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KA ORA, KA AKO | NEW ZEALAND HEALTHY SCHOOL LUNCHES PROGRAMME

SUPPLEMENTARY ATTENDANCE ANALYSIS FOR MOST UNDERSERVED ĀKONGA

13 March 2024

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Summary of results

The previous evaluation found that Ka Ora, Ka Ako did not contribute to change in attendance among the population of ākonga in schools with moderate levels of disadvantage. Although there was of particular interest to estimate the programme's impact on ākonga who face the greatest challenges (those '**most underserved**' ākonga), the data was not available at that time.

The data is now available. This supplementary analysis examines the impact of Ka Ora, Ka Ako on the attendance of those most underserved ākonga. We made use of the ākonga-level equity index (EQI) as a measure of disadvantage, and the updated 2022 attendance data available in the IDI. We analysed the impact of Ka Ora, Ka Ako on the overall population of ākonga again, and notably the impact of the programme on the most underserved 75%, 50%, 25% and 10% of ākonga. Our findings reflect what other research has found, which is that students who experience greater disadvantage benefit more from school lunch programmes than less disadvantaged students.

Specifically, we found similar results to the previous impact evaluations and broader literature insofar as: there were limited attendance benefits from the school lunch programme for the overall population of ākonga. We also similarly found patterns that suggest that the school lunch programme benefits those most underserved ākonga more so than this wider population of ākonga. The benefit of Ka Ora, Ka Ako for those most underserved ākonga amount to 3 additional days of school, on average, over the year.

More specifically, we found that in Terms 3 and 4 there were improved rates of attendance for the most underserved ākonga who participated in Ka Ora, Ka Ako, compared to the most underserved ākonga who attended schools that were ineligible for the programme. There was an estimated increase of 1.6 percent[1] in attendance rates for the most underserved 25 percent of ākonga in Term 3. This translates to nearly one additional day at school for this specific group of ākonga for the term.[2] For those even more disadvantaged – the lowest 10 percent – there was an estimated increase of 4 percent[3] in attendance rates (representing an additional 2 days of attendance at school[4] during these terms).

[1] We are 95% confident the true increase is between 0.01% and 3.3%.
[2] Assuming Term 3 consisted of 50 school days (10 weeks).
[3] We are 95% confident the true increase is between 0.8% and 7.3%.
[4] Assuming Term 4 consisted of 50 school days (10 weeks).

Introduction

In 2020/2021, approximately 15 percent of New Zealand children lived in households without adequate and safe foods. This level of food-insecure children is concerning as food security and hunger have been linked to lower levels of concentration, cognitive functioning, engagement and school achievement, as well as worse developmental outcomes later in life.

In 2020, a government-sponsored healthy school lunches programme – Ka Ora, Ka Ako – was introduced. The programme focused on providing healthy lunches to all ākonga in schools with the highest levels of deprivation. The pilot programme provided lunches to primary and intermediate ākonga in three regions. In 2020, the programme was expanded to make school lunches available to secondary school ākonga as well as covering the rest of New Zealand. The programme provides these lunches to schools with the greatest levels of need or, as referred throughout the report, those "underserved".

The impact of Ka Ora, Ka Ako on ākonga functioning, health and wellbeing

The Ka Ora, Ka Ako programme is part of the Government's Child Youth and Wellbeing Strategy. One of the six child and youth wellbeing outcomes most relevant to Ka Ora, Ka Ako is that children and young people have what they need, and notably that they have regular access to nutritious food.

Providing regular access to healthy lunches was intended to reduce the risk of food insecurity, and ultimately improve wellbeing among these underserved ākonga. The evaluations of the pilot and expanded programmes both demonstrated that Ka Ora, Ka Ako resulted in significantly happier and healthier ākonga across all age groups, and an overall better health quality of life. In other words, Ka Ora Ka Ako ākonga benefited from having less frequent problems with concentration and ability to keep up in school (school functioning); ability to walk, run and play sport (physical functioning); feelings of sadness, anger and fear (emotional functioning); getting along with others (social functioning), and overall mental wellbeing. They are also proportionally less at risk of impaired quality of life. Across all the outcomes, the most underserved ākonga consistently benefited more from Ka Ora, Ka Ako than other ākonga.

The impact of Ka Ora, Ka Ako on attendance

The previous evaluation found that Ka Ora, Ka Ako did not contribute to change in attendance. There were several possible reasons for these results. First, the results may have demonstrated that school lunches are not sufficient to improve attendance rates, at least as far as detectable, among the *population of ākonga* in schools with moderate disadvantage.[5]

[5] The ākonga included in this 2022 evaluation were those in schools and kura around the eligibility threshold. This means they were not the schools and kura with the greatest needs (i.e. higher EQIs) but rather they were ākonga that were in schools and kura with just sufficient, or nearly sufficient, levels of deprivation to be eligible for the school lunches programme.

A particular shortcoming of the previous evaluation was the lack of available data at that time, which meant we could not determine if the programme affected attendance for *those most underserved ākonga*. This was a notable gap, given the range of robust studies demonstrating the limited effects of school lunch programmes on attendance on overall populations in high-income, developed nations. Where significant benefits of school lunch programmes are found among these reviewed studies,[6] they are among some ākonga and often only among those underserved groups rather than overall population of students.

This report supplements the earlier evaluation, focusing on the programme's impact on attendance for those most underserved.

COVID-19 and broader effects on ākonga attendance

We expect that attendance behaviours, in particular during 2020 and 2021, would likely be impacted by the COVID-19 pandemic. Schools and kura started delivering the programme in January 2020, which was quickly followed by the first documented COVID-19 case in New Zealand (28 February 2020), travel and public gathering restrictions (March 2020) and ultimately self-isolation for the whole country (25 March 2020). New Zealand then moved between national and regional lockdowns, with Auckland, Northland and Waikato experiencing longer lockdowns than other regions throughout the 2020-2021 period.

Shifting from a four-tier alert system at the end of 2021, the Government moved to the COVID-19 protection framework (traffic lights) and then introduced Omicron phases, with the focus shifting to testing and isolating individuals and household contacts as case numbers grew.

In February 2022, at the start of the 2022 school year, all of New Zealand moved to Phase 2, meaning that all COVID-19 cases along with household and close contacts were required to isolate at home and test for COVID-19. Although schools and early services were allowed to stay open during this phase, individuals managed periodic home isolation throughout this period.

Beyond the obvious impacts of COVID-19 in New Zealand, there were a range of factors that likely influenced attendance, such as ākonga and whānau anxiety about their health and safety,[7] changes to family finances, interpersonal relationships and family dynamics, housing instability, mental health and physical health.[8] As part of the evaluation, we expected that these broad effects would be similar for those ākonga in schools and kura just above and just below the programme eligibility threshold. This meant that the evaluation could detect any programme effects on attendance, albeit within the COVID-19 context.

