3%)	318 (14.1%)	183 (13.9%)	69 (12.1%)	75 (6.5%)	54 (8.3%)	27 (6.9%)	9 (5%)
Inpatient admission	60 (6.4%)	75 (11.6%)	36 (9.6%)	15 (9.1%)	375 (12%)	276 (12.2%)	144 (10.9%)	60 (10.5%)	66 (5.7%)	57 (8.8%)	27 (6.9%)	15 (8.3%)
One ED admission	54 (5.7%)	42 (6.5%)	27 (7.2%)	12 (7.3%)	324 (10.4%)	243 (10.8%)	120 (9.1%)	48 (8.4%)	54 (4.7%)	42 (6.5%)	21 (5.3%)	12 (6.7%)
2+ ED admissions	15 (1.6%)	15 (2.3%)	6 (1.6%)	9 (5.5%)	162 (5.2%)	147 (6.5%)	72 (5.5%)	33 (5.8%)	12 (1%)	9 (1.4%)	6 (1.5%)	s
One ACC claim	180 (19.1%)	126 (19.5%)	81 (21.6%)	42 (25.5%)	609 (19.5%)	429 (19%)	249 (18.9%)	87 (15.3%)	192 (16.6%)	114 (17.6%)	81 (20.6%)	24 (13.3%)
2+ ACC Claims	60 (6.4%)	42 (6.5%)	18 (4.8%)	12 (7.3%)	261 (8.4%)	159 (7%)	84 (6.4%)	27 (4.7%)	54 (4.7%)	27 (4.2%)	24 (6.1%)	12 (6.7%)
Health-constraining areas	174 (18.5%)	108 (16.7%)	60 (16%)	27 (16.4%)	603 (19.3%)	435 (19.3%)	264 (20%)	117 (20.5%)	240 (20.7%)	138 (21.3%)	84 (21.4%)	36 (20%)
Health-promoting areas	84 (8.9%)	60 (9.3%)	33 (8.8%)	15 (9.1%)	222 (7.1%)	168 (7.4%)	108 (8.2%)	54 (9.5%)	84 (7.3%)	57 (8.8%)	39 (9.9%)	18 (10%)

Note

Entries denoted with "s" mean fewer than six people were identified and numbers have been suppressed for confidentiality.

14/07/2025 5:58 PM

FIGURE 4. Health outcomes: Adjusted odds ratio comparisons between Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates



Note

Odds ratios are adjusted for year of and age at graduation, gender, urban/rural and NZDep in year of graduation. Binomial logistic models were used to test outcome variables with binary response categories and multinomial logistic regression to test multiple variables (indicated with [1]).

Te Arotahi Paper_July 2025-FNL-corrected.indd 18 14/07/2025 5:58 PM

PhD graduates and the matched cohorts of Māori without a PhD and nMnP PhD graduates based on data from the 2018 Census (see Table 6). Binomial and multinomial logistic regressions were used to calculate adjusted odds ratios (AOR) – adjusted for year of and age at graduation, gender, urban/rural and NZDep in graduation (baseline) year – and these AOR were used to test differences in outcomes (see the Supplementary Table 6). We note that in 2018, one third of the Māori PhDs included here had not yet obtained their PhD. Thus, some of those whom we refer to here as "graduates" (within the complete study period) were not graduates in 2018.

Of those recorded in the 2018 Census, nearly two thirds (64%) of the Māori PhDs in our study identified with more than one ethnicity compared with 45% of Māori without a PhD (AOR: 1.6, 95% CI: 1.4–1.9, $p < 0.001$) and just 3% of nMnP PhD graduates (AOR: 51.4, 95% CI: 35.7–74.1, $p < 0.001$). Seven per cent of Māori PhD graduates identified with three or more ethnicities compared with 3% of Māori without a PhD. Unsurprisingly, the vast majority of Māori PhD graduates and Māori without a PhD were born in Aotearoa (95–99%), compared with fewer than half of the nMnP PhD graduates (43.4%).

Family and household outcomes

Few Māori PhD graduates indicated they had a limitation due to a disability (less an 3%), which is significantly lower odds than Māori without a PhD (AOR:0.41, 95% CI: 0.26–0.66, $p < 0.001$) but not significantly different to nMnP PhD graduates ($p = 0.2$).

There were several differences between the family and household composition and circumstances of Māori PhD graduates and those of both Māori without a PhD and nMnP PhD graduates (Table 7). AOR tests from statistical models are presented in Figure 5 and tabulated in the Supplementary Table 7. Māori PhD graduates were more likely to live alone (AOR: 1.3, 95% CI: 1.1–1.7, $p = 0.01$) and less likely to live in families as parents (AOR: 0.55, 95% CI: 0.42–0.73, $p < 0.001$)

TABLE 6. Descriptive analysis of Māori PhD graduates, Māori without a PhD, and non Māori non-Pacific PhD (nMnP) graduates from the 2018 Census

	Māori				nMnP	
	PhD graduates		Without a PhD		PhD graduates	
	N	%	N	%	N	%
Ethnicity						
Total Census responses[1]	885	100.0%	2706	100.0%	951	100.0%
One	318	35.9%	1497	55.3%	915	96.2%
Two	501	56.6%	1122	41.5%	30	3.2%
Three or more	63	7.1%	90	3.3%	s	0.0%
Age at Immigration						
Total Census responses	861	100.0%	2655	100.0%	930	100.0%
New Zealand born	831	96.5%	2640	98.9%	405	43.5%
Preschool age	s	0.0%	s	0.0%	159	17.1%
School age	s	0.0%	s	0.0%	204	21.9%
Adult	30	3.5%	15	0.6%	162	17.4%
Disability						
Total Census responses[2]	876	100.0%	2685	100.0%	930	100.0%
No	792	90.4%	1,809	67.4%	846	91.0%
Yes	81	9.2%	876	32.6%	81	8.7%

Notes

Entries denoted with "s" mean fewer than six people were identified and numbers have been suppressed for confidentiality.

Rounding and suppression of cell counts below six means that totals do not always add to 100%.

1 Total Census responses exclude people who did not respond to the ethnicity question.
2 Total excludes 60 Māori PhD graduates, 723 Māori without a PhD, and 676 nMnP PhD graduates who did not respond to any of the 2018 Census activity limitation questions.

Te Arotahi Paper_July 2025-FNL-corrected.indd 19 14/07/2025 5:58 PM

TABLE 7. Family and household measures of Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific PhD (nMnP) graduates at the 2018 Census

	Māori				nMnP	
	PhD graduates		Without a PhD		PhD graduates	
	N	%	N	%	N	%
Family type						
Total Census responses	672	100.0%	1746	100.0%	678	100.0%
Couple living alone	369	54.9%	897	51.4%	360	53.1%
Individual alone	216	32.1%	447	25.6%	264	38.9%
Parents with children	90	13.4%	402	23.0%	54	8.0%
Dependent children						
Total Census responses	672	100.0%	1734	100.0%	669	100.0%
None	306	45.5%	792	45.7%	354	52.9%
Two	135	20.1%	330	19.0%	135	20.2%
One	144	21.4%	363	20.9%	132	19.7%
Three	57	8.5%	159	9.2%	39	5.8%
Four or more	27	4.0%	93	5.4%	9	1.3%
Crowding						
Total Census responses	669	100.0%	1704	100.0%	672	100.0%
Crowding	33	4.9%	171	10.0%	30	4.5%
No crowding, 1 spare room	237	35.4%	528	31.0%	231	34.4%
No crowding, 2+ spare rooms	237	35.4%	450	26.4%	261	38.8%
No crowding, no spare room	150	22.4%	462	27.1%	147	21.9%
Severe crowding	9	1.3%	93	5.5%	s	0.0%

than Māori without a PhD. However, compared with nMnP PhD graduates, Māori PhD graduates were more likely to live in families as parents (AOR: 1.6, 95% CI: 1.1–2.4, $p = 0.01$).

Over half (54%) of Māori PhD graduates and Māori without a PhD lived in households with dependent children; this proportion compares with just under half (47%) of nMnP PhD graduates. There were no significant differences in the number of children living within their households (both Māori PhD graduates versus Māori without a PhD, and Māori versus nMnP PhD graduates). Similarly, there was no significant difference between the levels of crowding experienced by Māori and nMnP graduates. A smaller share of Māori PhD graduates lived in overcrowded homes (AOR: 0.44, 95% CI: 0.29–0.66, $p < 0.001$) or experienced severe overcrowding (AOR:0.24, 95% CI: 0.13–0.47, $p < 0.001$) than their Māori counterparts without a PhD.

Employment

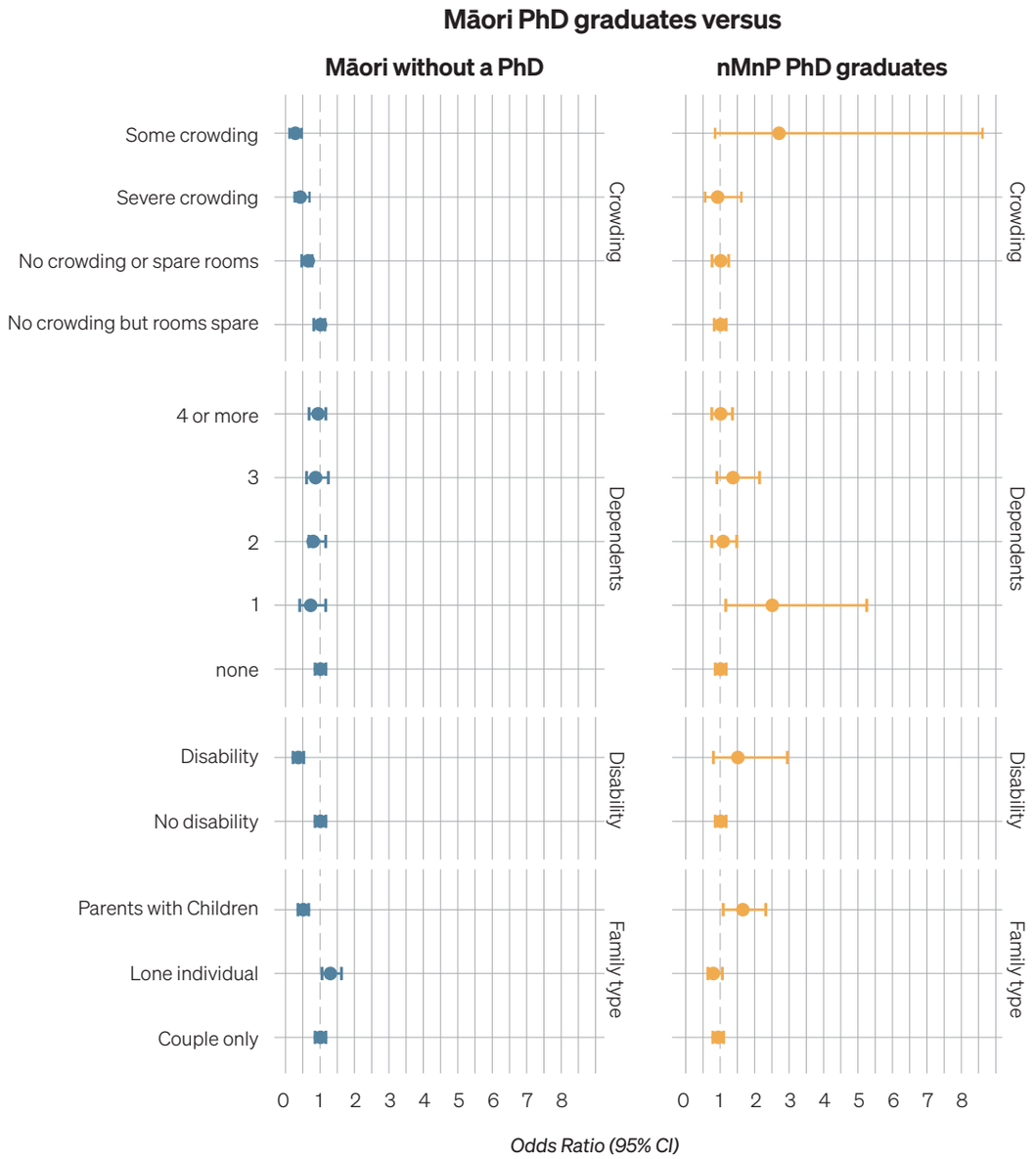
Comparisons of employment outcomes in 2018 are shown in Table 8 and AOR tests from statistical models in Figure 6.

Employment outcomes

Compared with Māori without a PhD in the 2018 Census, Māori PhD graduates were more likely to participate in the workforce (84% versus 71%) and less likely to be unemployed (2.7% versus 5.9%). Taking account of time since graduation, as well as other demographic factors, Māori PhD graduates had significantly greater odds of being (were more likely to be) in full-time employment, with lower odds of (less likely to be) non-labour force participation, meaning neither looking for nor able to work, (AOR: 0.48, 95% CI: 0.39–0.60, $p < 0.001$) (see Figure 6 and the Supplementary Table 8). That is, Māori PhD graduates were more likely to be employed full-time. There were,

Te Arotahi Paper_July 2025-FNL-corrected.indd 20 14/07/2025 5:58 PM

FIGURE 5. Family, household and social outcomes: Adjusted odds ratio comparisons between Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates



Note

Odds ratios are adjusted for year of and age at graduation, gender, urban/rural and NZDep in year of graduation. Multinomial logistic models were used to test outcome variables with multiple response categories and binomial logistic regression to test binary disability variable.

