Ngā Tamariki o Te Kupenga

Final Report

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Ka ketekete te Kākā, ka kūkū te Kereru, ka koekoe te Tūī!

Ko te kaha waiata o ngā manu o te ngāhere te tino tohu,

kei te ora a Tāne Mahuta.

The Kākā chatters, the Kererū coos, the Tūī chirps.

It is the strength of birdsong in the forest that tells us,

Tāne Mahuta is alive and well.

Disclaimer

The results of this report are not official statistics, they have been created for research purpose from the Integrated Data Infrastructure (IDI) managed by Statistics New Zealand.

The opinions, findings, recommendations and conclusions expressed in this report are those of the authors not Statistics New Zealand.

Access to the anonymised data used in this study was provided by Statistics New Zealand in accordance with security and confidentiality provisions of the Statistics At 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular person, household, business or organisation and the results in this report have been confidentialised to protect these groups from identification.

Careful consideration has been given to the privacy, security and confidentiality issues associated with using administrative and survey dta in the IDI. Further detail can be found in the Privacy impact assessment for Integrated Data Infrastructure available from *www.stats.govt.nz*.

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The starting point

Understanding the diversity of the Māori population of Aotearoa New Zealand is vital for meaningful engagement with Māori

The Māori population of Aotearoa New Zealand is large, and it encompasses a diverse range of different social and cultural features. There is no single way of living as or being Māori. Despite this, the consideration of Māori needs and experiences in public policy is often viewed through the lens of Māori ethnicity, where all who identify as Māori are grouped as one for reporting and policy planning.

Addressing poor outcomes for Māori in the educational system is a priority for the Ministry of Education, as reflected in Ka Hikitia, the Ministry's strategy for accelerating the success of Māori students. However, the challenge is significant. In particular, the diversity of the Māori population mean that what works in one context may not work in another. Understanding, measuring and quantifying the cultural diversity within the Māori population is a step towards more meaningful engagement. It provides a tool to understand in more detail how well the education system is performing for Māori learners, ultimately supporting better outcomes.

The opportunity

Comprehensive information on individual's connection to te ao Māori is now available within the Integrated Data Infrastructure opening the door to analysis that links the cultural diversity of New Zealand Māori students and educational outcomes

In 2013 Stats NZ undertook Te Kupenga – the Māori Social Survey – the most comprehensive study of the social and cultural outcomes of Māori ever undertaken in Aotearoa New Zealand. More than 5,000 Māori adults gave an hour of their time to provide information that would help Māori and support better engagement with Māori on the part of government.

With the inclusion of this dataset within Statistics New Zealand's Integrated Data Infrastructure (IDI) – a large research database that holds anonymised data about people and households from many different sources – it is possible to connect information from Te Kupenga on how adults connect to te ao Māori to information on students living in the household and their engagement with the education system. This research examines the interrelationship between whānau characteristics (such as knowledge of tikanga, use of te reo Māori, and engagement with Māori culture), student characteristics, and school characteristics. In particular, it addresses the following core research questions:

- What are the characteristics of the whānau of Māori students in terms of cultural identity, wellbeing, and socio-economic outcomes?
- What are the school characteristics of Māori students?
- How do whānau and school characteristics correlate with educational outcomes for Māori students?
- Do different school characteristics affect Māori children with different types of cultural identity in different ways?

Te Ao Māori

Ngā Tamariki o Te Kupenga focuses on exploring the relationship between Māori culture and educational outcomes, so an important part of the project was developing tikanga for working with Māori data.

In building and analysing the Ngā Tamariki o te Kupenga dataset three key principles have been

fundamental. First, Te Kupenga represents the voice of 5,459 Māori people. Te Kupenga is their kōrero and this must be respected. This creates an obligation to make the voices of Te Kupenga respondents heard, and to respect what they say through the Te Kupenga dataset.

The second principal is embodied in the idea of "nothing for us, without us". As a research project on Māori outcomes, Ngā Tamariki o Te Kupenga has engaged with Māori and involved Māori directly in every stage of the project. This has been reflected in the composition of the project at all levels: the project team, the Ministry of Education working group supervising it, and the Māori-led steering group to which the project was accountable[1]. Similarly, peer review for the project includes both a technical perspective from Māori researchers with experience in similar types of analysis[2] and an independent Māori community perspective[3].

Finally, tikanga Māori were given priority how the project proceeded. This has been reflected both in the protocol for meetings of the steering and working groups, but also in how peer review and engagement with stakeholders has been managed. For example, the Māori community peer review was conducted, not by formal feedback on written report, but through a hui involving presentation and discussion of the results in a Māori-led setting.

The Ngā Tamariki o te Kupenga data set

The Ngā Tamariki o te Kupenga dataset links information on whānau characteristics within the household - including cultural identity – to information on student educational outcomes and to school characteristics.

At the core of the Ngā Tamariki o Te Kupenga project was the construction of a dataset combining information from Te Kupenga, the Ministry of Education, and the IDI that paints a picture of the student, their home environment, and their school. In particular, by drawing on Te Kupenga it was possible to produce a detailed picture of the cultural environment in the home for Māori students. When combined with information about the student, their school, and more conventional measures of household social, demographic, and economic characteristics for the student, this enables analysis of the interaction between culture and education that has never before been possible.

The resulting dataset, however, is more than the sum of its parts. In the medium to long term further analysis of this dataset has the potential to go well beyond the outcomes discussed in this report. With this in mind it is worth noting that the Ngā Tamariki o Te Kupenga dataset is every bit as much an output of the project as this report. The dataset is fully documented and can be accessed in the IDI along with the code used for the analysis reported here.

Measuring cultural identity and connection

Starting from 35 different pieces of information on engagement with Māori culture from Te Kupenga, exploratory factor analysis was used to group these into scalar measures capturing five dimensions of Māori cultural identity and connection.

Māori cultural diversity has been recognised both by academic authorities in the field and by the wider Māori population for some time. Māori whānau and individuals experience being Māori in a wide variety of different ways and contexts. The relevance of traditional values will vary from person to person, and many people will still define themselves as Māori and reject the notion that

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[1] Members of the steering group were: Wayne Ngata (chair), Craig Jones, Rose Jamieson, Kiritina Johnstone, Tipene Chrisp, Kara Nepe-Apatu, Philip Stevens, Cyril Mako, Andrew Webber, Conal Smith, Atawhai Tibble, and Luisa Beltran-Castillon

[2] Peer reviewers included: Carla Houkamau and Chris Cunningham

[3] Peer review hui held on 18 July at Ministry of Education. Attendees included both internal Ministry of Education Māori staff and a range of external invitees.

they are any "less Māori" than others despite having a weaker attachment to traditional cultural norms. However, complexity and range of cultural measures contained in Te Kupenga has proved a challenge to many attempts to use this data to understand the relationship between Māori culture and wellbeing.

Ngā Tamariki o Te Kupenga employed exploratory factor analysis (EFA) to group a wide range of measures of cultural identity and connection from Te Kupenga into five distinct dimensions that represent distinct aspects of connection to te ao Māori. These five dimensions provide a tool to summarise the rich information related to culture from the Te Kupenga survey so that it can be easily used to further understand how Māori engāge with their culture. Table 1 describes each of the five dimensions of Māori cultural identity and connection.

Table 1. Dimensions of Māori cultural identity and connection

Dimensions of Māori cultural identity and connection	This dimension captures	High score represents someone who:	Low score represents someone who:
Te reo	Fluency in te reo Māori as well as the use of te reo in the home.	is fluent in te reo and who uses the language on a daily basis	cannot speak te reo or, at most, knows only a few words and phrases.
Tūrangawaewae	The strength of traditional Māori identity and a sense of "being" Māori.	is likely to identify solely as Māori and to be seen as Māori by others. They will know their pepeha and have strong links to ancestral lands and their tūrangawaewae. A person with a high score in this dimension is also likely to be registered with an iwi and to vote in iwi elections.	has Māori ethnicity, but it is likely to identify with other ethnic backgrounds and may not be seen as Māori by others. They may not feel that being Māori is their primary identity and have little connection with their ancestral places or iwi.
Tikanga	Engagement with traditional and modern Māori tikanga.	is frequently engaged in activities associated with Māori culture and has little need for support from family members to help with cultural issues.	is likely not to be engaged in Māori cultural activities and, if they needed to perform a mihi or speech in Māori, would likely need to look to family members for help.
Wairua	Engagement with spirituality and religion.	is likely to find both religion and spirituality important, and to attend church regularly	Is likely to report a lack of spiritual connection and have little engagement with religion or church.
Mahi marae	Engagement with and time on the marae.	is frequently on marae and contributes to the functioning of the marae by providing unpaid help and support with the tasks necessary for the functioning of the marae.	lacks significant connection to a marae.

Te Kupenga Māori identity signatures

The Te Kupenga Māori identity signatures are the primary method used in Ngā Tamariki o Te Kupenga to provide insight into the relationship between the cultural environment in the whānau and student outcomes.

Using the five dimensions of Māori culture identity and cluster analysis was used to identify six sub-groups within the Māori population that comprise respondents who share a similar pattern of connection to te ao Māori. Although there is still diversity within the groups, this provides a practical tool to understand the population further. These six Māori identity signatures have been named for the colours in te reo Māori to provide a simple way of discussing them. The choice of specific colours for each cluster, however, is arbitrary. The six Māori identity signatures are:

- **Kahurangi -** *Strong in tūrangawaewae and mahi marae but relatively weak in te reo*
- **Karaka -** *Little to no engagement with Māori culture*
- **Whero -** *Moderate sense tūrangawaewae but lower connection with other aspects of Māori culture*
- **Kōwhai -** *Very strong measured wairua but low levels of engagement with other aspects of Māori culture*
- **Waiporoporo -** *Strong in tūrangawaewae and in te reo but only moderate to low levels of engagement elsewhere*
- **Kākāriki -** *Strong across all five dimensions of Māori cultural identity and connection*

Figure 1 below illustrates the profile of the six Māori identity signatures in terms of engagement with the five dimensions of Māori cultural identity and connection developed in Ngā Tamariki o te Kupenga.

Figure 1. Māori identity signatures
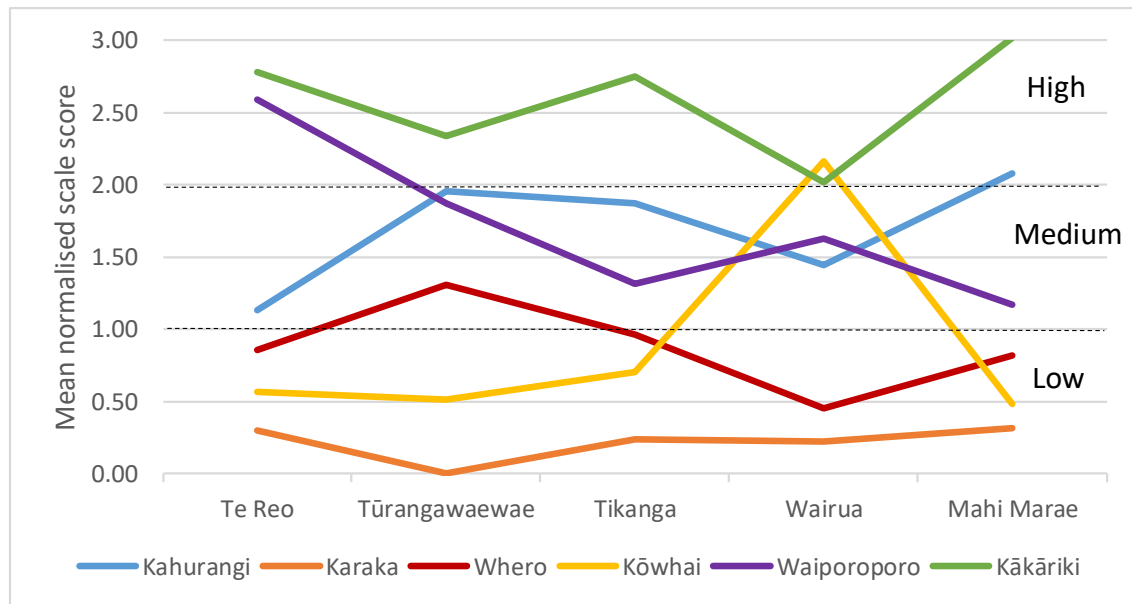
Source: Te Kupenga and Ministry of Education

The Māori identity signature groups identified in Te Kupenga vary from between about 10 percent of the Māori population (Kākāriki) to 31 percent (Karaka). The size of the Karaka group is an important consideration in that it may play a role in obscuring the relationship between culture and other outcomes when Māori are considered as a whole. Because the Karaka group identify as Māori when asked about ethnicity, but otherwise do not substantively see themselves as Māori, most statistical measures of Māori outcomes will include a relatively large group (up to a third) who lack connection to Māori culture but may be doing relatively well. Only when this group is identified separately is it possible to see the underlying positive relationship between stronger Māori cultural identity and better outcomes in other areas (such as wellbeing or educational

attainment).

Māori students in Aotearoa New Zealand

The Ngā Tamariki o te Kupenga dataset provides the opportunity to compare information on Māori students from the Census with information from the Ministry of Education's administrative data.

Māori descent and ethnicity are largely synonymous as less than 5 percent of people report Māori ethnicity but not Māori descent. However, there is a small but non-trivial difference in reported ethnicities between the Ministry of Education's administrative data and the Census. In particular, approximately 1 Māori student in 10 (10.4 percent) is identified as Māori only in Census data and does not show up as Māori in Ministry of Education administrative data. Including these students when assessing educational outcomes for Māori students increases the Māori NCEA level 2 attainment rate from 64.8 percent to 65.5 percent.

There is a wide diversity of ethnic identities within the wider Māori student population. While about a third of Māori students (33.7 percent) identify as only Māori, the remaining two thirds report more than one ethnicity. In fact, the most common reported ethnicity for Māori students is Māori and European (48.3 percent). Other groups are smaller, but there is still a significant group of Māori and Pasifica (7.3 percent) and Māori, Pasifica, and European students (7.1 percent).

Māori students are overwhelmingly urban (87.3 percent) and from the North Island, with only 14.8 percent of Māori students living in the South Island. About a quarter of Māori students come from one parent families (18.3 percent in single parent families with children and 7.8 percent in single parent families with children and others), but the majority live in families with two parents (52 percent couple with children plus 7.5 percent couple with children plus others).

There are the relatively high levels of Māori students living in households from the most deprived parts of New Zealand (NZDep deciles 8, 9, and 10). Fully one quarter of Māori students live in areas classified as in the most deprived decile in New Zealand using NZDep 2013. Despite this, there is also a large proportion of Māori students living in households with relatively high incomes. Roughly a quarter of Māori students (16.3 percent plus 11.4 percent) live in households with an annual income of more than $100,000.

Modelling educational outcomes for Māori students

Ngā Tamariki o te Kupenga confirms the importance of parental education and socio-economic characteristics in student achievement, but also identifies a strong positive impact from Māori medium education. This appears to be heavily driven by the positive impact of Māori teachers in the school environment for Māori students.

A series of statistical models were used to test the impact of whānau, student, and school characteristics on student educational outcomes. The baseline model (capturing the impact of student and whānau social, demographic, and economic factors only) accounts for about a quarter of NCEA level 2 outcomes and about a third of University Entrance outcomes. The main independent variables show the expected relationship with educational attainments:

- Income and parental education have a large positive effect on educational attainment
- Deprivation and experience of benefit receipt have a large negative effect attainment
- Household crowding has a negative effect on NCEA attainment but not UE
- The presence of a flag on the administrative data for any sort of special education is associated with a large decrease in the probability of educational attainment

Moving beyond the baseline model, the Māori identity signature of the student is important to their educational outcomes, even after controlling for all social and economic variables. In particular, students living in whānau from the the kākāriki group (high levels of connection across all five dimensions of Māori culture) had better educational outcomes than any other group both

before and after controlling for social, demographic, and economic factors.

Attending a school with Māori medium education (either sole Māori medium or mixed Māori medium/English) is associated with roughly a one third increase in the odds of attaining NCEA level 2 and UE. This effect appears to be mediated largely through the teacher: a 25% increase in the proportion of Māori teachers increases the odds of attaining NCEA level 2 and UE by about a third. At the same time, once the teacher effect is accounted for, Māori medium schools have no effect on NCEA level 2, and a much smaller effect on UE attainment. In contrast to the large impact from teachers, the effect of a school offering subjects in field Māori has no impact on NCEA level 2 attainment and only a small (c4%) effect on UE.

One analytical outcome of particular interest is the observation that some Māori identity signature groups benefit much more strongly from Māori medium education and teachers than others:

- At NCEA level 2, this is the Waiporoporo and Whero groups
- At UE this is the Waiporoporo and Kākāriki groups

While all groups benefit, these groups gain the most, and the impact on Waiporoporo appears potentially transformative. Students from the Waiporopro group in schools with no Māori teachers perform worse than any other group, while Waiporoporo students in schools with 30 percent or more Māori teachers perform better in terms of educational outcomes than students from any other group.

One reason why the Waiporoporo group may respond so well to Māori medium education is that the group includes a very high proportion of students who have had some engagement with Kōhangā Reo, but who have not made the transition to Kura Kaupapa Māori.

Policy Implications

Six key findings with potential relevance to policy where identified through Ngā Tamariki o te Kupenga.

Ministry of Education data does not identify all Māori students as Māori

Linking Ministry of Education data with Te Kupenga and Census data provided a second source of student ethnicity to supplement the measure already within the Ministry's administrative data. This showed that approximately 10 percent of students who are reported as of Māori ethnicity in the Census are not identified as of Māori ethnicity to the Ministry of Education. These students do better academically than the average for Māori students in the Ministry's data, implying that Māori educational attainment is underestimated by the administrative data by about half of a percentage point for NCEA level 2 (65.1 percent compared to an actual value of 65.6 percent).

We can identify different sub-groups of the Māori student population with different needs

Cluster analysis identifies six different Māori identity signatures which provide profiles of different groups within the Māori population based on cultural identity and connection across five different dimensions of Māori culture. These groups have quite different profiles, outcomes, and needs. The Karaka group for example, has little engagement with Māori culture and members do not identify strongly as feeling Māori. In contrast, the Kākāriki group are strongly engaged with all dimensions of Māori culture. Understanding the composition of the Māori student population in a region can potentially assist with building a better picture of the likely needs of the population and what sort of policy approaches will work.

Māori medium education has a positive impact on student outcomes

Attending a school offering Māori medium education is associated with higher attainment rates of between a quarter (NCEA level 2) and a third (UE) after controlling for the impact of student, parental, and household characteristics.

Māori teachers are a major reason why Māori medium education contributes to stronger educational outcomes

The proportion of Māori teachers in a school mediates the impact of Māori medium education. Much of the improvement in outcomes associated with Māori medium education appears to be associated with these schools having a higher proportion of Māori teachers. While the analysis does not indicate why this should be the case, this finding is consistent with findings from other countries showing that the ethnicity of the teacher matters for the educational outcomes of minority students.

The Waiporoporo group and – to a lesser degree the Whero and Kākāriki groups – benefit disproportionately from Māori teachers.

Three of the Māori identity signature groups identified in the analysis benefit disproportionately from Māori medium education and exposure to Māori teachers. While all of the six Māori identity signature groups do better with a higher proportion of Māori teachers, the Waiporoporo, Whero, and Kākāriki groups show a particularly large change in student outcomes. For the Waiporoporo group – who appear to have often had some exposure to Kōhangā Reo – this impact is particularly large. Areas with a high concentration of students in the Waiporoporo group may be good areas to target for the expansion of Māori medium education.

Māori teachers benefit Māori students not in Māori medium education almost as much as those in Māori medium education

Analysis of the outcomes for students not in Māori medium education shows that the impact of Māori teachers on student outcomes is almost as large for this group as it is for students in Māori medium education. This suggests that focusing on the recruitment and retention of Māori teachers may make a positive impact on educational attainment for Māori students in areas where Māori medium education is either not possible or not desirable due to lack of resources or demand.

Next steps

The analysis in this report represents only a fraction of the analysis possible with the linked student-whānau-school dataset that has been constructed.

There are a number of opportunities that were identified in the process of compiling this report that were beyond the scope of the available resources to investigate.

Working with variables already in the dataset

A number of measures in the Ngā Tamariki o Te Kupenga dataset were not used as extensively in the analysis as they might have been. Further analyses of these outcomes would help test some of the main conclusions around culture, school characteristics and student outcomes. Of particular interest would be the use of expected percentile as an outcome measure for modelling alongside NCEA level 2 and UE and the use of geocoded data on distance between the student's home and the nearest school offering Māori medium education.

Because moving house requires significantly more effort than changing school (where there is more than one option for school), distance to Māori medium education can – to some degree – be considered exogenous. A logical piece of analysis therefore is to use distance to Māori medium education in an instrumental variable analysis to obtain a more robust estimate of the causal impact of the provision of Māori medium education on student outcomes. It would also be possible to extend this analysis to take into account any interaction between Māori identity signature and distance to Māori medium education.

Further investigating the Māori identity signatures

While the Māori identity signatures developed for Ngā Tamariki o Te Kupenga already have strong evidence of their relevance and validity, there is additional work that could be undertaken to add to their value. First, the clustering process used to develop the Māori identity signatures could be

repeated with more extensive testing. In particular, the sensitivity of the clustering to dropping each of the five dimensions of Māori cultural identity and connection would provide useful information about the robustness of the clusters.

The second area where work on the Māori identity signatures could add value is the development of a short from version of the Te Kupenga cultural questions. The idea here would be to develop a shorter set of questions that preserved the main characteristics of the full set with respect to the five dimensions of Māori cultural identity and connection. If a valid short form set of questions of this sort could be developed, then this would open the possibility of collecting information on Māori identity signatures to help guide decision-making in an operational context.

Adding variables to the dataset

A number of potentially valuable pieces of analysis would be possible if additional measures from the Ministry of Education's administrative data were added to the existing Ngā Tamariki o Te Kupenga dataset. Two additional measures are of obvious immediate interest. Firstly, information on previous student engagement with Kōhangā Reo would be useful to better understand the impact of Māori medium education and the interaction between Māori medium education and culture.

A second additional measure that could be added to the dataset would be information on average outcomes at the school level. This would support further analysis of the peer effects associated with Māori students and would allow testing of the hypothesis that the negative relationship between the percentage of Māori students in a school and educational outcomes reflects the proportion of Māori students proxying for lower average performance at the school.

Analysis not currently possible

One potential issue with the analysis of student outcomes in this report is that it is limited to attainment within the school system. Ideally it would be good to know about student outcomes beyond the school system: in the labour market or tertiary education. Because of the ages of the students in the Ngā Tamariki o Te Kupenga data it was not possible to look at post-school outcomes for students in 2018/19 when this report was prepared. However, in 2019 the youngest students in the school leavers dataset from Ngā Tamariki o Te Kupenga will have a full year of post-school data. By 2020 or 2021 it should be possible to re-run the student outcomes analysis using labour market and tertiary education participation as success measures.

1 INTRODUCTION

The Māori population of Aotearoa New Zealand is large, and it encompasses a diverse range of different social and cultural features. There is no single way of living as or being Māori. Despite this, the consideration of Māori needs and experiences in public policy is often viewed through the lens of Māori ethnicity, where the distinction between identifying as Māori or not becomes the primary focus. Binary analysis of this sort inevitably involves the loss of much potentially relevant information. Although there is some recognition of the importance of iwi and hapū in elements of the Crown-Māori relationship, by and large policy targeted at Māori disadvantage treats Māori as culturally and socially homogenous.

One area where the cultural and social diversity of Māori is of crucial importance is the school system. Average levels of educational attainment and participation for Māori students are below those for the population as a whole. However, initiatives aimed at addressing the educational outcomes for Māori students will not be successful unless they recognise the diversity of those students. Not all students identifying as Māori are necessarily disadvantaged and of those that are, not all are disadvantaged in the same way. The most appropriate forms of intervention at the student, teacher, school, and system level will depend crucially on how different ways of being Māori affect student engagement with the education system.

Te Kupenga – the Māori Social Survey – represents the most comprehensive study of the social and cultural outcomes of Māori ever undertaken in Aotearoa New Zealand. However, moving from official statistics to actionable insights is a non-trivial task. Ngā Tamariki o Te Kupenga represents a first attempt at utilising the Te Kupenga dataset to realise insights for the education system. In particular, the project focuses on building a picture of the diverse make-up of the Māori student body in Aotearoa New Zealand, with a specific focus on how the household cultural, social, and economic environment interacts with the school system.

1.1 Motivation

Average levels of educational attainment and participation for Māori are below those for the population as a whole. The proportion of Māori children starting school having attended ECE was 5.9 percentage points below that for New Zealand Europeans in 2014, while in the same year only 58.6 percent of Māori school leavers attained NCEA level 2 or above compared to over 77 percent for the total population. Similar gaps show up in most other educational indicators.

Addressing poor outcomes for Māori in the educational system is a priority for the Ministry of Education, as reflected in Ka Hikitia, the Ministry's strategy for accelerating the success of Māori students. However, the challenge is significant. In particular, the Māori population itself is diverse and what works in one context may not work in another.

Traditionally there has been a lack of robust data capturing the diversity of Māori culture and experience, which has limited the quantitative analysis of the links between culture and educational outcomes. This is important, since qualitative and overseas evidence suggests that unconscious bias on the part of teachers and other educational staff may play a significant role in contributing to poor educational outcomes for Māori.

Te Kupenga, the Māori Social Survey, provides detailed quantitative information on the cultural environment in whānau and Māori households across New Zealand. With the inclusion of Te Kupenga in the Statistics NZ Integrated Data Infrastructure, there is for the first time the potential to link detailed information on the cultural milieu of whānau with the educational environment experienced by children and young people, and their resulting educational outcomes.

Ngā Tamariki o Te Kupenga has two aspects: it is a research programme into educational outcomes for Māori students and an investment in the infrastructure required to better understand how Te Ao Māori interacts with the New Zealand educational system.

As a research programme, Ngā Tamariki o Te Kupenga will focus on looking at the diversity of the

Māori student population and how this affects what works in an educational context. It will:

- ***Describe the diversity of the Māori student population*** in terms of whānau, engagement and knowledge of culture, values in the home environment, and household social and economic characteristics.

- Understand ***what are the things that matter to educational success for Māori students*** from different whānau and cultural backgrounds.

- Build a picture of ***what school characteristics are most important to outcomes for Māori students,*** and how do school characteristics affect success for Māori tamariki.

At the heart of Ngā Tamariki o Te Kupenga is the Ngā Tamariki dataset that links information on student, school, and whānau characteristics. After the initial research outlined above is finished, the dataset will remain as an important piece of infrastructure in its own right. Ngā Tamariki o Te Kupenga will:

- Create ***a resource that can be used in other contexts*** to help better understand how Māori outcomes in education and elsewhere.

1.2 Te Ao Māori

A key issue for this project is how we address the tikanga or ethical aspects of analysing and reporting on Māori data. This includes:

- How we look after the mana of Māori whose data we are using – particularly where it is anonymised?

- How we might include Māori in the governance, management and output of the project?

Te Ara Tika (Health Research Council) provides a useful starting point for thinking about the ethical issues associated with collecting and using Māori data. The challenge is how to apply this in a practical way, particularly with respect to data in the Integrated Data Infrastructure (IDI). Where Te Ara Tika focuses on the ethnics of collecting data for research and obtaining consent, the key issue in working with IDI data relates to the ethical concerns in working with anonymised data where consent has already been given in general terms for the use of the data, but there is no specific mandate for the research under consideration.

In working with Te Kupenga we take three key principals as fundamental. First, Te Kupenga represents the voice of 5,459 Māori people. The respondents of Te Kupenga gave their time to provide information that would help Māori. Te Kupenga is their kōrero and this must be respected. This creates an obligation to make the voices of Te Kupenga respondents heard, and to respect what they say through the Te Kupenga dataset.

The second principal is embodied in the idea of "nothing for us, without us". As a research project on Māori outcomes, Ngā Tamariki o Te Kupenga must engāge with Māori and involve Māori directly in every stage of the project. This has been reflected in the composition of the project at all levels. The project team comprises both Māori and non-Māori members as does both the Ministry of Education working group responsible for the project on a week to week basis and the project steering group, which has ultimate governance responsibility for the project[4]. Similarly, peer review for the project includes both a technical perspective from Māori researchers with experience in similar types of analysis[5] and an independent Māori community perspective[6].

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[4] Members of the steering group were: Wayne Ngata (chair), Craig Jones, Rose Jamieson, Kiritina Johnstone, Tipene Chrisp, Kara Nepe-Apatu, Philip Stevens, Cyril Mako, Andrew Webber, Conal Smith, Atawhai Tibble, and Luisa Beltran-Castillon

[5] Peer reviewers included: Carla Houkamau and Chris Cunningham

[6] Peer review hui held on 18 July at Ministry of Education. Attendees included both internal Ministry of Education Māori staff and a range of external invitees.