[6] Cohen JFW, Hecht AA, McLoughlin GM, Turner L, Schwartz MB. Universal School Meals and Associations with Student Participation, Attendance, Academic Performance, Diet Quality, Food Security, and Body Mass Index: A Systematic Review. Nutrients. 2021; 13(3):911. https://doi.org/10.3390/nu13030911
[7] Education Review Office (2021). Learning in a Covid-19 World: The Impact of Covid 19 on Schools. ISBN 978-1-99-000235-9
[8] Tomaszewski, W., Zajac, T., Rudling, E., te Riele, K., McDaid, L. & Western, M. (2022) Uneven impacts of COVID-19 on the attendance rates of secondary school students from different socioeconomic backgrounds in Australia: A quasi-experimental analysis of administrative data. Australian Journal of Social Issues, 00, 1– 20

Methods

The evaluation was commissioned to help the Ministry of Education's te puna kaupapahere (policy) and special projects teams understand the impact of the programme on attendance. Specifically, the question we answer is below.

> KQ: What difference does the Ka Ora, Ka Ako programme make for the most underserved ākonga in terms of attendance?

The key requirement for this analysis was to help the Government understand the effects of the programme – those effects above and beyond what would have been achieved otherwise (without the programme). Precise estimates of the effect were essential given that the resultant decisions would directly affect a significant proportion of ākonga in New Zealand.

This supplementary analysis made use of different techniques to provide robust estimates of impact. First, we identified two comparable groups – similar groups of ākonga, albeit one is receiving the school lunches and the other is not – albeit in a setting whereby the programme had been fully implemented in nearly all eligible schools. We made use of a regression discontinuity design to pull together two similar groups, and in particular those ākonga within schools just above and just below the threshold for eligibility into the programme (EQI 460). By selecting and comparing ākonga within schools and kura with moderate disadvantage, we are attempting to keep the schools as similar as possible in terms of need.

We also controlled for the factors likely to influence attendance, and the resultant impact estimate. We made use of the difference-in-difference approach to account for the person-specific patterns of attendance. Notably, we estimated the benefit of the programme by calculating the mean attendance rates for both ākonga in the programme ('treatment') and ākonga outside of the programme ('control') for each term in 2020 (before Ka Ora, Ka Ako was introduced) and 2022 (after Ka Ora, Ka Ako was introduced). We also controlled for other likely relevant factors within the analytical model (ākonga age, sex, ethnicity and past unjustified absences).

To identify the most underserved ākonga, we used ākonga-level EQI available in the IDI.[9] This was done in two ways. Firstly, we grouped ākonga into quartiles (four groups) according to their EQI and selected ākonga to represent the most underserved 75%, 50% and 25% of total ākonga. Secondly, we grouped ākonga into deciles (ten groups) according to their EQI and selected ākonga in the lowest decile to represent the most underserved 10 percent of total ākonga.

The data used to estimate the effects of the programme are summarised in the table below.

[9] Ākonga-level EQI data are only available to Ministry of Education approved researchers in the IDI.

Table 1: Overview of the quality of evidence used in the evaluation

	Most underserved 10% ākonga	All ākonga
	Between 783-1,368 ākonga attending 66-84 schools (who attended schools just above and below the programme eligibility threshold)	Between 7606-15,294 ākonga and 72-90 schools (who attended schools just above and below the programme eligibility threshold)
Are there sufficient numbers of data to estimate impact (i.e. power)?	There is sufficient sample to detect a 2.5% difference in attendance.	There is sufficient sample to detect a 1% difference in attendance.[10]
Are the results balanced, with low-to-moderate risk of bias?	Yes	
Are the results likely generalisable to New Zealand schools?	Data are limited in terms of generalisability to all New Zealand.[11]	
Are relevant comparison groups used?	Yes	

The methods are further described in the technical appendix at the end of this report.

[10] There were sufficient sample to detect a 1% difference in attendance for the most underserved 75%, 1.1% difference in attendance in the most underserved 50%, and a 1.5% difference in attendance for the most underserved 25%.
[11] The approach prioritised helping the Government understand the effects of the programme – those effects above and beyond what would have been achieved otherwise (without the programme). This approach came at the expense of obtaining data that could be generalised to the population of New Zealand ākonga, and focused on similar schools above and below the threshold (i.e. with moderate disadvantage).

Findings

This supplementary analysis focuses on the effect of the programme on the most underserved ākonga. It estimates the effect of the programme on ākonga attendance as those effects above and beyond what would have been achieved without the school lunches (i.e. by similar ākonga not in the programme). As such, the effect is sometimes referred to as the 'benefit' of the programme.

Although there are limited attendance benefits of the programme for the broader population, the programme contributes to improved attendance rates among the most underserved ākonga (albeit inconsistently)

The earlier evaluation demonstrated no benefit in relation to attendance for the overall population of ākonga when comparing attendance between 2020 and 2021.[12] Similar results were found here when comparing attendance between 2020 and 2022; there was no statistically significant benefit for those receiving Ka Ora, Ka Ako in relation to attendance for the overall population of ākonga. This result was consistent across all four school terms.

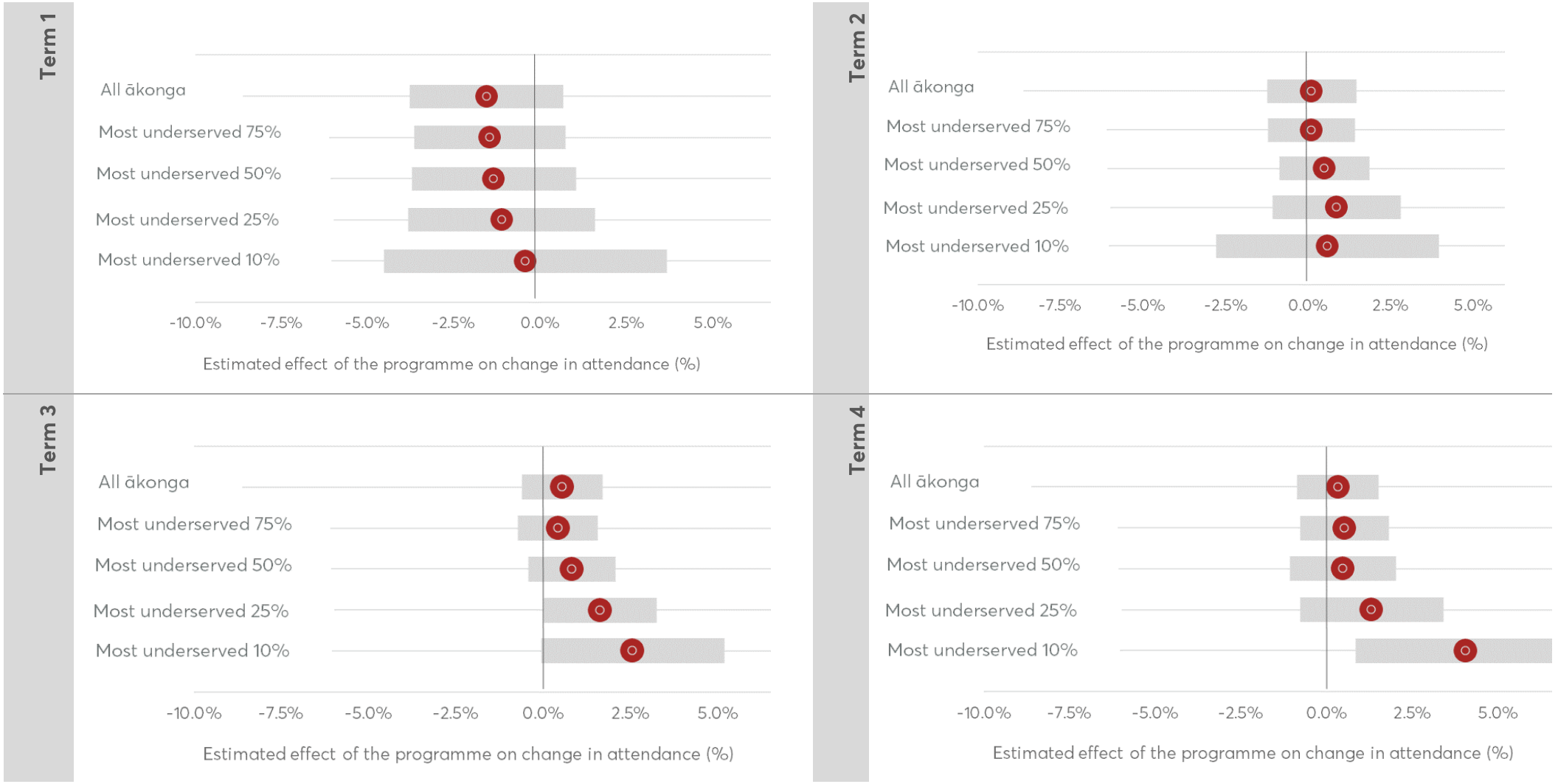
Nontheless, the evidence also suggests that the programme may benefit some ākonga more than others in relation to attendance. The figure below shows the benefit of the programme on different groups of ākonga, according to the extent of barriers these students will face – those most disadvantaged or underserved 10%, 25%, 50% and 75%. The results highlight the effect of the programme on attendance as the percentage advantage (to the right) or disadvantage (to the left) that Ka Ora, Ka Ako ākonga have over their peers in other schools and kura (the estimate is provided as a dot).