Te Arotahi Paper_July 2025-FNL-corrected.indd 21 14/07/2025 5:58 PM

TABLE 8. Labour force and employment information on Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates from the 2018 Census

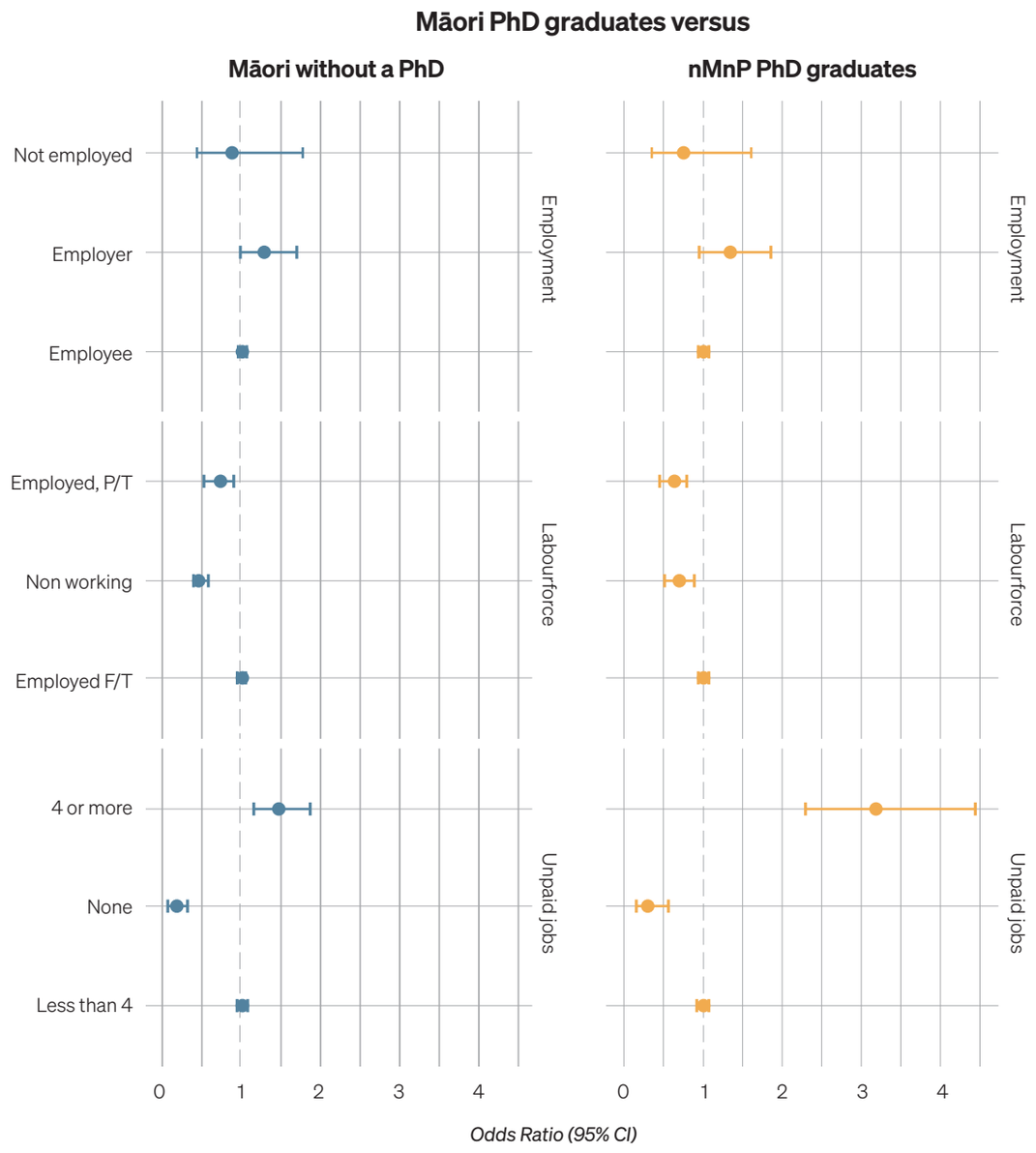
	Māori				nMnP	
	PhD graduates		Without a PhD		PhD graduates	
	N	%	N	%	N	%
Labourforce status[1]						
Total Census responses	873	100.0%	2679	100.0%	930	100.0%
Employed full-time	612	70.1%	1,542	57.6%	561	60.3%
Employed part-time	120	13.7%	354	13.2%	177	19.0%
Non-Labour force	123	14.1%	627	23.4%	165	17.7%
Not employed	24	2.7%	159	5.9%	27	2.9%
Unpaid jobs						
Total Census responses	885	100.0%	2706	100.0%	951	100.0%
Not Answered	72	8.1%	768	28.4%	90	9.5%
None	9	1.0%	174	6.4%	42	4.4%
One to three	654	73.9%	1518	56.1%	759	79.8%
Four plus	147	16.6%	240	8.9%	54	5.7%
Employment[2]						
Total Census responses	741	100.0%	1920	100.0%	753	100.0%
Not Answered	9	1.2%	21	1.1%	15	2.0%
Employee	627	84.6%	1674	87.2%	657	87.3%
Employer	18	2.4%	81	4.2%	15	2.0%
SE, no employees	81	10.9%	126	6.6%	63	8.4%
Unpaid/family	—	0.0%	15	0.8%	—	0.0%
Occupation[3]						
Total Census responses	732	100.0%	1899	100.0%	741	100.0%
Professionals	564	77.0%	282	14.8%	537	72.5%
Managers	102	13.9%	300	15.8%	78	10.5%
Clerical and Admin	30	4.1%	192	10.1%	45	6.1%
Community & Personal	18	2.5%	201	10.6%	30	4.0%
Technicians and Trade	9	1.2%	243	12.8%	15	2.0%
Other Occupations	6	0.8%	675	35.5%	24	3.2%
Industry[4]						
Total Census responses	732	100.0%	1899	100.0%	741	100.0%
Education/Training	387	52.9%	159	8.4%	396	53.4%
Professional/Science/Tech	99	13.5%	120	6.3%	108	14.6%
Healthcare or Social	81	11.1%	171	9.0%	66	8.9%
Public Admin/Safety	48	6.6%	105	5.5%	42	5.7%
Manufacturing	15	2.0%	258	13.6%	18	2.4%
Other areas	81	11.1%	1074	56.6%	96	13.0%

Notes

1 Labour force status is the availability of individuals to participate or look for work or their employment status if available to work.
2 Employment status was categorised as “Paid employee”, “Employer”, Self-Employed and without employees”, “Unpaid family worker”, and “Not elsewhere included”.
3 Occupations were defined by the Australian and New Zealand Standard Classification of Occupations (ANZSCO).
4 Industry by the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006.

Te Arotahi Paper_July 2025-FNL-corrected.indd 22 14/07/2025 5:58 PM

FIGURE 6. Work and employment outcomes: adjusted odds ratio comparisons between Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific PhD graduates



Note

Odds ratios are adjusted for year of and age at graduation, gender, urban/rural and NZDep in year of graduation. Multinomial logistic models were used to test outcome variables with multiple response categories.

Te Arotahi Paper_July 2025-FNL-corrected.indd 23 14/07/2025 5:58 PM

however, no significant differences in those who, although available to work, were not employed.

Compared with nMnP PhD graduates, Māori PhD graduates had small but significantly lower levels of labour force participation (AOR: 0.68, 95% CI: 0.53–0.88, $p = 0.003$). For PhD graduates in employment, there are no significant differences in types of employment (e.g., employee). Most Māori PhD graduates worked in professional or managerial occupations, significantly more than nMnP PhD graduates (AOR: 1.9, 95% CI: 1.4–2.6, $p < 0.001$) and Māori without PhDs (AOR: 3.6, 95% CI: 2.6–4.9, $p < 0.001$). A higher share of Māori PhD graduates worked in education and professional industries (AOR: 12.0, 95% CI: 9.5–15.1, $p < 0.001$) than did Māori without PhDs. Māori PhD graduates were also significantly more likely to work in health-related jobs than Māori without PhDs (AOR: 2.2, 95% CI: 1.6–2.9, $p < 0.001$) and nMnP PhD graduates (AOR: 2.7, 95% CI: 1.9–3.9, $p < 0.001$). Māori PhD graduates were more likely to have voluntary jobs than were both Māori without PhDs and nMnP PhD graduates, with Māori PhD graduates 50% more likely to have four or more voluntary jobs than Māori without a PhD (18% versus 12%) and nearly three times more likely than nMnP PhD graduates (18% versus 6%).

Economic outcomes

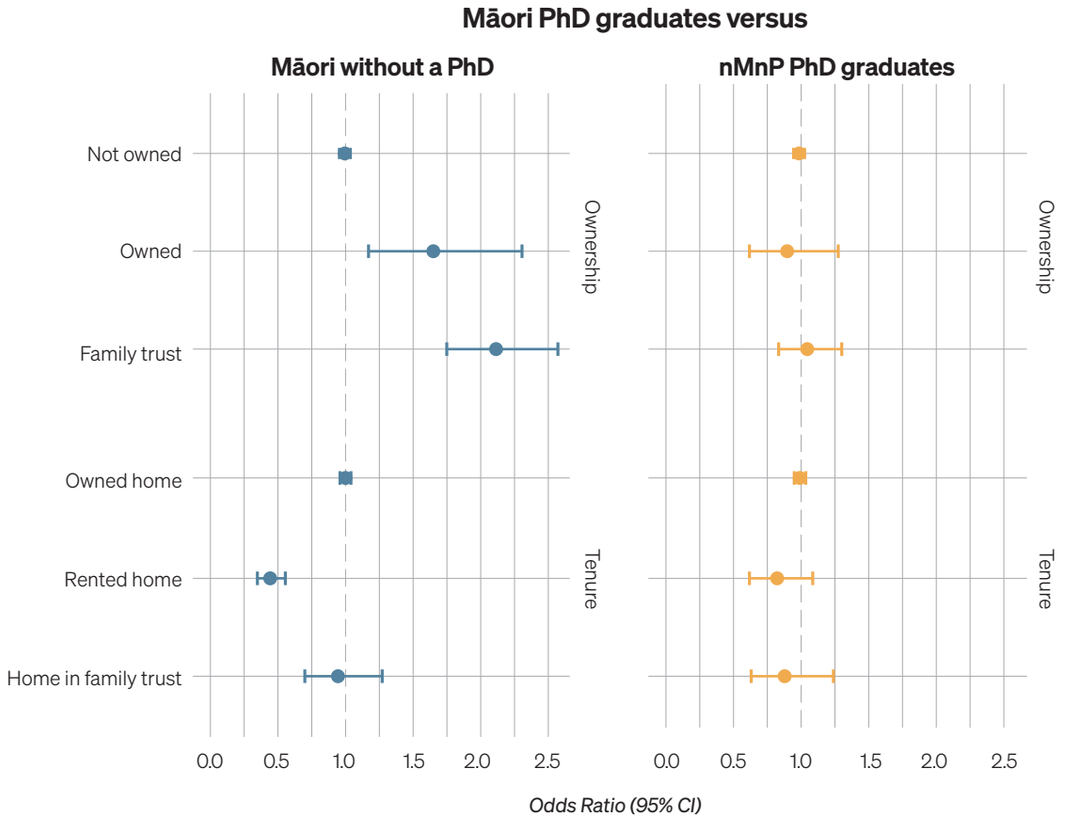
Home ownership in the 2018 Census focuses specifically on whether the household owns their dwelling, while tenure describes the living arrangement of the home where they live, including renting or ownership. Table 9 shows that compared with Māori without a PhD, Māori PhD graduates had greater chances of owning their homes, with or without a mortgage, while Figure 7 (see the Supplementary Table 9) shows that having a PhD increased their odds of home ownership by 70% (AOR: 1.7, 95% CI: 1.2–2.3, $p = 0.003$). Table 9 also shows that in terms of tenure, three quarters of Māori PhD graduates lived in homes that they owned outright or as part of a family trust, higher than 58% of Māori without a PhD, and the adjusted odds ratios in Figure 7 again show the advantage of a PhD degree in terms of home ownership (own home AOR: 1.66, 95% CI: 1.2–2.3, $p = 0.003$; family trust AOR: 2.1, 95% CI: 1.8–2.6,

TABLE 9. Home ownership, tenure and neighbourhood deprivation information on Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates from the 2018 Census

	Māori				nMnP	
	PhD graduates		Without a PhD		PhD graduates	
	N	%	N	%	N	%
Home ownership						
Total Census responses	882	100.0%	2703	100.0%	945	100.0%
Not answered	72	8.2%	756	28.0%	81	8.6%
Family trust	417	47.3%	735	27.2%	429	45.4%
Not owned	318	36.1%	1062	39.3%	339	35.9%
Owned	75	8.5%	147	5.4%	90	9.5%
Tenure						
Total Census responses	672	100.0%	1746	100.0%	678	100.0%
Family trust	81	12.1%	159	9.1%	93	13.7%
Owned	426	63.4%	855	49.0%	408	60.2%
Rented	165	24.6%	729	41.8%	171	25.2%
NZDep 2018						
Total Census responses	885	100.0%	2706	100.0%	945	100.0%
Quintile 1	195	22.0%	282	10.4%	237	25.1%
Quintile 2	180	20.3%	297	11.0%	186	19.7%
Quintile 3	189	21.4%	447	16.5%	198	21.0%
Quintile 4	183	20.7%	630	23.3%	183	19.4%
Quintile 5	135	15.3%	1047	38.7%	141	14.9%

Te Arotahi Paper_July 2025-FNL-corrected.indd 24 14/07/2025 5:58 PM

FIGURE 7. Home ownership: Adjusted odds ratio comparisons between Māori PhD graduates, Māori without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates



Note

Odds ratios are adjusted for year of and age at graduation, gender, urban/rural and NZDep in year of graduation. Multinomial logistic models were used to test outcome variables with multiple response categories.

$p < 0.001$). Conversely, Māori PhD graduates were less likely (had lower odds) of renting the home they live in (AOR: 0.43, 95% CI: 0.34–0.54, $p < 0.001$). However, Figure 7 shows no significant adjusted differences of home ownership or tenure for Māori PhD graduates compared with nMnP PhD graduates.

Finally, Māori PhD graduates were more likely than Māori without a PhD to live in neighbourhoods characterised as least deprived socioeconomically (that is, quintile 1: 22% versus 10%) but slightly less likely than nMnP graduates (22% versus 25%) to live in those neighbourhoods (see Table 9).

Discussion of Māori findings

Studies of graduate outcomes can provide an evidential basis for educational, social and health policy, planning and practice. Graduate studies identify ways that a university education can improve outcomes, transform life opportunities, and reduce inequalities, including for those who have been affected by colonisation, marginalisation, discrimination and disadvantage (Edwards & Coates, 2011). Previous studies have provided important insights on graduate outcomes for Indigenous students (Connor et al., 2004; Edwards & Coates, 2011; Li, 2014; Mahoney, 2014a; Theodore et al., 2017; 2019) but there have been no large quantitative studies of Māori PhD graduate economic, social and health outcomes. This is despite the increasing numbers of Māori students graduating from universities at the highest level.

Our findings show that having a doctoral qualification is associated with a broad range of benefits for Māori graduates and their whānau. Māori PhD graduates experienced better financial outcomes at graduation and across time compared with Māori without PhDs and of a similar age and stage.

Moreover, there were many similarities in outcomes between Māori PhD and nMnP PhD graduates. These findings suggest that higher

Te Arotahi Paper_July 2025-FNL-corrected.indd 25 14/07/2025 5:58 PM

education, and in particular doctoral studies, reduces ethnic disparities in labour market outcomes in Aotearoa. For example, accounting for time since graduation, Māori PhD graduates had similar employment outcomes to nMnP PhD graduates. Mahoney (2014a) observed that Māori graduates were more likely than nonMāori graduates to be in part-time and/or lower paying positions with slower earnings growth over time. At the doctoral level (PhD), however, Mahoney found that Māori doctoral graduates earned more than nMnP PhD graduates five years after study.

Similar to previous findings, this study has found a high proportion of Māori PhD graduates have employment compared with Māori without a PhD. Interestingly, Māori PhD graduates were largely employed either during or before their studies had been fully completed, as indicated by the four out of five Māori PhD graduates who were employed at the end of their year of graduation. This figure was 25% higher than for Māori without a PhD in the same years, and slightly higher than for nMnP PhD graduates. At graduation, a large number of Māori PhD graduates worked in education or public administration, but proportionally, Māori PhD graduates were more likely to work in health-related jobs than the other comparison groups. Fifteen years after graduation, however, the proportion of Māori PhD graduates working in education and professional or science industries had increased, while those working in health-related jobs had halved.