Finally, tikanga Māori have been given priority how the project proceeds. This has been reflected both in the protocol for meetings of the steering and working groups, but also in how peer review and engagement with stakeholders has been managed. For example, the Māori community peer review was conducted, not by formal feedback on written report, but through presentation and discussion of the results in a hui.

The process for managing Ngā Tamariki o Te Kupenga attempts to respect the koha provided by the Te Kupenga respondents and acknowledge the tikanga associated with working with Māori data. While the primary goal is to ensure that this project is conducted in an ethical manner that is consistent with the focus of the research within Te Ao Māori, reflections on the process will be captured as an outcome of the project to feed into and support the use of quantitative methods in te ao Māori more widely.

1.3 Research Questions

This research examines the interrelationship between whānau characteristics (such as knowledge of tikanga, use of te reo Māori, and engagement with Māori culture), student characteristics, and school characteristics. In particular, the following core research questions are a focus for the research:

- What are the characteristics of the whānau of Māori students in terms of cultural identity, wellbeing, and socio-economic outcomes?
- What are the school characteristics of Māori students?
- How do whānau and school characteristics correlate with educational outcomes for Māori students?
- Do different school characteristics affect Māori children with different types of cultural identity in different ways?

1.4 Report Overview

This report is divided into five sections. The first section – this introduction – sets out the motivation for undertaking Ngā Tamariki o Te Kupenga and discusses how the project fits within Te Ao Māori. The core research questions that Ngā Tamariki o Te Kupenga seeks to address are also set out here. Part two of the report focuses on data and methodology. This provides a descriptive overview of the datasets used in the report and addresses a number of key methodological issues. In particular, section two outlines both the study population and the approach to weighting used in the report.

Cultural identity is at the core of Ngā Tamariki o Te Kupenga and forms the focus for section three. While Te Kupenga 2013 includes a wide range of questions on different aspects of culture and cultural engagement, transforming these into a useful framework for analysis is challenging. This part of the report sets out a framework for the analysis of Māori culture and then tests this framework using questions from Te Kupenga. The results of this analysis are used to create profiles for Māori students with different types of identity.

Section four of the report – Māori students in Aotearoa New Zealand – contains the main descriptive analysis in the paper. This provides a breakdown of the Māori student population in terms of household social and cultural outcomes as well as the cultural profiles developed in section three. Finally, section five provides a concluding discussion identifying key points to emerge from the analysis. The paper identifies further uses for the Ngā Tamariki o Te Kupenga dataset developed as part of the project. However, the main focus of the section is on insights that will be of direct relevance for improving the educational outcomes of Māori students.

2 DATA AND METHOD

At the core of the project will be the development of an analytical dataset linking information on cultural identity in the home environment with child educational outcomes[7]. This will involve identifying all of the students[8] living in each household interviewed in Te Kupenga in the Statistics New Zealand's Integrated Data Infrastructure (IDI). Te Kupenga was added to the IDI in the May 2018 update, and it is thus possible to connect responses in Te Kupenga to information from administrative datasets. This enables the linking of detailed information on culture in the home with educational and other outcomes for students. The core of the analysis draws on Te Kupenga, the IDI spine[9], Census 2013, education records in the IDI, and other data from the IDI. However, even though we know the main datasets that we propose to work with, it is useful to structure the types of information required more formally.

2.1 Conceptual overview

The primary aim of the Ngā Tamariki o Te Kupenga is to build a linked dataset containing information on the student, their home environment, and their school. This dataset is structured so that it is relatively easy to add in further layers of information such as iwi or region. Figure 2 below sets out the main data elements used in the project. At the core of figure 2 is the student. It is the student that is the primary unit of analysis for Ngā Tamariki o Te Kupenga, and the other data required is structured around the student. From the student's point of view, we are interested in both engagement and participation and in outcome measures. Because the student is the primary unit of analysis, the weights for the analysis will need to be developed around the student rather than simply applying the personal or household weights from Te Kupenga.

The most important additional pieces of information are those next to the student: the whānau, and the school. Information about whānau characteristics will be of two types. First, the socio-economic characteristics of the whānau are important as these are well established as drivers of student outcomes and are therefore important as controls. Over and above this, a key focus of the project is to incorporate information about the cultural characteristics of the whānau in which Māori students live.

An important caveat regarding the whānau tier is that information for this tier will necessarily be a somewhat imperfect representation of the concept of whānau. Data in Te Kupenga captures information about the household and about family relationships within it. There is no information on whānau members outside the household. This means that, for the purposes of Ngā Tamariki o Te Kupenga, the whānau layer will capture information about whānau members living in the same household and, for some measures, the household as a whole.

School characteristics are important as it is the school that is the main vehicle for the student's engagement with the education system. This includes both the type and character of school as well as the composition of the student and teacher bodies. Information on the school is taken from Ministry of Education administrative datasets and is matched to the student in the IDI so that measures of school characteristics are associated with each student in Ngā Tamariki o Te Kupenga.

Beyond the school and whānau, we can also potentially bring information on Iwi and location to

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[7]	Note that once the analytical dataset is constructed, it will be relatively easy to adapt it to investigate outcomes beyond the educational sector. Other outcomes that could be examined include health, justice, and labour market outcomes.

[8]	For the purposes of the analysis this will include children who were students at the time of the Te Kupenga interview. If necessary to reach the necessary sample size the time period for selection may be widened.

[9]	The IDI spine is the core of the IDI that enables records to be matched across different datasets. It is based on visa information from customs, records from births, deaths, and marriages, and tax data.

bear. Iwi may be of interest both as a way of collecting unobservable information missing at the individual level due to the historical impact of social, cultural, and economic factors, as well as a possible source of resources outside of the family. Geographic information potentially helps to round out both the cultural picture but also the socio-economic situation of the student. This information is not extensively used in this first iteration of the project, but the core dataset is designed so that such measures can be easily incorporated and analysed.

Figure 2. Ngā Tamariki o Te Kupenga data map
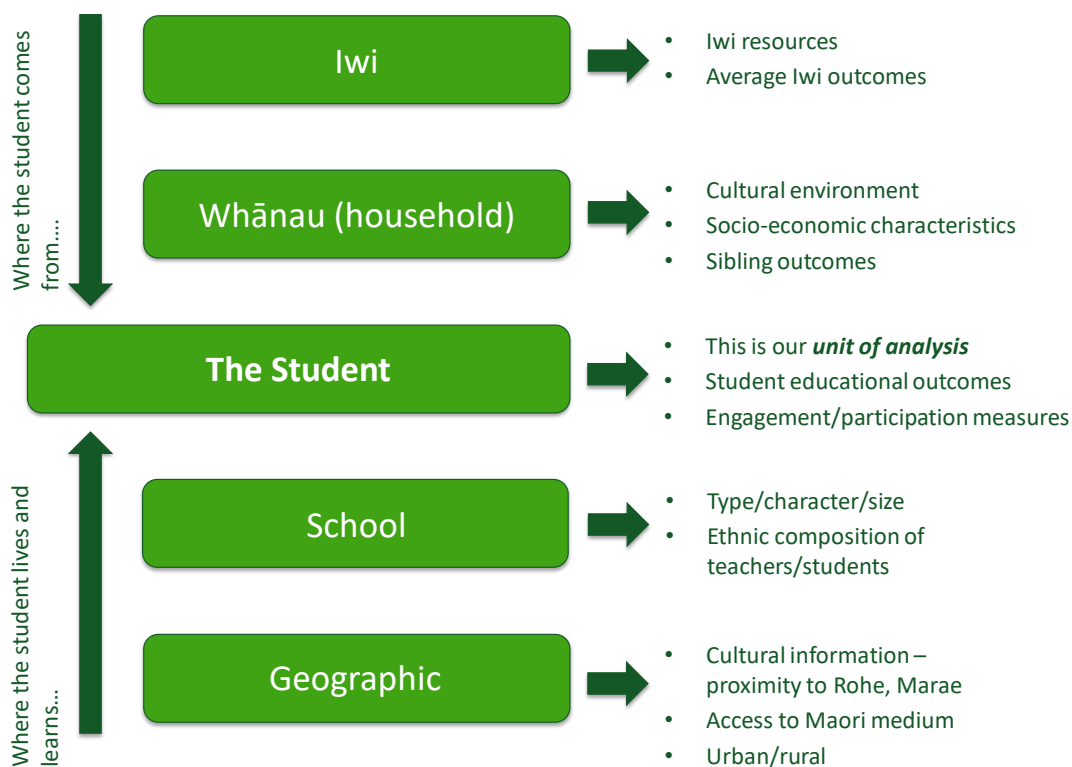
2.2 Data sources

The five types of information outlined in figure 2 serve as the structure for the analytical dataset built for the project. To fill these out we draw on a range of different data sources. The four main data sources for the analytical dataset are listed below:

- Te Kupenga 2013,
- Census 2013
- Education administrative data on students
- Education administrative data on school characteristics

Te Kupenga

Te Kupenga is a post-censal survey intended to be representative of the New Zealand resident Māori population. The survey was sampled from people aged 15 or older who indicated either Māori ethnicity or Māori descent in the 2013 census and has an achieved response rate of 74% (see Statistics New Zealand, 2014 for a more detailed discussion of Te Kupenga sampling and response rates). Total sample size for Te Kupenga is 5549 people.

The survey captures a wide range of information on the social and demographic characteristics of Māori, wellbeing outcomes, and engagement with Māori culture. Because Te Kupenga represents the population aged 15 and older, it is not used in this project as a primary source for information on the student. Only a small proportion of the sample are actually students, and all of these are in the last years of school. Instead, Te Kupenga is used to provide information on the characteristics

of the whānau and household in which the student lives.

Of particular importance for Ngā Tamariki o Te Kupenga is the cultural information contained in Te Kupenga. A primary goal of the project is better understanding how the cultural identity and connection of Māori students impacts on educational outcomes. For the purposes of this project we make the assumption that the cultural identity and connection of the Te Kupenga respondent provides valid information about the cultural environment of the whānau within which the respondent lives, and that this information can be used to inform analysis of students living within that household.

The 2013 Census

The 2013 Census was used to select the sample for Te Kupenga and is also included in IDI. It contains information on all households and families/whānau living within households in New Zealand as at the time of the Census 2013. Because of this, it is possible to use the 2013 Census to identify students who lived in the same household and who were part of the same whānau as respondents to Te Kupenga. The main role of Census data in Ngā Tamariki o Te Kupenga leverages this and has been to help select the student sample by identifying all individuals living in households with Te Kupenga participants who are also part of their families/whānau. It has also been used as a source of information on student ethnicity and Māori descent as well as of information used to correct sample bias.

Education administrative data on students

The Ministry of Education administrative data on students was used to identify the students from all family/whānau members living with a Te Kupenga respondent, helping to select the student samples. It has provided the source for educational information of those students, bringing information on enrolment, participation and achievement crucial to the study. This data has also been used to adjust the study population to reflect the size and composition of the total population of Māori students and correct for sample bias.

Education administrative data on school characteristics

The Ministry of Education administrative data on school was used to provide information on the school context the students were in, including whether the school provided Māori medium education. Education administrative data on students and teachers also provided information on the school context by providing student and teacher information of the whole school. Data provided by the Ministry of Education external to the IDI has also included information on the mean distance between the location of the students' residence[10] and the nearest school providing Māori medium education which has the potential to be used as a measure of access that students have to Māori Medium education.

Other administrative data within the Integrated Data Infrastructure

The Integrated Data Infrastructure (IDI) is a large research database. It holds microdata about people and households. As well as providing the platform to link all the above datasets, the IDI has allowed the project to add other valuable information related to the student. It has, for example, allowed us to link to information of the student's parents to understand further the family/whānau context, or to link to historical data like benefit receipt. This information is necessary to understand the relationship between student/whānau/school characteristics and educational outcomes.

2.3 Creating the Ngā Tamariki o Te Kupenga dataset

Creating the Ngā Tamariki o Te Kupenga dataset involved drawing together information from the different data sources discussed above and integrating these into a single analytical dataset focused on the student. In fact, the study has generated two datasets; one that includes the full

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[10] Measured as the centre of the meshblock where the student resides. Meshblocks are geographic units of 100 households

school student population from new entrants to Year 13 and another, which is formed of school leavers for whom final school outcomes are known. The process of generating these datasets involved:

- Merging the 2013 Te Kupenga, the 2013 Census and the MoE administrative enrolment and leavers datasets to select the study population; i.e. Māori students who belong to the family/whānau of a Te Kupenga respondent and lived in the same household.

- Merging the selected student dataset with all relevant data sources in the IDI to bring in information of interest.

- Merging into the student dataset further school information and 'access to Māori Medium' data not currently in the IDI but important for this analysis.

- Cleaning and auditing all the data that has been integrated, deriving any necessary business rules and additional variables.

- Merging the MoE administrative enrolment and leavers datasets with the 2013 Census to generate the full Māori student population as the target to adjust the study samples for size and bias.

- Generating individual post stratification weights and replica weights to be able produce representative and robust statistics. Weights are generated by comparing the target and study populations (see Box 1 for more information).

The linking process for constructing the Ngā Tamariki o Te Kupenga data generally went very smoothly. Because Te Kupenga was a post-censal survey no issues arose in linking information from Te Kupenga itself and Census household and family/whānau data (by construction, the link rate here is essentially 100 percent). Linking from Te Kupenga and the Census to Ministry of Education data in the IDI also went smoothly, with only a very small proportion of children living in the households of Te Kupenga respondents not able to be linked to education data. There was no obvious evidence of bias in the non-linkage rate.

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Box 1. Ngā Tamariki o Te Kupenga sample weights for the study populations

This section documents the population weights generated for the two sample populations used in this project. Statistics New Zealand created two sets of weights for Te Kupenga: personal weights that are applied so that descriptive statistics produced from Te Kupenga are representative of the total Māori population of New Zealand and replicate weights that are used to generate robust estimates of variance. However, the population of interest for Ngā Tamariki o Te Kupenga is not the total population of adult Māori New Zealanders, but students living in households with a Te Kupenga respondent. This requires a new set of sample weights.

Why do we need to introduce weights?

The main reason for generating sample weights is to correct for any existing bias in the sample population so that statistics generated from it represent the overall population of interest.

What are our sample population and our population of interest?

The general population of interest of Ngā Tamariki o Te Kupenga is Māori students. Specifically, two populations are the subject of our study: all Year 1 to Year 13 Māori students in 2013, and all Māori students who left school any year from 2011 to 2016. We call these two populations, our 'target populations'.

Two samples, one of each of the target populations, are used in the analysis. Our aim is that the statistics generated from them represent the two target populations.

Why is the sample not representative of the population of interest?

Both our sample selection criteria and the survey design of Te Kupenga introduce bias in our study samples.

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If the study samples had been randomly selected from the target populations, this would have ensured representation. Instead, the sample was selected so that the data from the 2013 Te Kupenga survey could be used. Therefore, only students who live in the same household with a family member who participated in the 2013 Te Kupenga survey, are selected for our study sample. This differs from a random sample of the target populations within Te Kupenga because different households have different numbers of school aged children within them.

In addition to this, the sample design of the 2013 Te Kupenga survey involved clustering around the primary survey units. This is a common technique used in face-to-face surveys to reduce the survey implementation costs. However, this clustering has the disadvantage of reducing the variation in the sample and increasing the sample errors.

Therefore, we need to adjust for bias in point estimates and in the variability of these estimates.

How have we corrected this bias?

Individual weights for point estimation

We have used post-stratification techniques to generate individual weights that adjust for the observed differences between target and sample populations.

Taking into account the selection criteria of our sample and the 2013 Te Kupenga sampling design, we identified and tested several potential stratification variables.

The final characteristics used to form the strata to create weights are:

- Regional council, with Northland further split into rural and urban
- Number of people in the household who were eligible to be selected as respondents in the 2013 Te Kupenga survey
- Being 15 years or over.

These groups lead to 14 strata. Individual weights were then generated by comparing the distribution of the sample and target population across the strata so that the final weighted sample would produce results that were representative of the target population sample. While the strata used for the weights focused on region, household composition, and age, other characteristics that might affect the weights – such as clustering of students within households – were tested during the process of developing weights and disregarded only because the proved unimportant to developing a set of representative weights.

Replicate weights for variance estimation

To be able to generate robust variance estimates, we have use Jack-Knife repeated replication method of resampling. We have generated 100 Jack-Knife weights for each individual (the replicate weights). Since this is the same technique used in the 2013 Te Kupenga survey, to estimate robustly the variance of estimates we have put the students in our sample into the same Jack-Knife group as the adult Te Kupenga respondent who lived in their household. Using this Jack-Knife groups and the already generated individual weights, we have generated 100 replicate weights for each student in the samples.

Student data in Ngā Tamariki o Te Kupenga

Information on students in the final Ngā Tamariki o Te Kupenga dataset is based on a synthesis of information from a number of different sources. It is important to keep this in mind in the subsequent analysis. For example, student ethnicity data is available from both the Census and from Ministry of Education administrative data. In the case of the former dataset ethnicity is likely to be filled in by either the student themselves or an adult in their household depending on the age of the student. Education data on ethnicity might come from the student, a parent/guardian, or even school administrative personal. Hence, when this report refers to the student's ethnic identification this may not necessarily reflect how the student sees themselves.

A particularly important aspect of the dataset to understand is the relationship between cultural information from Te Kupenga and the student. Except for a minority of cases where the student

was 15 or older and was selected as the respondent to Te Kupenga, information from Te Kupenga on Māori cultural identity refers to an adult living in the same household as the student and identified as part of the student's whānau through Census information on household relationships. For the purposes of Ngā Tamariki o Te Kupenga, we treat the information provided by the respondent on their cultural identity as though it applied to the student. This clearly will not be the case in all instances, but we assume that the cultural identity of an adult in the student's family provides useful information on the cultural identity of the student.

3 MEASURING CULTURAL IDENTITY AND CONNECTION

A core objective of Ngā Tamariki o Te Kupenga is to build a picture of who Māori students are that goes beyond simply looking at ethnic identification. The Māori student population is diverse, and any attempt to build an education system that meets the needs of Māori students will necessarily have to acknowledge and adapt to this diversity. The analytical dataset described in the previous chapter links information on a rich array of household characteristics from Te Kupenga with student and school information from the Ministry of Education. While some household characteristics – such as household income or the labour market status of household members – are relatively straight forward, obtaining the maximum value from Te Kupenga will involve the use of data for which there is much less precedent in terms of analytical approaches.

Of particular importance in Te Kupenga is the wide range of information on different aspects of cultural engagement, values, and knowledge. It is this information that has the potential to add the most new knowledge about Māori student outcomes, but it is also this information that will be the most challenging to use. While Statistics New Zealand has produced a range of descriptive statistical releases based on Te Kupenga data, these provide relatively little guidance for the use of Te Kupenga's extensive range of cultural measures in a more analytical context. To provide useful information on how different levels and types of Māori cultural identity affect student outcomes, the Te Kupenga data on specific activities and knowledge related to culture needs to be transformed into summary measures that provide a coherent descriptive picture of Māori identity and cultural engagement.

This chapter describes the process for developing a suite of measures of Māori identity and cultural engagement from the raw information in Te Kupenga that can be applied to Māori students. The aim here is for the measures to capture the important dimensions of Māori identity in sufficient detail that the diversity of the population is visible and groups of students with different characteristics can be identified while, at the same time, maintaining fidelity to Te Ao Māori and presenting a clear and concise picture. While the analysis here inevitably simplifies a more complex reality, identifying groups of students with similar characteristics in terms of connection to culture provides a practical way of engaging with the diversity of Māori students.

The first part of the chapter focuses on the development of a conceptual model of Māori identity and cultural engagement, while the second part of the chapter reports the results of a factor analysis of Te Kupenga data to identify empirically the main dimensions of identity and cultural engagement existing within Te Kupenga. A scalar measure of cultural identity and engagement is developed for each of the dimensions identified and this is then used for a clustering analysis of the Māori student population. Both the clustering analysis and the identity and cultural engagement scales form the basis of the descriptive analysis of the Māori student population in chapter 4.

3.1 Conceptual models of Māori Identity and cultural engagement

Māori cultural diversity has been recognised both by academic authorities in the field and by the general Māori population for some time. Mason Durie (1995) emphasised the fact that, far from being a homogenous group, Māori whānau and individuals experience being Māori in a wide variety of different ways and contexts. The relevance of traditional values will vary from person to person, and many people will still define themselves as Māori and reject the notion that they are any "less Māori" than others despite having a weaker attachment to traditional cultural norms. This recognition of the diversity of Māori identity drove the development of the framework and sampling strategy for the Te Hoe Nuku Roa study (Fitzgerald et al, 1996).

More recently Houkamau and Sibley (2010) have built on the work of Durie and others to develop a multi-dimensional model of Māori identity and cultural engagement (MMM-ICE). Working from the assumption that Māori identity is multi-dimensional, they construct a model that attempts to capture the distinct elements that are important to describing that identity and then examine empirically how these elements are structured both internally and with respect to each other.

Conceptually speaking, the methodology used by Houkamau and Sibley is very close to how the analysis of culture and identity is approached in Ngā Tamariki o Te Kupenga. Houkamau and Sibley commence with a conceptual model of Māori identity and then use exploratory factor analysis to test whether the dataset supports the conceptual model and to identify a reduced pool of questions that provide a scalar measure of each of the final dimensions of Māori identity. This makes the MMM-ICE model of particular relevance when considering how to approach the available data in Te Kupenga.

Before describing the conceptual model of Māori identity that was the starting point for analysis in Ngā Tamariki o Te Kupenga, it is useful to review models proposed elsewhere. These models guided the development of the conceptual model used in Ngā Tamariki o Te Kupenga and serve as a touchstone for interpreting the empirical analysis of Te Kupenga data.

Te Hoe Nuku Roa (Durie, 1995)

Te Hoe Nuku Roa was a longitudinal research programme focusing on Māori outcomes based in Massey University. At the core of the research programme was a conceptual framework that was used to organise and identify the information to be collected. The scope of the Te Hoe Nuku Roa framework was built around Māori cultural engagement, but went considerably beyond this. As was the case with the Te Kupenga survey, Te Hoe Nuku Roa aimed to investigate both Māori wellbeing – including social and economic outcomes – as well as demographic issues and cultural engagement.

Table 2 below (taken from Durie, 1995) sets out the full Te Hoe Nuku Roa framework. This is structured across four axes (Ngā Pūtake) that each identify specific areas to explore. Of these axes, the second – Te Ao Māori – is the area most closely focused on cultural identity and engagement. Within this, the framework identifies Mana ake (personal identity), Taongā tuku iho (cultural heritage), Ngā rawa a Rangā rāua ko Papa (connections to natural resources) and Whakanōhangā Māori (Māori institutions) as the key elements of Māori identity.

Axis 1 is also of potential relevance to the measurement of cultural identity. Although the main focus of axis 1 is not framed specifically in terms of identity, it focuses on whānau and could also be seen as having an identity or cultural element. Māori identity is often framed in collectivist/group-based terms (e.g. Moeke-Pickering, 1996), and it is therefore appropriate to consider the place of whānau as central to Māori identity.

Table 2. Te Hoe Nuku Roa Framework: Ngā Pūtake, Ngā Peka, Ngā Rau

Ngā Pūtake Axes	Ngā Peka Subsets	Ngā Rau Focused units of inquiry
Axis 1. *Paihere tanagata*. Human relationships	Individual family. *Whānau*.	Household roles and relationships. *Whānau* cohesion. Interdependence.
Axis 2. *Te Ao Māori*. Māori identity	*Mana ake* (personal identity), *Taongā tuku iho* (cultural heritage), *Ngā rawa a Rangi rāua ko Papa* (natural resources) *Whakanōhangā Māori* (Māori institutions)	Ethnic affiliation. Language, *Tikanga*, Land, Fisheries, Forests, Environment. Marae *Hapū* activities, Iwi links.
Axis 3. *Ngā āhuatangā noho-ā-*	*Orangā tangāta* (wellbeing),	Health, Education, Housing,

| tangāta. Socio-economic circumstances | Whai tūngā (societal standing), Whai huangā (economic position) | Employment, Lifestyle, Income |
| Axis 4. Ngā whakanekeneketangā. Change over time | Changing household dynamics. Wider interactions. Shift in cultural identity. Altered circumstances. | Mobility, Stability. Realisation of aspirations. Vulnerability. Impact of external factors. New Groupings |

Source: Durie, 1995.

The other main axes of the Te Hoe Nuku Roa framework, axis 3 – Ngā āhuatangā noho-ā-tangāta – and axis 4 – Ngā whakaneneketangā have relatively little direct impact on measuring Māori cultural identity and engagement. The former relates narrowly to wellbeing and socio-economic outcomes rather than cultural identity, while axis 4 is orthogonal to the other three axes and describes the ways in which changes over time in the other measures should be considered.

MMM-ICE (Houkamau and Sibley, 2010)

Houkamau and Sibley's MMM-ICE model of Māori cultural identity and engagement builds on the work of Durie and others but takes an explicitly psychological perspective on identity. In particular, they propose a multi-dimensional model of Māori identity derived from the "feelings, attitudes, beliefs, knowledge and behaviours individuals associate with being Māori". A key strength of this approach is that it goes beyond a narrow view of cultural identity as being exclusively linked to knowledge of Māori culture and engagement in traditional cultural practices to include subjective feelings and beliefs around group membership and identification.

The initial conceptual model that underpins MMM-ICE posited eight distinct dimensions of Māori identity and cultural engagement. These were:

- Identity centrality
- Collective self esteem
- Active identity engagement
- Spirituality
- Socio-political consciousness
- Interdependent aspects of Māori identity
- Essentialist or authenticity-based beliefs about what it meant to be Māori

A pool of 92 items covering all 8 posited dimensions was developed for a questionnaire, which was then completed by 270 Māori respondents identified through the electoral roll. Exploratory Factor Analysis was used to test the underlying dimensionality of the survey responses. This analysis suggested that there were, in fact, six independent factors underlying survey responses. Table 3, below, presents the six dimensions of MMM-ICE in a summarised form[11].

Table 3. MMM-ICE construct definitions

Scale construct	Definition
Group membership evaluation	This dimension captures the person's subjective evaluation of their membership in the social group Māori.
Socio-political consciousness	The perceived relevance and continued salience of the historical and socio-political context.

[11] In contrast to table 1, which effectively replicates Durie's own description of the Te Hoe Nuku Roa framework, table 3 is a summary prepared by the authors of this report of the much more detailed discussion presented by Houkamau and Sibley (2010).

Cultural efficacy and active identity expression	The respondent's perceived ability to engāge appropriately with other Māori in Māori social and cultural contexts including knowledge of te Reo and Tikanga Māori.
Spirituality	Engagement and belief in Māori concepts of spirituality.
Interdependent self-concept	This dimension measures the extent to which the respondent's self-perceived Māori identity is defined by virtue of relationships with other Māori.
Authenticity beliefs	The degree to which respondents believe that to be a "real" or "authentic" Māori a person must display specific features, knowledge, and behaviour.

Houkamau and Sibley (2015) have since updated the MMM-ICE to include a seventh subscale named Perceived Appearance. This addition was in direct response to participant emails and comments on the initial MMM-ICE such as 'I strongly identify as Māori, but people don't often realise that I am Māori at all because I don't look it' (see Houkamau & Sibley, 2018, p. 479). To test the Perceived Appearance Scale, Māori participants from Wave III of the New Zealand Attitudes and Values Study were invited to complete the MMM-ICE2 online (N = 276; Houkamau & Sibley, 2015). Results indicated that all seven subscales were internally reliable and Confirmatory Factor Analysis (CFA) revealed a reasonable model fit.

The MMM-ICE survey has been further refined with the intention to more accurately capture the distinct, yet interconnected factors hypothesised as being part of Māori identity. The latest version of the MMM-ICE (the MMM-ICE3) was created using feedback from participants who filled out the MMM-ICE2 who suggested that some items needed to be rephrased and these suggestions were taken on-board. Items that performed poorly in previous versions were removed, affording a more concise questionnaire. The MMM-ICE3 was then tested in 2017 as part of Te Rangāhau o Te Tuakiri Māori me Ngā Waiaro ā-Pūtea | The Māori Identity and Financial Attitudes Study, or MIFAS. The MIFAS is the first large-scale (n = 7,019) nationwide study of Māori aged 18 and over that aims to correlate personal cultural beliefs and practices to economic choices.

The MMM-ICE3 also included items which reliably index an important eighth factor Whānau Efficacy (WE) that was not in earlier versions of the survey. The Whānau Efficacy subscale was added because whānau are widely accepted as the primary social unit of Māori society and therefore crucial for identity formation (Kukutai, Sporle & Roskruge, 2016). Connection to whānau can therefore be considered an important aspect of identifying, expressing and experiencing the self culturally as Māori.