Mostly, these results show limited benefits, shown as the (grey) lines crosses "0" – demonstrating no significant difference between those receiving the healthy lunches and those not receiving the lunches across the four terms. However, the results suggest that those most underserved (at the bottom of the four figures) may be achieving greater benefits from the programme than their less disadvantaged peers (at the top of the four figures). These group differences are not statistically significant, although they show a pattern that is expected – that the programme benefits those of greater disadvantage more.

Of even greater importance is that we found statistically significant effects of the programme on attendance for the most underserved 25% of ākonga in Term 3, and the most underserved 10% of ākonga in Term 4. In particular, these showed a net increase in attendance rates in Term 3 (1.64% ± 1.63%) for the most underserved 25% of ākonga and a net increase in attendance rates in Term 4 (4.0% ± 3.3%) for the most underserved 10% of ākonga. In practical terms, this means that those most disadvantaged ākonga benefit from the programme an additional three days of school over the school year. These results were not mirrored in Terms 1 or 2.

[12] Vermillion Peirce, P., Jarvis-Child, B., Chu, L., Lennox, K., Kimber, N., Clarke, H., Wang, N., Nguyen Chau, T. and Winthrop, P. (2022). Ka Ora, Ka Ako New Zealand Healthy School Lunches Programme Impact Evaluation. Ministry of Education.

Figure 1: Ka Ora, Ka Ako's contribution to attendance, according to different groups of ākonga (level of need) within schools around the EQI eligibility threshold (EQI 455-466). Grey bars are 95% cluster robust confidence intervals. *Source: Stats NZ's IDI*



The table below specifies the net impact esimates across all groups and terms.

Table 2: Estimated impact of Ka Ora, Ka Ako on attendance rates, comparing the difference in change in attendance (2022-2020) between treatment and control groups, by term and group of ākonga. The net impact converted to days, assuming 50 days in the term. *Source: Ministry of Education administrative data sourced from Stats NZ's IDI*

Term 1	Net impact	Lower bound	Upper bound	Cluster robust SE	p-value
All ākonga	-1.5% (-0.8 days)	-3.8% (-1.9 days)	0.7% (+0.4 days)	1.1%	0.18
Most underserved 75%	-1.4% (-0.7 days)	-3.7% (-1.9 days)	0.8% (+0.4 days)	1.1%	0.20
Most underserved 50%	-1.3% (-0.7 days)	-3.8% (-1.9 days)	1.1% (+0.6 days)	1.2%	0.27
Most underserved 25%	-1.1% (-0.6 days)	-3.9% (-2.0 days)	1.6% (+0.8 days)	1.4%	0.42
Most underserved 10%	-0.4% (-0.2 days)	-4.6% (-2.3 days)	3.7% (+ 1.9 days)	2.1%	0.84
Term 2	**Net impact**	**Lower bound**	**Upper bound**	**Cluster robust SE**	**p-value**
All ākonga	0.1% (+0.1 days)	-1.3% (-0.7 days)	1.5% (+0.8 days)	0.7%	0.88
Most underserved 75%	0.1% (+0.1 days)	-1.2% (-0.6 days)	1.4% (+0.7 days)	0.7%	0.88
Most underserved 50%	0.5% (+0.3 days)	-0.9% (-0.5 days)	1.9% (+1.0 days)	0.7%	0.48
Most underserved 25%	0.9% (+0.5 days)	-1.1% (-0.6 days)	2.8% (+1.4 days)	1.0%	0.38
Most underserved 10%	0.6% (+0.3 days)	-2.8% (-1.4 days)	4.0% (+2.0 days)	1.7%	0.74
Term 3	**Net impact**	**Lower bound**	**Upper bound**	**Cluster robust SE**	**p-value**
All ākonga	0.6% (+0.3 days)	-0.6% (-0.3 days)	1.7% (+0.9 days)	0.6%	0.35
Most underserved 75%	0.4% (+0.2 days)	-0.7% (-0.4 days)	1.6% (+0.8 days)	0.6%	0.88
Most underserved 50%	0.8% (+0.4 days)	-0.4% (-0.2 days)	2.1% (+1.0 days)	0.6%	0.20
Most underserved 25%	**1.6% (0.8 days)**	**0.01% (+0.5 days)**	**3.3% (1.7 days)**	**0.8%**	**0.05**
Most underserved 10%	2.6% (+1.3 days)	-0.1% (-0.1 days)	5.2% (+2.6 days)	1.3%	0.06
Term 4	**Net impact**	**Lower bound**	**Upper bound**	**Cluster robust SE**	**p-value**
All ākonga	0.3% (+0.2 days)	-0.9% (-0.5 days)	1.5% (+0.8 days)	0.6%	0.59
Most underserved 75%	0.6% (+0.3 days)	-0.8% (-0.5 days)	1.8% (+0.9 days)	0.6%	0.46
Most underserved 50%	0.5% (+0.3 days)	-1.1% (-0.6 days)	2.1% (+1.1 days)	0.8%	0.55
Most underserved 25%	1.3% (+0.7 days)	-0.8% (-0.4 days)	3.4% (+1.7 days)	1.1%	0.22
Most underserved 10%	**4.1% (+2.1 days)**	**0.8% (+0.4 days)**	**7.3% (+3.7 days)**	**1.6%**	**0.02**