Our findings showed that Māori PhD graduates had increased chances of earning a taxable income and had overall higher incomes than both Māori without a PhD and nMnP PhD graduates. In the general population, Māori, on average, have lower incomes than the national median and are more likely than non-Māori to live in households affected by poverty (defined as incomes less than 60% of the national median income) (Perry, 2013). These disparities result from persistent and entrenched inequalities across the health, education, justice and public service sectors, leading to higher rates of unemployment, lower incomes, fewer assets and poorer health (Ministry of Health, 2015; Perry, 2013; Statistics New Zealand, 2002; Stats NZ, 2018).

We found that Māori PhD graduates were more likely to have multiple unpaid jobs compared with both Māori without a PhD and nMnP PhD graduates (50% more likely to have four or more voluntary roles). It may be that greater income affords more opportunity for Māori PhD graduates to provide more voluntary assistance. However, these voluntary roles can potentially place a drain on individuals and their families. Our findings are in keeping with other findings showing Māori are more likely to participate in unpaid work than other New Zealanders (Statistics New Zealand, 2011). Furthermore, Theodore et al. (2017) found that Māori and Pacific graduates were significantly more likely than nMnP graduates to report helping their families, friends and acquaintances and participating in community organisations. Māori PhD graduates are currently still in short supply, so there is likely a high demand for their civic service within their communities, and society in general, because of their skill sets.

Education may support positive health and wellbeing outcomes for Māori. When compared with Māori without a PhD, fully adjusted models showed that Māori PhD graduates had significantly lower odds of inpatient hospital admission, emergency admission and ACC claims. Our findings align with previous literature suggesting likely improved health outcomes for Māori graduates. The exact mechanism of the protective effect is likely to be a culmination of a multitude of factors (e.g., financial advantages).

We found no significant differences in the odds of Māori graduates living in areas with health-promoting or health-constraining features compared with either Māori without a PhD or nMnP PhD graduates. Māori PhD graduates compared with Māori without a PhD had higher proportions of homeownership, however, and were also more likely to live in areas of lower deprivation.

Māori PhD graduates (29%) were more likely to be enrolled in a tertiary institution in the year of graduation than nMnP PhD graduates and Māori without a PhD (both 19%). Fifteen years after graduation, the proportion still enrolled in tertiary institutions had reduced to a quarter. Theodore et al. (2017), in their study of New Zealand university graduate outcomes, found that of those who had not enrolled in further tertiary education at two years post-graduation, more than a third of Māori graduates expressed a desire to undertake more study compared with 28% of other graduates.

This present study focuses on high-level economic, social and health outcomes using administrative data. Our findings underscore the importance of equity in access and participation in higher education to the highest levels. Benefits of such are not only experienced by the graduates, but also their whānau, and wider society.

Te Arotahi Paper_July 2025-FNL-corrected.indd 26 14/07/2025 5:58 PM

Section 2:
Results for Pacific PhD graduates

Pacific PhD graduates at graduation

Socio-demographic profile at graduation

Four hundred and thirty-eight Pacific Peoples, usually resident in Aotearoa, completed their doctoral degree in Aotearoa between 2003 and 2022. Table 10 describes the socio-demographic characteristics of those Pacific PhD graduates as well as a cohort of 1374 Pacific Peoples without a PhD, selected from the IDI-ERP. This comparison cohort represents less than 1% of the Pacific population aged between 25 and 64 years (221,193) in the 2023 Census. Table 10 also describes a cohort of 1386 non-Māori non-Pacific (nMnP) PhD graduates (representing 7% of all nMnP PhD graduates over the study period). The two comparison cohorts were chosen so their demographic characteristics were like those of the Pacific PhD graduates.

While the two comparison cohorts – Pacific without a PhD and nMnP PhD graduates – were selected by matching on age, gender and level of economic deprivation, Table 10 shows that some noticeable demographic differences. In particular, Pacific without a PhD were more likely to be men.

Local-area deprivation at baseline for Pacific without a PhD retained the proportions evident in the Pacific population as a whole. Pacific PhD graduates were more than twice as likely to live in the least-deprived areas of Aotearoa at graduation (or baseline) than Pacific without a PhD (13% versus 6%, respectively), but less than for nMnP graduates (20%). It is well documented that in the general population, Pacific communities are most likely to live in areas with higher socioeconomic deprivation.

For those who graduated with a PhD, 60% of Pacific and 64% of nMnP graduates were enrolled in programmes with multiple fields of study. Pacific graduates were more likely to have graduated with PhDs in social and cultural degrees than nMnP, while the latter were more likely to have graduated in sciences. Though small numbers, Pacific PhD graduates were more likely to study education or health degrees than nMnP PhD graduates.

Wellbeing outcomes at or since graduation

This section explores the social, employment (including income) and health outcomes of Pacific PhDs at graduation, and up to 5, 10 and 15 years since. We note that the majority could only be observed within the first five years of graduation, allowing sufficient time to elapse to observe outcomes for the most recent graduates.

Social outcomes

Comparisons of longitudinal family and social outcomes for Pacific PhD graduates with others are shown in Table 11. Longitudinal outcomes for Pacific PhD graduates since graduation showed they were less likely to live in families with children than Pacific without a PhD (AOR: 0.50, 95% CI: 0.31–0.78, $p = 0.002$). Compared with nMnP PhD graduates, however, Pacific PhD graduates had lower odds of living alone (AOR: 0.47, 95% CI: 0.32–0.67, $p < 0.001$).

At graduation, just over half of Pacific PhD graduates indicated they lived in households with dependent children, compared with just under half of nMnP PhD graduates. After 15 years, three out of five Pacific PhD graduates lived with children in their households, a proportion which is similar to that of the other two cohorts.

Employment

Comparisons of longitudinal employment outcomes for Pacific PhD graduates with others are shown in Table 12. At graduation, most Pacific PhD graduates and nMnP PhD graduates worked in education-related jobs (41% and 48%, respectively; equivalent to 52% and 59% of those employed) followed by public administration (18% and 15%, respectively). Pacific PhD graduates remained nearly twice as likely to work in health-related jobs as nMnP graduates (8% versus 4%, respectively). Fifteen years after graduation, the proportions of Pacific PhD graduates still enrolled in tertiary institutions had reduced to levels too small to report. Employment had fallen to 67%, compared with 55% of Pacific without a PhD, and 63% of nMnP PhD graduates. The proportions of Pacific PhD graduates working in education and professional or science-related industries had increased while those working in health-related jobs had halved.

AOR or ARR tests from statistical models are depicted in Figure 8 and reported in full in the Supplementary Table 3. Taking account for time since graduation as well as other demographic factors, Pacific PhD graduates had 5-fold greater odds of employment compared with Pacific without a PhD (AOR: 4.8, 95% CI: 2.8–8.1, $p < 0.001$) and also greater odds compared with nMnP PhD graduates (AOR: 1.8, 95% CI: 1.0–2.9, $p = 0.04$).

Figure 9 (see the Supplementary Table 4) shows that compared with Pacific without a PhD, Pacific PhD graduates had significantly lower odds of receiving an unemployment benefit (AOR: 0.40, 95% CI: 0.14–0.29, $p < 0.001$) and higher odds of earning taxable incomes (AOR: 1.88, 95% CI: 1.83–1.94, $p < 0.001$). Compared with nMnP PhD graduates, Pacific PhD graduates had no significant association of being on an

Te Arotahi Paper_July 2025-FNL-corrected.indd 27 14/07/2025 5:58 PM

TABLE 10. Descriptive analysis of Pacific PhD graduates, Pacific without a PhD, and non Māori non-Pacific (nMnP) PhD graduates at baseline/graduation

	Pacific				nMnP	
	PhD graduates		Without a PhD		PhD graduates	
	N	%	N	%	N	%
Total	**438**	**100.0%**	**1374**	**100.0%**	**1386**	**100.0%**
Baseline Year[1]						
2003–2007	54	12.3%	159	11.6%	204	14.7%
2008–2012	87	19.9%	282	20.5%	300	21.6%
2013–2017	147	33.6%	450	32.8%	432	31.2%
2018–2022	150	34.2%	483	35.2%	450	32.5%
Months in Aotearoa[2]						
< 3 months	93	21.2%	54	3.9%	228	16.5%
3–6 months	24	5.5%	33	2.4%	102	7.4%
7–11 months	48	11.0%	63	4.6%	189	13.6%
Full year	273	62.3%	1224	89.1%	858	61.9%
Gender						
Male	183	41.8%	738	53.7%	534	38.5%
Female	252	57.5%	639	46.5%	849	61.3%
Age group						
25–34 years	117	26.7%	432	31.4%	453	32.7%
35–44 years	141	32.2%	399	29.0%	402	29.0%
45–54 years	123	28.1%	321	23.4%	336	24.2%
55–64 years	54	12.3%	216	15.7%	198	14.3%
Deprivation[3]						
Quintile 1	57	13.0%	78	5.7%	270	19.5%
Quintile 2	54	12.3%	105	7.6%	252	18.2%
Quintile 3	108	24.7%	168	12.2%	294	21.2%
Quintile 4	96	21.9%	276	20.1%	300	21.6%
Quintile 5	120	27.4%	747	54.4%	273	19.7%
Quintile 5	135	15.3%	1047	38.7%	141	14.9%
Field of study[4]						
Mixed Field Programmes	261	59.6%	na	—	882	63.6%
Society and Culture	102	23.3%	na	—	201	14.5%
Natural/Physical Science	51	11.6%	na	—	255	18.4%
Education	9	2.1%	na	—	21	1.5%
Health/Vet Sciences	9	2.1%	na	—	18	1.3%
No qualification	na	—	1374	100.0%	na	—

Notes

1 The baseline year is the year of graduation for Pacific PhD graduates and a matched sample from Pacific without a PhD or nMnP PhD graduates.
2 "Months in Aotearoa" is the average number of months per year spent in Aotearoa.
3 Deprivation is defined as the New Zealand deprivation (NZDep) quintiles.
4 Field of study is taken from the faculty of the PhD study.

Te Arotahi Paper_July 2025-FNL-corrected.indd 28 14/07/2025 5:58 PM

Te Arotahi Paper_July 2025-FNL-corrected.indd 29

TABLE 11. Longitudinal family and social outcomes for Pacific PhD graduates, Pacific without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates since baseline/graduation (2003–2022)

	Pacific PhD graduates				Pacific without a PhD				nMnP PhD graduates			
	Graduation	5 years	10 years	15 years	Baseline	5 years	10 years	15 years	Graduation	5 years	10 years	15 years
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Total	**342**	**204**	**111**	**45**	**1320**	**882**	**456**	**165**	**1158**	**648**	**393**	**180**
No children	168 (49.1%)	78 (38.2%)	36 (32.4%)	18 (40%)	474 (35.9%)	276 (31.3%)	129 (28.3%)	51 (30.9%)	762 (65.8%)	318 (49.1%)	159 (40.5%)	72 (40%)
1 child1	63 (18.4%)	42 (20.6%)	21 (18.9%)	12 (26.7%)	222 (16.8%)	150 (17%)	75 (16.4%)	24 (14.5%)	162 (14%)	126 (19.4%)	72 (18.3%)	33 (18.3%)
2 children1	63 (18.4%)	45 (22.1%)	30 (27%)	12 (26.7%)	255 (19.3%)	177 (20.1%)	96 (21.1%)	45 (27.3%)	162 (14%)	147 (22.7%)	120 (30.5%)	54 (30%)
3 children1	30 (8.8%)	27 (13.2%)	12 (10.8%)	9 (20%)	174 (13.2%)	117 (13.3%)	66 (14.5%)	21 (12.7%)	63 (5.4%)	48 (7.4%)	36 (9.2%)	15 (8.3%)
4+ children1	12 (3.5%)	9 (4.4%)	s	s	192 (14.5%)	162 (18.4%)	93 (20.4%)	30 (18.2%)	9 (0.8%)	12 (1.9%)	6 (1.5%)	s
Social housing	9 (2.6%)	s	s	s	204 (15.5%)	141 (16%)	69 (15.1%)	21 (12.7%)	9 (0.8%)	s	s	s
Any benefit	33 (9.6%)	12 (5.9%)	15 (13.5%)	12 (26.7%)	366 (27.7%)	243 (27.6%)	132 (28.9%)	57 (34.5%)	96 (8.3%)	63 (9.7%)	72 (18.3%)	54 (30%)

Note

Entries denoted with "s" mean fewer than six people were identified and numbers have been suppressed for confidentiality.

14/07/2025 5:58 PM

Te Arotahi Paper_July 2025-FNL-corrected.indd 30

TABLE 12. Longitudinal employment outcomes for Pacific PhD graduates, Pacific without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates since baseline/graduation (2003–2022)

	Pacific PhD graduates				Pacific without a PhD				nMnP PhD graduates			
	Graduation	**5 years**	**10 years**	**15 years**	**Baseline**	**5 years**	**10 years**	**15 years**	**Graduation**	**5 years**	**10 years**	**15 years**
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	
Total	**342**	**204**	**111**	**45**	**1320**	**882**	**456**	**165**	**1158**	**648**	**393**	**180**
Tertiary enrolment	75 (21.9%)	21 (10.3%)	9 (8.1%)	s	84 (6.4%)	36 (4.1%)	12 (2.6%)	s	222 (19.2%)	96 (14.8%)	42 (10.7%)	s
Employed (EOY)	267 (78.1%)	174 (85.3%)	87 (78.4%)	30 (66.7%)	894 (67.7%)	549 (62.2%)	267 (58.6%)	90 (54.5%)	867 (74.9%)	525 (81%)	282 (71.8%)	114 (63.3%)
Ever employed	291 (85.1%)	186 (91.2%)	96 (86.5%)	33 (73.3%)	987 (74.8%)	609 (69%)	294 (64.5%)	105 (63.6%)	1002 (86.5%)	546 (84.3%)	303 (77.1%)	120 (66.7%)
Industry[1]												
Education/Training	141 (41.2%)	75 (36.8%)	45 (40.5%)	21 (46.7%)	27 (2%)	21 (2.4%)	9 (2%)	s	561 (48.4%)	294 (45.4%)	171 (43.5%)	75 (41.7%)
Public Admin/Safety	63 (18.4%)	36 (17.6%)	24 (21.6%)	15 (33.3%)	345 (26.1%)	225 (25.5%)	132 (28.9%)	45 (27.3%)	174 (15%)	123 (19%)	99 (25.2%)	45 (25%)
Healthcare/Social Assistance	27 (7.9%)	18 (8.8%)	6 (5.4%)	s	75 (5.7%)	54 (6.1%)	24 (5.3%)	9 (5.5%)	51 (4.4%)	33 (5.1%)	24 (6.1%)	6 (3.3%)
Professional/Science/ Tech	18 (5.3%)	12 (5.9%)	s	s	30 (2.3%)	27 (3.1%)	12 (2.6%)	9 (5.5%)	105 (9.1%)	57 (8.8%)	33 (8.4%)	18 (10%)
Retail Trade	9 (2.6%)	s	s	s	84 (6.4%)	48 (5.4%)	24 (5.3%)	9 (5.5%)	30 (2.6%)	18 (2.8%)	s	s
Accommodation /Food	12 (3.5%)	9 (4.4%)	s	s	60 (4.5%)	42 (4.8%)	18 (3.9%)	s	30 (2.6%)	12 (1.9%)	s	s
Admin/Support Services	15 (4.4%)	6 (2.9%)	s	s	132 (10%)	90 (10.2%)	39 (8.6%)	15 (9.1%)	24 (2.1%)	9 (1.4%)	s	s
Agriculture/Forest/Fish	s	s	s	s	51 (3.9%)	36 (4.1%)	18 (3.9%)	s	9 (0.8%)	9 (1.4%)	s	s
Manufacturing	6 (1.8%)	6 (2.9%)	s	s	189 (14.3%)	123 (13.9%)	72 (15.8%)	33 (20%)	33 (2.8%)	12 (1.9%)	s	s
Arts/Recreation	s	s	s	s	9 (0.7%)	s	s	s	12 (1%)	9 (1.4%)	s	s
Other areas	12 (3.5%)	12 (5.9%)	6 (5.4%)	s	21 (1.6%)	12 (1.4%)	s	s	9 (0.8%)	9 (1.4%)	s	s