Because of the psychological focus of the MMM-ICE it has some fairly significant differences to the Te Hoe Nuku Roa framework. In particular, MMM-ICE has a much weaker link to natural resources, which take a prominent place in Durie's framework. However, there is a strong core of common content including personal identity, cultural identity (language, tikanga), Māori institutions, and whānau/relationships (group membership evaluation, cultural efficacy, and interdependent self-concept in MM-ICE 2 as well as whānau efficacy in MMM-ICE3). In addition, MMM-ICE singles out a number of additional dimensions to Māori cultural identity as important: notably spirituality, socio-political consciousness, and authenticity beliefs.

Te Kupenga (Statistics New Zealand, 2013)

The structure of Te Kupenga drew primarily from two sources: Te Hoe Nuku Roa and the New Zealand General Social Survey (NZGSS). While the NZGSS provided the content and structure for measures of wellbeing from a broad New Zealand perspective, Te Hoe Nuku Roa served as an important source for specifically Māori conceptions of wellbeing and measures of Māori identity and engagement. The survey itself is divided into 13 topics, of which 7 can be said to have information directly relevant to the measurement of identity and cultural engagement. These

seven topics are:

- Views and Perceptions
- Civil participation
- Whānau
- Unpaid work
- Te Reo
- Tikanga Tūturu
- Tikanga Hou

Of these 7 topics, 3 relate to traditional cultural markers. These include te reo, tikanga tūturu (which focuses on knowledge of pepeha and attachment to traditional marae and tūrangawaewae), and tikanga hou (which focuses on consumption of Māori media and engagement with Māori performance and arts in both traditional and contemporary forms). The views and perceptions topic captures a wide range of different subjective evaluations, including the importance of culture to the respondent, measures of spirituality and spiritual engagement, and how the respondent is perceived by others. Whānau, although intended to cover the role of whānau in Māori conceptions of wellbeing, also has clear links to the Te Hoe Nuku Roa framework and can be considered part of Te Kupenga's approach to measuring cultural identity.

The link between civil participation and unpaid work domains on the one hand and Māori cultural engagement on the other is less immediately obvious. Civil participation includes questions on registration with the Māori electoral role and with iwi along with eligibility to vote and voting behaviour in iwi elections. It is thus an important source of information on engagement with and links to iwi and traditional Māori authority structures. In addition to capturing more general information on caring and volunteering, the unpaid work domain captures information on specifically cultural forms of unpaid work such as providing help on a marae.

Ngā Tamariki o Te Kupenga

The approach to conceptualising Māori cultural identity and engagement adopted for Ngā Tamariki o Te Kupenga is both grounded in and constrained by the framework used in Te Kupenga. The questions asked in Te Kupenga limit the range of topics that can be addressed within Ngā Tamariki o Te Kupenga and also provide a framework for measuring cultural engagement. However, we do not follow the topic structure of Te Kupenga exactly. In contrast to Te Kupenga, which was primarily descriptive in nature, the cultural analysis here aims to be more analytical. Drawing on Te Kupenga, Houkamau and Sibley, and Te Hoe Nuku Roa, we hypothesised that seven dimensions of Māori cultural identity and engagement would be identified in analysis of Te Kupenga. These are:

- Te Reo
- Spirituality
- Self-identity
- Māori civic identity
- Whanaungatanga
- Tikanga Tūturu
- Tikanga Hou

Although seven dimensions are closely aligned with the Te Kupenga topics, they differ in some important respects. Following Houkamau and Sibley we separately identify spirituality as an important dimension in its own right as opposed to self-identity. In Te Kupenga both these concepts were addressed in the values and perceptions module. Here spirituality encompasses both the subjective importance of spirituality and religious belief to the respondent as well as

active engagement in a church. Self-identity, on the other hand captures both how the person perceives themselves as reflected in the number of ethnicities and importance of culture and how they believe other people perceive them.

Māori civic identity replaces civil participation reflecting the fact that the concept that we are interested in here is narrower than the civil participation topic in Te Kupenga, which also includes forms of civic engagement not specifically linked to Te Ao Māori. In this sense the Māori civic identity domain has links to Houkamau and Sibley's socio-political consciousness dimension.

Whanaungatanga is assumed to incorporate the whānau domain of Te Kupenga, but also those questions in the unpaid work domain that relate to engagement with others such as help on the marae. Finally, the remaining three domains – te reo, tikanga tūturu, and tikanga hou follow Te Kupenga closely. Table 4 below lists the variables from Te Kupenga used in the exploratory factor analysis and their hypothesised relationship to the seven proposed dimensions of cultural identity and engagement.

Table 4. Te Kupenga variables used in EFA of cultural engagement and identity

Dimension	Te Kupenga variables used
Te Reo	Speak Māori
	Understand Māori
	Read Māori
	Write Māori
	Speak Māori at home
Spirituality	Importance of spirituality
	Importance of religion
	Attendance of church
Self-identity	Ethnicity (no. of ethnicities)
	How others see you
	Experience of discrimination
	Importance of culture
Māori civic identity	Registered with iwi
	Eligible to vote in iwi election
	Voted in last iwi election
	On Māori electoral role
Whanaungatanga	Whānau size
	Experience of loneliness
	Availability of someone able to help with cultural issues if needed

	Frequency of calling on a whānau member to help with cultural issues	
	Frequency of providing unpaid help to family members	
	Frequency of providing unpaid help on a marae	
Tikanga tūturu	Knowledge of pepeha (waka, iwi, hapū, maungā, awa, tīpuna)	
	Frequency of visiting a marae	
	Frequency of visiting the respondent's ancestral marae	
	Sense of connectedness to tūrangawaewae if any	
	Length of time having lived near tūrangawaewae	
	Engagement with a Marae	
	Feeling excluded from ancestral marae because of lack of cultural knowledge or fluency in te reo.	
Tikanga hou	Count of basic activities (meeting/pounamu/iwi-branded clothing/ Māori social media use)	
	Count of contemporary activities (Māori event or festival/mihi/hui/traditional healing)	
	Count of intense activities (whakapapa/learn Māori culture/watch Māori TV/ Māori radio/ Māori magazine/taught Māori culture/other culture related learning or teaching)	
	Frequency of performing a mihi/haka/speech	
	Frequency of learning about Māori culture	
	Frequency of reading a Māori magazine	
	Frequency of listening to Māori radio	
	Frequency of watching Māori TV	
	Frequency of engaging in Māori performance (e.g. kapa haka)	

3.2 Empirical analysis

Moving from a conceptual model of Māori cultural identity and connection to an empirical analysis of the diversity of the Māori student population involves two steps. The first stage is to test the dimensions of Māori cultural identity and connection proposed in the conceptual model, and to develop measurement scales for each of the dimensions of cultural identity. Once we have measures of Māori cultural identity and connection, the second stage is to use these measures to describe different sub-populations within the broader Māori population that have different needs or preferences for engagement with the education sector.

Exploratory Factor Analysis

To test the dimensions of Māori cultural identity and connection we use Exploratory Factor Analysis (EFA) to understand the relationships between the wide range of different cultural questions in Te Kupenga and to group these up into a smaller number of common factors reflecting the underlying dimensionality in the data. EFA is a commonly used technique for examining the underlying structure of a dataset where a wide range of different question items are hypothesised to capture a smaller number of underlying, or latent, constructs. Houkamau and

Sibley (2010) use EFA to develop their Multi-Dimensional Model of Māori Identity and Cultural Engagement, and we follow a largely similar approach with Te Kupenga.

The EFA was conducted using maximum likelihood with oblique (direct oblimin) rotation to identify factor structure. Oblique rotation is preferred to the commonly used orthogonal rotation since oblique rotation does not require the assumption that there is no correlation between factors. In the event that all factors are uncorrelated with each other, oblique rotation will produce identical results to orthogonal rotation (Osborne and Costello, 2005).

The analysis commences with the 35 variables identified in table 5, which initially identified a 5 factor solution using the standard practice of dropping factors with eigenvalues below 1. An analysis of the 6th through to 10th showed none with high factor loadings (>0.3) on more than 1 variable. Following the initial analysis, variables that had no loadings on any of the first 5 factors (factor loading <0.3) were sequentially dropped from the EFA as were variables that had high loadings (>0.3) on more than one factor. This was repeated until a final solution was reached with 25 variables, all loading on only one factor each. Figure 3 below shows the scree plot for the final 25 variable solution. A scree plot represents one way to assess the number of factors to be retained in EFA. Typically, the number of factors retained is based on where the scree plot bends or "kinks" and flattens out.

Figure 3. Scree plot of observed eigenvalues for Te Kupenga EFA.
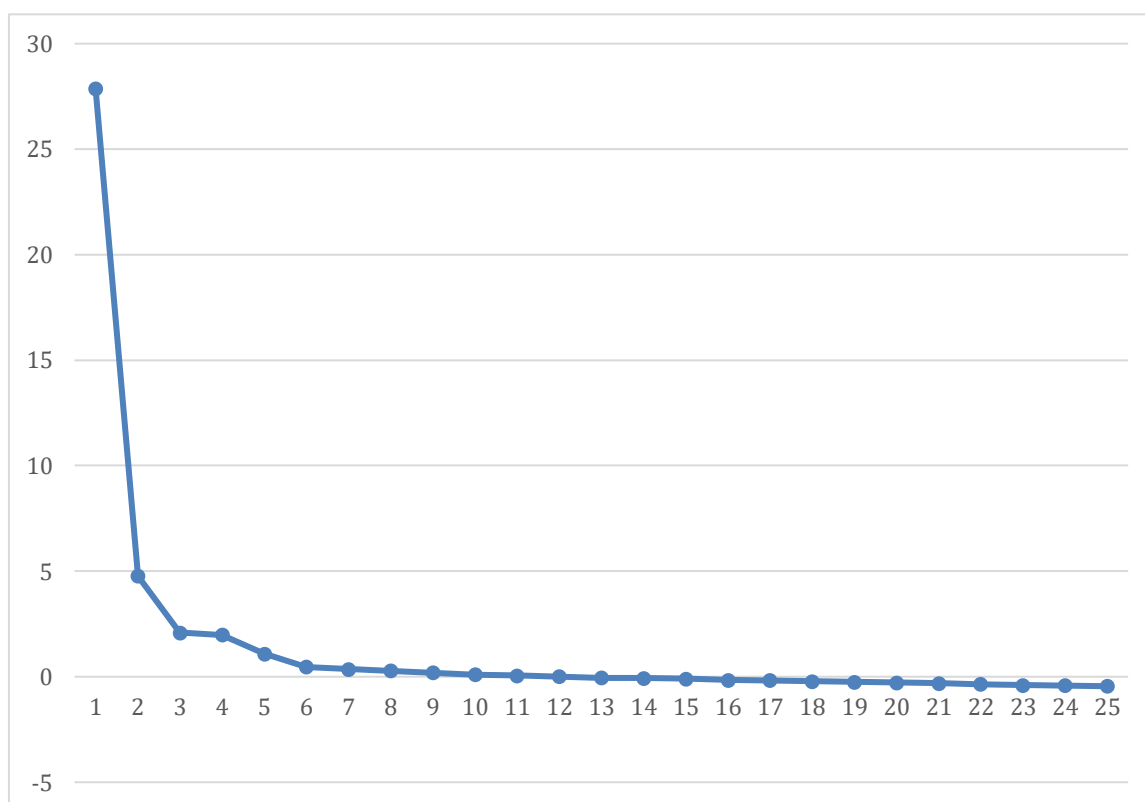
The scree plot in figure 3 shows two "kinks" where the proportion of variance added by additional factors declines and the line flattens. One of these occurs at 3 factors and the second at the 5th or 6th factor. However, the eigenvalues of factors 4 and 5 are still relatively high (2.64, 1.51), suggesting that these factors should be retained. Factor 6 has an eigenvalue below the traditional cut-off of 1 (0.53). Additional factors added relatively little explanatory power (eigenvalues 34.45, 8.56, 5.62, 2.64, 1.51, 0.53, 0.46, 0.44, 0.31, 0.14 for the first ten factors). For these reasons the five factor solution is preferred. An analysis of the contribution of additional variables to total variance explained showed that the final five factor solution explained 52.8 percent of total variance.

The structure of the final 5 factor solution is presented below in table 5. This reports the factor loadings for all 25 variables included in the final EFA across each of the five final factors.

Table 5. Factor loadings for Te Kupenga EFA.

Variable Name	Content	Factor1	Factor2	Factor3	Factor4	Factor5
aTRSpeak	Speak Māori	0.85	0.06	-0.02	0.01	0.05
aTRUnderstand	Understand Māori	0.82	0.13	0.01	0.03	-0.01
aTRRead	Read Māori	0.89	0.07	0.01	0.00	-0.01
aTRWrite	Write Māori	0.89	0.03	-0.02	0.02	0.03
aTRHomeSpeak	Speak Māori at home	0.42	0.08	0.14	0.02	0.14
aSPSpirituality	Importance of spirituality	0.05	0.15	0.17	0.56	-0.10
aSPReligion	Importance of religion	-0.05	0.05	-0.11	0.99	-0.05
aSPChurch	Attendance of church	0.00	-0.09	-0.02	0.66	0.08
aIVEthnicity	Number of ethnicities	-0.07	-0.46	0.07	0.00	-0.04
aIVSeen	How others see you	0.10	0.52	-0.02	0.01	0.04
aCITotal	Civic identity	0.05	0.43	0.16	0.03	0.06
aWHCulturalSuppF	Frequency of calling on family for cultural support	-0.04	0.03	-0.31	-0.08	-0.16
aWHHelpMarae	Frequency of providing unpaid help on a marae	0.07	-0.03	0.13	0.04	0.49
aTKTPepeha	Knowledge of pepeha	0.18	0.58	0.21	0.04	-0.05
aTKTMaraeF	Frequency visiting a marae	0.05	0.18	0.09	0.03	0.67
aTKTAMaraeF	Frequency of visiting ancestral marae	0.01	0.23	-0.08	0.02	0.74
aTKTTurangāCon	Sense of connectedness to tūrangawaewae if any	0.03	0.70	0.06	0.07	0.09
aTKTTurangāLive	Length of time having lived near tūrangawaewae	-0.01	0.57	-0.08	0.06	0.18
aTKHBasic	Count of basic activities	-0.17	0.13	0.43	-0.02	0.04
aTKHContemp	Count of contemporary activities	0.14	0.05	0.53	0.07	0.24
aTKHIntense	Count of intense activities	0.12	0.15	0.75	0.06	-0.05
aTKHFreqCul	Frequency of learning about Māori culture	0.11	-0.10	0.57	0.02	0.01
aTKHFreqMag	Frequency of reading a Māori magazine	0.13	0.04	0.39	0.06	0.10
aTKHFreqTV	Frequency of listening to Māori radio	0.09	0.40	0.27	0.04	0.00
aTKHFreqPerf	Frequency of performing a mihi/haka/speech	0.25	-0.09	0.47	0.05	0.19

A review of table 5 shows that the five factors accepted vary a little from the 7 factors hypothesised on the basis of Te Kupenga and the wider literature but are readily interpretable and quite intuitive. Broadly speaking, the factors can be considered to cover the following areas:

- Factor 1: **Te Reo**
- Factor 2: **Tūrangawaewae**
- Factor 3: **Tikanga**
- Factor 4: **Wairua**
- Factor 5: **Mahi Marae**

Of these five factors, two map directly on to the hypothesised dimensions set out earlier (Te Reo, Wairua). The hypothesised self-identity, Māori civic identity and tikanga tūturu domains are largely subsumed by the single factor relating to identity. This confirms that the different elements within these three hypothesised domains are important to Māori identity, but suggests that they covary so strongly that they should not be thought of as distinct aspects of identity. People who identify strongly as Māori are likely to be associated with iwi, know their pepeha and have an attachment to a traditional tūrangawaewae. Since connection to tūrangawaewae has the highest factor loading and since tūrangawaewae captures the idea of traditional Māori identity quite well, we refer to this factor as Tūrangawaewae.

Tikanga overlaps strongly with the hypothesised tikanga hou domain. However, the strongest weighting is on the most intense activities, suggesting that the domain does not so much capture contemporary forms of Māori culture as much as active engagement with cultural activities. While the Tūrangawaewae dimension captures the respondent's sense of "being Māori", Tikanga captures important elements of "doing Māori" through engagement with Māori media and tikanga.

The final factor, Mahi Marae, has a strong overlap with whanaungatanga, but with a much stronger focus on specifically Māori forms of cultural connection rather than engagement with whānau/family more generally. For this reason, we describe the domain by the specific set of activities involved – mahi marae – rather than the more generic whanaungatanga.

Working from the five factors identified above, a composite scalar measure was calculated for each dimension. This scalar measure of each dimensions was calculated as the sum of the different variables with a factor loading of greater than 0.3 for that specific factor weighted by the factor loading. This was then standardised so that each scale had a mean of 1 and a standard deviation of 1. The Te Reo measure, for example, is the sum of the scores for speaking, understanding, reading, and writing te Reo along with the score for the use of te Reo at home weighted by the relevant factor loadings from table 5 (0.85, 0.82, 0.89. 0.89, and 0.42). Box 2 below provides a more detailed description of each of the five factors.

> ## Box 2. The five dimensions of Māori cultural identity and connection
>
> Using Exploratory Factor Analysis the wide range of cultural information from Te Kupenga has been reduced to five summary measures capturing the main dimensions of Māori cultural identity and connection. These five measures summarise their identity and connection with Māori culture in comparable quantitative scales that can be easily used in any analytical context.
>
> **Te Reo**
>
> This dimension captures fluency in te reo Māori as well as the use of te reo in the home environment. A high score in Te Reo implies someone who is fluent in te reo and who uses the language on a daily basis. A low score represents someone who cannot speak te reo or, at most, knows only a few words and phrases.
>
> **Tūrangawaewae**
>
> Tūrangawaewae captures the strength of traditional Māori identity and a sense of "being" Māori. Someone with a high score on this dimension is likely to identify solely as Māori and to be seen as

Māori by others. They will know their pepeha and have strong links to ancestral lands and their tūrangawaewae. A person with a high score in this dimension is also likely to be registered with an iwi and to vote in iwi elections. In contrast, a person scoring low on the tūrangawaewae scale may have Māori ethnicity or descent, but is likely to identify with other ethnic backgrounds as well and may not be seen as Māori by others. While they acknowledge their Māori ethnicity, they may not feel that being Māori is their primary identity and would have little connection with their ancestral places and are likely not to be registered with an iwi.

Tikanga

If tūrangawaewae is about "being" Māori, then Tikanga is about "doing" Māori. The tikanga dimension captures the degree to which the respondent engaged with traditional and modern Māori tikanga. This includes both basic activities such as using Māori greeting or wearing a pounamu through to attending events such as kapa haka festivals or hui, and using Māori cultural media such as television, radio, or magazines. A person scoring highly on Tikanga is frequently engaged in activities associated with Māori culture and has little need for support from family members to help with cultural issues. In contrast, a person with low Tikanga is likely not to be engaged in Māori cultural activities and, if they needed to perform a mihi or speech in Māori, would likely need to look to family members for help. A low score on Tikanga suggests someone who is not confident with Māori tikanga or media.

Wairua

Wairua is based off answers to only three questions. These relate to the importance of spirituality, the importance of religion, and frequency of attending church. The dimension captures two core elements: a general set of spiritual beliefs and engagement with traditional Māori spirituality as well as a set of beliefs revolving around engagement with conventional religion and church. A person scoring high on Wairua is likely to find both religion and spirituality important, and to attend church regularly. Someone with a medium score might attend church less regularly or attach importance to spirituality, but not to religion or the church. A low Wairua score reflects a lack of spiritual connection in any sense.

Mahi Marae

The Mahi Marae dimension captures the degree to which a person is engaged with and spends time on marae. A person with a high score in Mahi Marae is frequently on marae and contributes to the functioning of the marae by providing unpaid help and support with the tasks necessary for the functioning of the marae. A low score in Mahi Marae implies a person without any significant connection to a marae. Fundamentally the Mahi Marae dimension captures an aspect of the connective side of Māori identity: how much of the respondent's social connection comes through the specifically Māori medium of time on and engagement with the marae.

Cluster analysis

The five dimensions of Māori cultural identity and connection identified in the previous section provide the tools for analysing different profiles of Māori identity, but do not themselves identify the main sub-groups in the Māori population. To identify key sub-groups within the population discrete cluster analysis was used. Cluster analysis looks for specific groupings of people that are by some metric "close" to each other across the range of variables under consideration. For the analysis here a least squares measure with random seeds was used to identify the clusters.

Greaves, Houkamau and Sibley (2015) use a similar, but somewhat more sophisticated technique called latent cluster analysis to identify different sub-groups of the Māori population based on their own MMM-ICE model of Māori cultural identity and engagement. This was not possible within the timeframe available for this project as the standard software available within the IDI does not support latent cluster analysis. To get around this a multiple stage method was used to identify the number of clusters as outlined below. However, in the future repeating the cluster analysis used here with latent cluster analysis might be a useful way to test the robustness of the existing work.

To identify the appropriate number of clusters, a varying number of clusters were trialled (from 3 to 8). A scree plot (figure 4) of the additional variance accounted as each cluster was added was created. This showed that after 6 clusters, adding additional clusters contributed relatively little to total variance explained. Based on this information each of the clusters were examined in greater detail. A descriptive analysis of each cluster was performed looking at the age, sex, education, urban/rural balance and whānau wellbeing of each cluster (see annex 1). These variables were not used in the clustering process – which relied entirely on the five dimensions of Māori cultural identity and connection – so any differences in the cluster populations with respect to these variables provides evidence of the face validity of the clusters. The descriptive analysis showed that the clusters each had distinct demographic profiles and also varied in terms of reported level of family wellbeing.

Figure 4. Scree plot of additional variance explained as number of clusters increases.
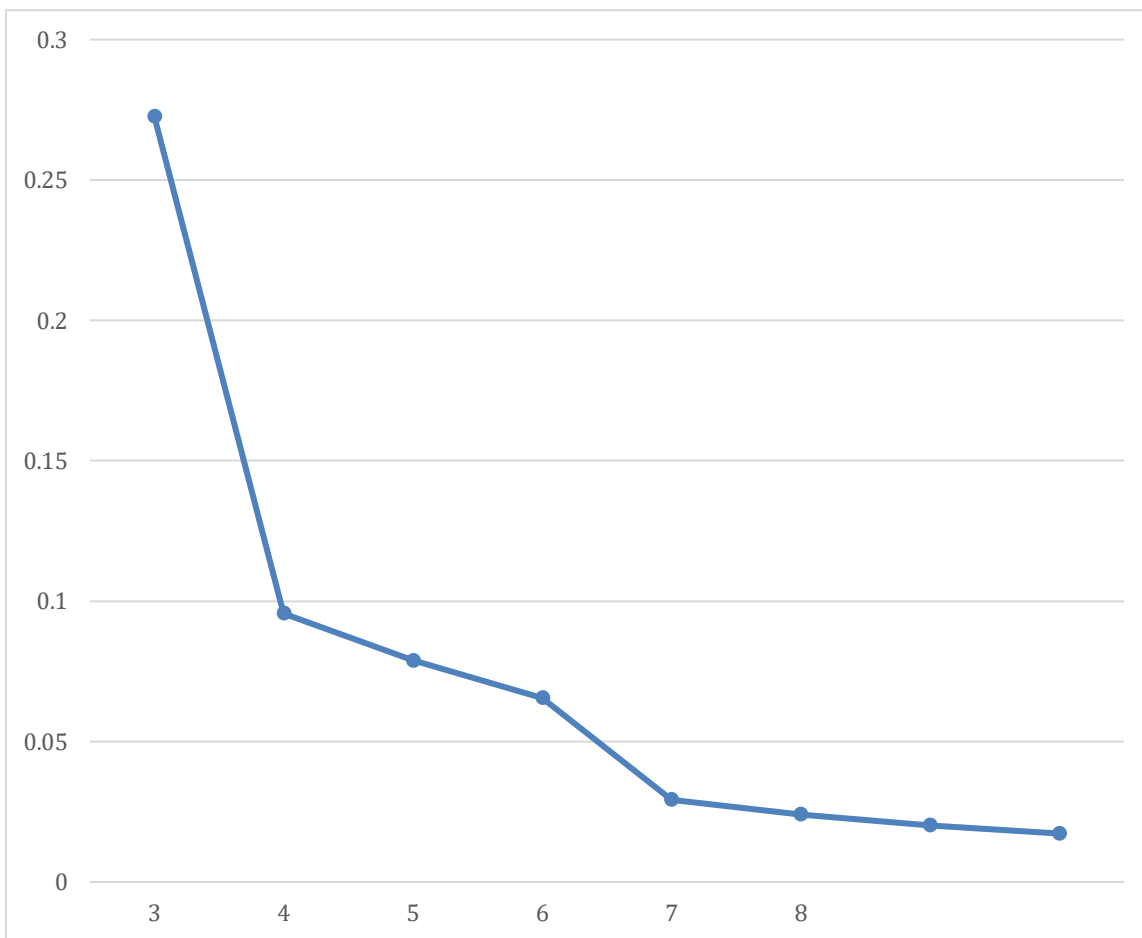
Source: Te Kupenga 2013

The quantitative analysis of the clusters was supported by qualitative engagement with a group of Māori advisors from within the Ministry of Education and the wider community. Information on the proposed final group of clusters was presented to the group at an initial meeting, and then a second meeting was held a week later to receive feedback. This process was used to test whether the proposed clusters resonated with experts in Māori culture and to help inform the interpretation and description of the clusters.

In the end, a total of 6 clusters was decided on, accounting for 51.2 percent of total variance between individuals. Figure 5 below presents the mean score for each of the 6 clusters across the 5 dimensions of Māori cultural identity and connection. Each cluster has been given an arbitrary label based on the colours. This is reflected both in the group labels, but also in the colours used to represent each cluster in the graphics and figures found throughout this report. A deliberate choice was made to avoid descriptive labels as these might be seen to imply a positive or negative view of some of the clusters.

Figure 5. Māori Identity Signatures
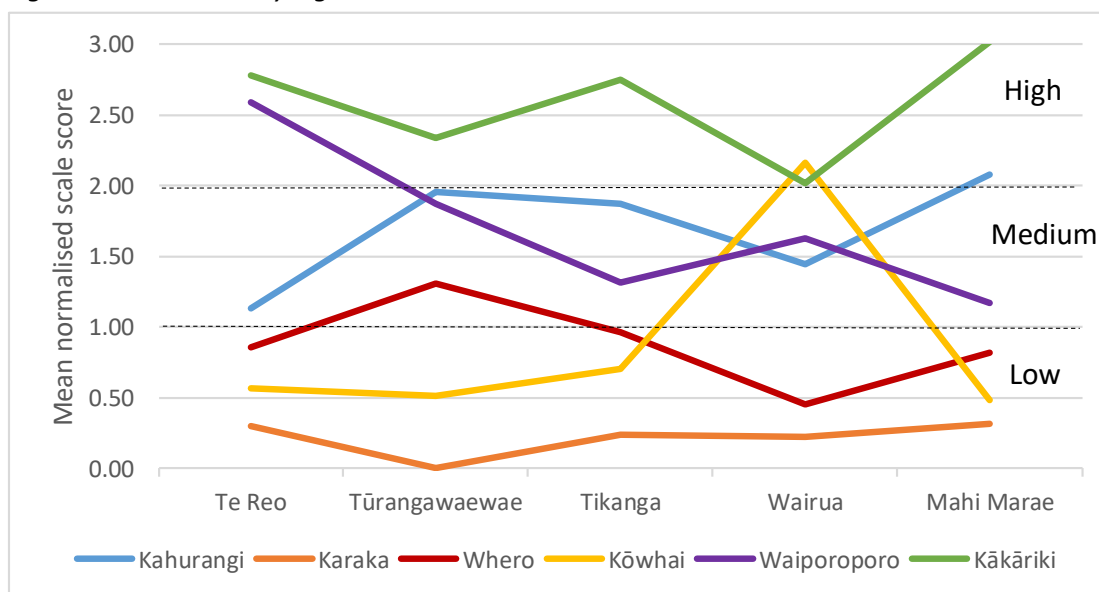
Source: Te Kupenga, 2013.

Comparison with Houkamou and Sibley

Another approach to testing the validity of the clustering is to compare the results from the analysis here with other similar approaches. Although the different make-up of the questions in Te Kupenga compared to the survey conducted by Houkamaou and Sibley means that the five dimensions of Māori cultural identity and connectedness used here are differ in important ways from the MMM-ICE scale dimensions, a comparison of the two sets of results nonetheless provides a useful test of the convergent validity of the clustering.

Like Houkamau and Sibley, analysis of the Te Kupenga data showed 6 different clusters. Of these, three can be related fairly closely to the clusters identified in Houkamau and Sibley's work. The karaka and whero clusters here have relatively similar profiles to the disassociated and low moderate clusters in Houkamau and Sibley. A spiritually oriented cluster is found in both analyses (kōwhai here vs spiritually oriented in Houkamau and Sibley) with a similar profile of high engagement with spirituality but otherwise relatively low engagement across other dimensions.