TECHNICAL APPENDIX

We used attendance data and other ākonga-related data sourced from Stats NZ's Integrated Data Infrastructure (IDI). Attendance was calculated for individual ākonga at the term level. The primary analysis of attendance is at the term level. Attendance data is made up of half days where an ākonga may be recorded as present, justified absent or unjustified absent. In this analysis attendance is calculated at the term level by:

$$Attendance = \frac{\sum\ half days = present}{\sum\ half days}$$

Selecting the most underserved ākonga

Ākonga equity index

This analysis focused on the impact of Ka Ora, Ka Ako on attendance for the most underserved ākonga. We used ākonga-level EQI data available in the IDI to identify the most underserved ākonga. As described by the Ministry of Education[13], the Equity Index looks at 37 different variables which are used to measure the socio-economic circumstances of the person. These variables are all weighted differently, and how they interact is what effect the model. The 37 variables have been determined by two conditions: 1) the variables should have a strong theoretical basis as a measure of socio-economic circumstances; 2) they should be correlated with educational achievement. They broadly fall under four headings:

1. Parental socio-economic indicators: Studies have shown that educational success depends very strongly on the socio-economic status of a student's parents.
2. Child socio-economic indicators: Children who have experienced poverty, abuse or neglect are more at risk of poor educational achievement.
3. National background: The national background or immigration status of parents has also been found to be an important mediating variable on the effect of socio-economic status on children's educational achievement.
4. Transience: Research suggests that students who move home or school frequently are more likely to underperform in formal education when compared with students that have a more stable school life.

To identify those most underserved, we first grouped all ākonga into quartiles (four groups) according to their EQI and selected ākonga to represent the most underserved 75%, 50% and

[13] https://assets.education.govt.nz/public/Documents/our-work/changes-in-education/Introduction-to-the-new-Equity-Funding-system-for-schools-and-kura.pdf, 13 March 2024

25% of total ākonga. Secondly, we grouped ākonga into deciles (ten groups) according to their EQI and selected ākonga in the lowest decile to represent the most underserved 10 percent of total ākonga.

Selecting schools and kura for comparison

School equity index

The approach makes use of a regression discontinuity (RD) design given how schools and kura were allocated (or not) a place in the programme. Schools and kura with an EQI above 460 were selected to participate in Ka Ora, Ka Ako. Ākonga in eligible schools and kura are considered to have greater levels of socioeconomic disadvantage than those in schools and kura below EQI 461. Because all ākonga in schools and kura with an EQI above 460 were selected for the programme,[14] we used information from ākonga within schools and kura not in the programme but with a similar equity index (just below the threshold of 461). Because these two groups of ākonga are similar insofar as the school-level estimate of socioeconomic barriers, differences in their attendance can reasonably be attributed to the programme, in particular when controlling for the impacts of other confounding factors.

In our previous evaluation, a band of schools and kura either side of EQI 461 were selected for investigation. With consideration to prior patterns of attendance, adequate sample size/power, and school-level demographics, a band of 5 either side of the eligibility criterion (EQI 456-465) was selected for the attendance analysis.[15] We use the same schools and kura within this band for this supplementary analysis.

Prior attendance patterns

Overall, in New Zealand there is negative relationship between socioeconomic barriers and attendance. Because the programme is allocated using the equity index we must ensure that this is not having a significant influence on impact estimates. To do this, pre-treatment attendance patterns were investigated at different EQI bands as it's important that those above and below the threshold have similar overall attendance before the programme.

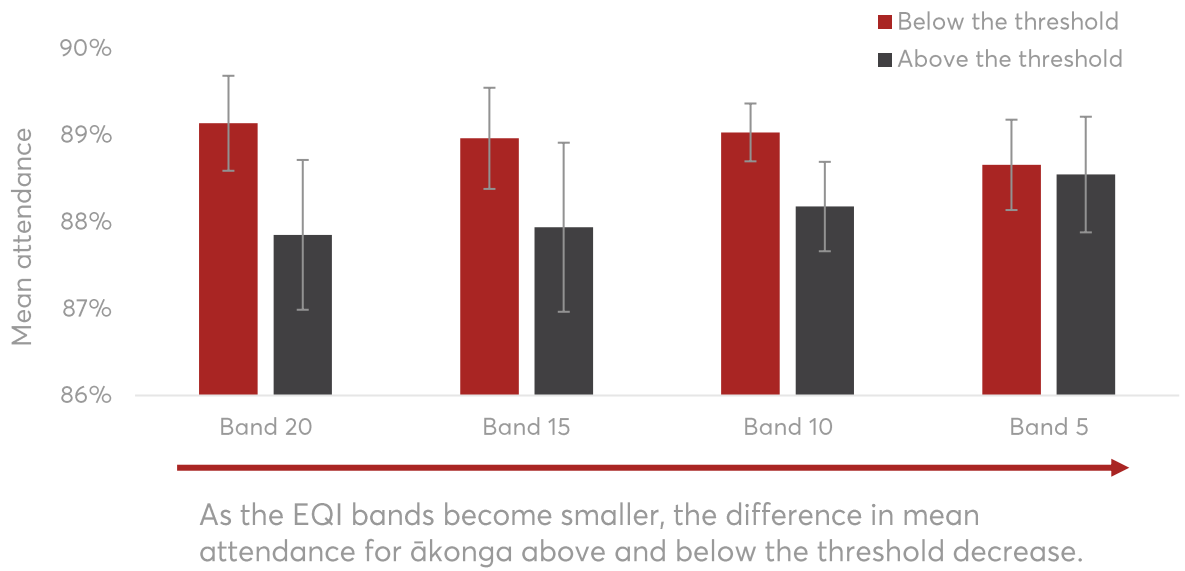
Figure A1 illustrates that as the band around the threshold is reduced, the difference in attendance for ākonga above and below the threshold becomes smaller. Statistical tests were conducted to test for a difference in mean attendance between ākonga above and below the threshold at each band. When accounting for the clustered nature of the data[16] a significant difference was only found for a band of 20 ($p=0.014$). When not accounting for the clustered nature of the data a significant difference was detected for bands of 20, 15 and 10 ($p<0.001$). For a band of 5, no significant difference was found ($p=0.246$). Additional tests were

[14] There were some cases of schools with an EQI greater than 461 who did not participate in the programme. Similarly, some schools and kura with an EQI lower than 461 participated in the programme. These schools and kura were removed from the analysis.
[15] Vermillion Peirce, P., Jarvis-Child, B., Chu, L., Lennox, K., Kimber, N., Clarke, H., Wang, N., Nguyen Chau, T. and Winthrop, P. (2022). Ka Ora, Ka Ako New Zealand Healthy School Lunches Programme Impact Evaluation: Technical Report and Appendices. Ministry of Education.
[16] Using cluster robust standard errors at the school level.

performed comparing the mean attendance between schools and kura above and below the 461 EQI threshold while controlling for age, gender and ethnicity.[17] These results were similar, with significant differences found for a band of 20 (F(291)= -3.74, p<0.001), a band of 15 (F(224)= -3.21, p= 0.0015) and a band of 10 (F(155)= -2.66, p=0.008). For schools and kura within a band of 5, mean attendance in 2019 was not significantly different (F(85)= -1.04, p=0.29).