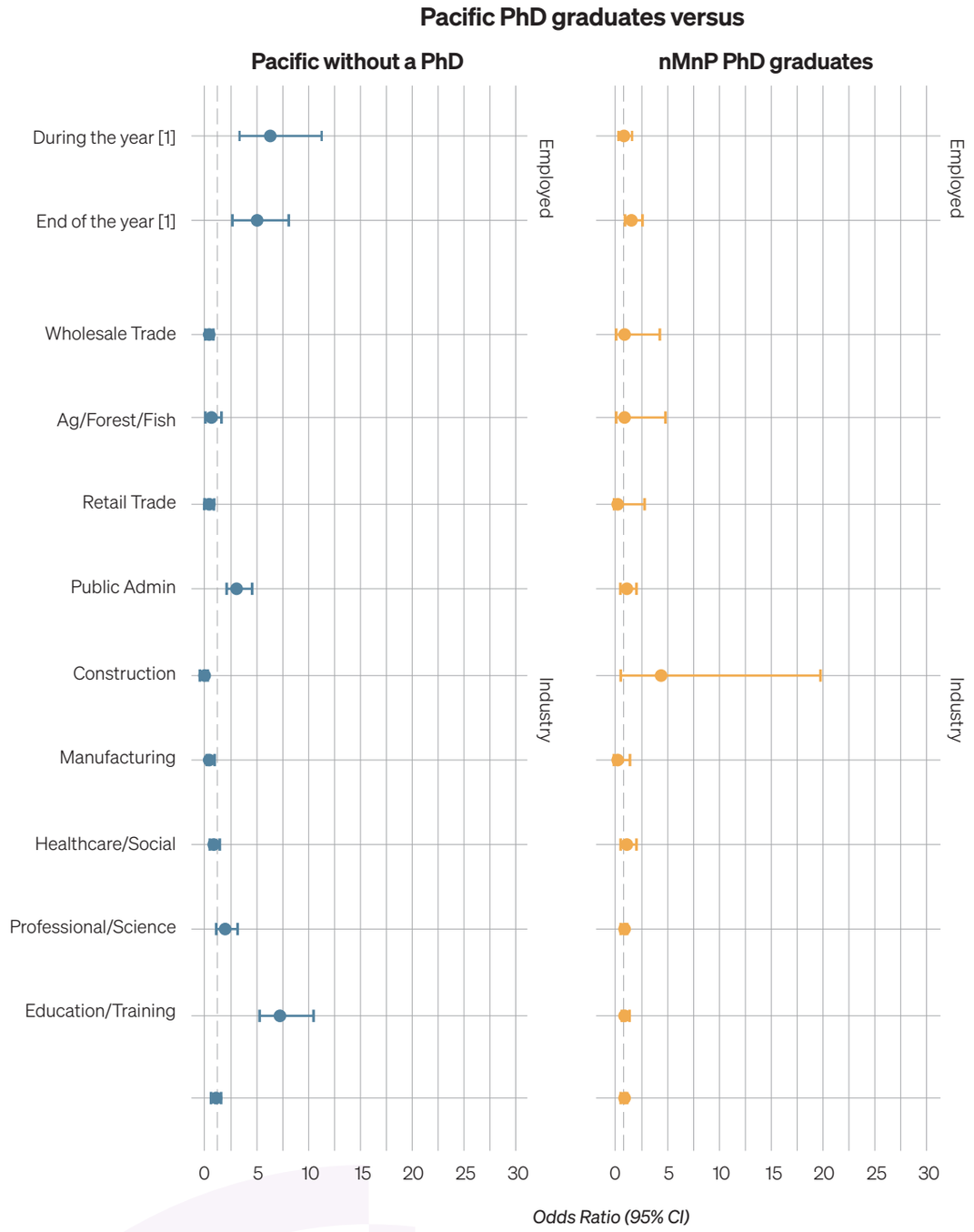
Notes

Entries denoted with "s" mean fewer than six people were identified and numbers have been suppressed for confidentiality.

The Industry categories were defined by the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006.

14/07/2025 5:58 PM

FIGURE 8. Employment-related outcomes: Adjusted odds ratio comparisons between Pacific PhD graduates, Pacific without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates

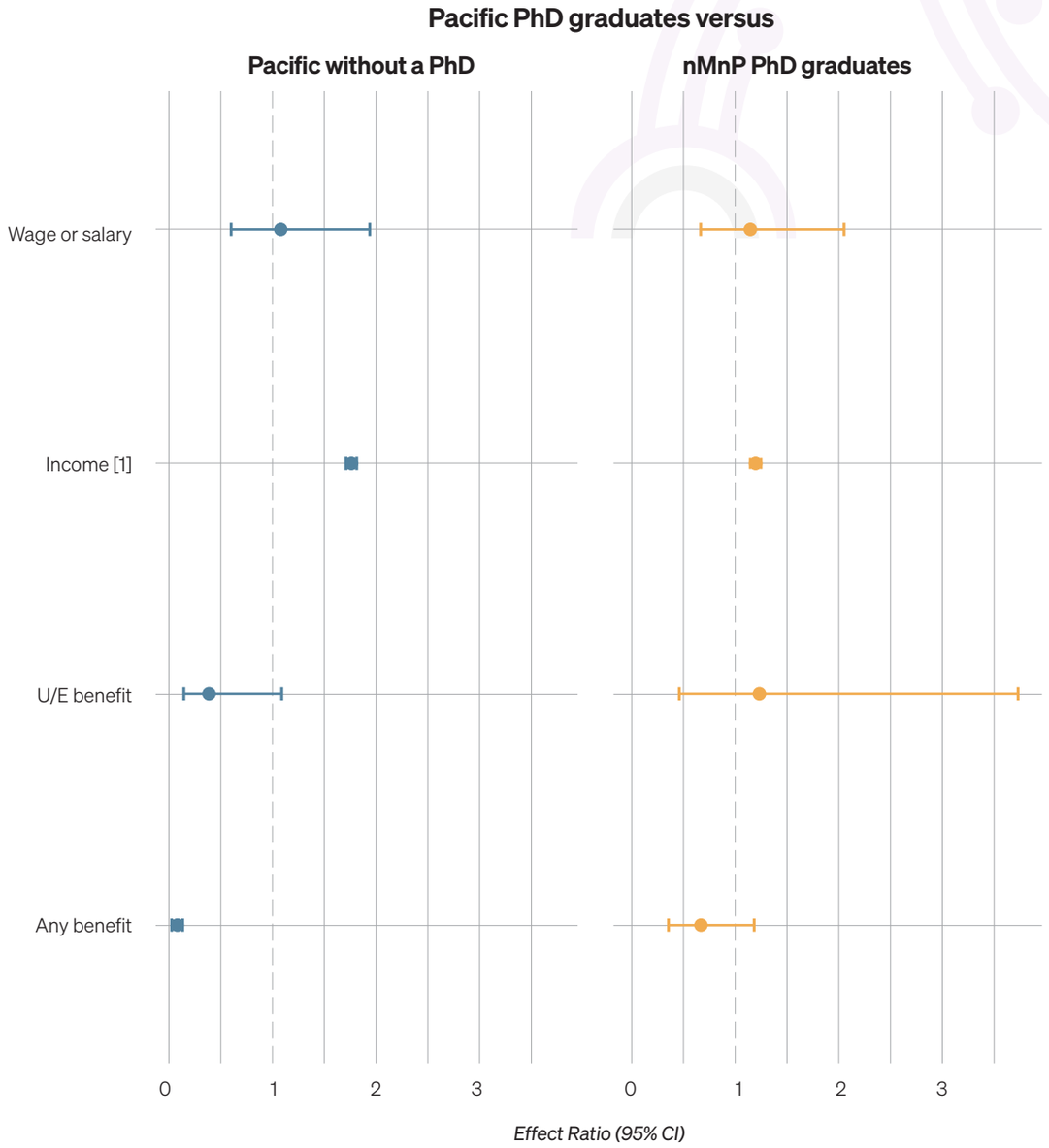


Note

Odds ratios are adjusted for year of and age at graduation, gender, urban/rural and NZDep in year of graduation. Multinomial logistic models were used to test the multiple response industry outcome variable categories and binomial logistic regression to test binary variables (indicated with [1]).

Te Arotahi Paper_July 2025-FNL-corrected.indd 31 14/07/2025 5:58 PM

FIGURE 9. Income and welfare outcomes: Adjusted odds ratio comparisons between Pacific PhD graduates, Pacific without a PhD, and non-Māori non-Pacific PhD graduates



Note

Odds ratios are adjusted for year of and age at graduation, gender, urban/rural and NZDep in year of graduation. Binomial logistic models were used to test outcome variables with binary response categories and log-linear regression to test the continuous income variables (indicated with [1]).

Te Arotahi Paper_July 2025-FNL-corrected.indd 32 14/07/2025 5:58 PM

unemployment benefit, but significantly higher odds of earning taxable incomes (AOR: 2.0, 95% CI: 1.4–3.0, $p < 0.001$).

Incomes since graduation

In terms of earnings and incomes, Table 13 shows that in their year of graduation, very few PhD graduates – fewer than 3% of Pacific PhD graduates and fewer than 1% of nMnP PhD graduates – received an unemployment benefit. Most had registered an income with Inland Revenue: 90% of Pacific PhD graduates, 90% of Pacific without a PhD and 89% of nMnP PhD graduates. Pacific PhD graduate earnings at graduation were slightly higher than nMnP PhD graduates ($51K versus $46K) and 25% higher than Pacific without a PhD ($51K versus $41K). Ten years after graduation, 91% of Pacific PhD graduates registered a taxable income while the proportions for Pacific without a PhD and nMnP PhD graduates had fallen slightly, to 82% and 85%, respectively.

Incomes of Pacific PhD graduates remained 50% higher than those of nMnP PhD graduates but the margin increased to more than twice those of Pacific without a PhD.

Figure 9 shows that compared with Pacific without a PhD, Pacific PhD graduates had higher incomes than both Pacific without a PhD (ARR: 1.76, 95% CI: 1.67–1.84, $p < 0.001$) and nMnP PhD graduates (ARR: 1.19, 95% CI: 1.13-1.24, $p < 0.001$).

Figure 10 shows annual incomes for each group in the study, with all incomes adjusted to the dollar value in 2018, showing a marked increase in PhD graduate incomes in their first year in the workforce and a general increase in the first 10 years after which, while Pacific PhD incomes continued to climb, Pacific and nMnP incomes plateau or dropped slightly. Most noticeable is the flat trajectory of earnings for Pacific without a PhD.

Health outcomes since graduation

Pacific PhD graduates, in their year of graduation, were more likely than nMnP PhD graduates to be admitted an inpatient (10% versus 6%, respectively) or to an emergency department (12% versus 6%, respectively), but were seen at similar levels as Pacific without a PhD (see Table 14). However, they had similar levels of ACC claims as nMnP PhD graduates (21% each) and less than Pacific without a PhD (21% versus 26%). Ten years on, Pacific PhD graduates were more likely to be admitted as an inpatient than Pacific without a PhD (14% versus 11%, respectively) but had similar rates for emergency department admission (11% versus 10%) - rates that are higher than the rate for nMnP graduates (7% in each). Pacific

TABLE 13. Longitudinal earnings and income outcomes for Pacific PhD graduates, Pacific without a PhD, and non-Māori non-Pacific PhD graduates since baseline/graduation (2003–2022)

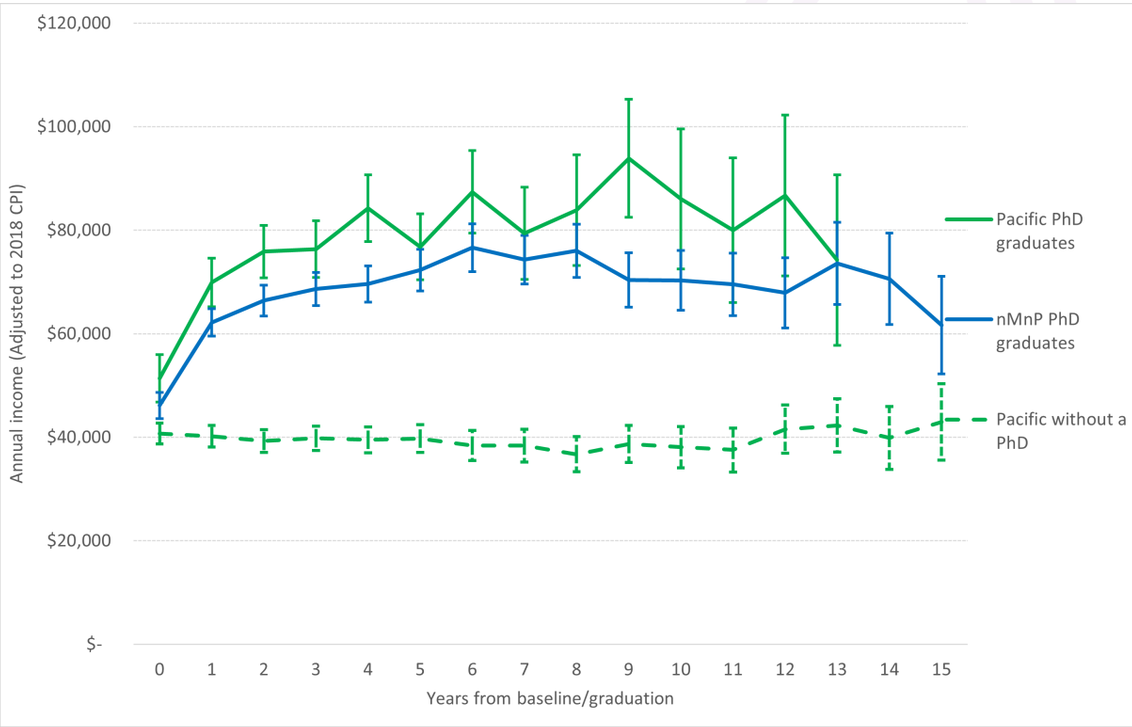
	Pacific PhD graduates						Pacific without a PhD				nMnP PhD graduates					
	Graduation		5 years		10 years		15 years		Baseline		5 years		10 years		15 years		Graduation		5 years		10 years		15 years	
	N (%)		N (%)		N (%)		N (%)		N (%)		N (%)		N (%)		N (%)		N (%)		N (%)		N (%)		N (%)	
Total	**342**		**204**		**111**		**45**		**1320**		**882**		**456**		**165**		**1158**		**648**		**393**		**180**	
UE benefit (EOY)	9 (2.6%)		s		s		S		48 (3.6%)		21 (2.4%)		15 (3.3%)		s		12 (1%)		6 (0.9%)		s		s	
Any income earned	306 (89.5%)		192 (94.1%)		102 (91.9%)		39 (86.7%)		1191 (90.2%)		768 (87.1%)		375 (82.2%)		141 (85.5%)		1035 (89.4%)		585 (90.3%)		333 (84.7%)		150 (83.3%)	
Average annual income (SE)	$50,928		$73,097		$68,513		na		$40,624		$39,230		$37,432		$37,685		$46,131		$69,595		$66,631		$61,181	
	($3,557)		($6,030)		($8,338)				($1,385)		($1,666)		($2,266)		($3,848)		($1,819)		($3,255)		($4,273)		($6,231)	

Note

Entries denoted with "s" mean fewer than six people were identified and numbers have been suppressed for confidentiality.