In addition, a fourth cluster – Houkamau and Sibley's high moderates – shows a relatively similar profile to the Waiporoporo group from Te Kupenga. This is reflected in relatively high scores across most dimensions of Māori cultural identity, but with a slight dip relating to cultural competence/cultural efficacy and marae engagement/interdependent self concept.

The differences between the Te Kupenga clusters and those of Houkamau and Sibley relate to those groups with relatively high levels of connection to te Ao Māori. Where Houkamau and Sibley's two profiles with high levels of engagement are largely distinguished by attitudes to authenticity beliefs, these differences cannot be identified with the Te Kupenga dataset. In contrast, Te Kupenga has detailed information on Te Reo, so in figure 5 it is fluency in Te Reo that separates the kahurangi group from the waiporoporo group.

A key caveat in the comparison of the Te Kupenga clusters and Houkamau and Sibley's Māori identity signatures is the very different proportions of the population accounted for by the groups. Figure 6 below shows the proportion of the total Māori population accounted for by the different Te Kupenga clusters. Compared to Houkamau and Sibley, Te Kupenga shows a far larger proportion of the Māori population in the karaka/disassociated group (32% compared to 6.9%) and in the kōwhai/spiritually oriented group (14% compared to 4.1%) and far fewer in the waiporoporo cluster compared to Houkamau and Sibley's high moderates (10% compared to 31.7%).

Figure 6. Cluster sizes
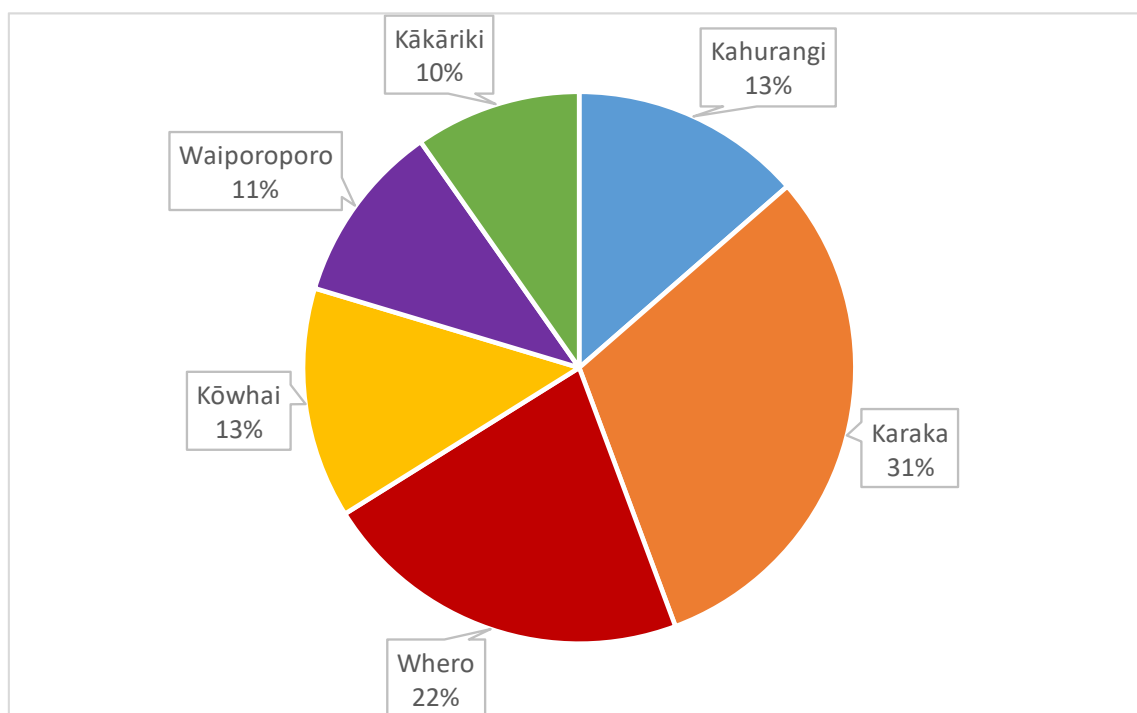
Source: Te Kupenga, 2013

The large differences in the cluster sizes between Te Kupenga and Houkamau and Sibley raises the question as to whether difference in cluster sizes reflects different sets of questions clustering fundamentally different people in ways that are superficially similar. However, there are also large differences between the sample frames of the two surveys and it is likely that much of the apparent difference is driven by this.

Houkamau and Sibley used a Māori oversample from the New Zealand Attitudes and Values Survey based on people who had indicated they were of Māori descent in the New Zealand electoral roll. This sample had a response rate of 7.8% and an achieved sample size of 686. Te Kupenga was sampled from people indicating either Māori ethnicity *or* Māori descent in the 2013 Census and had an achieved response rate of 74% with a total sample size of 5,549. A particularly important difference in the two samples is that the New Zealand Attitudes and Values Survey is voluntary, while Statistics New Zealand surveys are not. Respondents choosing to voluntarily respond to a research survey on Māori culture are likely to be people who feel strongly about contributing to Māori development, while people who feel less strongly connected to Māori culture – such as people in the disassociated or Karaka groups – may be less likely to respond. It is also possible that Census respondents may be more likely to report Māori ethnicity on the basis of some Māori descent rather than identification with Māori culture as such. People indicating Māori descent in the electoral roll, however, may be more likely to view Māori culture as central to their identity. To the degree this is true, it would explain why groups with a weaker sense of Māori identity/Tūrangawaewae are underrepresented in the Houkamau and Sibley analysis compared to Te Kupenga.

3.3 Te Kupenga Māori identity signatures

The Te Kupenga Māori identity signatures (the clusters) are the primary method used in Ngā Tamariki o Te Kupenga to provide insight into the relationship between the cultural environment in the whānau and student outcomes. It is therefore important to have a good understanding of what each cluster represents. The following section provides a descriptive overview of each cluster based on information from Te Kupenga. Box 3, below, summarises how information on each cluster is presented and lists some important caveats to be kept in mind when interpreting the clusters.

Box 3. Reading the cluster summaries

All of the cluster descriptions follow the same general format. They begin with a one-line summary of the cultural orientation of the cluster and present a chart showing mean outcomes for the cluster across all five dimensions of Māori cultural identity and connection. Following this, is a short descriptive summary of the characteristics of the cluster in terms of culture, but also a set of social and demographic outcomes including age, gender, urban/rural split, education, and whānau wellbeing.

In reading the cluster summaries, it is important to keep in mind that the *cluster accounts for about half of all variation* in the five dimensions of Māori cultural identity and connection. This means that *there is as much variation within clusters as between them*. Although the clusters are a useful way of interpreting a very complex dataset, it is important to recognise that the picture presented of a "typical" member of a cluster will not be representative of all – or even most – cluster members.

Cluster 1: Kahurangi

Strong in tūrangawaewae but relatively weak in te reo.

Figure 7. Kahurangi mean cultural identity and connection scores
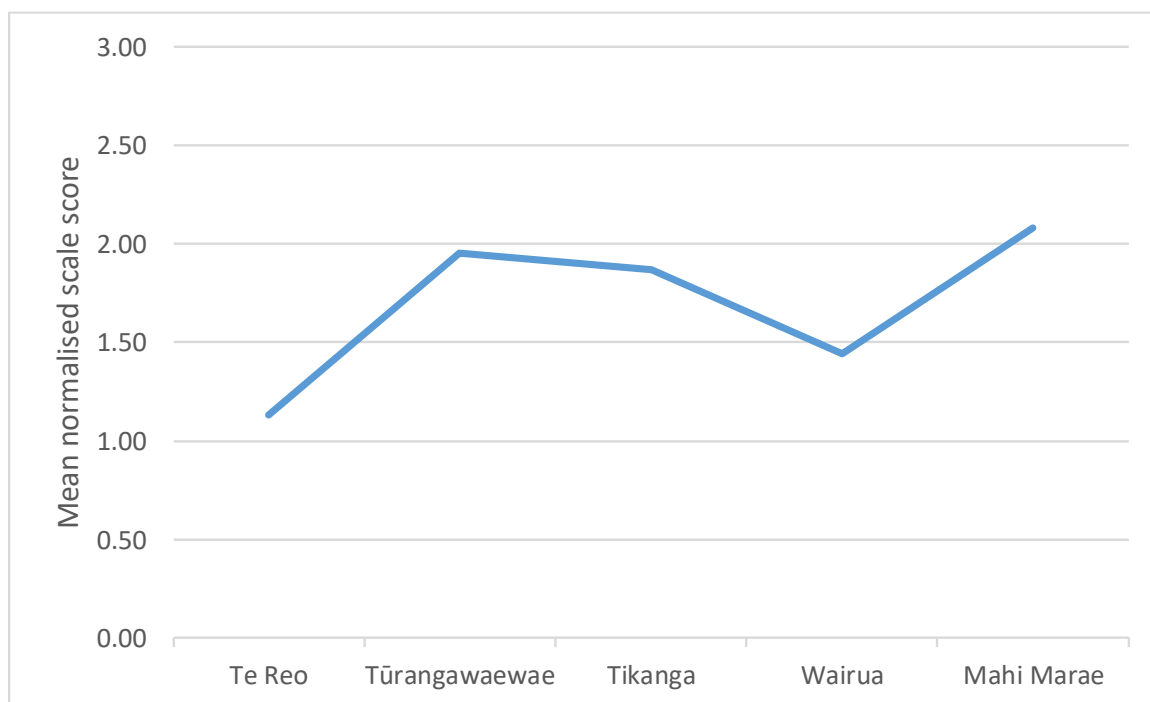
Source: Te Kupenga, 2013

Kahurangi consists of people who identify strongly as Māori. This is evidenced through a very high score on the ***tūrangawaewae***, second only to Kākāriki. This suggests that people in the Kahurangi group report that Māori culture is important to them, engāge in iwi governance processes and/or live near ancestral marae. Interestingly this group reports an intermediate level of identification with ethnicities other than Māori (39.6% sole Māori). Levels of ***te reo*** are low to moderate among the Kahurangi group, well below the levels of Waiporoporo and Kākāriki. However, in other dimensions of Māori cultural identity and connection Kahurangi appears to have a relatively high level of engagement. Engagement with ***tikanga*** and ***mahi marae*** are higher than for any other groups except Kākāriki, while engagement with ***wairua*** is at an intermediate level. Culturally Kahurangi is most similar to Kākāriki, but with lower levels of ***te reo***.

Compared to other groups, Kahurangi tilts towards a slightly older age profile with only 19.4% of the cluster aged 15 to 24, and 23.8% aged 55 or older. Kahurangi is heavily rural compared to all other groups except Kākāriki. It is also heavily female (59.7%). However, in contrast to Kākāriki – which is similar in many other ways – Kahurangi adults are associated with the lowest level of NCEA attainment (45.9%) and second lowest rate of tertiary qualifications (9%).

Whānau wellbeing[12] is lower for Kahurangi than for any other group with an average score of 7.16 out of 10.

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[12] Whānau wellbeing here is the response to a subjective question asking Te Kupenga respondents to rate "how their whānau is doing" on a scale from 0 to 10, where 0 "extremely badly" and 10 is "extremely well".

Cluster 2: Karaka

Little to no engagement with Māori culture.

Figure 8. Karaka mean cultural identity and connection scores
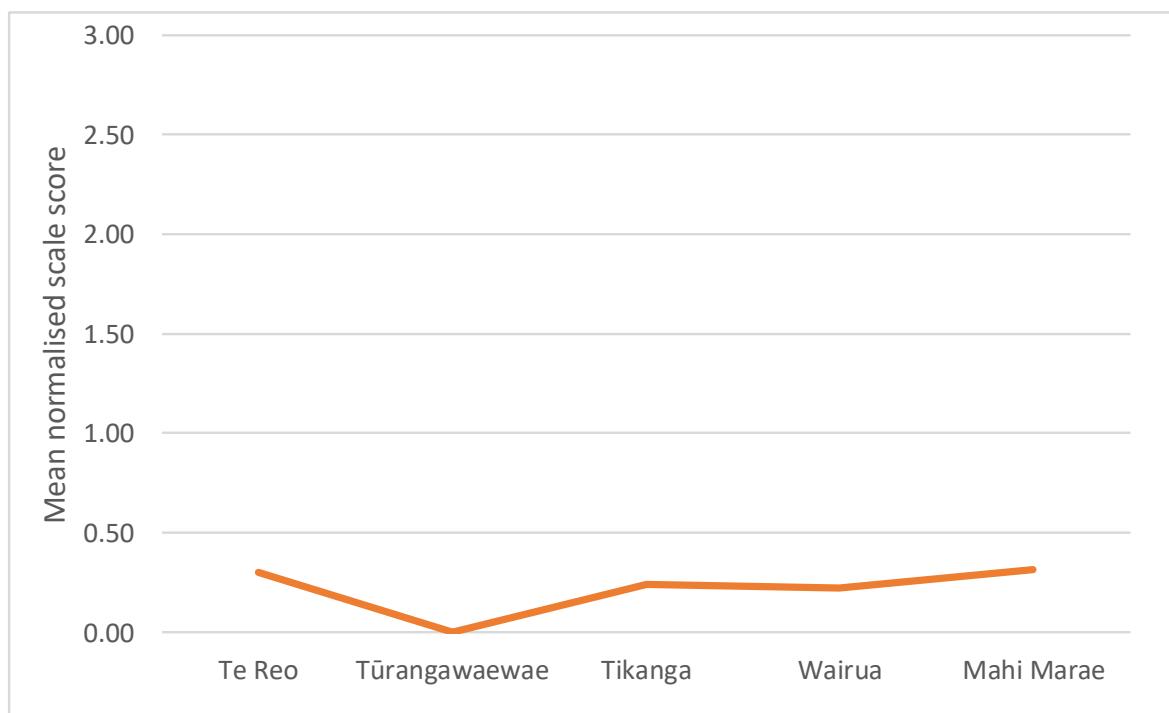
Source: Te Kupenga 2013

Karaka is an outlier compared to the other five clusters in that it is characterised by people who report essentially no identification with Māori culture beyond including Māori as one of several ethnic identities. ***Tūrangawaewae*** is lower than for any other group and suggests that this group does not subjectively see Māori culture as relevant to them. Similarly, all except 12% of this group report at least one ethnicity in addition to Māori. There is relatively little variation across any of the other dimensions of Māori cultural identity and connection, with ***te reo***, ***tikanga***, ***wairua***, and ***mahi marae*** all lower than for any other cluster. This distribution of outcomes may suggest that people in the Karaka group do not think of themselves primarily as Māori and that they may identify more strongly with another ethnic group or culture.

This cluster is the youngest of all six clusters by some margin, with only 14.3% aged 55 and older but 34.7% aged between 15 and 24. It is a moderately urban group, but with a slight tilt towards minor urban areas rather than big cities or truly rural environments. Along with Whero, the Karaka group is tilted towards males, with 47.4% of the cluster being female. NCEA level 2 attainment rates for adults in the cluster are higher compared to other groups at 52.5 percent, but tertiary attainment rates are low at 9.5 percent.

This cluster reports relatively high average whānau wellbeing at 7.41 out of 10.

Cluster 3: Whero

Moderate sense tūrangawaewae but lower connection with other aspects of Māori culture.

Figure 9. Whero mean cultural identity and connection scores
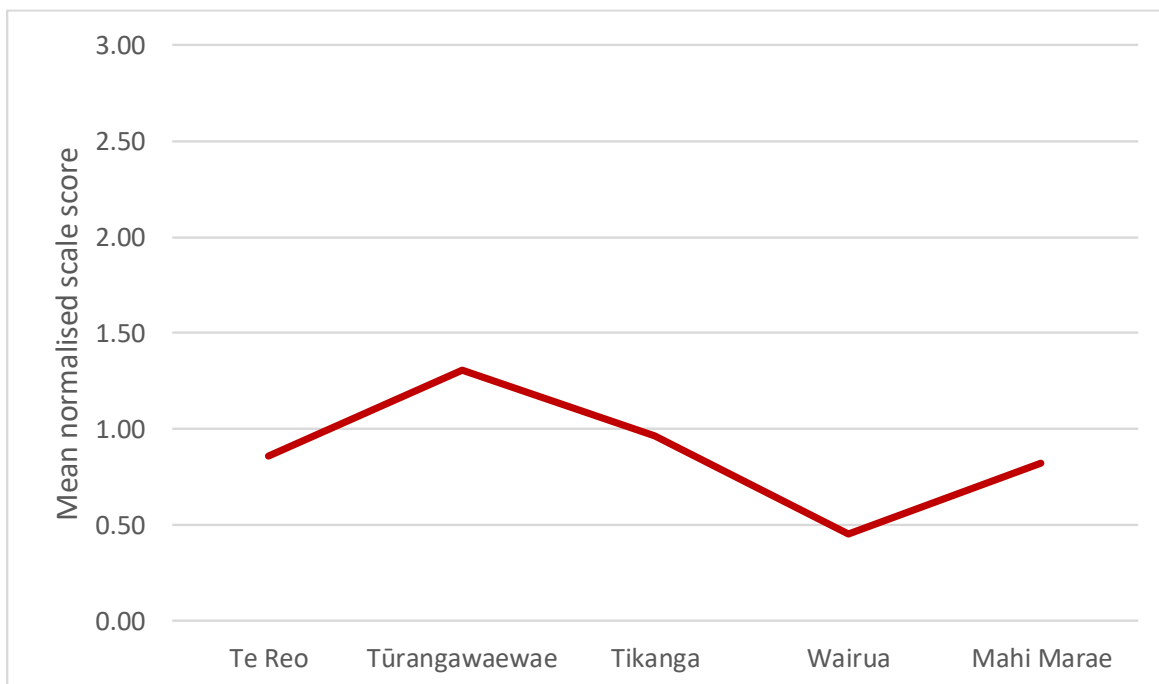
Source: Te Kupenga 2013

Whero comprises people who have a moderately strong sense of being Māori but relatively little engagement with Māori culture more broadly. For people in the Whero group, ***tūrangawaewae*** is reported at moderate levels and sole Māori ethnicity is reported at higher levels (36%) than for the Karaka and Kōwhai groups. ***Tikanga*** is lower than for all other groups except Karaka and Kōwhai, and is only marginally higher than is the case for Kōwhai. A similar picture is visible with respect to ***te reo*** and ***mahi marae***. In fact, this group is in many ways similar to Kōwhai with the exception that ***tūrangawaewae*** is higher and ***wairua*** is much lower. With the exception of Karaka, this group has by far the lowest engagement with ***wairua***.

The people making up Whero tend to be younger, with particularly small numbers aged 55 or older (14.5%). They are disproportionately male, with a lower proportion of female members than any other cluster (45%). Adult members of the Whero group tend to have relatively low levels of qualification with only 7.9% having tertiary qualifications – the lowest of any group- and only 47.7% having attained NCEA level 2 (similar to Waiporoporo and only just above Kahurangi).

Levels of whānau wellbeing for Whero are relatively low with an average score of 7.21.

Cluster 4: Kōwhai

Very strong measured wairua but low levels of engagement with other aspects of Māori culture.

Figure 10. Kōwhai mean cultural identity and connection scores
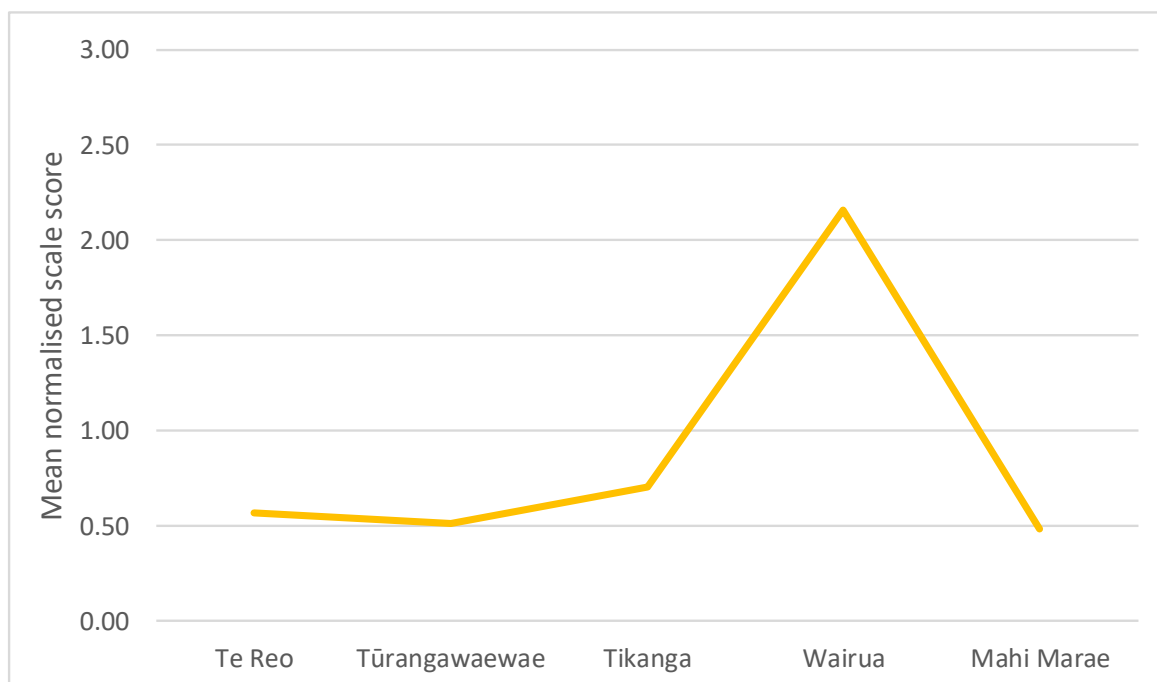
Source: Te Kupenga 2013

People in the Kōwhai group tend to have only a relatively weak sense of Māori identity. Levels of ***tūrangawaewae*** are very low compared to all other groups except Karaka, and only 22.8% of the group report sole Māori ethnicity. Levels of ***te reo***, ***tikanga***, and ***mahi marae*** are also exceptionally low, suggesting that the majority of this group have little to no engagement with traditional aspects of Māori culture. However, engagement with ***wairua*** is the highest of any cluster. Given the lack of engagement with any other aspects of traditional Māori culture it is likely that the high score on ***wairua*** reflects engagement with a church – not necessarily one with strong links to traditional Māori culture – rather than engagement with more traditional concepts of ***wairua***.

The Kōwhai group includes a high proportion of younger people aged 15 to 24 (31.6%), but also has the second largest proportion of people aged 55 or older out of all the clusters (24.9%). Along with Waiporoporo, Kōwhai is the most highly urbanised group, with only 12.4% living in rural areas and 31.4% living outside of a major urban area. Adult members of Kōwhai are more likely to be female (59.5%) than male and have moderately good levels of NCEA level 2 attainment (49.2%). Tertiary attainment rates for adults in this group are lower than for Waiporoporo and Kākāriki, but higher than for other clusters (10.2%).

Self-assessed whānau wellbeing for Kōwhai is relatively high with an average score of 7.42 out of 10.

Cluster 5: Waiporoporo

Strong in tūrangawaewae and in te reo but only moderate to low levels of engagement elsewhere.

Figure 11. Waiporoporo mean cultural identity and connection scores
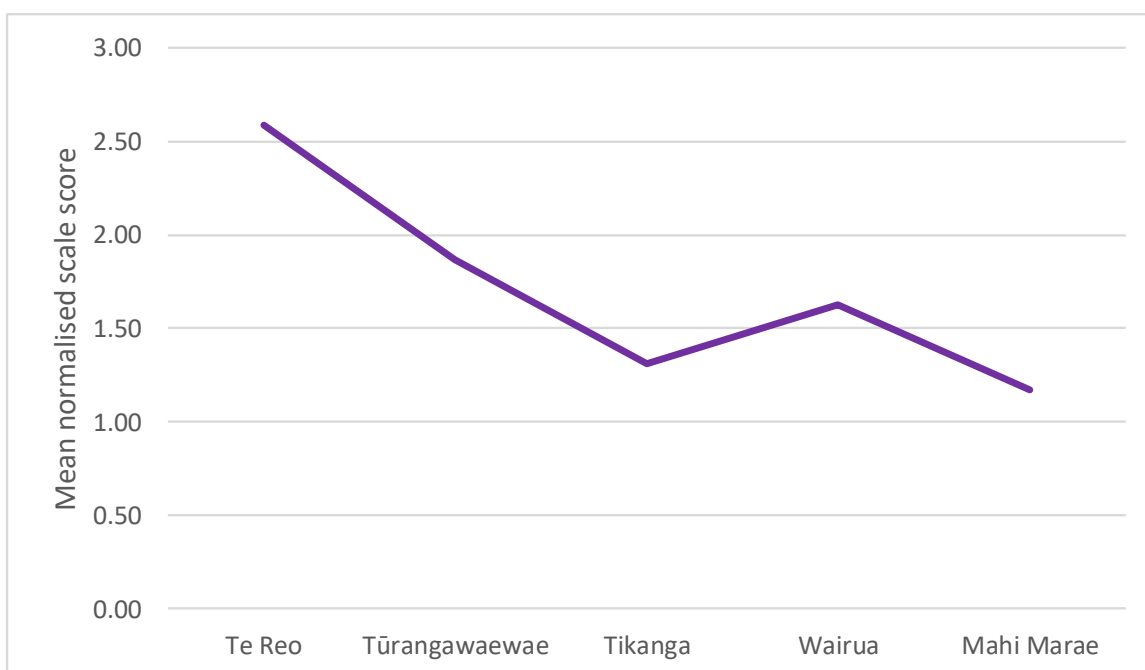
Source: Te Kupenga 2013

Waiporoporo is characterised by people with a moderate to strong sense of Māori identity. They score moderately highly on ***tūrangawaewae***, possibly indicating high subjective identification with Māori culture with lower levels of connection to traditional marae and/or engagement with iwi governance. Mean levels of fluency in ***te reo*** are relatively high compared to most other clusters, reinforcing the view that this group has a clear sense of Māori identity. However, engagement with ***tikanga*** is much lower as is ***mahi marae*** suggesting that while this group feels Māori, they are not actively engaged in doing activities traditionally associated with Māori culture at a high level. ***Wairua*** is relatively high, suggesting that active engagement with a church is not uncommon for this group.

This cluster is intermediate in terms of age and gender. However, it is the most urban of all the clusters. Tertiary attainment rates for adults in the cluster are the second highest, but still barely half the rate of Kākāriki. NCEA level 2 attainment rates for adults in the cluster are the second lowest among the six clusters.

Self-assessed whānau wellbeing for this group is low, with an average score of 7.23.

Cluster 6: Kākāriki

Strong across all five dimensions of Māori cultural identity and connection.

Figure 12. Kākāriki mean cultural identity and connection scores
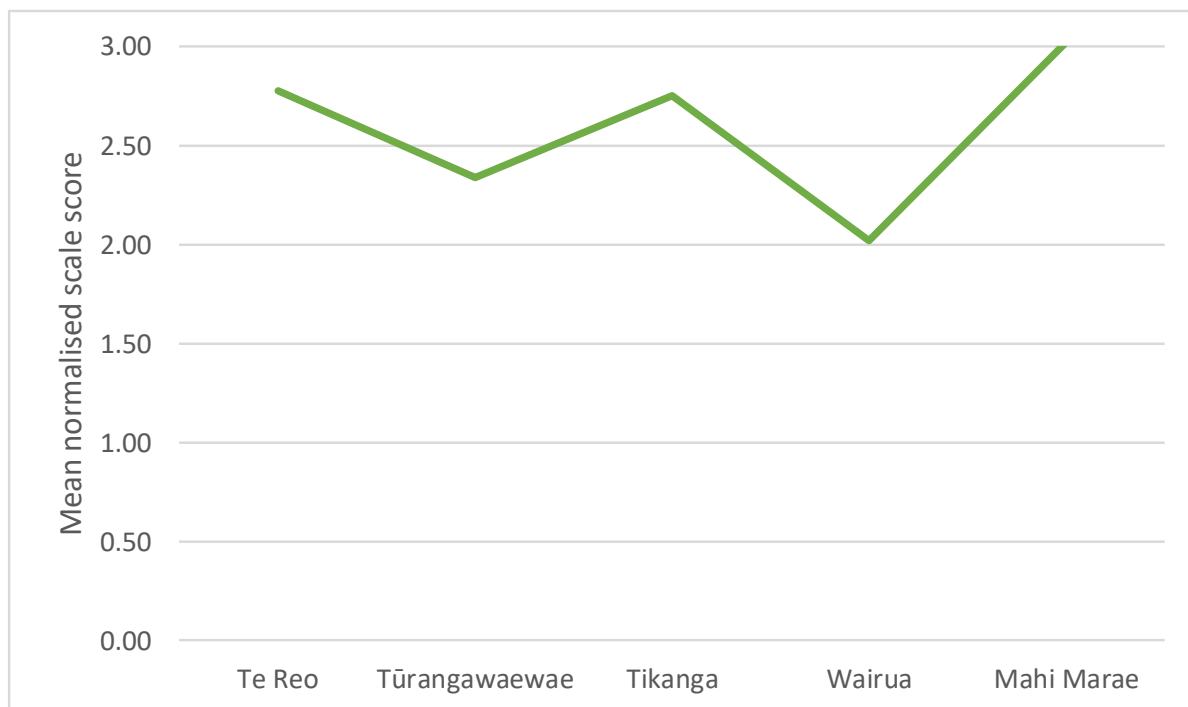
Source: Te Kupenga 2013

This cluster consists of people who strongly identify as Māori. 59% identify as sole Māori ethnicity, and they score higher on ***tūrangawaewae*** than any other group, indicating strong subjective identification as Māori, active engagement with iwi governance, and strong links to their ancestral marae, and turanagawaewae. Engagement with Māori culture is higher than for any other group with high levels of fluency in ***te reo*** and engagement with ***tikanga***. This group is also much more likely to actually be on a marae and engaged with ***mahi marae*** than any other group. A high score for ***Wairua*** indicates that this group is relatively strongly engaged with church and spirituality more generally.