These results provide evidence that for the smaller band of 5 there are no statistically significant pre-existing differences in the outcome variable prior to treatment and therefore provide the rationale for our school and kura selection.

Figure A1: Mean attendance of ākonga above and below the threshold at different EQI bands prior to the programme (2019), cluster robust 95% CI



Comparing attendance: 2020-2022

In our previous evaluation, attendance was compared between 2020 and 2021. As we now have access to attendance data for the full 2022 year, this supplementary analysis compares attendance between 2020 and 2022.

As most schools started Ka Ora, Ka Ako during 2021, comparing changes in attendance between 2020 and 2022 provides a clear reference period for schools before programme implementation (attendance observed in 2020) and after programme implementation (attendance observed in 2022). Schools that started Ka Ora, Ka Ako in 2020 and 2022 were excluded from our analysis.

[17] Fixed effects model with cluster robust standard errors, like the model used in the difference in difference analysis.

Data description and cleaning

Overall, the steps taken to ensure the data is fit for analysis included removing attendance records impacted by COVID-19 lockdowns, removing those with high numbers of days of missing attendance data, and matching individuals in the same schools and kura between 2020 and 2022.

Lockdown periods removed

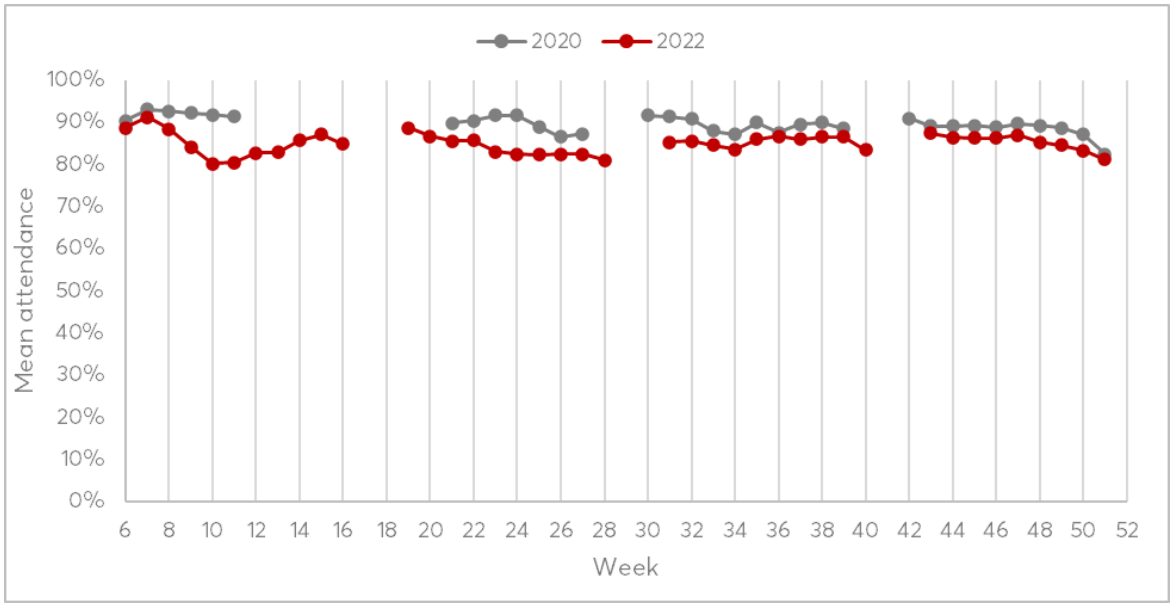
Attendance records for 2020 and 2022 available in the IDI were used for this analysis. The dataset creates term-level attendance spells derived from ad-hoc data loads supplied by the Ministry of Education.

Attendance records that looked like they occurred when a school was in lockdown were removed. The attendance code = 'F' was used when schools were in lockdown. Therefore, attendance records were removed when over 70 percent of attendance records for the school and date have an attendance code = 'F', or when over 35 percent of the attendance records for the region and date have an attendance code = 'F'.

This resulted in attendance records for weeks 14-20 of 2020 being removed. We also removed weeks 12-13 to remain consistent with our previous evaluation. These periods coincide with the first national lockdown in New Zealand.

Further, our previous evaluation excluded schools and kura in Auckland and Waikato, due to further impacts of lockdown on attendance throughout 2021. However, as we are comparing attendance between 2020 and 2022, we have included schools and kura in Auckland and Waikato.

Figure A1: Patterns of attendance, by week across 2020 and 2022 school years, with lockdown periods impacted by COVID-19 removed.



Missing data

Missingness is common in attendance data. It occurs when no records on ākonga attendance can be found on a particular day such that we are not sure if the ākonga were present or absent from school or kura.

There are some instances where there is no record of ākonga attendance found on a particular day, such that we are not sure if they were present or absent from school or kura. Ākonga with below 50 percent of the total half days for a standard term (after removal of lockdown affected days) were removed.

Matching by school and kura between 2020 and 2022

We retained only ākonga who remained in the same school or kura during 2020 and 2022. Those ākonga with changing school status were removed from the sample. This practice is important to ensure that we adjust for variations in ākonga conditions when estimating programme impacts on attendance.

Analysis approach

Summary statistics

Summary statistics can be calculated to demonstrate how the change in attendance differs for those receiving the programme compared to not. However, the general change in attendance does not consider the multitude of factors that will influence these changes over time, such as changes in age and past attendance behaviour, especially when changes in conditions are not the same on all ākonga. In addition, the general change in attendance in summary tables assumes that the impacts of the programme are the same across different groups of ākonga (ethnicity, region, sex). The initial analysis findings demonstrated the need to control for at least some of these influencing factors to estimate the net effect of the programme on ākonga. These controlled factors included:

- age
- sex
- ethnicity
- past unjustified absence rates (2020)
- interactions between the programme and other factors to see whether the programme has different impacts on different groups of ākonga.

Difference in difference coupled with equity grouping

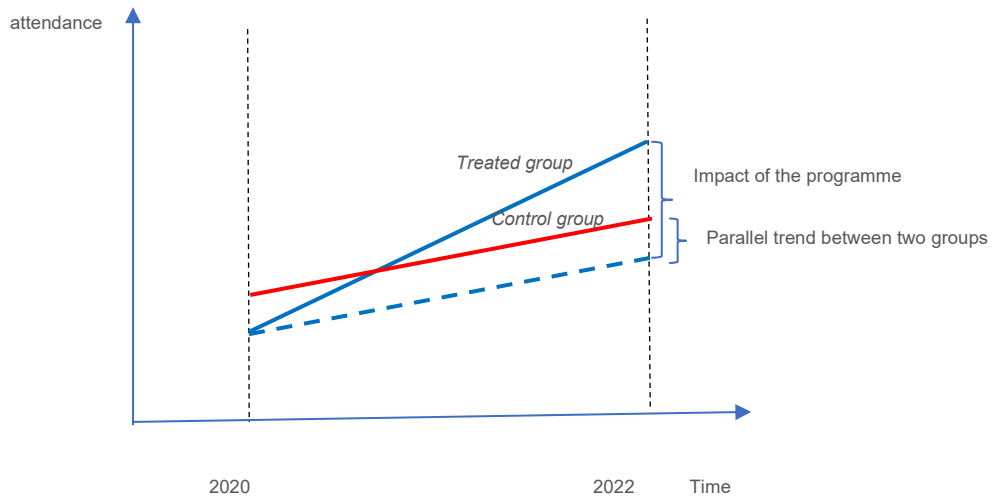
We estimate a difference in difference (DID) model using a binary treatment variable representing if the ākonga was in a participating school or kura, or not, and its interactions with other variables. The main objective of the DID approach is to confirm the statistical significance of the overall impact of the programme on ākonga attendance and to adjust for pre-existing differences between the two groups.