Te Arotahi Paper_July 2025-FNL-corrected.indd 33 14/07/2025 5:58 PM

FIGURE 10. Mean incomes for Pacific PhD graduates, Pacific without a PhD, and non Māori non-Pacific (nMnP) PhD graduates since baseline/graduation (2003–2022)



PhD graduates, however, had fewer ACC claims (16%) than both Pacific without a PhD (23%) and nMnP PhD graduates (27%).

Taking account for time since graduations (see Figure 11 and the Supplementary Table 5), as well as other demographic factors, Pacific PhD graduates had significantly lower odds of inpatient (AOR: 0.75, 95% CI: 0.59–0.94, $p = 0.01$) and emergency admissions (AOR: 0.50, 95% CI: 0.40–0.63, $p < 0.001$) or making an ACC claim (AOR: 0.51, 95% CI: 0.41–0.64, p<0.001) compared with Pacific without a PhD. Compared with nMnP PhD graduates, they had higher odds of inpatient (AOR: 1.4, 95% CI: 1.1–1.8, $p = 0.003$) and emergency admissions (AOR: 1.7, 95% CI: 1.4–2.2, $p < 0.001$) but no difference in ACC claim frequency.

Table 14 also shows that in the year they graduated, fewer Pacific PhD graduates lived in areas with health-constraining features than Pacific without a PhD (18% versus 21%) and less than nMnP PhD graduates (21%). Conversely, Pacific PhD graduates were more likely than the other two cohorts to live in health-promoting areas (9% versus 4% of Pacific without a PhD and 7% of nMnP PhD graduates). Small numbers make it difficult to identify a clear pattern for health-promoting environments over time, although statistical tests suggest that adjusting for time and other demographic factors, there were significantly higher odds that Pacific PhD graduates lived in health-promoting areas than did Pacific without a PhD (AOR: 3.0, 95% CI: 1.6–7.7, $p = 0.02$) but there was no statistical difference for their odds of living in health-constraining areas (see Figure 11 and the Supplementary Table 5). Though not significant, Table 14 shows that the absolute differences between Pacific PhD graduates and Pacific without a PhD increased by 15 years after graduation or baseline. The difference between Pacific PhD graduates and Pacific without a PhD living in the health-constraining areas is 14% at 15 years (13% versus 27%) compared with 7% in the baseline year (13% versus 6%, respectively). However, Figure 11 shows there are no significant differences in the adjusted odds ratio for Pacific PhD graduates versus nMnP PhD graduates.

Pacific PhD outcomes at 2018 Census

Socio-demographic outcomes

Several demographic differences existed between Pacific PhD graduates and the matched cohorts of Pacific without a PhD and nMnP PhD graduates based on data from the 2018 Census (see Table 15). Binomial and multinomial logistic regressions were used to calculate adjusted odds ratios (AOR) – adjusted for year of and age at graduation, gender, urban/rural and NZDep in graduation (baseline) year – and these AOR

Te Arotahi Paper_July 2025-FNL-corrected.indd 34 14/07/2025 5:58 PM

Te Arotahi Paper_July 2025-FNL-corrected.indd 35

TABLE 14. Longitudinal health outcomes for Pacific PhD graduates, Pacific without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates since baseline/graduation (2003–2022)

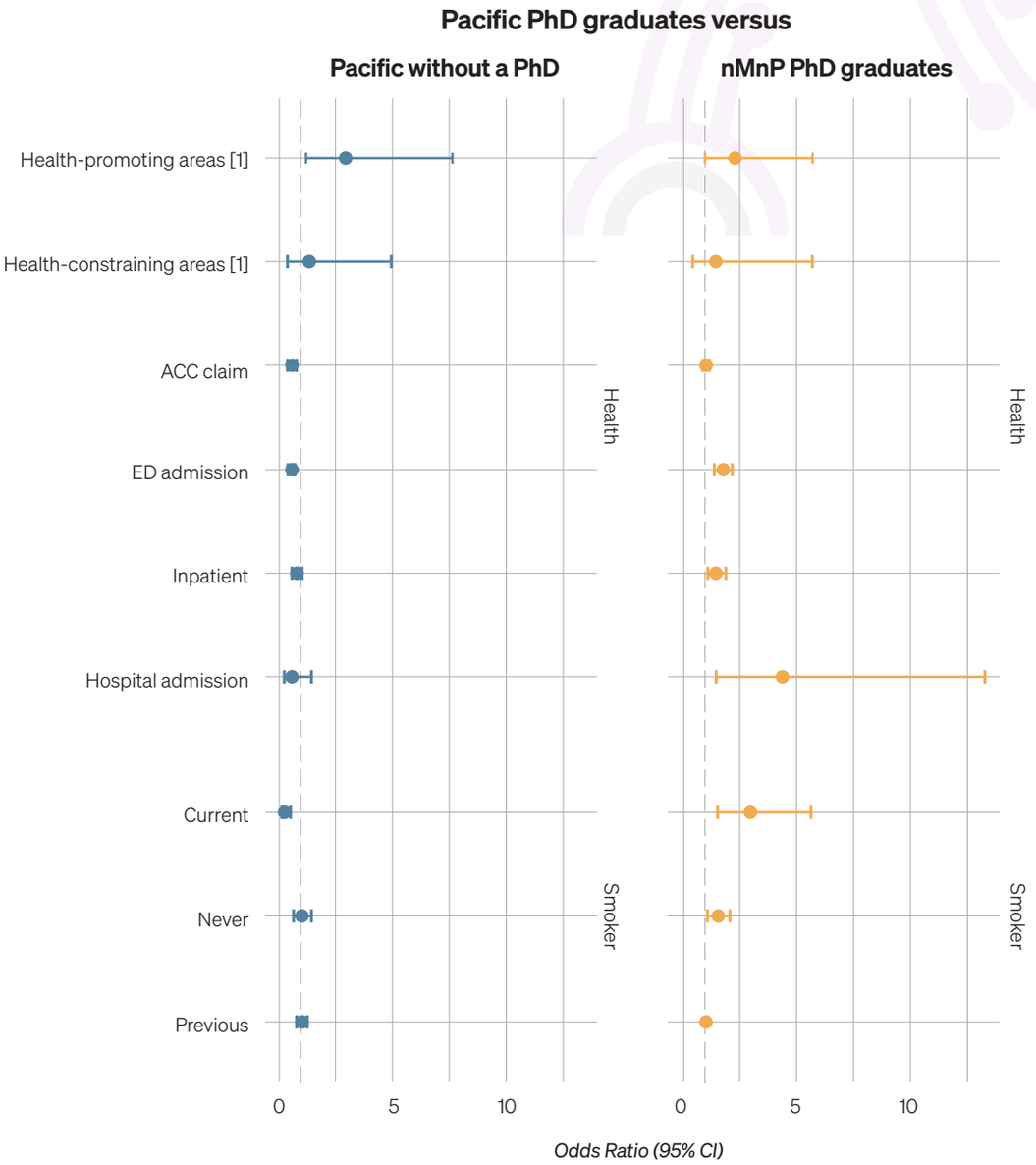
	Pacific PhD graduates				Pacific without a PhD				nMnP PhD graduates			
	Graduation	5 years	10 years	15 years	Baseline	5 years	10 years	15 years	Graduation	5 years	10 years	15 years
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Total	**342**	**204**	**111**	**45**	**1320**	**882**	**456**	**165**	**1158**	**648**	**393**	**180**
Sickness beneficiary	s	s	s	s	111 (8.4%)	78 (8.8%)	42 (9.2%)	24 (14.5%)	6 (0.5%)	6 (0.9%)	s	s
Hospital admission	39 (11.4%)	27 (13.2%)	21 (18.9%)	6 (13.3%)	195 (14.8%)	141 (16%)	78 (17.1%)	27 (16.4%)	75 (6.5%)	54 (8.3%)	27 (6.9%)	9 (5%)
Inpatient admission	33 (9.6%)	21 (10.3%)	15 (13.5%)	9 (20%)	159 (12%)	90 (10.2%)	48 (10.5%)	21 (12.7%)	66 (5.7%)	57 (8.8%)	27 (6.9%)	15 (8.3%)
One ED admission	33 (9.6%)	15 (7.4%)	12 (10.8%)	s	138 (10.5%)	99 (11.2%)	27 (5.9%)	18 (10.9%)	54 (4.7%)	42 (6.5%)	21 (5.3%)	12 (6.7%)
2+ ED admissions	9 (2.6%)	s	s	s	54 (4.1%)	33 (3.7%)	18 (3.9%)	12 (7.3%)	12 (1%)	9 (1.4%)	6 (1.5%)	s
One ACC claim	54 (15.8%)	45 (22.1%)	9 (8.1%)	12 (26.7%)	249 (18.9%)	147 (16.7%)	66 (14.5%)	30 (18.2%)	192 (16.6%)	114 (17.6%)	81 (20.6%)	24 (13.3%)
2+ ACC Claims	18 (5.3%)	9 (4.4%)	9 (8.1%)	s	99 (7.5%)	54 (6.1%)	39 (8.6%)	12 (7.3%)	54 (4.7%)	27 (4.2%)	24 (6.1%)	12 (6.7%)
Health-constraining areas	60 (17.5%)	33 (16.2%)	18 (16.2%)	6 (13.3%)	279 (21.1%)	186 (21.1%)	105 (23%)	45 (27.3%)	240 (20.7%)	138 (21.3%)	84 (21.4%)	36 (20%)
Health-promoting areas	30 (8.8%)	15 (7.4%)	9 (8.1%)	6 (13.3%)	54 (4.1%)	36 (4.1%)	21 (4.6%)	9 (5.5%)	84 (7.3%)	57 (8.8%)	39 (9.9%)	18 (10%)

Note

Entries denoted with "s" mean fewer than six people were identified and numbers have been suppressed for confidentiality.

14/07/2025 5:58 PM

FIGURE 11. Health outcomes: Adjusted odds ratio comparisons between Pacific PhD graduates, Pacific without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates



Note

Odds ratios are adjusted for year of and age at graduation, gender, urban/rural and NZDep in year of graduation. Binomial logistic models were used to test outcome variables with binary response categories and multinomial logistic regression to test multiple variables (indicated with [1]).

Te Arotahi Paper_July 2025-FNL-corrected.indd 36 14/07/2025 5:58 PM

TABLE 15. Descriptive analysis of Pacific PhD graduates, Pacific without a PhD, and non Māori non-Pacific (nMnP) PhD graduates from the 2018 Census

	Pacific				nMnP	
	PhD graduates		Without a PhD		PhD graduates	
	N	%	N	%	N	%
Ethnicities						
Total Census responses	318	100.0%	1098	100.0%	951	100.0%
One	171	53.8%	831	75.7%	915	66.0%
Two	96	30.2%	210	19.1%	30	2.2%
Three or more	45	14.2%	54	4.9%	—	0.0%
Age at Immigration						
Total Census responses	300	100.0%	1032	100.0%	933	100.0%
New Zealand born	165	55.0%	477	46.2%	405	43.4%
Preschool age	21	7.0%	15	1.5%	159	17.0%
School age	39	13.0%	177	17.2%	204	21.9%
Adult	78	26.0%	363	35.2%	162	17.4%
Disability						
Total Census responses[1]	264	100.0%	750	100.0%	864	100.0%
No	252	95.5%	693	92.4%	846	97.9.0%
Yes	9	3.4%	57	7.6%	15	1.7%

Notes

Entries denoted with "s" mean fewer than six people were identified and numbers have been suppressed for confidentiality.

Rounding and suppression of cell counts below six means that totals do not always add to 100%.

1 Total excludes 39 Pacific PhD graduates, 330 Pacific without a PhD, and 66 nMnP PhD graduates who did not respond to any of the 2018 Census activity limitation questions.

were used to test differences in outcomes (see the Supplementary Table 6 and 7). We note that, in 2018, 27% of the Pacific PhDs included here had not yet obtained their PhD. Thus, some of those whom we refer to here as "graduates" (within the complete study period) were not graduates in 2018.

Of those who participated in the 2018 Census, 45% of Pacific PhD graduates identified with more than one ethnicity compared with 24% of Pacific without a PhD (AOR: 2.2, 95% CI: 1.7–2.9, $p < 0.001$) and 2% of nMnP PhD graduates (AOR: 28.2, 95% CI: 18.5–42.9, $p < 0.001$). Fourteen per cent of Pacific PhD graduates identified with three or more ethnicities compared with 5% of Pacific without a PhD.

More than half (55%) of the Pacific PhD graduates were born in Aotearoa compared with 46% of Pacific without a PhD and 44% of nMnP PhD graduates. Fewer Pacific PhD graduates had immigrated to Aotearoa as adults (26%) than Pacific without a PhD (35%). Significantly more Pacific PhD graduate migrants had come as preschoolers compared with Pacific migrants without a PhD (AOR: 6.1, 95% CI: 2.9–12.8, $p < 0.001$). But compared with nMnP PhD graduates, significantly fewer Pacific PhD graduate migrants had arrived as preschoolers (AOR: 0.19, 95% CI: 0.11–0.33, $p < 0.001$) or school-aged children (AOR: 0.41, 95% CI 0.27–0.61, $p < 0.001$) (see the Supplementary Table 6).

Few Pacific PhD graduates indicated that they lived with a limitation due to a disability (3.4%), a proportion that is less than half that of the Pacific cohort without a PhD (7.6%) but almost twice as that of the nMnP PhD graduate cohort (1.7%).