Kākāriki is older than any other cluster with only 15.3% of the cluster aged between 15 to 24 and 27.8% aged 55 or over. This cluster is also the most likely to live in rural areas and is disproportionately female (61.5%). It is also the most highly educated cluster by a large margin, with 59.7% of adults having achieved NCEA level 2 or better and 21.1% having a tertiary degree.

Kākāriki reports the highest subjective evaluation of whānau wellbeing of any group with an average score of 7.51.

4 MĀORI STUDENTS IN AOTEAROA NEW ZEALAND

The Ngā Tamariki o Te Kupenga dataset provides an unparalleled ability to understand the diversity of Māori students in New Zealand. This is important information. The delivery of high quality education to students depends crucially on understanding how different students learn and getting the right teaching and support to the right students. It is not possible to do this without knowing who students are and building on each student's connection to their identity, language, and culture. While awareness that the education system needs to meet the needs of Māori students is an important prerequisite for high quality Māori education, it is not sufficient. Not all Māori students have the same background, needs, or values.

The previous section of this report developed an approach to measuring the different dimensions of Māori cultural identity and connection and used this approach to identify six different clusters (Māori identity signatures) within the Māori population. These Māori identity signatures form the basis of the analysis in this chapter. Here, we explore cultural, social, economic, and educational outcomes for different parts of the Māori student population.

The first part of the chapter (section 4.1) provides a broad descriptive overview of Māori students in New Zealand, including household demographic, social, economic, and cultural characteristics. This provides a baseline context for the rest of the chapter.

Following this, section 4.2 looks at how outcomes for Māori students vary by ethnic identification. This explores both what different combinations of ethnic identification tell us about Māori students, but also explores biases in different sources of ethnicity data. Of particular interest is the group of students who identify as Māori in Te Kupenga or the Census but are not identified as Māori in Ministry of Education administrative data.

The third part of the chapter (section 4.3) looks at how outcomes vary for students from households with different Māori identity signatures. Here the focus is building a clear picture of who the students with different Māori identity signatures are. The analysis includes both demographic analysis as well as analysis of household social and economic characteristics.

Finally, section 4.4 moves beyond analysis of information from Te Kupenga to look at educational outcomes using the full linked dataset form Ngā Tamariki o Te Kupenga. This section presents information on how key educational outcomes vary based on source of ethnicity data and across students coming from households with different Māori identity signatures.

4.1 Descriptive overview of Māori students

The total 2013 Māori primary and secondary student population comprised 160,000 people. Table 6 below provides a breakdown of this population in terms of ethnicity, source of ethnicity data, and Māori descent[13] from the Ngā Tamariki o Te Kupenga dataset, which links information from Te Kupenga and the Census with Ministry of Education administrative data. This allows the analysis of how ethnicity and descent information from the Census compares to the Ministry of education's administrative data. Although the Ngā Tamariki o te Kupenga dataset is a sample, the figures in table 6 have been weighted to give frequency counts for the total population of Māori students (rounded to the nearest 500).

It is evident from the table that Māori descent and ethnicity are largely synonymous. Less than 5 percent of people report Māori ethnicity but not Māori descent. However, there is a small but non-trivial difference in reported ethnicities between the Ministry of Education's administrative

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[13] The New Zealand Census collects information on both Maori descent (does the respondent have any Maori ancestors) and ethnicity (does the respondent identify as Maori). The latter is the usual focus of social and demographic analysis.

data and the Census. In particular, approximately 1 Māori student in 10 (10.4 percent) is identified as Māori only in Te Kupenga/Census data and does not show up as Māori in Ministry of Education administrative data. A smaller group of 5.3 percent are recorded as Māori in the Ministry's administrative data but do not record Māori ethnicity in the Te Kupenga/Census dataset. In total, approximately 25,000 out of 160,000 Māori students record their ethnicity differently in the Census/Te Kupenga and Education administrative datasets.

The characteristics of students not recorded as Māori in both datasets are of particular interest. Typically, one imagines that a population group is a relatively clearly defined thing: that the group labelled Māori in the Census provides a meaningful comparison with students picked up in the education system as Māori. If this is not actually the case it can lead to false inferences – particularly if the group of students reporting different ethnicities in the two contexts differs systematically from the majority of students in other ways.

Table 6. Ethnicity of Māori students

Classification variable	Weighted frequency counts	% of classification
Māori *ethnicity/descent and source*		
Māori in MoE only - No Māori descent	1,500	0.8
Māori in MoE only - Māori descent	7,500	4.5
Māori in Census only - No Māori descent	1,000	0.7
Māori in Census only - Māori descent	15,500	9.5
Māori in MoE and Census - No Māori descent	7,000	4.3
Māori in MoE and Census - Māori descent	132,000	80.3
Māori ethnicity source		
Māori in MoE only	8,500	5.3
Māori in Census only	16,500	10.2
Māori in MoE and Census	139,000	84.6
Ethnicity groups		
Māori only	55,500	33.7
Māori and other	1,000	0.7
Māori and European	79,500	48.4
Māori and European and other	3,500	2.2
Māori and Pasific	11,500	7.3
Māori and Pasific and other	S	S
Māori and Pasific and European	11,500	7.1
Māori and Pasific and European and other	1,000	0.5

All counts are randomly rounded to the nearest 500 and cell sizes of less than 500 have been supressed (S).

Source: Te Kupenga and Ministry of Education

The other main point to be taken from table 6 is the diversity of ethnic identities within the wider Māori group. While about a third of Māori students (33.7 percent) identify as only Māori, the remaining two thirds report more than one ethnicity. In fact, the most common reported ethnicity for Māori students is Māori and European (48.3 percent). Other groups are smaller, but there is still a significant group of Māori and Pasific (7.3 percent) and Māori, Pasific, and European students (7.1 percent).

Table 7 below provides more general information on the demographic composition of the Māori student body, taking into account students who are identified as Māori from both census and Ministry of Education administrative data. While the primary intent of table 7 is as a baseline for interpreting the information in the rest of this chapter, a number of points are worth noting. First, Māori students are overwhelmingly urban (87.3 percent) and from the North Island, with only 14.8 percent of Māori students living in the South Island. About a quarter of Māori students come from one parent families (18.3 percent in single parent families with children and 7.8 percent in

single parent families with children and others), but the majority live in families with two parents (52 percent couple with children plus 7.5 percent couple with children plus others).

Table 7. Demographic characteristics of Māori students

Classification variable	Weighted frequency counts	% of classification
Age		
5 -10	77,000	46.8
11 - 14	49,000	30.0
15+	38,000	23.2
Regional Council		
Northland Region	13,000	7.8
Auckland Region	36,500	22.2
Waikato Region	20,500	12.5
Bay of Plenty Region	24,000	14.6
Gisborne and Hawkes Bay Regions	13,000	8.0
Taranaki and Manawatu-Wangānui Regions	18,000	10.9
Wellington Region	15,500	9.5
All South Island	24,000	14.4
Urban/Rural area		
Urban	142,500	86.8
Not Urban	21,500	13.2
Household composition (1st order classification)		
One-family household (with or without other people)	141,000	86.0
Two-or-more family household (with or without other people)	23,000	14.0
Household composition (2nd order classification)		
Couple only with or without other person(s)	1,000	0.5
Couple with child(ren)	85,500	52.1
Couple with child(ren) and other person(s)	12,500	7.5
One 2-parent family and one 1-parent family	6,500	3.9
One parent with child(ren)	30,000	18.2
One parent with child(ren) and other person(s)	12,500	7.8
Other two-family household	6,000	3.7
Three-or-more family household (with or without other people)	3,500	2.0
Two 1-parent or 2-parent families	7,000	4.3

All counts are randomly rounded to the nearest 500 and cell sizes of less than 500 have been supressed (S).

Source: Te Kupenga and Ministry of Education

Moving beyond basic demographics, table 9 provides contextual information about the social and economic circumstances of the households in which Māori students live. The key points to note in table 8 are the relatively high levels of Māori students living in households from the most deprived parts of New Zealand (NZDep deciles 8, 9, and 10). Fully one quarter of Māori students live in areas classified as in the most deprived decile in New Zealand using NZDep 2013. Despite this, there is also a large proportion of Māori students living in households with relatively high incomes. Roughly a quarter of Māori students (16.3 percent plus 11.4 percent) live in households with an annual income of more than $100,000.

Table 8. Social and economic characteristics of Māori students

Classification variable	Weighted frequency counts	% of classification
Total household income		
Loss or Zero income	1,500	0.9

Classification variable	Weighted frequency counts	% of classification
$1-$5,000	1,000	0.8
$5,001-$10,000	1,000	0.9
$10,001-$15,000	4,000	2.9
$15,001-$20,000	4,500	3.3
$20,001-$25,000	4,000	2.8
$25,001-$30,000	5,000	3.8
$30,001-$35,000	6,000	4.4
$35,001-$40,000	6,000	4.5
$40,001-$50,000	12,500	9.2
$50,001-$60,000	11,500	8.4
$60,001-$70,000	11,500	8.3
$70,001-$100,000	30,500	22.3
$100,001-$150,000	22,500	16.3
$150,001 or More	15,500	11.2
Total family income		
Loss or Zero income	2,000	1.4
$1-$5,000	2,000	1.5
$5,001-$10,000	2,000	1.4
$10,001-$15,000	6,000	4.3
$15,001-$20,000	6,000	4.3
$20,001-$25,000	5,500	4.0
$25,001-$30,000	8,000	5.8
$30,001-$35,000	7,500	5.4
$35,001-$40,000	5,500	4.1
$40,001-$50,000	12,500	9.0
$50,001-$60,000	12,000	8.6
$60,001-$70,000	11,000	8.0
$70,001-$100,000	28,000	20.6
$100,001-$150,000	18,000	13.1
$150,001 or More	11,500	8.5
Tenure		
Owned	62,000	37.6
Not-owned	87,500	53.2
Family trust	12,000	7.4
Not stated	3,000	1.8
NZ Deprivation Index (2013 decile)		
1 *(lowest deprivation)*	7,000	4.3
2	5,500	3.3
3	8,000	4.9
4	7,500	4.5
5	12,500	7.5
6	13,500	8.2
7	15,500	9.4
8	23,000	14.0
9	31,000	18.8
10 *(Highest deprivation)*	41,500	25.1

All counts are randomly rounded to the nearest 500 and cell sizes of less than 500 have been supressed (S).

Source: Te Kupenga and Ministry of Education

4.2 Ethnicity of Māori students

As discussed in section 4.1, a key feature of interest in understanding the Māori student population is the difference between the Māori student population recorded in the Ministry of Education's administrative data and the Māori student population based on Census ethnicity records. The former is the group that forms the basis of the Ministry's analysis of Māori student outcomes and any ethnically targeted interventions. However, the existence of a substantial minority of Māori students not captured in the administrative data raises the question as to how representative of the total Māori student population the administrative data actually is?

Table 9 below compares the demographic characteristics of students identified as Māori in both the Census and the Ministry's administrative data as well as students who report being Māori either only in the Census/Te Kupenga or only in the Ministry of Education administrative data. Comparing the three groups, a number of important differences emerge. Those students who report being Māori in only one of the data sets are, on average, different to those who report identifying as Māori in both.

The first point to note is that the Ministry of Education data appears to identify more Māori in younger age groups than the Census, which is tilted slightly more towards older groups. The proportion of students aged 15+ is 34.9 percent for students who identify as Māori only in the Census compared to 22.2 percent for students identifying as Māori in both data sources and 20.1 percent for students identified as Māori only in the administrative data.

In some respects, students who appear in only one dataset – either the Census or administrative data – are more similar to each other than they are to students appearing in both datasets. They are both marginally less likely to be urban (84.2 percent for Census only and 85.1 percent for Education data only compared to 87.8 percent for students recording Māori ethnicity in both) and both much less likely to report sole Māori ethnicity. However, in other respects they are very different.

Students identifying as Māori only in the Census are disproportionately more likely to live in the South Island when compared to students identifying as Māori in both datasets (24 percent compared to 13.5 percent), with students reporting Māori ethnicity only in the Education data somewhere in between (17.8 percent). Census/Te Kupenga students are also slightly more likely to live in Auckland but less likely to live in Northland or the Bay of Plenty.

Table 9 Demographic characteristics of Māori students by source of ethnicity data

Classification variable	Māori in Census *and* MoE data	Māori in Census but *not* MoE data	Māori in MoE but *not* Census data
Age			
5 -10	47.1	44.2	48.1
11 - 14	31.0	20.8	31.9
15+	22.0	35.0	20.0
Regional Council			
Northland Region	8.3	S	10.4
Auckland Region	21.8	26.3	21.1
Waikato Region	12.5	13.3	10.9
Bay of Plenty Region	15.3	9.9	12.3
Gisborne and Hawkes Bay Region	8.4	5.4	S
Manawatu-Wangānui and Taranaki Regions	10.8	11.9	10.9
Wellington Region	9.7	6.4	11.6
All South Island	13.2	24.1	17.5
Urban/Rural area			
Urban	87.2	84.4	84.7
Not Urban	12.8	15.6	15.3

Māori *ethnicity/descent*			
Māori ethnicity / No Māori descent	5.0	7.0	15.0
Māori ethnicity / Māori descent	95.0	93.0	85.0
Ethnicity			
Māori only	39.4	S	S
Māori and other	0.7	S	S
Māori and European	44.6	72.6	60.3
Māori and European and other	1.6	5.8	S
Māori and Pasific	6.5	5.9	20.9
Māori and Pasific and other	S	S	S
Māori and Pasific and European	6.5	12.0	7.8
Māori and Pasific and European and other	0.5	S	S
Household composition (1st order classification)			
One-family household (with or without other people)	85.5	93.1	80.3
Two-or-more family household (with or without other people)	14.5	6.9	19.7
Household composition (2nd order classification)			
Couple only with or without other person(s)	0.5	S	S
Couple with child(ren)	51.2	63.5	44.6
Couple with child(ren) and other person(s)	7.4	6.1	10.7
One 2-parent family and one 1-parent family	4.1	S	6.2
One parent with child(ren)	18.3	16.6	20.0
One parent with child(ren) and other person(s)	8.2	6.1	S
Other two-family household	3.8	S	S
Three-or-more family household (with or without other people)	2.0	S	5.9
Two 1-parent or 2-parent families	4.6	S	S

All counts are randomly rounded to the nearest 500 and cell sizes of less than 500 have been supressed (S).

Source: Te Kupenga and Ministry of Education

A major difference in students identifying differently in the Census and Ministry of Education datasets relates to other ethnicities recorded. More than 90 percent of students identifying as Māori only in the Census report European ethnicity alongside Māori ethnicity (72.5 percent Māori and European, 6 percent Māori, European and other, and 11.8 percent Māori, European, Pacific, and other). In contrast, students identifying as Māori only in the Ministry of Education dataset are somewhat more likely to identify as Māori and European than students captured in both Census and Education data (59.7 percent compared to 44.6 percent), but are much more likely to identify as Māori and Pacific (21.4 percent compared to 6 percent). Overall there is a clear pattern that students identifying as Māori in only one dataset are more likely to report multiple ethnicities than students identifying as Māori in both, but mix of ethnicities is very different between the Census-only group (Māori and European) and the Education-only group (Māori and Pasific).

Table 10 extends the analysis of students identifying as Māori in different sources of data to the social and economic characteristics of the household in which they live. It is evident that students identifying as Māori in census data only tend to live in households with a higher incomes than other groups (16.7 percent of households earning $150,000 or more compared to 10.9 percent for both data sources and 9.6 percent for Māori only in administrative data). This pattern repeats for family incomes and home ownership, and is particularly pronounced with respect to NZDep decile (11.8 percent in the top decile compared to 3.4 and 6.1 percent for the other two groups).

Table 10   *Social and economic characteristics of Māori students by source of ethnicity data*

Classification variable	Māori in Census *and* MoE data	Māori in Census but *not* MoE data	Māori in MoE but *not* Census data
Total household income			
Loss or Zero income	1.0	S	S
$1-$5,000	0.8	S	S
$5,001-$10,000	1.0	S	S
$10,001-$15,000	2.9	S	S
$15,001-$20,000	3.4	3.6	S
$20,001-$25,000	2.9	3.8	S
$25,001-$30,000	3.9	S	S
$30,001-$35,000	4.6	S	S
$35,001-$40,000	4.7	S	S
$40,001-$50,000	9.1	11.0	S
$50,001-$60,000	8.4	9.3	S
$60,001-$70,000	8.2	8.5	8.8
$70,001-$100,000	22.8	18.8	21.7
$100,001-$150,000	15.6	16.9	26.7
$150,001 or More	10.7	16.3	9.2
Total family income			
Loss or Zero income	1.6	S	S
$1-$5,000	1.6	S	S
$5,001-$10,000	1.5	S	S
$10,001-$15,000	4.5	S	S
$15,001-$20,000	4.2	5.3	S
$20,001-$25,000	4.0	5.1	S
$25,001-$30,000	6.0	S	9.1
$30,001-$35,000	5.9	S	S
$35,001-$40,000	4.3	3.5	S
$40,001-$50,000	9.1	10.3	S
$50,001-$60,000	8.6	9.4	S
$60,001-$70,000	7.8	8.5	10.6
$70,001-$100,000	20.7	19.2	21.9
$100,001-$150,000	12.6	15.0	19.1
$150,001 or More	7.6	14.9	8.6
Tenure			
Owned	36.8	44.0	39.2
Not-owned	54.8	44.9	42.5
Family trust	6.6	9.9	14.7
Not stated	1.8	S	S
NZ Deprivation Index (2013 decile)			
1	3.3	11.6	5.9
2	2.7	6.5	6.3
3	4.4	9.8	S
4	4.2	6.2	S
5	6.8	11.2	11.9
6	8.3	9.2	S
7	9.5	8.7	9.4
8	14.3	10.3	15.6

9	19.8	11.5	16.4
10	26.7	14.9	19.5

All counts are randomly rounded to the nearest 500 and cell sizes of less than 500 have been supressed (S).

Source: Te Kupenga and Ministry of Education

Taken collectively the picture presented by integrating ethnicity data from the Census and Ministry of Education is interesting. It suggests that students with a mixed ethnic background are less likely to identify as Māori in Ministry of Education data than others. This is particularly the case for students with a mixed Māori/New Zealand European background. The students missing from the Ministry of Education data are more likely to be from the South Island or Auckland and come from households with generally better economic and social outcomes. Although these effects are not large in absolute terms, the net effect is that any analysis of the Māori student population using Ministry of Education ethnicity data will describe a population that is less ethnically mixed, poorer, and more northern than the Census Māori population and about 10 percent smaller.

4.3 Māori identity signatures of the student population

A better understanding of the ethnic identification of Māori students, as discussed in the preceding section, is a useful side-product of Ngā Tamariki o Te Kupenga. The main focus for the project, however, is to better understand the interaction between the cultural identity and connection of Māori students and educational outcomes. From this perspective, a key starting point is to apply the Māori identity signatures developed from Te Kupenga to the Māori student population.

To apply Māori identity signatures to students we have linked data from adult family members in the household to school aged children as discussed in the data section of this report. The key result of this is that the Māori identity signature for each student is taken to be the Māori identity signature of the single adult family member who responded to Te Kupenga. This implies a relatively weak link between the Māori identity signature and the student as the Māori identity signature attributed to the student is not based on their own question responses except for a small minority of students aged 15 or older who themselves were respondents to Te Kupenga.

Differences between the adult's Māori identity signature and the student's actual cultural identity and connection could arise from a number of sources. Generational change might mean that the adult's cultural identity and connection differs from that of the younger generation. Individual differences in personality and exposure to peer effects and the wider social environment might lead students to have different cultural values to their parents or other adults in the household. Finally, in families with more than one adult, the other adult might have a different ethnic or cultural background. For example, the adult interviewed in Te Kupenga might fit into the Kākāriki cluster but be married to a New Zealand European with no Māori ancestry. In Ngā Tamariki o Te Kupenga the children in the household would be assigned in this case to the Kākāriki cluster. However, their lived experience growing up with two cultures might lead to a different clustering if the children themselves had responded to Te Kupenga.

The net impact of inferring the student's cultural identity and connection from adult responses to Te Kupenga will be to weaken any empirical link between the student's cultural identity (as represented through the Māori identity signature cluster to which they belong) and other outcomes. This means that any links between student Māori identity signature and other outcomes identified in the following analysis are likely to *underestimate* the true relationship.

Figure 13 below shows the proportion of Māori students in each of the six Māori identity signature clusters as well as the proportion of the total adult (15+) Māori population in each of the clusters. The distribution of Māori students across the different Māori identity signatures is generally fairly similar to that of adults with one important exception. Where, for adults, the Karaka group was the largest – comprising 30.7 percent of the total population – for students the Karaka group comprises only 23.3 percent of the population. The largest cluster for students is the

Whero cluster which comprises 23.4 percent of the Māori student population.

This is not an age-related effect because, as discussed above, the proportions in figure 13 are the proportion of Māori students living in a household with an adult family member in one of the clusters and are not based on direct responses from the students. The most obvious interpretation of these results is therefore that the differences in the proportions of the Māori population in each Māori identity signature between adults and students represents differences in the number of students per family across the different clusters. In particular, it appears that the Karaka cluster is associated with fewer school-aged children per family than other clusters.

Figure 13. Māori identity signatures of the adult and student populations
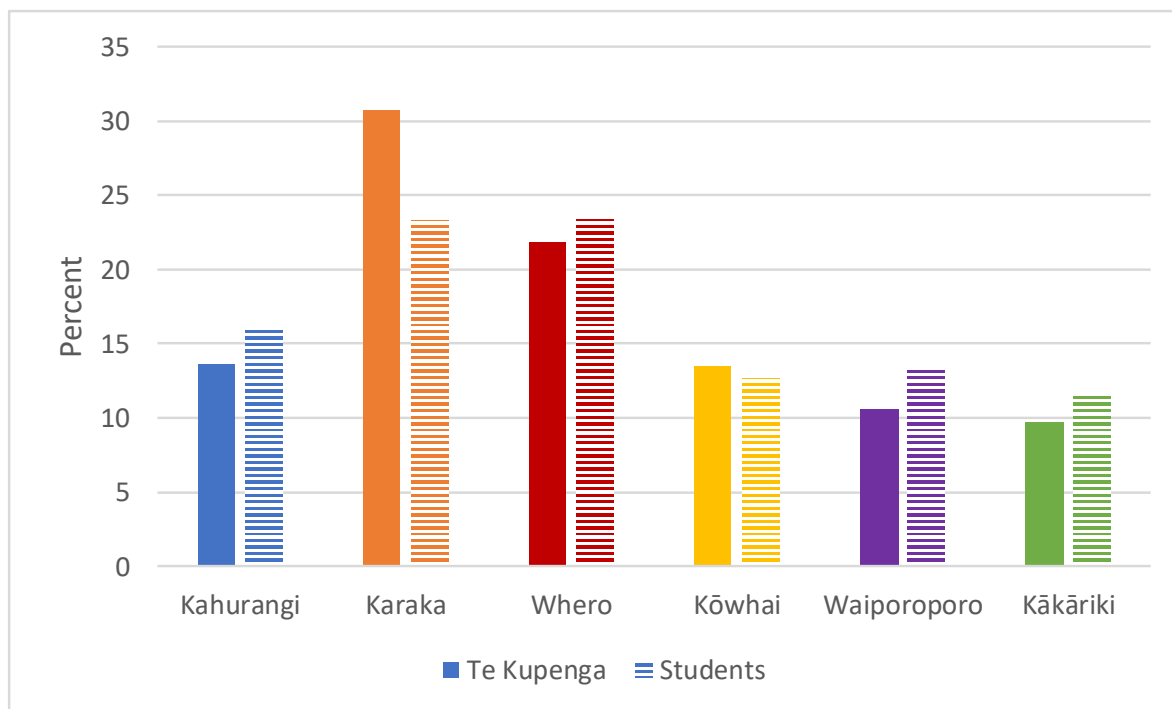
Source: Te Kupenga and Ministry of Education

Understanding which Māori identity signature clusters students fit into tells us little of use about Māori students if we do not also understand what this means. Table 11 presents the demographic characteristics of Māori students for each of the six Māori identity signatures. With six clusters it is not practical to try and provide a comprehensive description of the differences between each cluster. Box 3, at the end of this section provides a descriptive overview for each cluster, while the focus here is to identify some of the main over-arching trends that distinguish between the different clusters.

There is relatively little difference in the age structure of students in the different clusters. The most obvious feature is that the Karaka and Kōwhai clusters have a higher proportion of students aged 15+ than the other four clusters. Greater differences, however, can be observed in the how students of different regions cluster. In fact, the differences in the regional composition of the clusters underscores the degree to which the cultural outcomes measured in Te Kupenga reflect substantive differences in peoples' lifestyles.

Only a very small proportion of students from the Kākāriki and Kahurangi clusters live in the South Island, while nearly a quarter of Karaka students and about 17 percent of Whero and Kōwhai students do. By way of contrast, more than half of Kākāriki students and about 43 percent of Kahurangi students live in Northland, the Waikato, or the Bay of Plenty. These three regions account for less than a quarter of Karaka students and less than 30 percent of Whero and Kōwhai students. The Waiporoporo and Kōwhai clusters are both Auckland centric, with about 30 percent of students in each of these groups living in Auckland. Although a large majority of all students live in urban areas, the proportion living in rural areas varies from 7.8 percent for the Waiporoporo cluster to nearly twice that for the Whero (14.8 percent) and Kākāriki (14.5 percent)

clusters.

Table 11. Demographic characteristics of Māori students by cluster

Classification variable	Kahurangi	Karaka	Whero	Kōwhai	Waiporoporo	Kākāriki
Age						
5 -10	46.8	45.4	49.1	39.8	52.3	46.6
11 - 14	31.6	27.6	29.6	32.4	27.5	33.8
15+	21.5	27.0	21.4	27.8	20.1	19.6
Regional Council						
Northland Region	9.8	5.0	8.5	7.3	4.6	14.2
Auckland Region	19.6	25.0	17.5	28.5	30.9	12.3
Waikato Region	16.6	9.5	10.7	15.5	10.4	16.0
Bay of Plenty Region	23.6	11.8	12.7	7.0	11.2	24.4
Gisborne and Hawkes Bay Region	11.2	5.9	7.8	8.5	9.2	9.0
Taranaki and Manawatu-Wangānui Region	9.2	12.6	14.1	7.4	11.2	7.4
Wellington Region	8.8	6.9	11.1	8.8	10.6	13.4
All South island	4.9	23.4	17.6	17.0	11.9	3.3
Urban/Rural area						
Urban	85.9	86.9	84.1	88.8	92.5	84.4
Not Urban	14.1	13.1	15.9	11.2	7.5	15.6
Māori *ethnicity source*						
Education only	4.4	7.9	5.2	8.0	S	S
Census only	4.8	21.1	5.7	17.2	4.0	S
Census and education	90.8	71.0	89.1	74.8	93.6	95.6
Māori ethnicity						
Māori only	39.2	12.5	35.8	23.6	48.3	59.9
Māori and other	S	S	S	S	S	S
Māori and European	43.2	70.5	46.9	54.0	31.3	26.0
Māori and European and other	S	3.0	1.6	5.6	S	S
Māori and Pasific	10.2	3.7	5.9	6.3	12.1	7.2
Māori and Pasific and other	S	S	S	S	S	S
Māori and Pasific and European	4.8	8.5	9.1	8.6	5.5	4.1
Māori and Pasific and European and other	S	S	S	S	S	S
Household composition (1st order classification)						
One-family household (with or without other people)	87.2	87.0	86.3	87.1	80.4	87.5
Two-or-more family household (with or without other people)	12.8	13.0	13.7	12.9	19.6	12.5
Household composition (2nd order classification)						
Couple only with or without other person(s)	S	S	S	S	S	S
Couple with child(ren)	51.1	60.1	53.8	55.2	40.5	43.5
Couple with child(ren) and other person(s)	9.5	5.1	6.5	7.2	6.4	13.4
One 2-parent family and one 1-parent family	2.2	3.3	3.3	5.2	6.9	3.9
One parent with child(ren)	17.8	17.5	17.2	20.1	17.3	21.0
One parent with child(ren) and other person(s)	8.2	3.8	8.2	4.2	15.8	9.1

Other two-family household	4.4	4.2	3.4	4.2	3.4	S
Three-or-more family household (with or without other people)	3.8	S	2.2	S	3.4	S
Two 1-parent or 2-parent families	2.5	4.9	4.8	2.9	5.8	4.1

All counts are randomly rounded to the nearest 500 and cell sizes of less than 500 have been supressed (S).