Ākonga from the same school or kura may have the same pattern of reported attendance. This is potentially due to their similar contextual condition and the school or kura attitude towards reporting ākonga attendance. Therefore, we cluster the standard errors by school or kura to account for this. The model utilised the lm_robust() function in the estimatr package in R.

DID is one of the most important evaluation tools that can help control for the impacts of other confounding factors when estimating the impact of a treatment on outcome measures. The DID model uses data on the treated (ākonga provided with healthy school lunches) and control groups (ākonga not provided with healthy school lunches) with similar conditions at two time periods, one period before the treatment and at least one period after the treatment. The control group of ākonga did not receive the treatment in both periods and therefore any changes in attendance for this group are not related to the programme but rather to other broader factors. The treated group was provided with healthy school lunches in 2021, and changes in attendance for this group are likely related to the programme as well as the broader factors that would also be affecting those not in the programme. The difference between these groups, assuming these groups are similar, is therefore whether or not they are benefiting from the healthy school lunches.

The figure below illustrates the DID method used for estimating the impact of Ka Ora, Ka Ako on attendance.

Figure A1: Illustration of the DID approach



One important aspect of assessing the Ka Ora, Ka Ako programme is that different groups of ākonga (e.g. age, sex, ethnicity) might have responded differently to the programme. We take into account this potential heterogeneity in the impacts by introducing interactions between the binary 'treatment' variable with other factors likely relevant to any change. This practice is important and can help reveal interesting features of the programme impacts given the high heterogeneity in the contexts where the programme is delivered.

Sample size/power

Given that a smaller EQI band results in more comparable groups, a sample size calculation was important to consider if there remained sufficient statistical power to detect a small impact. Statistical power was calculated using the sample sizes given at each band. Sample size was estimated using a fixed-effects model with cluster robust standard errors. The model contained six predictor variables (treatment, Māori, Pacific, other ethnicity, sex, age) under the following assumptions: unequal allocations of treatment and control groups; that the predictors have no predictive power; normality of outcome variables and an equivalent number of schools and kura as seen in the data. Significance was set at $\alpha=0.05$ (a Bonferroni correction was not necessary as each term has unique data).

Given that the number of ākonga decreases when considering the most underserved 25% and 10% of ākonga, the size of the impact that could be detected differed depending on the group of ākonga being analysed.

For all ākonga, the EQI bandwidth of 5 provided sufficient sample sizes to detect a 1% increase in attendance. More specifically, the estimated power for all ākonga was Term 1: 0.99, Term 2: 0.99, Term 3: 0.99, Term 4: 0.93.

For the most underserved 75% of ākonga, the EQI bandwidth of 5 provided sufficient sample sizes to detect a 1% difference in attendance. More specifically, the estimated power for the most underserved 75% of ākonga was Term 1: 0.98, Term 2: 0.99, Term 3: 0.97, Term 4: 0.91.

For the most underserved 50% of ākonga, the EQI bandwidth of 5 provided sufficient sample sizes to detect a 1.1% difference in attendance. More specifically, the estimated power for the most underserved 50% of ākonga was Term 1: 0.99, Term 2: 0.98, Term 3: 0.99, Term 4: 0.85.

For the most underserved 25% of ākonga, the EQI bandwidth of 5 provided sufficient sample sizes to detect a 1.5% difference in attendance. More specifically, the estimated power for the most underserved 25% of ākonga was Term 1: 0.95, Term 2: 0.98, Term 3: 0.98, Term 4: 0.82.

For the most underserved 10% of ākonga, the EQI bandwidth of 5 provided sufficient sample sizes to detect a 2.5% difference in attendance. More specifically, the estimated power for the most underserved 10% of ākonga was Term 1: 0.84, Term 2: 0.96, Term 3: 0.97, Term 4: 0.80.

Sample description

For the analysis an EQI band of 5 was selected. This meant that ākonga from schools and kura with an equity index of 456-460 were selected for the 'control' group, and ākonga from schools and kura with an equity index of 461-465 were selected to represent the 'treatment' group. Change in attendance between 2020 and 2022 at the term level was analysed for all ākonga and the most underserved ākonga in the treatment and control groups.

Table A1: Number of ākonga in control and treatment groups (band of 5, EQI 456-465), by term after cleaning

Ākonga	Group	Term 1	Term 2	Term 3	Term 4
All	Control	8430	9087	9399	4542
	Treatment	5448	5913	5895	3066
	Total	13878	15000	15294	7608
Most underserved 75%	Control	6801	7548	7833	3855
	Treatment	4629	5106	5088	2664
	Total	11430	12654	12921	6519
Most underserved 50%	Control	4872	5442	5643	2763
	Treatment	3429	3795	3762	1986
	Total	8301	9237	9405	4749
Most underserved 25%	Control	2301	2550	2634	1368
	Treatment	1527	1698	1677	966
	Total	3828	4248	4311	2334
Most underserved 10%	Control	717	795	810	450
	Treatment	498	558	558	333
	Total	1215	1353	1368	783

Table A2: Number of schools and kura in control and treatment groups (band of 5, EQI 456-465), by term after cleaning

Schools	Treatment	Term 1	Term 2	Term 3	Term 4
All	Control	54	54	57	45
	Treatment	36	39	39	27
	Total	90	93	96	72
Most underserved 75%	Control	51	54	54	45
	Treatment	33	39	39	27
	Total	84	93	93	72
Most underserved 50%	Control	51	54	57	45
	Treatment	36	39	39	27
	Total	87	93	96	72
Most underserved 25%	Control	48	51	57	42
	Treatment	33	39	39	27
	Total	81	90	96	69
Most underserved 10%	Control	48	48	54	39
	Treatment	36	39	39	27
	Total	84	87	93	66

Attendance results

The mean attendance for ākonga in treatment and control groups are calculated for terms in 2020 and 2022. These are calculated by term for each group of ākonga in Table A3 below.