Family and household outcomes

Several differences including inequalities were found, using data from the 2018 Census, between family and households of Pacific PhD graduates and those of Pacific without a PhD and nMnP PhD graduates (Table 16). Adjusted odds ratio tests from statistical models are presented in Figure 12 and tabulated in the Supplementary Table 7.

Compared with Pacific without a PhD who participated in the 2018 Census, Pacific PhD graduates were less likely to live in families as parents

Te Arotahi Paper_July 2025-FNL-corrected.indd 37 14/07/2025 5:58 PM

TABLE 16. Family and household measures of Pacific PhD graduates, Pacific without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates from the 2018 Census

	Pacific				nMnP	
	PhD graduates		Without a PhD		PhD graduates	
	N	%	N	%	N	%
Family type						
Total Census responses	240	100.0%	774	100.0%	678	100.0%
Couple living alone	159	66.3%	492	63.6%	360	53.1%
Individual alone	51	21.3%	123	15.9%	264	38.9%
Parents with children	30	12.5%	159	20.5%	54	8.0%
Dependent children						
Total Census responses	240	100.0%	771	100.0%	669	100.0%
None	96	40.0%	312	40.5%	354	52.9%
Two	54	22.5%	129	16.7%	135	20.2%
One	60	25.0%	171	22.2%	132	19.7%
Three	18	7.5%	81	10.5%	39	5.8%
Four or more	15	6.3%	78	10.1%	9	1.3%
Crowding						
Total Census responses	237	100.0%	753	100.0%	672	100.0%
Crowding	24	10.1%	117	15.5%	30	4.5%
No crowding, 1 spare room	75	31.6%	177	23.5%	231	34.4%
No crowding, 2+ spare rooms	63	26.6%	105	13.9%	261	38.8%
No crowding, no spare room	57	24.1%	237	31.5%	147	21.9%
Severe crowding	18	7.6%	120	15.9%	—	0.0%

(AOR: 0.49, 95% CI: 0.31–0.78, $p = 0.002$). However, compared with nMnP PhD graduates, Pacific PhD graduates were nearly half as likely to live alone (0.477, 95% CI: 0.33–0.67, $p < 0.001$) and no significant differences were found in relation to living in families as parents.

Three in five (60%) of both Pacific cohorts – PhD graduates and those without a PhD – indicated they lived in households with dependent children. This proportion compares with just under half of nMnP PhD graduates. Most Pacific Peoples in this study lived with no overcrowding – 82% of Pacific PhD graduates and 69% of Pacific without a PhD – while 95% of nMnP PhD graduates lived with no overcrowding. Compared with Pacific PhD graduates, Pacific without a PhD were more likely to live with some overcrowding (AOR: 0.52, 95% CI: 0.31–0.867, $p = 0.01$) and more than twice as likely to live with severe overcrowding (AOR: 0.38, 95% CI: 0.22–0.65, $p = 0.001$). Inequalities in levels of crowding were higher for Pacific PhD graduates than for nMnP PhD graduates: Pacific PhD graduates were more likely to live with some overcrowding (AOR: 2.2, 95% CI: 1.3–4.0, $p = 0.007$) and more than twice as likely to live with severe overcrowding (AOR: 12.9, 95% CI: 4.3–38.9, $p < 0.001$) than their nMnP PhD counterparts.

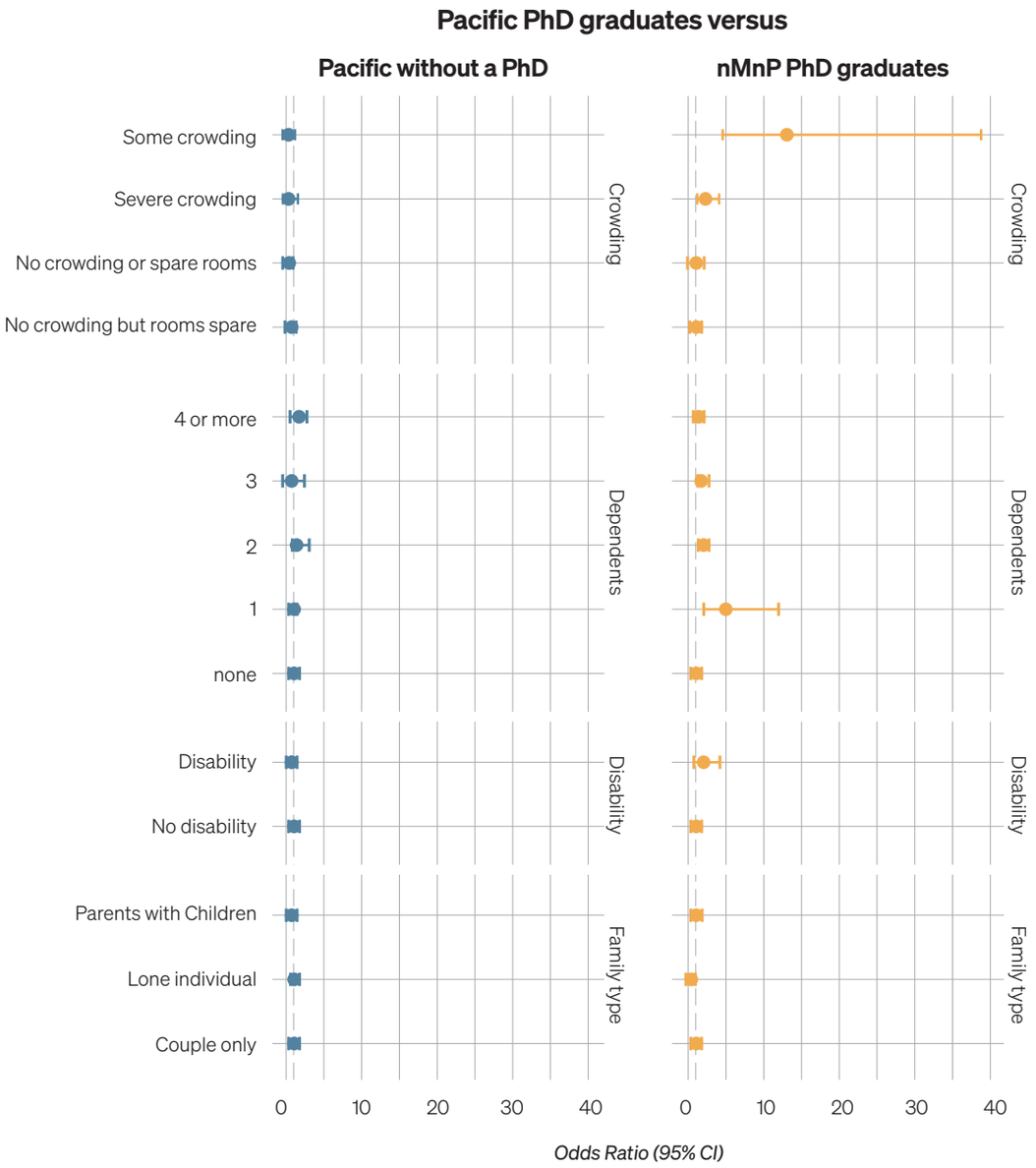
Two thirds of Pacific PhD graduates lived in homes they owned, a proportion lower but not significantly lower than that of nMnP PhD graduates but significantly higher than that of Pacific without a PhD. The adjusted odds ratio was 2.3 (95% CI: 1.3–4.3, $p = 0.009$) for owned homes and 2.9 (95% CI: 2.1–4.0, $p < 0.001$) for homes owned as a family trust for Pacific PhD graduates compared with Pacific without a PhD.

Employment

Several differences including inequalities were found, using data from the 2018 Census, in terms of labour force participation and employment for Pacific PhD graduates compared with the other two cohorts (see Table 17). AOR tests from statistical models are presented in Figure 13 and tabulated in the Supplementary Table 8. Table 17 shows that in the 2018 Census, Pacific PhD graduates and nMnP PhD graduates were more likely to participate in the workforce than Pacific without a PhD (79% versus

Te Arotahi Paper_July 2025-FNL-corrected.indd 38 14/07/2025 5:58 PM

FIGURE 12. Family, household and social outcomes: Adjusted odds ratio comparisons between Pacific PhD graduates, Pacific without a PhD, and non Māori non-Pacific (nMnP) PhD graduates

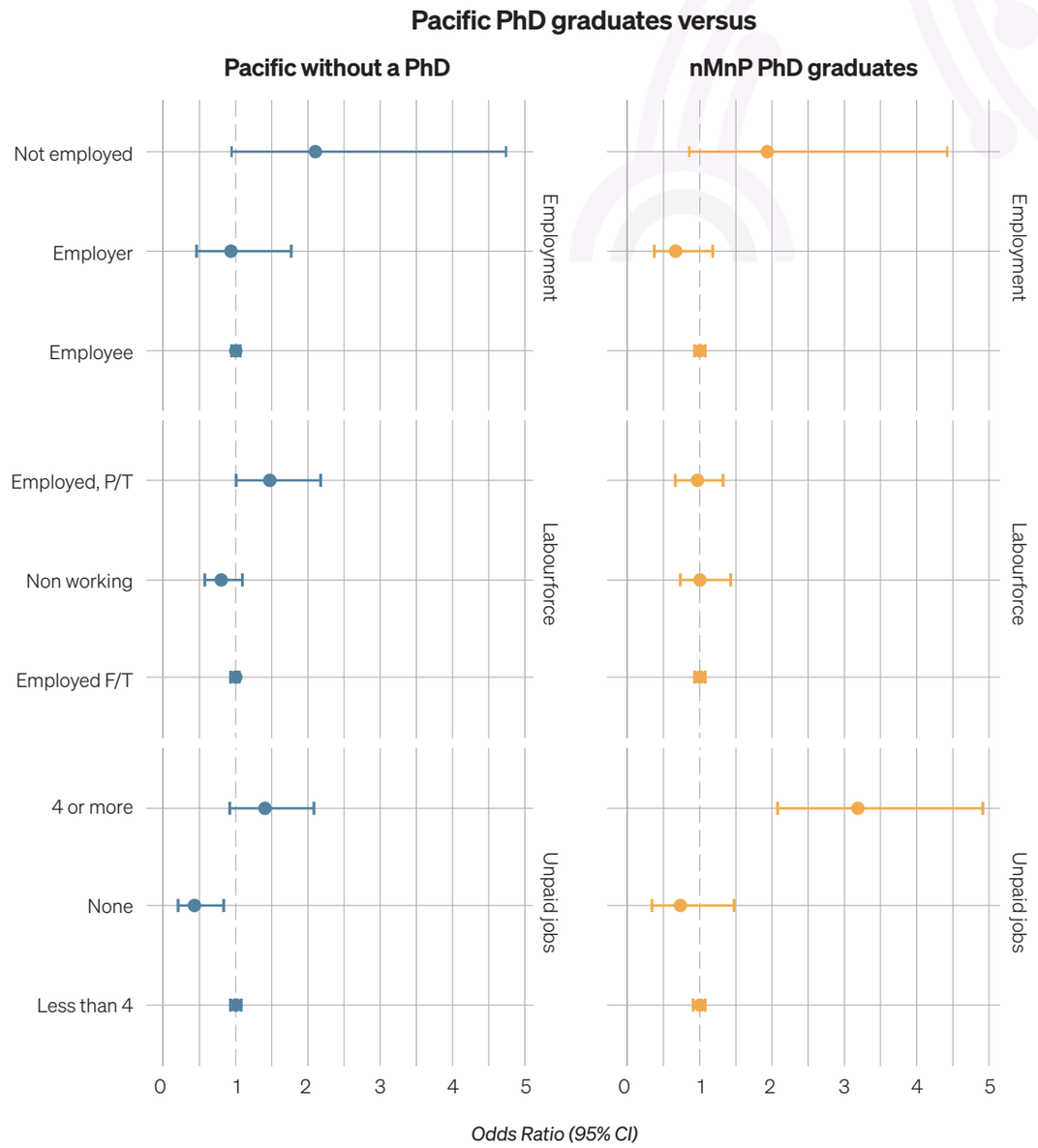


Note

Odds ratios are adjusted for year of and age at graduation, sex, urban/rural and NZDep in year of graduation. Multinomial logistic models were used to test outcome variables with multiple response categories and binomial logistic regression to test binary disability variable.

Te Arotahi Paper_July 2025-FNL-corrected.indd 39 14/07/2025 5:58 PM

FIGURE 13. Work and employment in 2018: Adjusted odds ratio comparisons between Pacific PhD graduates, Pacific without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates



Note

Odds ratios are adjusted for year of and age at graduation, gender, urban/rural and NZDep in year of graduation. Multinomial logistic models were used to test outcome variables with multiple response.

Te Arotahi Paper_July 2025-FNL-corrected.indd 40 14/07/2025 5:58 PM

TABLE 17. Labour force and employment information on Pacific PhD graduates, Pacific without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates from the 2018 Census

	Pacific				nMnP	
	PhD graduates		Without a PhD		PhD graduates	
	N	%	N	%	N	%
Labourforce status[1]						
Total Census responses	303	100.0%	1080	100.0%	930	100.0%
Employed full-time	183	60.4%	660	61.1%	561	60.3%
Employed part-time	57	18.8%	117	10.8%	177	19.0%
Non-Labour force	57	18.8%	240	22.2%	165	17.7%
Not employed	9	3.0%	63	5.8%	27	2.9%
Unpaid jobs						
Total Census responses	315	100.0%	1098	100.0%	951	100.0%
Not Answered	54	17.1%	357	32.5%	90	9.5%
None	12	3.8%	78	7.1%	42	4.4%
One to three	204	64.8%	579	52.7%	759	79.8%
Four plus	45	14.3%	81	7.4%	54	5.7%
Employment[2]						
Total Census responses	246	100.0%	792	100.0%	753	100.0%
Not Answered	9	3.7%	18	2.3%	15	2.0%
Employee	219	89.0%	729	92.0%	657	87.3%
Employer	—	0.0%	12	1.5%	15	2.0%
SE, no employees	12	4.9%	33	4.2%	63	8.4%
Unpaid/family	—	0.0%	—	0.0%	—	0.0%
Occupation[3]						
Total Census responses	237	100.0%	777	100.0%	741	100.0%
Professionals	177	74.7%	123	15.8%	537	72.5%
Managers	27	11.4%	78	10.0%	78	10.5%
Clerical and Admin	12	5.1%	102	13.1%	45	6.1%
Community & Personal	12	5.1%	84	10.8%	30	4.0%
Technicians and Trade	—	0.0%	78	10.0%	15	2.0%
Other Occupations	—	0.0%	312	40.2%	24	3.2%
Industry[4]						
Total Census responses	237	100.0%	777	100.0%	741	100.0%
Education/Training	138	58.2%	60	7.7%	396	53.4%
Professional/Science/Tech	27	11.4%	42	5.4%	108	14.6%
Healthcare or Social	24	10.1%	78	10.0%	66	8.9%
Public Admin/Safety	15	6.3%	51	6.6%	42	5.7%
Manufacturing	—	0.0%	123	15.8%	18	2.4%
Other areas	6	2.5%	426	54.8%	96	13.0%

Notes

1 Labour force status is the availability of individuals to participate or look for work or their employment status if available to work.
2 Employment status was categorised as "Paid employee", "Employer", Self-Employed and without employees", "Unpaid family worker", and "Not elsewhere included".
3 Occupations were defined by the Australian and New Zealand Standard Classification of Occupations (ANZSCO).
4 Industry by the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006.