Source: Te Kupenga and Ministry of Education

Differences between the clusters are visible in the ethnicity of students, both in terms of source of ethnicity data and number of ethnicities. The Kōwhai and Karaka clusters are much more likely than any other group to report Māori ethnicity in Census/Te Kupenga but not in education data. The Karaka group is also much more likely than any other group to report Māori and European ethnicity. In contrast, the Kākāriki and Waiporoporo groups both count roughly half of their number as sole Māori compared to only 12 percent for Karaka.

There is some variation in household composition between the clusters. The Waiporoporo cluster stands out as more likely than any of the other clusters to involve a two-or-more family household, while students from the Kākāriki and Waiporoporo households are more likely than others to come from sole parent families.

Table 12 extends the cluster analysis to social and economic outcomes at the household level. The differences here are less obvious than was the case for region, but nonetheless some clear differences in the household circumstances of students are visible. The Kahurangi and Whero groups have lower household and family incomes than other groups, while the Karaka group generally has a somewhat higher income. Students from the Karaka and Kōwhai groups are most likely to live in an owner-occupied house, while the Waiporoporo group is the least likely to. The Waiporoporo group is also associated with household crowding, with a much higher rate of students in this group living in a household in need of additional bedrooms.

There are some important differences in the probability of a student from different clusters living in areas of high deprivation visible in table 12. Students from the Karaka group are much less likely than others to live in high deprivation areas (deciles 8 to 10), while the Kākāriki group is most likely to live in these areas. Interestingly, however, the Kākāriki group is less likely to live in the most deprived areas (decile 10) than the Kahurangi, Whero, and Waiporoporo groups.

Table 12. Household social and economic characteristics of Māori students

Classification variable	Kahurangi	Karaka	Whero	Kōwhai	Waiporoporo	Kākāriki
Total household income						
Loss or Zero income	S	S	S	S	S	S
$1-$5,000	S	S	S	S	S	S
$5,001-$10,000	S	S	S	S	S	S
$10,001-$15,000	3.5	2.7	2.4	S	7.4	S
$15,001-$20,000	3.0	1.6	3.0	3.6	5.5	5.4
$20,001-$25,000	2.4	3.0	3.0	3.0	3.9	S
$25,001-$30,000	4.4	2.7	4.0	S	4.1	6.8
$30,001-$35,000	5.5	3.7	4.2	5.7	5.3	S
$35,001-$40,000	5.8	3.3	4.8	6.6	3.7	S
$40,001-$50,000	7.4	11.5	8.4	7.3	6.5	12.7
$50,001-$60,000	6.8	8.2	9.9	6.8	8.9	9.1
$60,001-$70,000	11.5	8.9	9.5	5.8	5.4	5.6
$70,001-$100,000	25.4	19.6	23.1	26.3	19.5	21.1
$100,001-$150,000	12.3	18.6	14.9	18.9	14.2	18.8

$150,001 or More	8.6	14.5	10.0	11.3	12.1	8.7

Total family income						
Loss or Zero income	S	1.8	S	S	S	S
$1-$5,000	S	1.6	2.7	S	S	S
$5,001-$10,000	S	S	2.1	S	3.4	S
$10,001-$15,000	4.4	3.5	3.1	S	10.6	3.3
$15,001-$20,000	4.9	3.0	3.1	3.6	8.1	5.7
$20,001-$25,000	3.3	5.3	4.3	3.1	3.6	S
$25,001-$30,000	9.5	4.0	5.3	3.1	5.0	9.3
$30,001-$35,000	7.3	4.3	4.6	7.3	7.4	S
$35,001-$40,000	3.8	3.2	4.0	6.9	S	4.8
$40,001-$50,000	8.7	10.2	8.6	6.9	7.3	11.5
$50,001-$60,000	7.8	8.4	10.1	8.0	6.6	9.9
$60,001-$70,000	11.6	7.3	10.8	6.2	4.6	4.6
$70,001-$100,000	18.4	19.2	22.9	24.1	19.0	19.6
$100,001-$150,000	11.0	15.9	9.5	16.0	10.5	16.5
$150,001 or More	5.5	12.1	7.6	9.6	7.3	6.2

Tenure						
Owned	37.2	44.4	33.1	46.2	29.7	33.4
Not-owned	55.0	45.3	57.1	43.8	63.5	57.2
Family trust	6.5	9.2	7.2	8.6	6.1	5.2
Not stated	S	S	2.6	S	S	4.2

NZ Deprivation Index (2013 decile)						
1	S	7.0	4.0	7.1	3.3	S
2	S	5.2	3.6	4.0	S	2.7
3	3.5	8.5	3.6	7.9	2.5	S
4	2.7	6.2	4.4	7.2	3.6	S
5	6.7	10.3	8.5	8.7	3.5	4.4
6	5.0	10.6	10.0	7.0	8.1	5.2
7	10.3	14.0	7.5	7.2	7.5	7.2
8	13.0	11.2	15.9	13.1	16.2	15.5
9	22.7	12.1	16.4	17.7	19.1	33.1
10	33.8	15.0	26.1	20.1	34.2	27.5

Housing crowding index						
Two or more bedrooms needed	9.6	4.3	10.7	5.1	18.9	7.8
One bedroom needed	19.8	13.9	17.2	12.5	19.8	19.4
No bedrooms needed	38.0	33.7	36.8	40.3	30.9	41.1
One bedroom spare	23.6	34.1	24.1	28.4	20.4	24.8
Two or more bedrooms spare	8.1	13.7	9.4	13.2	9.9	5.2
N/A	S	S	1.7	S	S	S

Housing in need of repair (self reported)						
Not a problem	40.7	58.0	47.3	51.6	45.6	41.6
a small problem	35.3	32.0	35.5	32.8	34.5	32.2
a big problem	24.0	10.0	17.2	15.6	20.0	26.3

Housing dampness (self reported)						
Not a problem	54.2	68.9	60.0	68.3	56.9	48.1
a small problem	28.8	23.9	23.3	18.3	25.1	30.1
a big problem	17.6	7.1	16.8	13.3	18.0	21.7

Housing cold (self reported)						
Not a problem	48.4	63.5	54.3	61.7	49.6	47.2

a small problem	26.8	24.7	25.8	20.7	26.7	26.2
a big problem	24.8	11.8	19.9	17.6	23.7	26.5

All counts are randomly rounded to the nearest 500 and cell sizes of less than 500 have been supressed (S).

Source: Te Kupenga and Ministry of Education

An analysis of the demographic characteristics and socio-economic outcomes of students in different clusters highlights a number of patterns. In particular, the clusters are associated with clear regional differences. This is reflected both in where students in different clusters live (table 11) and in the probability of living in a deprived area (table 12). Note, however, that some caution should be exercised in interpreting these results. Although the clusters are different on average, there is as much variation within clusters as between them. The clusters primarily capture differences in cultural identity and connection. While this is correlated with differences in average social and economic outcomes at the cluster level, this does not mean that everyone within a cluster has similar economic and social outcomes. With this in mind, box 4 below summarises the key demographic, social, and economic characteristics of students in different clusters.

Box 4. Characteristics of students by cluster

Kākāriki

Kākāriki students are more likely to live in Northland, Bay of Plenty or Gisborne and Hawkes Bay regions as well as Wellington compared to students from other Māori identity signatures. They are also one of the less urban groupings, although a large absolute majority still live in urban areas. They are disproportionately more likely than other groups to report only Māori as an ethnicity and to identify as Māori in both the Census and Ministry of Education data.

In terms of socio-economic outcomes (table 12), students in Kākāriki families are more likely to live in a household reporting an income of $70,000 or more (49.5%) than all other groups except for Karaka and Kōwhai. Despite this, Kākāriki households are more likely to live in areas of high deprivation (NZDEP deciles 8 to 10), than any other group, but are less likely to live in the most deprived areas (decile 10).

Waiporoporo

This group is among the youngest in terms of Māori students, with more than half of the student body aged 5 to 10. Waiporoporo is also the most urban of all the Māori identity signatures, with only 7.8 percent living outside an urban area. Nearly a third of the student population lives in Auckland, with a significant proportion also in Wellington and the Waikato. While the proportion identifying solely as Māori is relatively high at 48.9 percent, there is a relatively large minority identifying as Māori and Pasifika (11.3 percent). The Waiporoporo group included the highest proportion of students living in single parent families (33.7%).

Students from Waiporoporo families tend to come from households with somewhat lower incomes (46.4% with an income of $70,000 or more), but are still somewhat better off in economic terms than the Whero or Kahurangi groups. Rates of household crowding a much larger than for other groups (38.5% of students in this group living in households needing one or more additional bedroom), possible reflecting the more urban nature of the Waiporoporo group. The probability of living in an area of high deprivation is high (69.8% in deciles 8 to 10).

Kōwhai

The Kōwhai Māori identity signature group is skewed towards older students, with the lowest proportion of students aged 5 to 10 (40.4%) and the highest proportion aged 15+ (27.6%). A relatively high proportion of Māori students from families in the Kōwhai live in Auckland (29%) while relatively few live in Northland (5.9%), Bay of Plenty (6.2%) or the Gisborne and Hawkes Bay region (7.9%). After the Waiporoporo cluster, students from the Kōwhai cluster are the most highly urbanised of any of the six Māori identity signatures with only 10.6% living outside an urban area. More than two thirds of this group (69%) report European as well as Māori ethnicity, making this group the most strongly European cluster after the disengaged cluster.

Students in the Kōwhai group are more likely to have high household incomes than other groups, with 57.1% living in households with an income over $70,000 per year. After the Karaka group students from the Kōwhai cluster are least likely to live in highly deprived areas (52% living in NZDEP deciles 8 to 10) and have low rates of household crowding (18.4% living in households needing one or more additional bedroom).

Whero

The Whero cluster skews relatively young with respect to Māori students, with 49.7% of students aged 5 to 10. This puts it just behind the Waiporoporo group. It is the least urban group (14.8% living outside of urban areas) but compared to other groups is spread out more evenly across the country. In particular, the Whero group has the second lowest proportion of students living in Auckland (19.5%) and the lowest proportion living in the greater Auckland/Waikato area (31.2%). The ethnic profile of the group is mixed with 36% of student reporting sole Māori ethnicity and just over 57% reporting European as well as Māori ethnicity.

Household incomes for students living in Whero households were relatively low with a similar proportion of students living in households earning $70,000 or more (47.7%) to Kahurangi households (45.6%) and Waiporoporo households (46.4%). Compared to other clusters the level of concentration in deprived areas is in between the extremes with 58.1% living in NZDEP deciles 8 to 10. Rates of household crowding are also intermediate with 27.1% of students living in households needing one or more additional bedroom.

Karaka

The Karaka Māori identity signature group is tilted slightly towards older students with the second largest proportion of students aged 15 or older (27.5%). Students from this group are disproportionately likely to live in the South Island (24.3%) and are less likely to live in Northland (4.5%), Gisborne and the Hawkes Bay (6.7%) or Wellington (7.1%) than is the case for students in other clusters. Students from this group are much more likely than other groups to have reported Māori ethnicity in the census but not to the Ministry of Education than is the case for other clusters (21.5%) and are also more likely to report Māori ethnicity to the Ministry but not the census (8.5%). A large majority of Karaka students report Māori and European ethnicity (71.5%) and more than 83% report European as one of their ethnicities.

Students from the Karaka group are second most likely to be living in a household earning $70,000 or more per year (53.6%) and the most likely to be living in a household earning $100,000 or more per year. By a large margin, students from this group are least likely to live in deprived areas (36.6% live in NZDEP deciles 8 to 10).

Kahurangi

The Kahurangi group mirrors the Kākāriki group in some important respects. It has a similar age profile for students and relatively high proportions of the population live in Northland (8.8%), Bay of Plenty (17.4%) and the Gisborne and Hawkes Bay region (11.2%). Only 5.7% of students in this group live in the South Island. Nearly two fifths of the student population (39.6%) identify as Māori only, and a large majority report the same ethnicity in Ministry of Education and census data. Only the Waiporoporo group is more likely to report sole Māori ethnicity.

Of all the six clusters, students from the Kahurangi group are least likely to live in a household with an income of $70,000 or more (45.6%). The proportion of students living in deprived areas is high (68.4%) as is the proportion of students living in households requiring an extra bedroom (31.9%).

The geographic distribution of Māori Identity Signatures

Māori students from households with different Māori Identity Signatures are not distributed evenly across New Zealand. In fact, there is considerable geographic variation in the mix of Māori students with respect to cultural identity and connection. From the perspective of education policy and planning, it would be useful to be able to obtain a picture of the cultural mix of Māori

students at the school level. The sample size of Te Kupenga prevents this level of analysis, but it is possible to examine the distribution of the six different clusters at the regional level. This is illustrated in figure 14 below with the precise figures in table 13.

Figure 14. Māori Identity Signatures of the enrolled student population by region
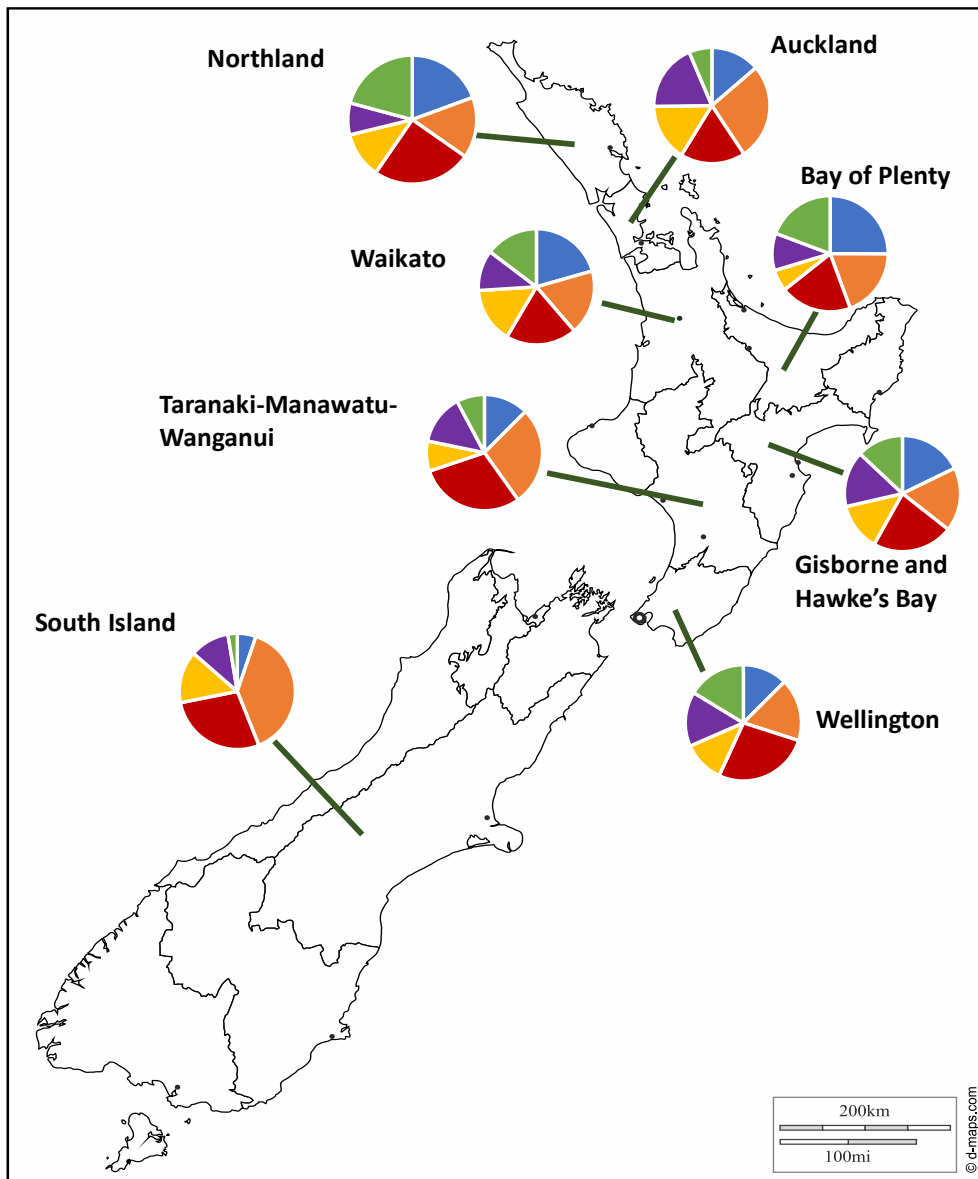
Māori Identity Signature Groups are colour coded and presented in order clockwise from the 12 o'clock position: Kahurangi (blue); Karaka (orange); Whero (red); Kōwhai (yellow); Waiporoporo (purple); and Kākāriki (green).

Source: Te Kupenga and Ministry of Education

Table 13. Māori Identity Signatures of the enrolled student population by region

	Kahurangi	Karaka	Whero	Kōwhai	Waiporoporo	Kākāriki
Northland Region	19%	15%	25%	12%	8%	21%
Auckland Region	14%	27%	18%	16%	19%	6%
Waikato Region	21%	18%	20%	16%	11%	15%
Bay of Plenty Region	25%	18%	23%	13%	16%	13%
Gisborne and Hawkes Bay Region	18%	6%	23%	11%	14%	13%
Taranaki-Manawatu-Wangānui	13%	28%	30%	8%	14%	8%
Wellington Region	13%	17%	27%	12%	15%	16%
All South island	5%	39%	28%	15%	11%	3%

Source: Te Kupenga and Ministry of Education

There are considerable differences in the make-up of the Māori student body between different regions in New Zealand. Northland is characterised by a relatively high proportion of students in the Kākāriki group (21%) and has a high proportion of students from the three clusters with relatively high Tūrangawaewae (Kahurangi, Waiporoporo, Kākāriki). In contrast, the Kākāriki group is almost absent from Auckland, Taranaki-Manawatu-Wangānui, and the South Island. In all three areas the Karaka group makes up over a quarter of the student population.

The distribution of the Whero group across the regions is of some interest as it is this group that both has a moderate score on the Tūrangawaewae scale (i.e. they feel Māori) but low levels of engagement across the other four dimensions of Māori cultural identity and connection. In this, they differ from the Karaka and Kōwhai groups, for whom Māori is not necessarily their primary identity and from the Kākāriki, Kahurangi, and Waiporoporo groups have significant engagement with Māori culture. This group is spread across New Zealand, but comprises a particularly large proportion of the Northland, Taranaki-Manawatu-Wangānui, Wellington, and South Island student populations.

4.4 Educational outcomes for Māori students

A key objective of Ngā Tamariki o Te Kupenga is to better understand how Māori identity and connection interacts with the education system to affect educational outcomes for Māori students. This involves bringing together information on the household characteristics of Māori students from Te Kupenga with information on educational attainment from the Ministry of Education's administrative data. By using data linked at the individual level in the Ngā Tamariki o Te Kupenga dataset, it is possible to look at the educational outcomes of different sub-groups of the Māori student population that are impossible to identify from the administrative data on its own.

A number of measures of educational attainment are available in the Ministry of Education's administrative data and the broader IDI. These include records of student participation, disciplinary procedures, NCEA attainment, university admissions, and labour market outcomes. However, these records are not equally useful as measures of educational outcomes. Some, such as records relating to participation and discipline, are more usefully considered as contextual factors and drivers of educational outcomes. Other measures, such as those related to tertiary education or labour market participation are of high potential interest as outcome measures but are only observable for those students who have left school.

Given that Te Kupenga took place in 2013, focusing on post school outcomes gives a relatively small pool of students who were both at school when Te Kupenga took place and are sufficiently old that they have left a meaningful post-school imprint in the IDI. For this reason, the focus for

examining educational outcomes for Māori students in Ngā Tamariki o Te Kupenga is on NCEA attainment rates. In particular, we use two NCEA derived measures as out key outcome indicators. These are NCEA level 2 attainment and University Entrance.

NCEA level 2 attainment is one of the most commonly used primary measure of educational outcomes. This measure has three key advantages. First, it is a clear measure of educational outcomes for which information is available in the IDI. In addition to this, NCEA level 2 attainment corresponds with standard international benchmarks for "upper secondary school attainment". Finally, the use of NCEA level 2 provides a large sample of Māori students to work with as we can potentially use any Māori in the Ngā Tamariki o Te Kupenga dataset aged between 11 and 18 as part of the sample.

Qualifying for University Entrance represents a higher threshold of attainment than NCEA level 2 and has a stronger qualitative component in terms of the courses taken. In addition to attainment of NCEA level 3, University Entrance also requires that basic numeracy (NCEA level 1) and literacy (NCEA level 2) requirements are met and that a proportion of NCEA level 3 credits are from a list of approved sources. This makes qualifying for University Entrance a suitable secondary measure of educational outcomes to use alongside NCEA level 2.

The impact of Census ethnicity records on educational attainment of Māori students

Although the primary focus of Ngā Tamariki o Te Kupenga is to gain a better understanding of the diversity of the Māori student population in terms of cultural identity and engagement, the construction of the dataset sheds light on Māori educational outcomes in other ways. One particularly important aspect of the project is that it brings together information on the ethnicity of students from Ministry of Education administrative data sources with information on student ethnicity from the Census. Comparing these two measures of ethnicity with each other is instructive, since they do not always coincide.

Because many Māori students come from families with mixed ethnic backgrounds and have ancestors who are not Māori it is unsurprising that there should be variation in responses to questions on ethnicity. While a large proportion of students will have a fairly stable view of their ethnicity, a proportion of students with mixed backgrounds may choose to report Māori ethnicity in some circumstances but not in others. This phenomenon is well documented in the literature on public health and ethnicity (Callister et al, 2007). Table 14 below presents information on Māori student numbers aged 11 to 18 by source of ethnicity data and educational outcomes.

Table 14. Source of ethnicity data educational attainment

Ethnicity Source	Number of students	NCEA level 2 attainment	University Entrance Rate
Education only	3,000	76.4	22.4
Census only	9,500	68.7	22.5
Education and Census	50,500	64.4	19.8
Overall Māori NCEA level 2 attainment rate in MoE data			
Reported in Education data	53,500	65.1	19.9
Corrected Māori NCEA level 2 attainment rate			
True total	63,000	65.6	20.3

All counts are randomly rounded to the nearest 500 and cell sizes of less than 500 have been supressed (S).

Source: Census and Ministry of Education

Ministry of Education administrative data identifies 53,500 students in the 11 to 18 age group as

of Māori ethnicity. When data from these students is matched to the Census we find that 50,500 of them also record Māori ethnicity in the Census. However, there are another 9,500 students aged 11 to 18 who identify as Māori in the Census but are not recorded as Māori in the Ministry of Education administrative data. When both data sources are combined, the total number of students aged 11 to 18 identifying as Māori in either or both data sources rises to 63,000.

Students recording Māori ethnicity in only one dataset have different average educational outcomes from those recording ethnicity consistently in both datasets. Of particular interest is the fact that census-only Māori students have higher average attainment rates for NCEA level 2 (68.7 percent) than the average for all Māori students currently recorded in the Ministry of Education's data (65.1 percent). The net effect is that when we look across all students who identify as Māori in either the Ministry of Education or census datasets, not only do we end up with a larger total pool of Māori students (63,000 compared to 53,500) but we also find a higher average NCEA level 2 attainment rate (65.6percent comparted to 65.1 percent).

The same pattern is repeated with respect to University Entrance rates. Ministry of Education data shows a 19.9 percent attainment rate for University Entrance among Māori students. However, when we look at students identifying as Māori in the Census but not in Ministry of Education data, we find that this sub-group has a University Entrance attainment rate of 22.5 percent. If we combine this data to obtain a University Entrance rate for all students identifying as Māori in either dataset, we find that the total University Entrance rate for Māori students is 20.3 percent rather than 19.9 percent.

Māori identity signature and educational attainment

The Māori identity signature clusters reveal significant variation in educational outcomes between different parts of the Māori student population. Table 15 below shows a range of different educational outcome measures for the six clusters. The best performing groups in terms of attainment of NCEA level 2 are found in the Kākāriki cluster (68.1 percent) as well as the Kōwhai cluster (68.2 percent). The Karaka cluster also have relatively high NCEA level 2 attainment rates (67.4 percent). In contrast, the Kahurangi cluster, the Waiporoporo cluster, and the Whero cluster have lower attainment rates (64 percent, 57.6 percent, 65.8 percent). The gap between the Kākāriki group and the Waiporoporo group is relatively wide at 10.5 percentage points. For reference, the difference between Māori NCEA level 2 attainment rates and the New Zealand average for NCEA level 2 attainment at age 18 is only 9.7 percentage points.

Table 15. Selected educational outcomes by Māori Identity Signature Group

Outcome		Kahurangi No.	Kahurangi %	Karaka No.	Karaka %	Whero No.	Whero %	Kōwhai No.	Kōwhai %	Waiporoporo No.	Waiporoporo %	Kākāriki No.	Kākāriki %
University Entrance													
	No	8500	81.7	15000	78.0	12000	81.0	8000	79.7	6500	80.3	4500	76.2
	Yes	2000	18.3	4500	22.0	3000	19.0	2000	20.3	1500	19.7	1500	23.8
NCEA Level 2													
	No	3500	36.0	6500	32.6	5000	34.2	3000	31.8	3500	42.4	2000	31.9
	Yes	6500	64.0	13000	67.4	9500	65.8	7000	68.2	4500	57.6	4000	68.1
NCEA level													

0	2000	21.7	3500	17.3	2500	18.4	1500	14.1	2000	25.6	1000	20.7
1	1500	14.3	3000	15.4	2500	15.8	2000	17.7	1500	16.8	500	11.2
2	3500	32.4	7000	35.6	5500	36.6	3500	37.4	2000	26.6	2000	30.0
3	3000	31.2	6000	31.6	4500	29.2	3000	30.4	2500	30.6	2500	38.2
School leaver age												
15	1000	7.9	s	s	500	4.4	s	s	500	6.5	s	s
16	2000	21.0	4500	23.3	3000	19.0	1500	14.0	2000	23.1	1000	20.1
17	4000	38.7	7500	38.7	6000	41.7	4000	38.9	2500	32.6	2000	35.8
18	3000	29.2	6500	32.1	4500	30.3	4000	38.4	2500	32.2	2000	35.2
19	s	s	500	3.2	500	3.4	s	s	s	s	s	s
Expected Percentile (mean)												
		29		34		33		36		30		33

All counts are randomly rounded to the nearest 500 and cell sizes of less than 500 have been supressed (S).

Source: Te Kupenga and Ministry of Education

The same broad pattern of achievement across the clusters is also found when measures other than NCEA level 2 attainment are used. Using University Entrance, the group performing best is the Kākāriki group with 23.8 percent attaining University Entrance. The Karaka group also does well (22 percent with University Entrance). Although performing well in terms of NCEA level 2 attainment, the Kōwhai cluster does less well in terms of University Entrance (20.3 percent) with rates similar to that of the Waiporoporo group (19.7 percent) and only a little ahead of the Whero (19 percent) or Kahurangi clusters (18.3 percent). Section 5 examines the relationship between cluster and educational outcomes in more detail and identifies the distinct impacts on educational attainment of differences in education and socio-economic outcomes between clusters as opposed to the pure impact of student cluster.

5 MODELLING THE IMPACT OF CULTURE ON EDUCATION

The Ngā Tamariki o Te Kupenga dataset provides a rich descriptive picture of the Māori student population in New Zealand schools. This shows important differences in the makeup of the Māori student population in different parts of New Zealand and in the educational outcomes for students with different levels of Māori cultural identity and connection. However, the dataset has the potential to provide more than just a descriptive picture of who Māori students are. It can also be used to examine how culture interacts with student outcomes and the schooling system. Importantly, it provides an opportunity to look at whether different policy interventions impact on students with different levels of Māori cultural identity and engagement in different ways.