Table A3: Mean attendance for treatment and control groups in 2020 and 2022, by term and group of ākonga

	Treatment		Control	
Term 1	Mean attendance 2020	Mean attendance 2022	Mean attendance 2020	Mean attendance 2022
All ākonga	93.2%	84.0%	92.8%	85.2%
Most underserved 75%	93.0%	84.0%	92.8%	85.4%
Most underserved 50%	92.3%	82.4%	92.2%	83.9%
Most underserved 25%	91.0%	79.6%	91.1%	80.9%
Most underserved 10%	89.7%	77.5%	89.5%	77.3%
Term 2	Mean attendance 2020	Mean attendance 2022	Mean attendance 2020	Mean attendance 2022
All ākonga	90.0%	84.0%	90.6%	83.6%
Most underserved 75%	89.5%	83.6%	90.3%	83.3%
Most underserved 50%	88.2%	82.3%	89.1%	81.6%
Most underserved 25%	86.0%	80.0%	86.6%	78.3%
Most underserved 10%	83.5%	77.9%	83.3%	75.5%
Term 3	Mean attendance 2020	Mean attendance 2022	Mean attendance 2020	Mean attendance 2022
All ākonga	90.4%	85.3%	91.1%	84.1%
Most underserved 75%	89.7%	84.6%	90.6%	83.5%
Most underserved 50%	88.6%	83.4%	89.5%	81.8%
Most underserved 25%	86.3%	81.1%	87.4%	78.5%
Most underserved 10%	83.8%	79.0%	85.3%	75.9%
Term 4	Mean attendance 2020	Mean attendance 2022	Mean attendance 2020	Mean attendance 2022
All ākonga	90.8%	88.1%	90.6%	87.3%
Most underserved 75%	90.4%	87.8%	90.0%	86.7%
Most underserved 50%	89.4%	86.6%	88.9%	85.5%
Most underserved 25%	87.6%	85.2%	87.1%	82.8%
Most underserved 10%	84.2%	82.9%	84.6%	78.6%

A mean change in attendance was further calculated by subtracting the mean attendance in 2020 from the mean attendance in 2022. These differences, while accounting for time-invariant factors (via the difference in difference approach) do not account for the time-variant factors, such as sex and ethnicity, and therefore do not fully isolate the effect of the programme. What these estimates do show is the general trend of attendance between the treatment and control groups, and how these changes differ by term. The mean change in attendance is summarised in Table A4 below.

Table A4: Mean change in attendance (2022-2020) by term and group of ākonga, lower and upper bound are 95% cluster robust confidence intervals

	Treatment			Control		
Term 1	Change in attendance	Lower bound	Upper bound	Change in attendance	Lower bound	Upper bound
All ākonga	-9.2%	-10.9%	-7.5%	-7.6%	-9.0%	-6.2%
Most underserved 75%	-9.1%	-10.9%	-7.3%	-7.3%	-8.8%	-5.9%
Most underserved 50%	-9.9%	-11.8%	-8.0%	-8.3%	-9.9%	-6.8%
Most underserved 25%	-11.4%	-13.6%	-9.2%	-10.2%	-11.8%	-8.6%
Most underserved 10%	-12.2%	-15.5%	-8.8%	-12.2%	-14.7%	-9.7%
Term 2	Change in attendance	Lower bound	Upper bound	Change in attendance	Lower bound	Upper bound
All ākonga	-6.0%	-7.1%	-4.9%	-7.0%	-7.9%	-6.2%
Most underserved 75%	-5.9%	-7.0%	-4.8%	-6.9%	-7.8%	-6.1%
Most underserved 50%	-5.9%	-7.1%	-4.8%	-7.4%	-8.5%	-6.4%
Most underserved 25%	-6.0%	-7.8%	-4.3%	-8.3%	-9.9%	-6.6%

	Treatment			Control		
Term 1	Change in attendance	Lower bound	Upper bound	Change in attendance	Lower bound	Upper bound
Most underserved 10%	-5.6%	-8.5%	-2.6%	-7.8%	-10.8%	-4.8%
Term 3	Change in attendance	Lower bound	Upper bound	Change in attendance	Lower bound	Upper bound
All ākonga	-5.1%	-6.8%	-3.4%	-7.0%	-8.0%	-5.9%
Most underserved 75%	-5.2%	-7.0%	-3.3%	-7.1%	-8.2%	-6.0%
Most underserved 50%	-7.7%	-9.0%	-6.4%	-5.2%	-7.2%	-3.1%
Most underserved 25%	-5.3%	-7.4%	-3.1%	-8.9%	-10.8%	-7.0%
Most underserved 10%	-4.8%	-7.1%	-2.6%	-9.4%	-12.3%	-6.4%
Term 4	Change in attendance	Lower bound	Upper bound	Change in attendance	Lower bound	Upper bound
All ākonga	-2.7%	-3.5%	-2.0%	-3.3%	-4.5%	-2.0%
Most underserved 75%	-2.6%	-3.4%	-1.7%	-3.3%	-4.7%	-2.0%
Most underserved 50%	-2.7%	-3.8%	-1.6%	-3.4%	-4.9%	-1.9%
Most underserved 25%	-2.4%	-3.9%	-0.9%	-4.3%	-6.2%	-2.4%
Most underserved 10%	-1.3%	-3.5%	0.8%	-6.1%	-9.2%	-2.9%

The above results show that the estimates for mean attendance between treatment and control groups were similar in 2020 across the four terms for all ākonga and those most underserved. Although the changes in attendance differ slightly, there is a consistent negative trend between 2020 and 2022 for both treatment and control groups.

To control for confounding factors a fixed effects model was used. This model treated mean change in attendance at the term level as the dependent variable, with treatment (in the programme or not), age, sex (male, female), ethnicity (Māori, Pacific, other) and past unjustified absence as predictor variables. This allowed for cluster robust standard errors to be calculated at the school level.

Tables A5-A24 present the results for each term and group of ākonga. These results show the effect of the programme on changes in attendance between 2020 and 2022 for all ākonga and the most underserved ākonga, while controlling for the variables described above.

When estimating the effect of the programme on changes in attendance for all ākonga, there were no significant impacts of the programme (treatment) across all four terms. More specifically, being in the programme did not significantly predict a change in mean attendance for all ākonga in Term 1 (β=-1.55%, p=0.17), Term 2 (β=0.11%, p=0.88), Term 3 (β =0.56%, p=0.35) or Term 4 (β=0.33%, p=0.59).

However, when estimating the effect of the programme on changes in attendance for the most underserved ākonga, we observe significant positive impacts of the programme in Terms 3 and 4. More specifically, being in the programme contributed to a 1.64% increase in attendance for the most underserved 25% of ākonga in Term 3 (β=1.64%, 95% CI: 0.01%, 3.28%). Additionally, being in the programme contributed to a 4.06%% increase in attendance for the most underserved 10% of ākonga in Term 4 (β=4.06%, 95% CI: 0.80%, 7.32%).

In other words, the most underserved ākonga who participated in Ka Ora, Ka Ako had improved attendance rates between 2020 and 2022 in Terms 3 and 4, when compared to the most underserved ākonga who did not participate.

The model also tells us how the confounding variables (age, sex, etc) impact changes in attendance. While these results are not relevant to the impact of the programme, they do help us understand the changes in attendance between 2020 and 2022.