Te Arotahi Paper_July 2025-FNL-corrected.indd 41 14/07/2025 5:58 PM

72%) conversely Pacific without a PhD were more likely to be unemployed if available to work. Figure 13 shows no significant adjusted differences in employment status. Pacific PhD graduates were less likely to have no unpaid jobs than Pacific without a PhD (AOR: 0.43, 95% CI: 0.22–0.84, $p = 0.01$). They were also more likely to have more than one voluntary job than nMnP graduates with over three times greater odds (AOR: 3.206, 95% CI: 2.1–5.0, $p < 0.001$).

Those in employment in the 2018 Census were most likely to be employees – 95% of Pacific PhD graduates, 94% of Pacific without a PhD, and 89% of nMnP PhD graduates. Pacific PhD graduates were not significantly different in terms of being an employer or self-employed than either of the other cohorts. Pacific PhD graduates and nMnP PhD graduates worked in similar industries. Pacific PhD graduates were three times more likely than Pacific without a PhD to work in professional or managerial jobs (AOR: 1.9, 95% CI: 1.1–3.1, $p = 0.02$) and significantly more worked in education and training industries (AOR: 7.3, 95% CI: 5.2–10.3, $p < 0.001$). There were, however, no significant difference in numbers working in health-related jobs.

Economic outcomes

Home ownership in the 2018 Census focuses specifically on whether the household owns their dwelling, while tenure describes the living arrangement of the home where they live, including renting or ownership(see Table 18). Compared with Pacific without a PhD, Pacific PhD graduates had significantly higher odds of owning their homes, with or without a mortgage (AOR: 2.3, 95% CI: 1.2–4.3, $p < 0.009$), with 48% of Pacific PhD graduates living in the homes they owned, compared with 27% of Pacific without a PhD (see Figure 14 and the Supplementary table 9). In terms of tenure, they were more likely to live in homes they owned (60% versus 34%) and less likely to live in rented homes (AOR: 0.34, 95% CI: 0.24–0.47, $p < 0.03$). Pacific PhD graduates were slightly, but not significantly, less likely than nMnP PhD graduates to own their homes, particularly in a family trust (7% for Pacific PhD graduates and 11% of nMnP PhD graduates).

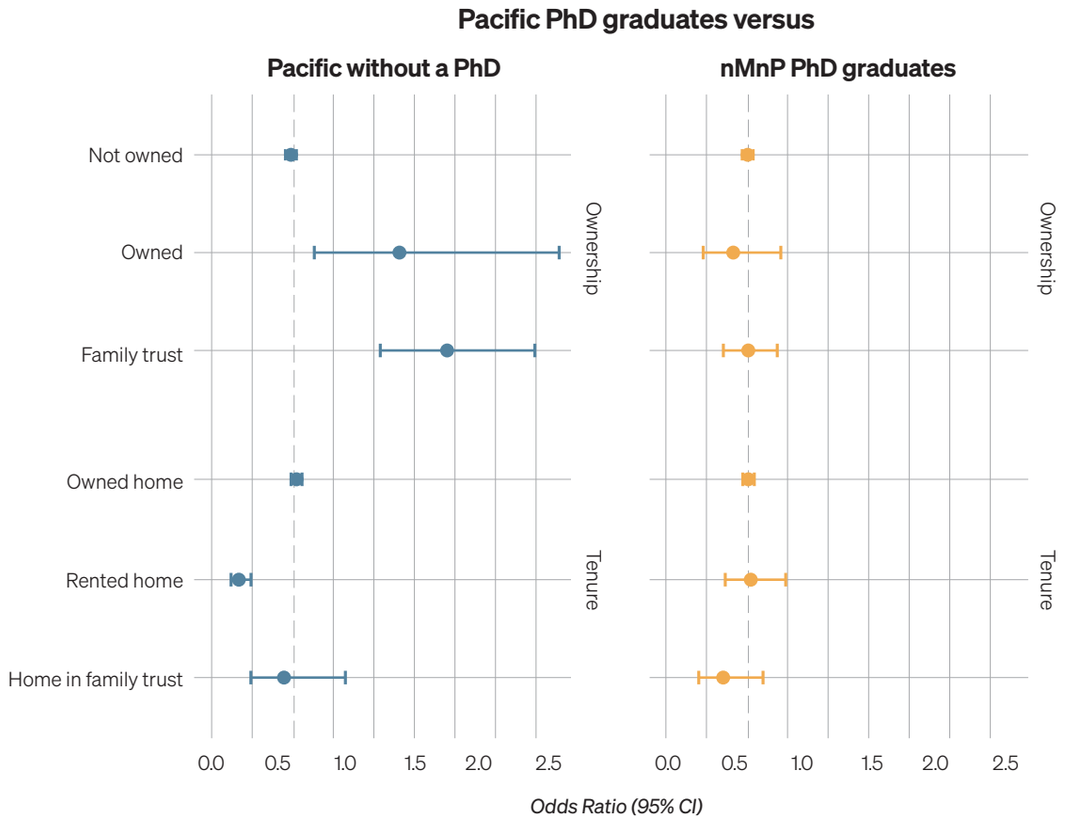
Pacific PhD graduates were more than twice as likely than Pacific without a PhD to live in neighbourhoods characterised as least deprived socioeconomically (quintile 1; 14% versus 6%) but

TABLE 18. Home ownership, tenure and neighbourhood deprivation information on Pacific PhD graduates, Pacific without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates from the 2018 Census

	Pacific				nMnP	
	PhD graduates		Without a PhD		PhD graduates	
	N	%	N	%	N	%
Home ownership						
Total Census responses	312	100.0%	1095	100.0%	945	100.0%
Not answered	48	15.4%	351	32.1%	81	8.6%
Family trust	126	40.4%	207	18.9%	429	45.4%
Not owned	117	37.5%	504	46.0%	339	35.9%
Owned	18	5.8%	36	3.3%	90	9.5%
Tenure						
Total Census responses	240	100.0%	774	100.0%	678	100.0%
Family trust	15	6.3%	39	5.0%	93	13.7%
Owned	141	58.8%	264	34.1%	408	60.2%
Rented	78	32.5%	468	60.5%	171	25.2%
NZDep 2018						
N/A	312	100.0%	1098	100.0%	945	100.0%
Quintile 1	45	14.4%	66	6.0%	237	25.1%
Quintile 2	45	14.4%	75	6.8%	186	19.7%
Quintile 3	75	24.0%	159	14.5%	198	21.0%
Quintile 4	69	22.1%	228	20.8%	183	19.4%
Quintile 5	78	25.0%	570	51.9%	141	14.9%

Te Arotahi Paper_July 2025-FNL-corrected.indd 42 14/07/2025 5:58 PM

FIGURE 14. Home ownership: Adjusted odds ratio comparisons between Pacific PhD graduates, Pacific without a PhD, and non-Māori non-Pacific (nMnP) PhD graduates



Note

Odds ratios are adjusted for year of and age at graduation, gender, urban/rural and NZDep in year of graduation. Multinomial logistic models were used to test outcome variables with multiple response categories.

less likely than nMnP PhD graduates (14% versus 25%) (see Table 18). Pacific communities in Aotearoa are overrepresented in areas of high socioeconomic deprivation (quintile 5), which is reflected by 52% of Pacific without a PhD living in those areas. However, only 25% of Pacific PhD graduates lived in these areas of high socioeconomic deprivation.

Discussion of Pacific findings

This study looked at a range of social, economic, education and health outcomes for Pacific PhD graduates post-graduation. The study is novel in that it looks at outcomes for all Pacific PhD graduates, from 1st Jan 2003 to 31st December 2022, through employing an administrative data quantitative design, comparing the results of the Pacific PhD graduates with a similar group from the rest of the Pacific community and another group of nMnP PhD graduates. The study is also novel in that, wherever possible, the outcomes are analysed longitudinally, giving insight into how Pacific PhD graduates fare compared with the two other cohorts, following on from the year of their graduation.

Numbers of Pacific students graduating from universities are increasing, and while there is a growing body of research about their careers post-graduation (Universities NZ | Te Pōkai Tara, 2022), little is known about their post-graduation lives. Our findings thus address an important knowledge gap and show that a doctoral qualification is associated with a broad range of benefits for Pacific graduates and their families. When compared with a propensity-matched cohort of Pacific without a PhD, Pacific PhD graduates experience greater employment opportunities, greater income and other associated socioeconomic advantages, along with positive long-term health outcomes.

Pacific Peoples in Aotearoa experience persistent and entrenched inequities across the education, health, justice and public service sectors, resulting in

Te Arotahi Paper_July 2025-FNL-corrected.indd 43 14/07/2025 5:58 PM

higher rates of unemployment, lower incomes, fewer assets and poorer health compared with the rest of the population (Ministry of Health, 2015; Perry, 2013; Statistics New Zealand, 2002; Statistics New Zealand and Ministry of Pacific Island Affairs, 2011; Stats NZ, 2018). Gaining a higher education qualification has the potential to reduce these disparities and has been a key government strategy for increasing Pacific wellbeing (Ministry for Pacific Peoples, 2022).

We found that Pacific PhD graduates 10 years post-graduation were more likely to have registered a taxable income than either Pacific without a PhD or nMnP PhD graduates. Pacific PhD graduates had higher incomes than both Pacific without a PhD and nMnP PhD graduates. Ten years after graduation, Pacific PhD graduates' incomes were 50% higher than nMnP PhD graduates and more than twice those of Pacific without a PhD. While there is limited data about the economic outcomes of Pacific PhD graduates, previous studies have shown that Pacific graduates had similar employment and income outcomes as their nMnP peers two years after graduation (Theodore et al., 2017) but earned more than their nMnP peers five years after graduation (Mahoney, 2014b). These findings were confirmed by a report of PhD graduates between 2011 and 2015: 55% of Pacific graduates earned more than $75,000, compared with 43% of all New Zealand PhD graduates (Universities NZ | Te Pōkai Tara, 2022). Our findings showed sustained increases in Pacific PhD graduates' incomes over a 10-year period post-graduation, with the margin increasing to more than twice the incomes of Pacific without a PhD.

We found that most Pacific PhD graduates were employed by the end of their PhD studies, and at similar rates to their nMnP PhD graduate counterparts. Significantly, the employment rates for both PhD graduate cohorts were much higher than for Pacific without a PhD. We also found that, after adjusting for time since graduation and other confounders, Pacific PhD graduates had five-fold greater odds of employment than Pacific without a PhD and 80% greater odds than nMnP PhD graduates. However, in the 2018 Census, these differences were not as noticeable. Even so, Pacific Peoples unemployment rates in Aotearoa are nearly twice the overall national average (Stats NZ, 2025).

Pacific PhD graduates were also more likely to have multiple unpaid jobs compared with both Pacific without a PhD and nMnP PhD graduates, consistent with previous research showing Pacific graduates were significantly more likely than nMnP graduates to report helping their families, friends and acquaintances and participating in community organisations (Theodore et al., 2017). It is also consistent with international literature on ethnic-minority graduates, who pursue higher education to build a better future for their communities (Barney, 2013; Bradburn et al., 2006; DiGregorio et al., 2000; Perna, 2005). This type of unpaid work may reflect cultural obligations and duties, reciprocity and a focus on collective benefit for Pacific communities in Aotearoa and the wider Pacific region (Tamasese et al., 2010). Because Pacific graduates are in short supply, and given the social and familial investment for them to attain their qualification, they are likely in greater demand for civic service within their communities because of their learned skill sets. Moreover, increased income may afford greater opportunity for Pacific graduates to provide voluntary assistance.

Pacific PhD graduates were more than three times more likely than Pacific without a PhD to work in professional or managerial positions. This provides one explanation for the difference in income between Pacific PhD graduates and Pacific without a PhD. Pacific PhD graduates were more likely to graduate with social, cultural, education or health degrees than nMnP PhD graduates, while the latter were more likely to graduate with science degrees. At graduation, most Pacific PhD graduates and nMnP PhD graduates worked in education or public administration roles but Pacific PhD graduates were two times more likely than nMnP PhD graduates to work in health-related jobs. Fifteen years after graduation, however, the numbers of Pacific PhD graduates working in health-related jobs had halved.

Five years post-graduation, one in ten Pacific PhD graduates were still enrolled in a tertiary institution, indicating that they were continuing their education journeys. This is consistent with previous research that showed that more than a third of Pacific graduates expressed a desire to undertake further tertiary study two years after graduation (Theodore et al., 2017).

We found that Pacific PhD graduates were more likely than Pacific without a PhD to own their homes (48% versus 27%), with or without a mortgage. They were also more than twice as likely to live in the least socioeconomically deprived neighbourhoods (quintile 1) than Pacific without a PhD (14% versus 6%), but less likely than nMnP PhD graduates to live in those neighbourhoods (14% versus 25%).

This present study is also the first study to examine the longitudinal health outcomes of Pacific PhD graduates in Aotearoa. When considering time since graduation in an adjusted model, Pacific PhD graduates were more likely to live in health-promoting areas than Pacific without a PhD. There was, however,

Te Arotahi Paper_July 2025-FNL-corrected.indd 44 14/07/2025 5:58 PM

no difference in terms of their odds of living in health-constraining areas. This is to be expected as previous research has found that Pacific Peoples tend to cluster in urban areas that contain a mix of both health-promoting and health-constraining features (Hobbs et al., 2023).

Findings from this study suggest that gaining a PhD qualification is associated with a protective health effect over time. At graduation, Pacific PhD graduates had similar levels of admission to inpatient and emergency departments as Pacific without a PhD and fewer ACC claims. However, overall odds for Pacific PhD graduates were three quarters as likely to be admitted as an inpatient while half as likely to be admitted to an emergency department or an ACC claim than Pacific without a PhD, when fully adjusting for demographic factors and time since graduation. What accounted for better health outcomes could not be fully explained by the variables we adjusted for. It is possible that a culmination of greater service access, health literacy and financial opportunity may result in greater health outcomes for PhD graduates compared with those without a PhD .

In summary, our study investigated social, education, economic and health outcomes of Pacific PhD graduates. By employing a quasi-experimental design, we showed that Pacific PhD graduate outcomes were similar if not better than outcomes for nMnP PhD graduates. There were also greater social benefits in that Pacific PhD graduates were more likely than nMnP PhD graduates to help others through voluntary work. Over time, we found a growing divide, however, between a range of economic, social and health outcomes for PhD graduates compared with the rest of the Pacific community. Overall, our findings highlight significant private and social benefits for Pacific PhD graduates, their families, communities and society in general.