In this section of the report we combine the student and household elements of the Ngā Tamariki o Te Kupenga dataset with information on school characteristics to investigate the drivers of educational attainment in Māori students. The analysis follows the general structure of the Ngā Tamariki o Te Kupenga dataset. A baseline model is estimated first capturing information on the student and the standard social and economic characteristics of the household. This serves as a reference for interpreting the subsequent models and also as a test that the modelling approach is producing sensible output.

In the subsequent phases of the analysis household cultural characteristics (Māori Identity Signature), and a number of different school characteristics are added to the model. In particular, the provision of Māori medium education, the proportion of Māori teachers in a school, the proportion of Māori students in a school, and the provision by the school of subjects relevant to Te Ao Māori (field Māori) are examined. This provides the basis for an understanding of how these different school characteristics affect the educational attainment of Māori students. The final phase of the modelling examines the interaction between the Māori Identity Signature of students and school characteristics to establish whether school characteristics impact on students with different cultural backgrounds in different ways.

Two measures of educational attainment are used in the modelling. The first of these is attainment of NCEA level 2. NCEA level 2 attainment is the standard measure used in New Zealand for upper secondary school attainment and is used as the basis for international comparisons (e.g. OECD, 2017, p201). However, as a measure of education attainment, NCEA level 2 has some drawbacks in that attainment contains little information about the range of subjects taken or level of achievement. To address this attainment of University Entrance is used as an additional outcome measure in the modelling. The requirements for University Entrance involve not only attainment of a minimum number of NCEA credits, but also requirements that those credits include specific minimums relating to mathematics and English. Although neither outcome measure is perfect, taken together they provide a richer picture of student outcomes than either does on its own.

The presentation of the modelling results in this section is intended to be non-technical and focuses on the odds ratios for attaining NCEA level 2 and University Entrance rather than describing the technical details of the models. The odds ratios are calculated from the models and are a measure of the effect size associated with a specific treatment or event. They tell us how many times better the odds of an outcome occurring in one group are than in another group. For example, an odds ratio of 2 associated with NCEA level 2 attainment for female students would mean that the odds of a female student attaining NCEA level 2 were twice those of a male student with otherwise similar characteristics. If 2 male students attained NCEA level 2 for every 1 that failed (odds of 2:1), then an odds ratio of 2 for female students would imply that 4 female students attain NCEA level 2 for every one that fails (odds of 4:1). An odds ratio of 1 implies that the measure in question has no effect on educational attainment.

For those with an interest in the technical details of the modelling, full regression output is

presented in annex 2. Box 5 below provides a descriptive overview of the specific modelling strategy adopted.

Box 5. Modelling strategy

The two outcome measures used in this analysis – NCEA level 2 and University Entrance – are binary. For this reason, a logistic regression is used to model the outcomes. In a logistic regression the model estimates the logarithm of the odds of an outcome occurring and the coefficients represent the logarithm of the odds ratio associated with the independent variable. In presenting the analysis graphically throughout the rest of this chapter we use the odds ratio associated with each independent variable (determinant of educational attainment) as this is easier to understand and is simple to calculate from the logistic regression coefficients.

Because the Ngā Tamariki o Te Kupenga dataset is based on survey data it is also necessary to take this into account in the modelling. Clustering during the survey process means that output from a logistic regression may be biased unless the sampling characteristics of the survey are considered. To reflect this, the analysis estimates the logistic regression with replicate weights to account for sample design using jackknife estimation.

The models for both NCEA level 2 attainment and University Entrance attainment take essentially the same form:

$$\log \frac{P_A}{1 - P_A} = \beta_0 + \beta_1 D + \beta_2 C + \beta_3 S + \beta_4 C.S + \epsilon$$

Where P_A is the probability of attaining a specific educational outcome (NCEA level 2 or University Entrance), D is a vector of demographic, social, and economic measures for the student, C is the Māori identity signature of the student, S is a vector of school characteristics, and ϵ is the error term.

For each outcome the analysis starts by estimating a model containing only D as an independent variable (the baseline model) and then progressively adds C (household cultural characteristics), and S (school characteristics). The final part of the modelling – C.S – considers the interaction between household cultural characteristics and school characteristics. This provides a test as to whether different school characteristics affect students with differing cultural backgrounds in different ways.

5.1 The baseline model

The baseline model of educational outcomes estimates the impact of demographic and socio-economic characteristics on educational attainment and does not consider the impact of culture or school characteristics. From a demographic perspective the model considers the student's gender and whether they identify as Pacifica or European alongside having Māori ethnicity. The socio-economic drivers of educational attainment considered in the model include the highest qualification of the student's mother and father, household income, and history of benefit receipt in the household. In the case of NCEA level 2 attainment household crowding is also included in the model, but this was dropped from the University Entrance model when it proved not to be statistically significant. The baseline model also includes a measure of small area deprivation (NZDEP quintile) which captures the average level of deprivation in the area in which the respondent lives.

Finally, the model includes an education variable flagging whether the respondent has ever been in receipt of any sort of special educational assistance or has faced significant disciplinary actions[14] over the course of their school career (such as being suspended). Because the flag for special educational assistance and/or disciplinary proceedings is likely to be very strongly

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[14] Ideally learning support and disciplinary proceedings would be measured separately. Here, because of the small numbers involved, they are combined into one variable.

associated with poor outcomes, it might be argued that it should be excluded from the model as it risks confounding the impact of school characteristics when these are introduced. In fact, the reverse is likely to be the case. The education flag applies to the student's whole school career from year 1 through to when the leave school. In comparison, the educational outcomes considered here relate to the final school that the student attended and attainment at years 12 and 13. Hence the flag for special education mostly captures information about the student's characteristics before interaction with the school at which they studied for NCEA and University Entrance.

Figure 15 below presents odds ratios from the baseline model for attaining NCEA level 2 and for attaining University Entrance (UE). For small area deprivation (NZDEP), household crowding, household income, and parent's education, the chart shows only selected categories. For example, for NZDEP the odds ratio is shown for the 5th (most deprived) quintile relative to the 1st (least deprived) decile. Ratios for the remaining categories for each of these variables are presented in annex 2.

It is clear from figure 15 that parental education is associated with a large increase in the odds of educational attainment at both NCEA level 2 and at UE level. Where the mother's educational attainment is generally more important for NCEA level 2 outcomes, it is the father's educational attainment that is associated with a larger impact for UE. High household income, low household crowding, and reporting a European ethnicity in addition to Māori are also associated with higher odds of educational attainment.

In contrast, being male as opposed to female, living in a deprived area, proportion of time on benefit before the age of 15, and having received special education and/or disciplinary action are associated with reduced odds of attaining both NCEA level 2 and UE. The effect of the flag for special education/discipline suggests a particularly strong effect, which is unsurprising given the nature of the flag. Only one of the odds ratios shown in figure 15 is not significantly different from 1 (i.e. no effect), which is the impact of a Pacifica ethnicity on UE.

Figure 15. Baseline model: odds ratios for attaining NCEA level 2 and University Entrance.
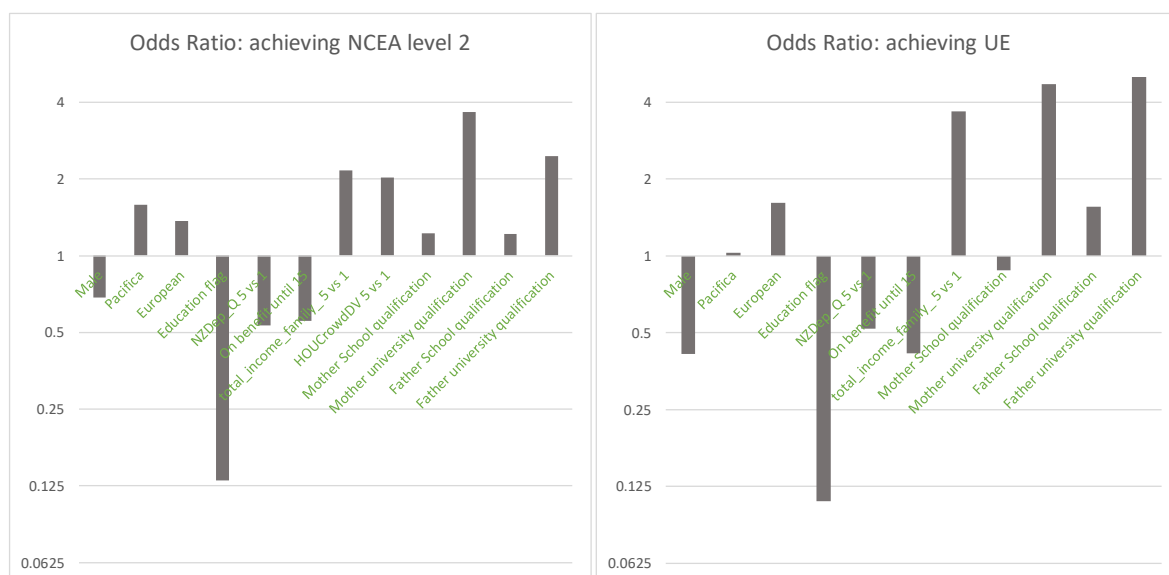
Source: Te Kupenga and Ministry of Education

The standard measures of how well the models fit the underlying data (goodness of fit) show that the proposed models work well and that both the model as a whole and each independent variable are significant for both NCEA level 2 and UE. Using max-rescale R^2 (Nagelkerke, 1991), the models account for 25.7% (NCEA level 2) and 29.7% (UE) of total variance in outcomes.

These formal measures combined with the fact that all of the odds ratios are in the intuitive direction (e.g. high parental education is associated with higher odds of achieving NCEA level 2 or UE) provides some comfort that the proposed model functions well.

5.2 Household cultural characteristics

The analysis of Māori identity signatures and student educational outcomes in chapter 4 showed that the Māori identity signature (cluster) of a student was associated with differences in educational attainment in terms of both NCEA level 2 and UE. This association, however, is almost certainly partly due to differences in average household income and parental education between students in different clusters. Information on average differences between households with different Māori identity signatures is important. For example, differences in parental education between households of different Māori identity signatures may be an important way in which cultural identity affects outcomes. However, it is also interesting to know what the unique effect of culture is on educational attainment after controlling for socio-economic differences.

Figure 16 below builds on the baseline model by adding in each of the Māori identity signatures. The Karaka group forms the reference category for Māori identity signatures and is hence omitted (by definition it will have an odds ratio of 1). Looking across the other five categories it is possible to see that there are noticeable differences in the odds ratios associated with different Māori identity signatures even after controlling for demographic and socio-economic outcomes. Only the Kahurangi group (for NCEA level 2) and the Waiporoporo group (for UE) that are not statistically significant, although the odds ratios for Kōwhai and Waiporoporo (NCEA level 2) are significant but very close to 1.

Figure 16. Household cultural environment: odds ratios
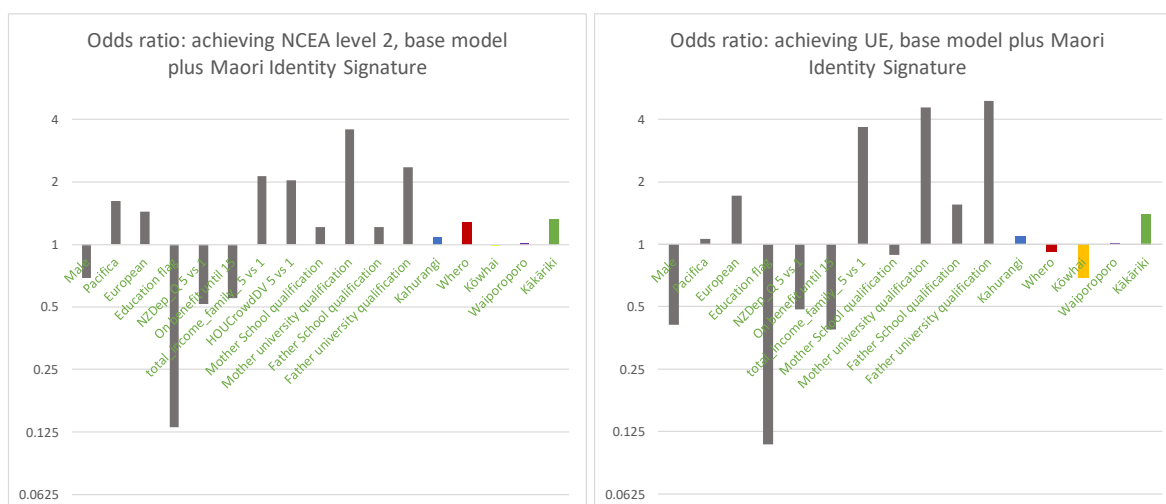
Source: Te Kupenga and Ministry of Education

Students from the Kākāriki group have significantly higher odds ratios at both the NCEA level 2 and UE level implying that, after controlling for demographic and socio-economic outcomes, students from the Kākāriki group have odds of educational success on these measures that are roughly 1.5 times higher than the Karaka group. This effect size is relatively large, being roughly the equivalent to the impact of having a father with a school qualification compared to a father with no school qualification.

Beyond the Kākāriki group, it is interesting to note that the Whero group have a relatively high odds ratio at NCEA level 2, but a ratio below 1 at UE. Both are significant, suggesting that being from the Whero group is, after controlling for other factors, associated with a higher probability of attaining NCEA level 2, but a lower probability of attaining UE. A similar, but more extreme pattern is found for the Kōwhai group who have essentially the same probability as the reference group (Karaka) for attaining NCEA level 2 but are less likely to attain UE by some margin with an odds ratio of 0.69.

Introducing the Māori identity signatures into the model is interesting in its own right, but is also important as a precursor to looking at the impact of school characteristics on educational attainment. There is wide variation between the Māori identity signatures with respect to

engagement with Māori medium education. Without controlling for cultural group any analysis of school characteristics risks conflating the impact of factors such as Māori medium education with the impact of students living in a household with high levels of cultural capital. The Kākāriki group, for example, are characterised by high levels of cultural capital and high rates of engagement with Māori medium education and it is necessary to control for the former in order to examine the impact of the latter.

5.3 School characteristics and educational attainment

From a policy perspective the impact of school characteristics on educational attainment is of the highest interest. Where many of the factors that impact on student outcomes – such as parental education – are unable to be directly affected by education policy in anything less than an intergenerational context, the Ministry of Education has considerable leverage over what happens in schools.

Four school characteristics were investigated in the modelling (figure 17 below). These were whether the school offered Māori medium education (I), the percentage of teaching staff who were Māori (II), the percentage of the student body who were Māori (III), and whether the school offered subjects falling within the broad area of field: Māori (IV – te reo Māori, te reo rangātira, and other courses related to tikanga Māori). These characteristics were added sequentially to the model, starting with Māori medium education. The odds ratios for the Māori identity signatures are included in figure 17 along with the school characteristics as these change slightly when compared to figure 16. Odds ratios for the socio-economic and demographic factors in the baseline model are not reported below as they did not change much with the addition of school characteristics, but were included in the model.

Several points emerge from figure 17. First, for both NCEA level 2 and UE, attending a school providing Māori medium education[15] is associated with increased odds of educational attainment. Controlling for all the socio-economic and demographic outcomes in the baseline model plus the Māori identity signatures, the odds of attaining NCEA level 2 are 1.29 times higher for students attending a school that provides Māori medium education and the odds of attaining UE are 1.44 times higher. Including Māori medium education does not eliminate – or even substantially reduce – the favourable odds of educational attainment associated with being in the Kākāriki cluster indicating that the positive outcomes for this group are not driven by engagement with Māori medium education.

Figure 17. Impact of school characteristics on educational outcomes: odds ratios
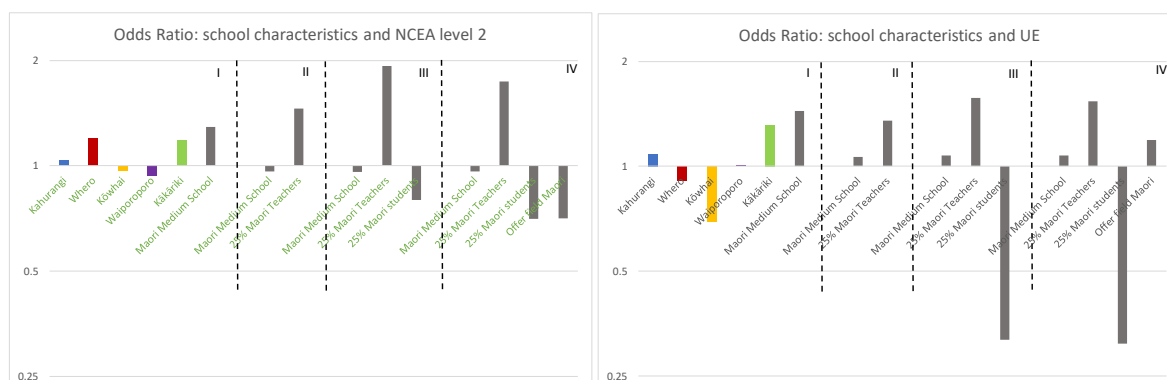
Source: Te Kupenga and Ministry of Education

When the proportion of the teaching staff that are Māori are added to the model (II), the odds ratio for Māori medium education falls. In the case of NCEA level 2 there is no longer a significant

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[15] A Māori medium school is defined here as a school of special character focusing entirely on Māori medium education such as Kura kaupapa Māori or a school that includes both Māori medium classes and classes with English as the language of instruction.

improvement in odds associated with Māori medium education once the percentage of Māori teachers are accounted for, while for UE Māori medium education continues to be associated with higher odds of success, but at a lower level than was the case without accounting for Māori teachers (odds ratio of 1.06 as opposed to 1.44). The effect of Māori teachers on student outcomes, however, is strongly positive at both NCEA level 2 and UE. A school with 25 percent of the teaching body Māori is associated with an odds ratio of 1.46 for NCEA level 2 and 1.35 at UE compared to the outcomes for students at a school with no Māori teachers.

These results are intriguing in that they suggest that one of the main mechanisms by which Māori medium education leads to good educational outcomes for Māori students is through having a teaching body that includes a relatively high proportion of Māori teachers. Because of the potential policy implications of this result it is investigated further in section 5.4.

Adding the percentage of Māori students in the school results in an increase in the effect size for Māori teachers while the estimated effect for Māori students is negative. This result holds for both the NCEA level 2 and UE outcomes, although the effect is stronger for UE. Peer effects of this sort are well documented in the academic literature (e.g. Van Ewijk & Sleegers, 2010), although the exact causal mechanism is not understood. With the data available to this study it is not possible to control for the average level of educational attainment at the school, and it may be that a high proportion of Māori students is proxying for lower peer attainment in general simply because of the ethnic gap in education outcomes. The increased effect size for Māori teachers when Māori students are included in the model is such that a student in a school with an equal percentage of Māori students and Māori teachers is better off when the percentage of both is higher rather than lower.

The final aspect of school characteristics included in the model was whether the school offered subjects in field: Māori. In contrast to the other school characteristics examined, the impact of field: Māori differed strongly for NCEA level 2 and UE. At NCEA level 2, a student attending a school offering field: Māori is associated with slightly poorer odds (0.71) of attaining NCEA level 2 than one who does not. However, at UE this result is reversed. A student attending a school offering field: Māori has higher odds (1.19) of attaining UE than one who does not.

It is difficult to know how to interpret the results associated with field: Māori. One possibility is that field: Māori is correlated with the proportion of Māori teachers in the school, and that the observed results are therefore biased. However, this remains an area where further investigation might potentially be rewarding.

## 5.4 Māori teachers, student cultural characteristics, and language of instruction

One of the most interesting findings from the modelling of school characteristics is the large positive impact that Māori teachers have on the educational outcomes of Māori students. While consistent with findings from elsewhere in the world (Fairlie, Hoffmann, & Oreopoulos, 2014, Gershenson et al, 2018), the magnitude of the impact and its potentially large role in the success of Māori medium education means that the finding warrants further investigation. Two questions, in particular, are worth examining. First, does the ethnicity of the teacher have a larger impact on students with some Māori identity signatures more than others. This is important, because it potentially provides guidance as to which communities will benefit most from the expansion of Māori medium education and may be useful for targeting the location of new Māori medium education units either within existing schools or as new institutions.

The second important question relates to the impact of Māori teachers on Māori students not in Māori medium education. The effect of the proportion of Māori teachers on the effect size associated with Māori medium education found in section 5.3 suggests that one important reason Māori medium education works may be due to a higher proportion of Māori teachers in the classes. However, given that the majority of Māori students in New Zealand are not in Māori medium education, an important question is whether improving the ratio of Māori teachers in

English medium education would be equally effective.

Figures 18 and 19 below illustrate the interaction between the student's Māori identity signature and the percentage of Māori teachers in the student's school. Each figure presents (on the vertical axes) both the odds ratio for failing to achieve NCEA level 2 (figure 18) or UE (figure 19) and the odds ratio for achieving the relevant outcome[16]. The comparison point for the odds ratio is a student belonging to the Karaka Māori identity signature group who has no Māori teachers in their school. Each line in figures 18 and 19 illustrates how this ratio changes for a different Māori identity signature group. This horizontal axis has been truncated at 70% Māori teachers as the sample contains very few observations with quantities greater than this.

Figure 18. Māori Identity Signature and teacher ethnicity: odds ratios for NCEA level 2
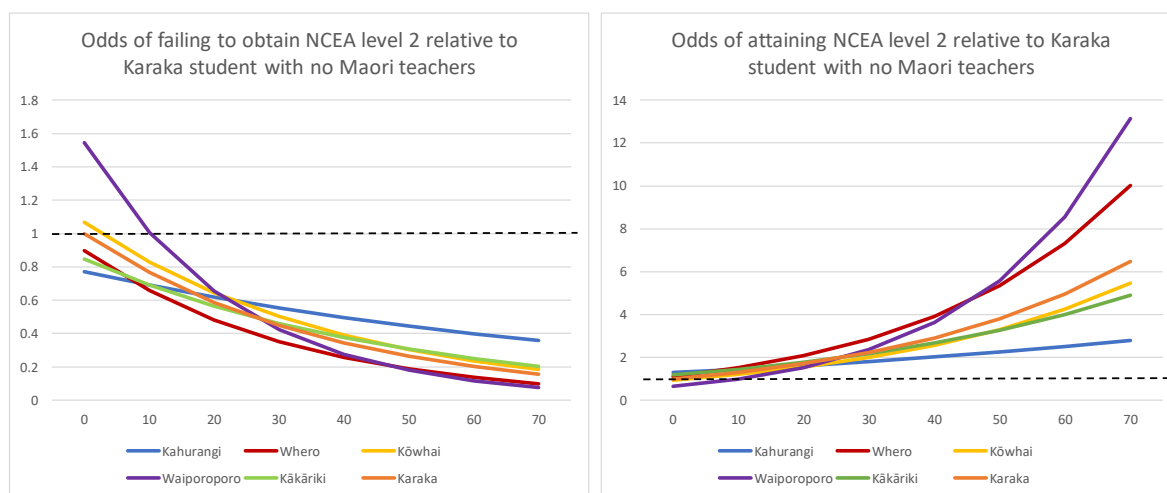
Source: Te Kupenga and Ministry of Education

Two clear points emerge from figures 18 and 19. The first is that Māori teachers are more important for all students. The higher the proportion of Māori teachers, the lower the probability of failure to attain NCEA level 2 or UE. This supports the view that the presence of Māori teachers in the school improves the outcomes for Māori students.

However, a second point is also visible in figures 18 and 19. Some Māori identity signature groups benefit more from being in a school with a high number of Māori teachers than others. In particular, the Waiporoporo group benefits very strongly from increases in the proportion of Māori teachers both at NCEA level 2 (figure 18) and UE (figure 19). In both instances the effect is such that the Waiporoporo group moves from having the lowest probability of educational attainment in schools with no Māori teachers to the group with the highest probability in schools with more than half Māori teachers.

No other group is affected as strongly as the Waiporoporo group, but several other Māori identity signatures also show interesting response patterns. At NCEA level 2, the Whero group improves more than proportionately as the percentage of Māori teachers increases, while the Kahurangi group is relatively less sensitive than other groups. This remains true for the Kahurangi group at UE, where it is also joined by the Whero and Kōwhai groups. In contrast, the Kākāriki group, which is relatively less sensitive to the proportion of Māori teachers at NCEA level 2, is one of the more sensitive groups at UE.

Some of these patterns can be explained fairly easily. The Kākāriki group, for example, already attains NCEA level 2 at fairly high rates, so the marginal impact of Māori teachers shows up more strongly at UE where there is a greater proportion of students at the margin for whom the

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[16] Although the two ratios presented (failing vs achieving) are simply the inverse of each other, presenting both makes it clearer what is happening at each end of the spectrum with respect to the proportion of Māori teachers.

presence of Māori teachers might make a difference. In the case of Whero, the opposite may be true. Rates of NCEA level 2 attainment are intermediate, and teaching may make a difference. However, relatively few Whero students go on to attain UE and those who do are likely to be systematically different from other students in that group.

Figure 19. Māori Identity Signature and teacher ethnicity: odds ratios for University Entrance
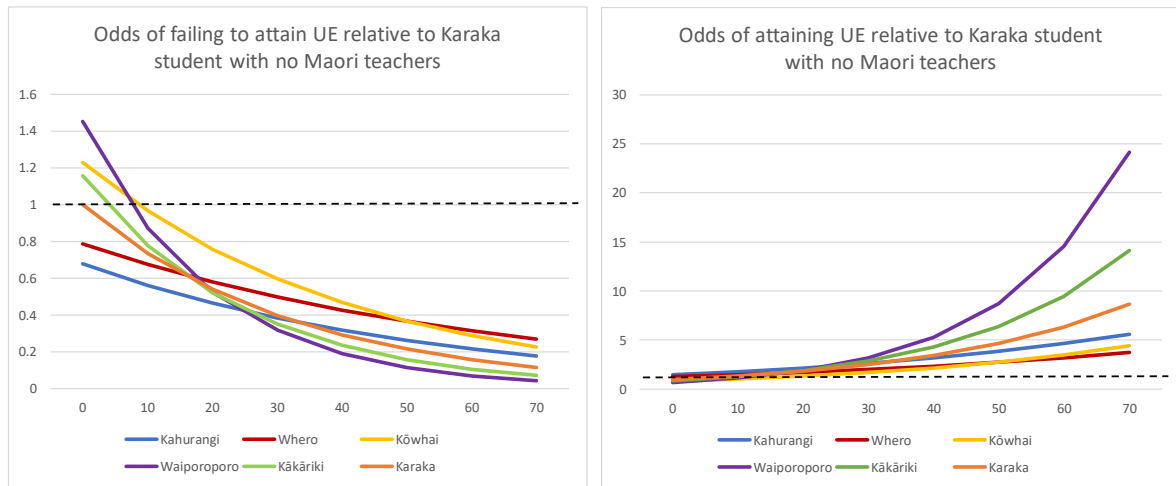
Source: Te Kupenga and Ministry of Education

Variation in the response of different Māori identity signatures to Māori teachers has potentially important policy implications. In particular, the strong response of the Waiporoporo group suggests that communities where this group is well-represented are a strong candidate for investment in Māori teachers and Māori medium education. The fact that Whero and Kākāriki also benefit disproportionately (although less so than Waiporoporo) could also be used to guide investment.

Figures 20 and 21 investigate whether the percentage of Māori teachers has a similar impact in Māori medium schools and in English medium schools. The charts show the odds of failing (left hand side) and succeeding (right hand side) in achieving NCEA level 2 (figure 20) and UE (figure 21). Each chart shows two lines capturing the impact on students in Māori medium education and on students in English medium education as the percentage of Māori teachers rises.

Figure 20. Māori medium education and teacher ethnicity: odds ratios for NCEA level 2
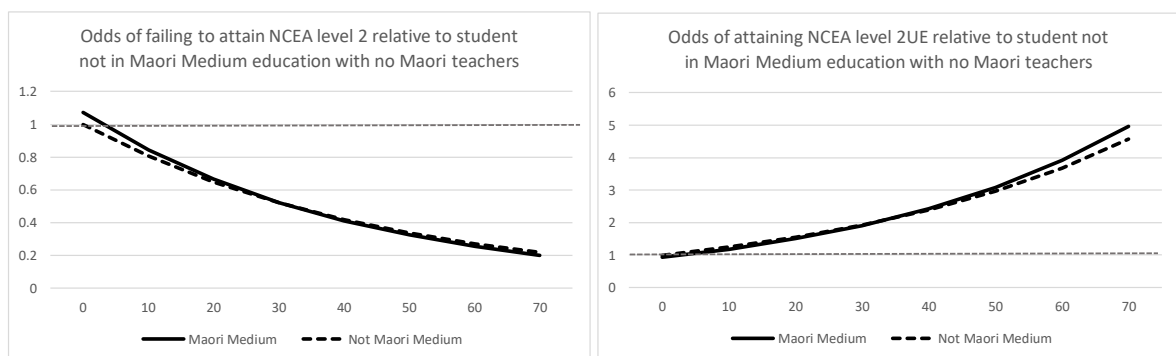
Source: Te Kupenga and Ministry of Education

It is evident in figure 20 that there is little difference in the impact of Māori teachers between Māori medium and non- Māori medium schools. Although the lines for Māori medium and not Māori medium have marginally different slopes, the absolute magnitude of the difference in outcomes between the two lines is very small over the entire range of different levels of Māori teachers. This indicates that the impact of Māori teachers on student outcomes at NCEA level 2 is not substantively different between Māori medium and English medium schools.

Figure 21. Māori medium education and teacher ethnicity: odds ratios for UE

Source: Te Kupenga and Ministry of Education
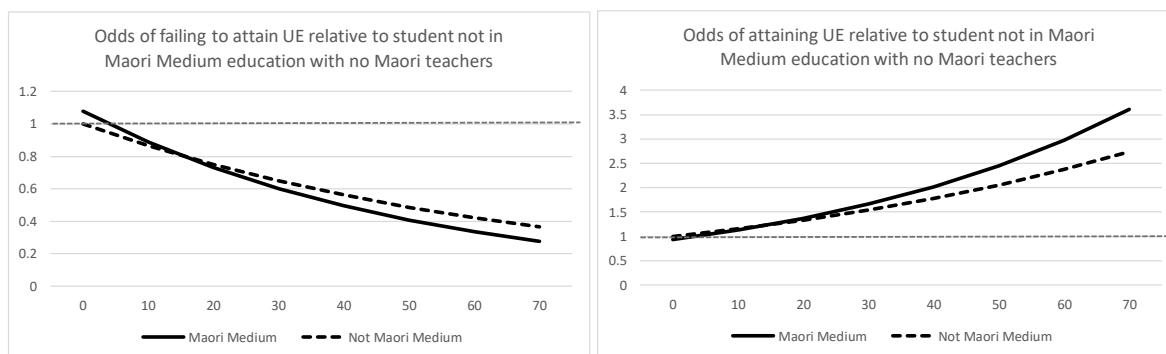
Figure 21 shows a slightly larger difference in the slope of the Māori medium and not Māori medium lines for student UE outcomes. Students in Māori medium education appear to benefit more from the presence of Māori teachers in respect to UE than do students in English medium education. This effect is particularly apparent in the odds ratios for higher proportions of Māori teachers. However, even here the magnitude of the difference between Māori medium and not Māori medium education is not large in absolute terms.

Taken together figures 20 and 21 suggest that Māori teachers are important for the educational outcomes of Māori students. The fact that this effect holds for both for students in Māori medium education and those not in Māori medium education is also important as it suggests an avenue for improving educational attainment in communities or schools where establishing a Māori medium unit or school is not feasible.

5.5 Limitations of the modelling

The opportunities provided by the Ngā Tamariki o Te Kupenga dataset to better understand Māori educational outcomes are significant. The key findings presented earlier in this section are both plausible and supported by similar studies in other countries. However, it is also important to be clear about the limitations of the modelling presented here. Four limits are particularly worthy of attention:

- Endogeneity
- Sample size
- Omitted variables
- Timeframe and modelling resource

Endogeneity

While the modelling attempts to control for as many confounding factors as possible, there are still some caveats with respect to whether it is possible to ascribe the highest level of confidence to the causal impact of Māori education and Māori teachers on student outcomes. In particular, there is a risk that families committed to Māori medium education are systematically different to those that do not in ways that are not directly observable in the data and hence cannot be controlled for. One approach that would strengthen the evidence for causality in this area would be to use distance to the nearest Māori medium education school as an instrument since Māori medium schools are unevenly distributed across New Zealand and residency choices are less flexible than decisions around which school to attend within a given area. The data for this analysis is in the Ngā Tamariki o Te Kupenga dataset, but it has not yet been fully analysed.

Sample size

A key constraint with the model is the size of the Ngā Tamariki o Te Kupenga dataset. In particular, the school leavers dataset used for modelling has a sample size of 1683. While this is enough to allow for meaningful analysis, it does mean that some parts of the modelling are based

on relatively few observations. This is particularly the case for the analysis of outcomes for Māori medium education or high proportions of Māori teachers (more than 50 percent), particularly when these are interacted with the Māori identity signatures. While all results reported in the analysis are statistically significant (most at the $p<0.0001$ level), the dependence of some results on a relatively small group of respondents should be kept in mind.

Omitted variables

The Ngā Tamariki o Te Kupenga dataset is, compared to most analyses of education outcomes in New Zealand, comparatively rich. However, it is certain that there are variables impacting on educational outcomes that are not available within the dataset. This is highlighted by the pseudo-R^2 for the models, which suggest that the available variables account for roughly between a quarter and a third of total variance. Two variables in particular would add significantly to the analysis. The first is the average outcomes in NCEA level 2 and UE for the schools in the dataset. This information is available and could be incorporated into the Ngā Tamariki o Te Kupenga dataset with little trouble. Such data would help gain a better understanding of the effects associated with the proportion of Māori students in the school.

A more difficult gap to fill is the fact that cultural outcome measures – and hence the Māori identity signature of the student – are based off the response of one adult in the household only. In the majority of cases this is not the student. A more accurate picture of the interaction between the student's cultural identity and connection and the school system would ideally include information both on the student's Māori identity signature and those of all other adults in the household. However, it should be noted that the bias here will tend to be to underestimate any links between culture and educational outcomes, not over-estimate them.

Timeframe and modelling resource

The final major limitation associated with the analysis in this report derives from the available timeframe and modelling resource for investigating the Ngā Tamariki o Te Kupenga data. On the one hand, the dataset is exceptionally rich, implying that there are a very wide range of potentially useful opportunities for analysis. On the other hand, assembling the data required a significant investment in time and resource, competing directly with that available for modelling. As a result, the modelling reported here falls short of investigating many promising or useful analyses.

These resource-driven limitations fall into two categories. The first consists of additional analyses in support of the models reported here that would increase confidence in the findings. The use of data on distance to Māori medium education as an instrumental variable discussed above under endogeneity is an example of this. The second set of limitations relate to potentially interesting questions that there was simply not time to examine (e.g. the impact of language of instruction or average school outcomes). A number of the most relevant of these opportunities for further analysis are discussed in the conclusion under next steps.

6 CONCLUSION

Ngā Tamariki o Te Kupenga was intended to enable a better understanding of the diversity of Māori students and how this impacts on Māori educational attainment. Conceptually, this project breaks down into three main elements: the dataset, measuring cultural outcomes, and modelling culture and education. Each of these three elements is distinct, although the success of the latter two is dependent on the success of the first. The discussion in this section considers the main findings from each of these three elements in turn, before moving on to discuss further uses for the Ngā Tamariki o Te Kupenga dataset. Box 6, below, provides a short summary of the main findings of relevance from a policy perspective.

Box 6. Policy Implications

The primary reason for commissioning Ngā Tamariki o Te Kupenga was to provide insights that would support education policy making and contribute to improving educational outcomes for Māori students. Similarly, the rationale behind the Te Kupenga survey in the first place was driven by the idea that better information on diversity within the Māori population would lead to better outcomes. It is therefore useful to reflect on the major policy implications from the project. Six key findings are highlighted here.

Ministry of Education data does not identify all Māori students as Māori

Linking Ministry of Education data with Te Kupenga and Census data provided a second source of student ethnicity to supplement the measure already within the Ministry's administrative data. This showed that approximately 10 percent of students who are reported as of Māori ethnicity in the Census are not identified as of Māori ethnicity to the Ministry of Education. These students do better academically than the average for Māori students in the Ministry's data, implying that Māori educational attainment is underestimated by the administrative data by about half of a percentage point for NCEA level 2 (65.1 percent compared to an actual value of 65.6 percent).

We can identify different sub-groups of the Māori student population with different needs

Cluster analysis identifies six different Māori identity signatures which provide profiles of different groups within the Māori population based on cultural identity and connection across five different dimensions of Māori culture. These groups have quite different profiles, outcomes, and needs. The Karaka group for example, has little engagement with Māori culture and members do not identify strongly as feeling Māori. In contrast, the Kākāriki group are strongly engaged with all dimensions of Māori culture. Understanding the composition of the Māori student population in a region can potentially assist with building a better picture of the likely needs of the population and what sort of policy approaches will work.

Māori medium education has a positive impact on student outcomes

Attending a school offering Māori medium education is associated with higher attainment rates of between a quarter (NCEA level 2) and a third (UE) after controlling for the impact of student, parental, and household characteristics.

Māori teachers are a major reason why Māori medium education contributes to stronger educational outcomes

The proportion of Māori teachers in a school mediates the impact of Māori medium education. Much of the improvement in outcomes associated with Māori medium education appears to be associated with these schools having a higher proportion of Māori teachers. While the analysis does not indicate why this should be the case, this finding is consistent with findings from other countries showing that the ethnicity of the teacher matters for the educational outcomes of minority students.

> **The Waiporoporo group and – to a lesser degree the Whero and Kākāriki groups – benefit disproportionately from Māori teachers.**
>
> Three of the Māori identity signature groups identified in the analysis benefit disproportionately from Māori medium education and exposure to Māori teachers. While all of the six Māori identity signature groups do better with a higher proportion of Māori teachers, the Waiporoporo, Whero, and Kākāriki groups show a particularly large change in student outcomes. For the Waiporoporo group – who appear to have often had some exposure to Kōhangā Reo – this impact is particularly large. Areas with a high concentration of students in the Waiporoporo group may be good areas to target for the expansion of Māori medium education.
>
> **Māori teachers benefit Māori students not in Māori medium education almost as much as those in Māori medium education**
>
> Analysis of the outcomes for students not in Māori medium education shows that the impact of Māori teachers on student outcomes is almost as large for this group as it is for students in Māori medium education. This suggests that focusing on the recruitment and retention of Māori teachers may make a positive impact on educational attainment for Māori students in areas where Māori medium education is either not possible or not desirable due to lack of resources or demand.

6.1 The dataset

At the core of the Ngā Tamariki o Te Kupenga project was the construction of a dataset combining information from Te Kupenga, the Ministry of Education, and the IDI that painted a picture of the student, their home environment, and their school. In particular, by drawing on Te Kupenga it was possible to produce a detailed picture of the cultural environment in the home for Māori students. When combined with information about the student, their school, and more conventional measures of household social, demographic, and economic characteristics for the student, this enables analysis of the interaction between culture and education that has never before been possible.

The construction of the Ngā Tamariki o Te Kupenga dataset proved to be relatively straight forward. Because Te Kupenga is a post-Census survey, the process of linking Te Kupenga records to Census records in the IDI is relatively straight forward and encountered negligible issues with the linkage rate. Since the Census is one of the key elements of the IDI spine it was therefore also relatively straight forward to bring student data from the Ministry of Education into the dataset. This student information, in turn, was relatively easy to link to school records.

The resulting dataset, however, is more than the sum of its parts. Data increases in value the more different pieces of information it is linked to, and the wider the range of measures that can be examined against each other. By linking survey data from Statistics New Zealand with administrative data from the Ministry of Education, Ngā Tamariki o Te Kupenga brings together an exceptionally wide range of different types of measure.

One important insight from bringing these different datasets together relates to the differences revealed between the ethnicity of Māori students in the Ministry of Education's data and the ethnicities recorded in Census data. The 10 percent of students who are identified as of Māori ethnicity in the Census but not to the Ministry of Education are interesting for two reasons. First, because they differ systematically from other Māori students. Including these students when assessing educational outcomes for Māori students increases the Māori NCEA level 2 attainment rate from 64.8 percent to 65.5 percent. However, this group is also interesting because it demonstrates the value of confronting administrative data with survey data. Neither dataset on its own could have revealed the mismatch between the two in terms of ethnic identification.

6.2 Measuring cultural outcomes

Having built the Ngā Tamariki o Te Kupenga dataset, finding a way to measure cultural outcomes

was crucial to using the data effectively. The complexity and range of cultural measures contained in Te Kupenga has proved a challenge to many attempts to use Te Kupenga to understand the relationship between Māori culture and wellbeing (e.g. Statistics New Zealand, 2015). A core focus of the project was therefore to develop summary measures of engagement with and connection to Māori culture that could be more easily used to support analysis.

In developing summary measures of Māori cultural identity and connection an approach developed by Houkamau and Sibley (2010; 2011) was used as model. While proven with the New Zealand Values Survey sub-sample used for analysis, there was a risk that Houkamau and Sibley's approach would not work well with the data in Te Kupenga. In fact, the reverse proved to be true. Not only was it relatively straight forward to develop five summary dimensions of Māori cultural identity and connection, but the six Māori identity signatures that emerged from analysis of these had a high degree of commonality with Houkamau and Sibley's results. The fact that two entirely distinct datasets produce recognizably similar groupings within the Māori population is meaningful evidence of the validity of the underlying groups.

A second point supporting the validity and practical relevance of the Māori identity signature groups developed through Ngā Tamariki o Te Kupenga, is the degree to which the groups differ not only in terms of cultural identity and connection, but also in terms of demographic, social, economic, and wellbeing outcomes. The fact that household cultural characteristics from Te Kupenga are correlated with educational attainment from the Ministry of Education's administrative database is difficult to explain unless the Māori identity signatures developed from Te Kupenga's cultural data capture real information about peoples' lifestyles.

The Māori identity signature groups identified in Te Kupenga vary from between about 10 percent of the Māori population (Kākāriki) to 31 percent (Karaka). In the Māori student population, the distribution of Māori identity signatures is fairly similar, but the Whero group replaces Karaka as the largest group. Importantly, it is possible to build a picture of how the composition of the student population varies between different parts of New Zealand. The South Island, for example, is dominated by the Karaka and Whero groups, while Kākāriki and Kahurangi together make up nearly half of the Northland student population.

An important finding from looking at the Māori identity signatures is the potential role of the Karaka group in obscuring the relationship between culture and other outcomes when Māori are considered as a whole. Because the Karaka group identify as Māori when asked about ethnicity, but otherwise do not substantively see themselves as Māori, most statistical measures of Māori outcomes will include a relatively large group (up to a third) who lack connection to Māori culture but are doing relatively well. Only when this group is identified separately is it possible to see the underlying positive relationship between stronger Māori cultural identity and better outcomes in other areas (such as wellbeing or educational attainment).

6.3 Modelling culture and education

From the perspective of understanding how culture interacts with the school system to affect educational outcomes for Māori students, the modelling is the most relevant part of Ngā Tamariki o Te Kupenga. The baseline model on which the analysis of cultural and school effects is built (capturing the impact of student and household social, demographic, and economic factors only) performs well. It accounts for about a quarter of NCEA level 2 outcomes and about a third of University Entrance outcomes. The main independent variables show the expected relationship with educational attainments:

● Income and parental education have a large positive effect on educational attainment

● Deprivation and experience of benefit receipt have a large negative effect attainment

● Household crowding has a negative effect on NCEA attainment but not UE

● The presence of a flag on the administrative data for any sort of special education is associated with a large decrease in the probability of educational attainment

Moving beyond the baseline model, the Māori identity signature of the student is important to

their educational outcomes, even after controlling for all social and economic variables. This remains the case when school characteristics are introduced. However, from a policy perspective it is the analysis of Māori medium education that is most interesting.

Attending a school with Māori medium education (either sole Māori medium or mixed Māori medium/English) is associated with roughly a one third increase in the odds of attaining NCEA level 2 and UE. This effect appears to be mediated largely through the teacher: a 25% increase in the proportion of Māori teachers increases the odds of attaining NCEA level 2 and UE by about a third. At the same time, once the teacher effect is accounted for, Māori medium schools have no effect on NCEA level 2, and a much smaller effect on UE attainment. In contrast to the large impact from teachers, the effect of a school offering subjects in field Māori has no impact on NCEA level 2 attainment and only a small (c4%) effect on UE.

Two analytical outcomes are of particular interest. The first of these is the observation that some Māori identity signature groups benefit much more strongly from Māori medium education and teachers than others:

- At NCEA level 2, this is Waiporoporo and Whero
- At UE this is Waiporoporo and Kākāriki

While all groups benefit, these groups gain the most, and the impact on Waiporoporo appears potentially transformative. Students from the Waiporopro group in schools with no Māori teachers perform worse than any other group, while Waiporoporo students in schools with 30 percent or more Māori teachers perform better in terms of educational outcomes than students from any other group. One reason why the Waiporoporo group may respond so well to Māori medium education is that the group includes a very high proportion of students who have had some engagement with Kōhangā Reo, but who have not made the transition to Kura Kaupapa Māori.

The flip side of this is that the Kahurangi group is less sensitive to the impact of Māori teachers than other groups. Despite generally high levels of connection to Māori culture, the Kahurangi group responds less to the presence of Māori teachers in the school than does any other group, including the Karaka group (who largely do not think of themselves as Māori).

The second major analytical finding from the modelling relates to students not in Māori medium education. An analysis of the interaction between Māori medium education, proportion of Māori teachers, and student outcomes shows that the impact of Māori teachers on student outcomes is almost as high for students not in Māori medium education as for students in Māori medium education.

6.4 Next steps

While the analytical outcomes of the Ngā Tamariki o Te Kupenga project are of high immediate policy interest, they represent only a fraction of the analysis possible with the linked student-household-school dataset that has been constructed. In the medium to long term further analysis of this dataset has the potential to go well beyond the outcomes discussed in this report. With this in mind it is worth noting that the Ngā Tamariki o Te Kupenga dataset is every bit as much an output of the project as this report. The dataset is fully documented and can be accessed in the IDI along with the code used for the analysis reported here.

Analysis of the Ngā Tamariki o Te Kupenga dataset by other researchers – either within the Ministry of Education or externally – will inevitably consider research questions not considered here. Nonetheless, there are a number of opportunities that were identified in the process of compiling this report that were beyond the scope of the available resources to investigate. These fall into four broad groups:

- Working with variables already in the dataset
- Further investigating the Māori identity signatures

- Adding variables to the dataset
- Analysis not currently possible.

Working with variables already in the dataset

A number of measures in the Ngā Tamariki o Te Kupenga dataset were not used as extensively in the analysis as they might have been. Further analyses of these outcomes would help test some of the main conclusions around culture, school characteristics and student outcomes. Of particular interest would be the use of expected percentile as an outcome measure for modelling alongside NCEA level 2 and UE. This has the potential to provide a better understanding of the quality of educational attainment beyond the binary achieved/not achieved distinction reflected in NCEA level 2 and UE attainment.

The dataset also contains a measure of distance from the center of the meshblock where the student lives to the nearest school providing Māori medium education. This has significant potential to further strengthen analysis of the impact of Māori medium education on student outcomes. Because moving house requires significantly more effort than changing school (where there is more than one option for school), distance to Māori medium education can – to some degree – be considered autonomous. A logical piece of analysis therefore is to use distance to Māori medium education in an instrumental variable analysis for the causal impact of the provision of Māori medium education on student outcomes. It would also be possible to extend this analysis to take into account any interaction between Māori identity signature and distance to Māori medium education to test whether the relationship between outcomes for the Waiporoporo group and Māori medium education held up under a more robust model specification.

Further investigating the Māori identity signatures

While the Māori identity signatures developed for Ngā Tamariki o Te Kupenga already have strong evidence of their relevance and validity, there is additional work that could be undertaken to add to their value. This work falls into two areas. First, the clustering process used to develop the Māori identity signatures could be repeated with more extensive testing. In particular, the sensitivity of the clustering to dropping each of the five dimensions of Māori cultural identity and connection would provide useful information about the robustness of the clusters.

The second area where work on the Māori identity signatures could add value is the development of a short from version of the Te Kupenga cultural questions. The idea here would be to develop a shorter set of questions that preserved the main characteristics of the full set with respect to the five dimensions of Māori cultural identity and connection. If a valid short form set of questions of this sort could be developed, then this would open the possibility of collecting information on Māori identity signatures to help guide decision-making in an operational context. In addition, it would also enable analysis of the relationship between student Māori identity signatures and student outcomes rather than inferring student Māori identity signatures from adult Te Kupenga respondents as was done here.

Adding variables to the dataset

A number of potentially valuable pieces of analysis would be possible if additional measures from the Ministry of Education's administrative data were added to the existing Ngā Tamariki o Te Kupenga dataset. Two additional measures are of obvious immediate interest. Firstly, information on previous student engagement with Kōhangā Reo would be useful to better understand the impact of Māori medium education and the interaction between Māori medium education and culture. This is of particular interest in terms of testing hypotheses as to why the Waiporoporo group shows relatively high levels of engagement and use of te Reo despite lower levels of other forms of cultural engagement and why this group appears to benefit so strongly from Māori medium education.

A second additional measure that could be added to the dataset would be information on average outcomes at the school level. This would support further analysis of the peer effects associated

with Māori students and would allow testing of the hypothesis that the negative relationship between the percentage of Māori students in a school and educational outcomes reflects the proportion of Māori students proxying for lower average performance at the school.

Analysis not currently possible

One potential issue with the analysis of student outcomes in this report is that it is limited to attainment within the school system. Ideally it would be good to know about student outcomes beyond the school system: in the labour market or tertiary education. Because of the ages of the students in the Ngā Tamariki o Te Kupenga data it was not possible to look at post-school outcomes for students in 2018/19 when this report was prepared. However, in 2019 the youngest students in the school leavers dataset from Ngā Tamariki o Te Kupenga will have a full year of post-school data. By 2020 or 2021 it should be possible to re-run the student outcomes analysis using labour market and tertiary education participation as success measures.

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Figure A1.1 Cluster descriptive statistics

	Proportion 55+	Proportion female	Proportion with tertiary qualifications	Proportion live outside major urban area	Mean whānau wellbeing (0-10)
Kahurangi	23.8%	59.7%	9.0%	40.7%	7.2
Karaka	14.3%	47.4%	9.5%	32.0%	7.4
Whero	14.5%	45.0%	7.9%	35.8%	7.2
Kōwhai	24.9%	59.5%	10.2%	31.4%	7.4
Waiporoporo	22.7%	55.7%	11.6%	33.1%	7.2
Kākāriki	27.8%	61.5%	21.1%	47.6%	7.5

Figure A2.1 Baseline model

	Model 1 ((CEA level 2)		Model 2 (University entrance)	
	Coefficient	**SE**	**Coefficient**	**SE**
gender	**0.1884**	0.00654	**0.4426**	0.00579
Pacific	**-0.2297**	0.0088	-0.0144	0.0104
European	**-0.1576**	0.00382	**-0.2399**	0.00328
Educational issues	**1.0146**	0.0109	**1.1055**	0.0251
NZDep_Q2	**-0.2193**	0.0145	**-0.244**	0.0125
NZDep_Q3	**-0.1743**	0.00664	**0.3484**	0.00678
NZDep_Q4	**0.2234**	0.013	**0.0739**	0.0122
NZDep_Q5	**0.3996**	0.0154	**0.2387**	0.0158
Benefit	**0.5872**	0.0177	**0.8796**	0.0113
Family income 2_	**0.0647**	0.0178	**-0.321**	0.0287
Family income 3	**-0.1642**	0.00837	**0.494**	0.0174
Family income 4	**-0.1893**	0.0127	-0.0255	0.0138
Family income 5	**-0.2869**	0.00711	**-0.6717**	0.00972
Crowing 2	**0.0936**	0.0131		
Crowding 3	**-0.0487**	0.00889		
Crowding 4	**-0.3197**	0.0149		
Crowding 5	**-0.4222**	0.0135		
Mother school	**0.3206**	0.012	**0.5856**	0.011
Mother post school	**-0.07**	0.0128	**-0.0648**	0.0143
Mother degree	0.00207	0.0148	**0.114**	0.0102
Mother postgrad	**-0.7748**	0.0345	**-1.092**	0.0144
Father school	**0.4068**	0.0121	**0.5344**	0.0122
Father post school	**-0.1736**	0.0177	**-0.2041**	0.0178

Father degree	**-0.5396**	0.0457	-0.6766	0.0156
Father postgrad	**-0.2959**	0.061	-0.634	0.0218
Max Rescale R²	0.255		0.297	

N=1683. Coefficients significant at P=0.01 or greater are in **bold**. Logistic regression with robust standard errors.

Table A2.2. Modelling school effects on NCEA level 2

	Model 3 Coefficient (SE)	Model 4 Coefficient (SE)	Model 5 Coefficient (SE)	Model 6 Coefficient (SE)	Model 7 Coefficient (SE)
Kahurangi	0.0213 (0.0108)	0.0136 (0.0106)	*0.0241* *(0.0104)*	0.0029 (0.01)	-0.00273 (0.0099)
Whero	**-0.1406** **(0.0151)**	**-0.1380** **(0.015)**	**-0.1715** **(0.0149)**	**-0.1923** **(0.0152)**	**-0.2047** **(0.0166)**
Kōwhai	**0.1066** **(0.0119)**	**0.0919** **(0.0118)**	**0.0653** **(0.0117)**	**0.0758** **(0.0116)**	**0.0821** **(0.0109)**
Waiporoporo	**0.0864** **(0.0113)**	**0.0794** **(0.0108)**	**0.0994** **(0.0108)**	**0.117** **(0.0113)**	**0.1069** **(0.0114)**
Kākāriki	**-0.1781** **(0.0209)**	**-0.1476** **(0.0208)**	*-0.0469* *(0.0203)*	*-0.0416* *(0.0204)*	-0.0321 (0.0218)
Māori Medium School		**-0.135** **(0.0089)**	*0.0252* *(0.0121)*	*0.0256* *(0.0109)*	0.0178 (0.0114)
% Māori teachers			**-0.0146** **(0.0005)**	**-0.0259** **(0.001)**	**-0.0222** **(0.0013)**
% Māori students				**0.00934** **(0.0006)**	**0.0138** **(0.0011)**
Māori field of study offered					**0.3086** **(0.0206)**
Max-rescale R2	0.2571	0.2587	0.2568	0.2616	0.2621

N=1683. Coefficients significant at P=0.01 or greater are in **bold,** and those significant at P=0.05 **in** *italics*. Logistic regression with robust standard errors.

Table A2.3. Modelling school effects on University Entrance

	Model 8 Coefficient (SE)	Model 9 Coefficient (SE)	Model 10 Coefficient (SE)	Model 11 Coefficient (SE)	Model 12 Coefficient (SE)
Kahurangi	**-0.0912 (0.0097)**	**-0.0995 (0.0088)**	**-0.108 (0.0082)**	**-0.1289 (0.0093)**	**-0.1569 (0.0093)**
Whero	**0.0833 (0.0125)**	**0.0802 (0.0128)**	*0.0339 (0.0136)*	-0.0156 (0.0146)	**-0.0627 (0.0158)**
Kōwhai	**0.3648 (0.013)**	**0.3472 (0.0123)**	**0.2718 (0.0125)**	**0.3295 (0.0124)**	**0.3625 (0.0130)**
Waiporoporo	-0.0127 (0.0132)	-0.0198 (0.0133)	-0.0238 (0.0126)	**-0.0403 (0.0132)**	**-0.0485 (0.0126)**
Kākāriki	**-0.3416 (0.0181)**	**-0.2911 (0.0188)**	**-0.1204 (0.0224)**	**-0.0896 (0.0232)**	-0.0292 (0.0250)
Māori Medium School		**-0.1828 (0.0109)**	**-0.0315 (0.011)**	-0.0101 (0.0119)	**-0.0351 (0.0115)**
% Māori teachers			**-0.0118 (0.0004)**	**-0.0387 (0.0005)**	**-0.0176 (0.0005)**
% Māori students				**0.0245 (0.0004)**	**0.0469 (0.0010)**
Māori field of study offered					**-0.1743 (0.0208)**
Max-rescale R2	0.3022	0.3045	0.2964	0.3085	0.3155

N=1683. Coefficients significant at P=0.01 or greater are in **bold,** and those significant at P=0.05 **in italics**. Logistic regression with robust standard errors.

Table A2.4. Modelling Interaction effects between cluster and proportion of Māori teachers

	Model 13 Coefficient	SE	Model 14 Coefficient	SE
Kahurangi	**-0.2621**	0.0192	**-0.379**	0.0183
Whero	**-0.0972**	0.019	**-0.2311**	0.0161
Kōwhai	**0.1259**	0.0178	**0.3129**	0.014
Waiporoporo	**0.3456**	0.0133	**0.2554**	0.0214
Kākāriki	**-0.2212**	0.0257	**0.0744**	0.0269

Kahurangi x teacher%	**-0.00623**	0.000957	**0.0116**	0.000935
Whero x teacher%	**-0.00231**	0.000838	**0.0133**	0.00096
Kōwhai x teacher%	**-0.0134**	0.000644	**0.00302**	0.000624
Kākāriki x teacher%	**0.0091**	0.000775	**-0.016**	0.000799
Māori teacher %	**-0.0255**	0.000972	**-0.0054**	0.000622
Max-rescale R2	0.2669		0.3196	

N=1683. Coefficients significant at P=0.01 or greater are in **bold**. Logistic regression with robust standard errors.