Strengths and limitations of this study

A major strength of this study was the use of the IDI to identify all Māori and Pacific PhD graduates from 1 Jan 2003 to 31 December 2022 and their linked economic, social, education and health outcomes in the years following their graduation. The use of whole-of-population data from the IDI allowed this present study to overcome limitations of other smaller studies including low response rates, the use of cross-sectional versus longitudinal data, and insufficient power to control for potential confounders. Our study is novel in that the IDI afforded the opportunity to use a quasi-experimental design to compare Māori and Pacific PhD graduates with a propensity-matched group from the rest of the Māori and Pacific community, respectively, and another matched group from nMnP PhD graduates. The study is also novel in that where possible, we have reported analyses of longitudinal outcomes, giving insight into how Māori and Pacific PhD graduates lives unfold compared with the other groups in the years following their graduation.

Limitations of the present study should be considered. While this study sought to describe education, economic, health and social differences between PhD graduates and those without a PhD, and therefore the potential benefits of higher education, the associations may not be causative, despite adjusting for multiple covariates. Moreover, despite including all Māori and Pacific PhD graduates over the study period, statistical tests remained underpowered for rare health events, such as mortality or emergency events in these cohorts.

This present study focused on high-level graduate economic, social, education and health outcomes using administrative data. Further research is needed to examine the transformative work that Māori and Pacific PhD graduates undertake within their whānau, hapū, iwi and hāpori/communities.

Implications

Our findings underscore the importance of equity in access and participation in university education to the highest levels. Benefits of such are not only experienced by the graduates, but also their whānau and wider society. We found that boosting higher education success for Māori and Pacific students resulted in positive economic, social, education and health outcomes.

Future research

The results presented in this report focus on high-level findings from administrative data to enable whole-of-population analyses over a period of transformational change in the higher education sector. More research, however, is needed that delves further into the rich lives of Māori and Pacific PhD graduates. This should include understanding the experiences, challenges and opportunities experienced by Māori and Pacific PhD graduates as well as their broad intellectual, cultural, economic and social contributions that have a positive impact for whānau, hapū, iwi, hāpori and society in general.

Te Arotahi Paper_July 2025-FNL-corrected.indd 45 14/07/2025 5:58 PM

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Te Arotahi Paper_July 2025-FNL-corrected.indd 47 14/07/2025 5:58 PM

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The results are not official statistics; they have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Stats NZ. For more information about the IDI, please visit https://www.stats.govt.nz/integrated-data/

Access to the data used in this study was provided by Stats NZ under conditions designed to give effect to the security and confidentiality provisions of the Data and Statistics Act 2022. The results presented in this study are the work of the authors, not Stats NZ or individual data suppliers.

Te Arotahi Paper_July 2025-FNL-corrected.indd 48 14/07/2025 5:58 PM

Supplementary Tables

Adjusted odds ratio comparisons for Pacific PhD graduates versus Pacific without a PhD and non-Māori non-Pacific (nMnP) PhD graduates, and Māori PhD graduates versus Māori without a PhD and nMnP PhD graduates

	Pacific PhD graduates versus								Māori PhD graduates versus							
	Pacific without a PhD				nMnP graduates				Māori without a PhD				nMnP graduates			
	OR	95% CI		*p* value	OR	95% CI		*p* value	OR	95% CI		*p* value	OR	95% CI		*p* value
TABLE 1																
Proportion in NZ	0.706	0.668	0.747	0.000	0.989	0.933	1.049	0.719	0.928	0.908	0.950	0.000	1.320	1.283	1.359	0.000
NZDep Quintile																
Quintile 5	ref				ref				ref				ref			
Quintile 1	2.628	1.465	4.716	0.001	0.438	0.248	0.771	0.004	2.962	2.100	4.177	0.000	0.767	0.513	1.147	0.196
Quintile 2	2.770	1.571	4.881	0.000	0.623	0.356	1.089	0.097	3.062	2.190	4.281	0.000	0.922	0.619	1.372	0.688
Quintile 3	1.855	1.152	2.987	0.011	0.692	0.420	1.142	0.150	2.328	1.704	3.181	0.000	1.036	0.708	1.515	0.857
Quintile 4	1.578	1.006	2.474	0.047	0.731	0.450	1.188	0.207	1.721	1.278	2.318	0.000	0.966	0.666	1.401	0.854
TABLE 2																
Dependent Children																
1 dependent	ref				ref				ref				ref			
No dependents	0.848	0.450	1.598	0.610	5.077	2.171	11.872	0.000	0.734	0.449	1.199	0.216	2.460	1.153	5.250	0.020
2 dependents	1.272	0.855	1.894	0.235	1.732	1.163	2.578	0.007	0.893	0.694	1.150	0.380	1.112	0.832	1.487	0.472
3 dependents	0.780	0.421	1.443	0.428	1.528	0.805	2.901	0.195	0.884	0.621	1.257	0.492	1.387	0.895	2.149	0.144
4+ dependents	1.555	1.020	2.372	0.040	1.480	0.981	2.235	0.062	0.895	0.691	1.160	0.402	1.042	0.777	1.397	0.784
Social housing*					97.127	15.685	601.445	0.000					3.916	0.468	32.800	0.208
Any benefit*	0.064	0.035	0.114	0.000	0.647	0.357	1.171	0.150	0.048	0.034	0.069	0.000	0.997	0.657	1.515	0.990

Te Arotahi Paper_July 2025-FNL-corrected.indd 49 14/07/2025 5:58 PM

	Pacific PhD graduates versus								Māori PhD graduates versus							
	Pacific without a PhD				nMnP graduates				Māori without a PhD				nMnP graduates			
	OR	95% CI		*p* value	OR	95% CI		*p* value	OR	95% CI		*p* value	OR	95% CI		*p* value
TABLE 3																
Tertiary enrolment					7.223	1.371	38.042	0.020								
Ever employed	6.153	3.387	11.180	0.000	1.030	0.575	1.846	0.921	14.564	10.344	20.505	0.000	1.279	0.870	1.879	0.211
Employed (EOY)	4.784	2.832	8.081	0.000	1.745	1.040	2.926	0.035	10.616	7.713	14.612	0.000	2.148	1.501	3.073	0.000
Industry																
Other industry	ref				ref				ref				ref			
Education/Training	7.306	5.160	10.343	0.000	1.137	0.884	1.463	0.318	11.997	9.536	15.092	0.000	2.185	1.799	2.654	0.000
Professional/Science	1.873	1.124	3.121	0.016	0.903	0.577	1.413	0.654	3.572	2.628	4.856	0.000	1.914	1.410	2.599	0.000
Healthcare/Social	0.867	0.522	1.441	0.582	1.260	0.758	2.094	0.372	2.146	1.578	2.919	0.000	2.737	1.917	3.907	0.000
Manufacturing	0.062	0.015	0.253	0.000	0.399	0.091	1.755	0.224	0.337	0.198	0.572	0.000	2.111	1.040	4.284	0.039
Construction	0.153	0.047	0.499	0.002	4.704	0.775	28.539	0.092	0.040	0.010	0.162	0.000	2.117	0.296	15.128	0.455
Public Admin/Safety	0.838	0.453	1.549	0.573	1.249	0.675	2.311	0.479	2.110	1.448	3.076	0.000	2.547	1.648	3.936	0.000
Retail Trade	0.125	0.017	0.926	0.042	0.368	0.046	2.973	0.348	0.393	0.187	0.826	0.014	2.171	0.806	5.845	0.125
Ag/Forest/Fish	0.341	0.077	1.514	0.157	1.030	0.207	5.110	0.971	0.717	0.362	1.420	0.340	1.926	0.713	5.203	0.196
Wholesale Trade	0.120	0.029	0.502	0.004	0.912	0.187	4.441	0.909	0.267	0.114	0.624	0.002	1.909	0.636	5.736	0.249
TABLE 4																
U/E benefit (EOY)	0.394	0.143	1.084	0.071	1.281	0.439	3.734	0.650	0.164	0.094	0.286	0.000	1.227	0.611	2.464	0.565
Any wage or salary	1.087	0.611	1.934	0.777	1.153	0.651	2.043	0.626	1.683	1.184	2.394	0.004	2.044	1.373	3.044	0.000
Income	1.755	1.841	1.674	0.000	1.186	1.243	1.130	0.000	1.883	1.934	1.834	0.000	1.266	1.307	1.228	0.000
Any benefit*	0.064	0.035	0.114	0.000	0.647	0.357	1.171	0.150	0.048	0.034	0.069	0.000	0.997	0.657	1.515	0.990

Te Arotahi Paper_July 2025-FNL-corrected.indd 50 14/07/2025 5:58 PM

TABLE 5																
Sickness benefit	0.009	0.001	0.071	0.000	8.497	1.132	63.803	0.038	0.015	0.004	0.057	0.000	38.881	8.430	179.323	0.000
Hospital admission	0.508	0.184	1.401	0.191	4.413	1.461	13.325	0.008	0.120	0.057	0.253	0.000	0.833	0.319	2.175	0.709
Inpatient	0.748	0.594	0.943	0.014	1.437	1.134	1.820	0.003	0.710	0.616	0.818	0.000	1.322	1.113	1.570	0.001
ED admission	0.503	0.399	0.634	0.000	1.722	1.356	2.187	0.000	0.464	0.399	0.540	0.000	1.793	1.497	2.148	0.000
ACC claim	0.512	0.408	0.642	0.000	0.966	0.772	1.208	0.759	0.828	0.731	0.937	0.003	1.851	1.606	2.132	0.000
Health-constraining areas	1.323	0.348	5.039	0.681	1.496	0.393	5.691	0.555	1.330	0.550	3.219	0.526	0.956	0.343	2.660	0.931
Health-promoting areas	2.986	1.159	7.694	0.024	2.281	0.915	5.686	0.077	1.225	0.647	2.319	0.534	1.379	0.654	2.910	0.399
Smoking																
Ex-smoker	ref				ref				ref				ref			
Non-smoker	0.926	0.660	1.299	0.656	1.490	1.058	2.098	0.023	0.504	0.415	0.611	0.000	1.710	1.346	2.173	0.000
Smoker	0.238	0.145	0.392	0.000	2.989	1.571	5.686	0.001	0.149	0.111	0.201	0.000	3.357	2.004	5.622	0.000
TABLE 6																
Ethnic group numbers																
One ethnic group	ref				ref											
Two plus	2.205	1.668	2.915	0.000	28.185	18.537	42.855	0.000								
Age at immigration																
One ethnic group	ref				ref											
Two plus	2.205	1.668	2.915	0.000	28.185	18.537	42.855	0.000								
New Zealand born	ref				ref											
Preschool	6.087	2.892	12.812	0.000	0.188	0.108	0.326	0.000								
School	0.709	0.473	1.064	0.097	0.408	0.274	0.606	0.000								
Adult	0.672	0.488	0.927	0.015	1.210	0.861	1.701	0.271								
Not Identified	1.474	1.113	1.954	0.007	0.687	0.522	0.903	0.007								
Disability																
No disability	ref				ref				ref				ref			
Yes	0.547	0.269	1.111	0.095	1.903	0.833	4.347	0.127	0.411	0.256	0.659	0.000	1.527	0.790	2.951	0.208
Not answered	0.393	0.272	0.567	0.000	1.912	1.253	2.919	0.003	0.228	0.171	0.303	0.000	0.972	0.674	1.402	0.879

Te Arotahi Paper_July 2025-FNL-corrected.indd 51 14/07/2025 5:58 PM

	Pacific PhD graduates versus						Māori PhD graduates versus					
	Pacific without a PhD			nMnP graduates			Māori without a PhD			nMnP graduates		
	OR	95% CI	*p* value	OR	95% CI	*p* value	OR	95% CI	*p* value	OR	95% CI	*p* value
TABLE 7												
Family type												
Couples only	ref			ref			ref			ref		
Individual alone	1.169	0.794	1.721	0.430	0.468	0.325	0.674	0.000	1.321	1.060	1.647	0.013	0.871	0.685	1.108	0.262
Parents with children	0.489	0.308	0.778	0.002	1.101	0.663	1.829	0.709	0.549	0.415	0.725	0.000	1.615	1.108	2.353	0.013
Crowding												
No crowding: 1+ spare	ref				ref				ref				ref			
No crowding, no spare rooms	0.564	0.390	0.816	0.002	1.197	0.826	1.734	0.343	0.658	0.524	0.826	0.000	0.995	0.763	1.298	0.972
Crowding	0.522	0.314	0.867	0.012	2.242	1.249	4.026	0.007	0.438	0.290	0.663	0.000	0.967	0.573	1.629	0.899
Severe crowding	0.377	0.217	0.654	0.001	12.910	4.283	38.911	0.000	0.244	0.127	0.469	0.000	2.706	0.851	8.602	0.092
TABLE 8												
Employment Status												
Employee	ref				ref				ref				ref			
Employer	0.950	0.508	1.777	0.873	0.664	0.369	1.196	0.173	1.302	0.991	1.710	0.058	1.327	0.964	1.826	0.083
Not employed	2.130	0.953	4.760	0.065	1.957	0.859	4.458	0.110	0.901	0.455	1.782	0.764	0.745	0.348	1.596	0.450
Labour force status												
Employed-FT	ref				ref				ref				ref			
Non-labour force	0.784	0.566	1.087	0.144	1.013	0.724	1.416	0.941	0.483	0.391	0.597	0.000	0.684	0.533	0.878	0.003
Employed-PT	1.490	1.023	2.171	0.038	0.938	0.657	1.341	0.726	0.707	0.555	0.902	0.005	0.610	0.467	0.795	0.000
Unpaid work												
1 unpaid job	ref				ref				ref				ref			
None	0.433	0.223	0.844	0.014	0.732	0.366	1.466	0.379	0.182	0.097	0.340	0.000	0.287	0.147	0.564	0.000
4+	1.388	0.915	2.107	0.123	3.206	2.075	4.954	0.000	1.468	1.155	1.866	0.002	3.147	2.260	4.383	0.000
Not answered	0.496	0.355	0.694	0.000	2.038	1.400	2.968	0.000	0.255	0.196	0.334	0.000	0.910	0.654	1.266	0.577

Te Arotahi Paper_July 2025-FNL-corrected.indd 52 14/07/2025 5:58 PM

Te Arotahi Paper_July 2025-FNL-corrected.indd 53

TABLE 9																
Home ownership																
Not owned	ref				ref				ref				ref			
Owned	2.286	1.225	4.265	0.009	0.815	0.465	1.429	0.475	1.656	1.189	2.306	0.003	0.905	0.632	1.296	0.586
Family trust	2.875	2.067	4.000	0.000	1.013	0.738	1.390	0.938	2.126	1.749	2.584	0.000	1.058	0.850	1.317	0.616
NotAnswered	0.669	0.461	0.971	0.034	1.709	1.124	2.597	0.012	0.371	0.280	0.491	0.000	0.926	0.651	1.317	0.667
Tenure																
Owned	ref				ref				ref				ref			
Rented	0.337	0.241	0.471	0.000	1.042	0.737	1.473	0.817	0.435	0.348	0.544	0.000	0.840	0.644	1.094	0.196
Family trust	0.902	0.492	1.654	0.738	0.697	0.405	1.197	0.190	0.940	0.691	1.278	0.693	0.892	0.641	1.242	0.497

14/07/2025 5:58 PM