Age has a significant negative impact on changes in mean attendance among all ākonga and the most underserved of ākonga in Terms 2, 3, and 4.[18] On average, as ākonga get older, their change in attendance between years decreases. This finding is consistent with the Ministry's finding on the inverse relationship between age and attendance among ākonga.[19]

Sex was a significant predictor of change in attendance for all ākonga for Terms 3 and 4. Here, males on average saw a positive increase in attendance compared to females. Sex was not significant for the underserved ākonga across all four terms.

Table A5: Term 1, all ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-11.64%	-16.13%	-7.16%	2.25%	<0.001
Treatment	**-1.55%**	**-3.80%**	**0.71%**	**1.13%**	**0.18**
Age	-0.02%	-0.30%	0.26%	0.14%	0.89
Sex (M=1)	0.16%	-0.37%	0.68%	0.26%	0.55
Past unjustified absence	65.40%	57.32%	73.49%	4.07%	<0.001
Māori (Yes=1)	-2.97%	-4.01%	-1.93%	0.52%	<0.001
Pacific (Yes=1)	-1.32%	-3.06%	0.41%	0.87%	0.13
Other (Yes=1)	4.17%	2.46%	5.88%	0.86%	<0.001

Table A6: Term 2, all ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-5.17%	-7.61%	-2.73%	1.23%	<0.001
Treatment	**0.11%**	**-1.27%**	**1.48%**	**0.69%**	**0.88**
Age	-0.40%	-0.57%	-0.22%	0.09%	<0.001
Sex (M=1)	0.45%	-0.05%	0.94%	0.25%	0.08
Past unjustified absence	58.27%	50.84%	65.70%	3.74%	<0.001
Māori (Yes=1)	-1.58%	-2.36%	-0.79%	0.40%	<0.001
Pacific (Yes=1)	-0.90%	-2.04%	0.24%	0.57%	0.12
Other (Yes=1)	2.21%	1.00%	3.42%	0.61%	<0.001

[18] For the most underserved 25% of ākonga, age has a significant negative impact on changes in mean attendance for Terms 2 and 3. For the most underserved 10% of ākonga, age has a significant negative impact on changes in mean attendance for Terms 2, 3 and 4.
[19] Reporting on the Child Poverty Related Indicators 2020/2021.

Table A7: Term 3, all ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-0.56%	-2.47%	1.35%	0.96%	0.56
Treatment	**0.56%**	**-0.61%**	**1.73%**	**0.59%**	**0.35**
Age	-0.72%	-0.85%	-0.59%	0.07%	<0.001
Sex (M=1)	0.64%	0.01%	1.28%	0.32%	0.05
Past unjustified absence	44.22%	32.40%	56.04%	5.95%	<0.001
Māori (Yes=1)	-2.06%	-2.90%	-1.23%	0.42%	<0.001
Pacific (Yes=1)	-0.93%	-1.90%	0.04%	0.49%	0.06
Other (Yes=1)	2.34%	1.29%	3.40%	0.53%	<0.001

Table A8: Term 4, all ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-2.46%	-8.32%	3.39%	2.94%	0.40
Treatment	0.33%	-0.88%	1.55%	0.61%	0.59
Age	-0.25%	-0.90%	0.39%	0.33%	0.44
Sex (M=1)	-0.56%	-1.10%	-0.02%	0.27%	0.04
Past unjustified absence	43.43%	30.69%	56.18%	6.40%	<0.001
Māori (Yes=1)	-0.94%	-1.75%	-0.13%	0.41%	0.02
Pacific (Yes=1)	0.16%	-1.11%	1.43%	0.64%	0.81
Other (Yes=1)	0.86%	-0.40%	2.11%	0.63%	0.18

Table A9: Term 1, most underserved 75% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-12.76%	-17.33%	-8.18%	2.30%	<0.001
Treatment	-1.44%	-3.67%	0.78%	1.12%	0.20
Age	0.11%	-0.17%	0.40%	0.14%	0.44
Sex (M=1)	0.19%	-0.31%	0.69%	0.25%	0.45
Past unjustified absence	63.43%	55.15%	71.71%	4.16%	<0.001
Māori (Yes=1)	-2.35%	-3.39%	-1.31%	0.52%	<0.001
Pacific (Yes=1)	-1.39%	-3.11%	0.34%	0.87%	0.11
Other (Yes=1)	3.74%	1.99%	5.48%	0.88%	<0.001

Table A10: Term 2, most underserved 75% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-5.17%	-7.69%	-2.65%	1.27%	<0.001
Treatment	0.10%	-1.24%	1.44%	0.68%	0.88
Age	-0.39%	-0.57%	-0.21%	0.09%	<0.001
Sex (M=1)	0.63%	0.10%	1.17%	0.27%	0.02
Past unjustified absence	58.17%	51.67%	64.66%	3.27%	<0.001
Māori (Yes=1)	-1.38%	-2.15%	-0.61%	0.39%	<0.001
Pacific (Yes=1)	-0.77%	-1.83%	0.30%	0.54%	0.15
Other (Yes=1)	1.96%	0.76%	3.16%	0.60%	<0.001

Table A11: Term 3, most underserved 75% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	0.80%	-1.53%	3.13%	1.17%	0.50
Treatment	0.43%	-0.73%	1.59%	0.58%	0.46
Age	-0.83%	-1.01%	-0.65%	0.09%	<0.001
Sex (M=1)	0.83%	0.14%	1.52%	0.35%	0.02
Past unjustified absence	43.83%	31.97%	55.70%	5.98%	<0.001
Māori (Yes=1)	-2.07%	-2.86%	-1.27%	0.40%	<0.001
Pacific (Yes=1)	-0.61%	-1.62%	0.41%	0.51%	0.24
Other (Yes=1)	2.06%	0.99%	3.12%	0.54%	<0.001

Table A12: Term 4, most underserved 75% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-1.99%	-8.12%	4.13%	3.07%	0.52
Treatment	0.52%	-0.80%	1.83%	0.66%	0.44
Age	-0.31%	-0.99%	0.37%	0.34%	0.37
Sex (M=1)	-0.50%	-1.11%	0.11%	0.31%	0.11
Past unjustified absence	42.58%	29.87%	55.28%	6.37%	<0.001
Māori (Yes=1)	-0.95%	-1.79%	-0.11%	0.42%	0.03
Pacific (Yes=1)	0.18%	-1.15%	1.52%	0.67%	0.78
Other (Yes=1)	0.78%	-0.46%	2.03%	0.62%	0.21

Table A13: Term 1, most underserved 50% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-12.63%	-17.62%	-7.64%	2.51%	<0.001
Treatment	-1.34%	-3.75%	1.08%	1.21%	0.27
Age	0.09%	-0.22%	0.40%	0.16%	0.55
Sex (M=1)	0.08%	-0.57%	0.73%	0.33%	0.80
Past unjustified absence	58.26%	48.75%	67.78%	4.78%	<0.001
Māori (Yes=1)	-2.12%	-3.18%	-1.06%	0.53%	<0.001
Pacific (Yes=1)	-1.29%	-3.19%	0.61%	0.96%	0.18
Other (Yes=1)	3.05%	1.24%	4.87%	0.91%	<0.001

Table A14: Term 2, most underserved 50% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-4.68%	-7.36%	-2.00%	1.35%	<0.001
Treatment	0.50%	-0.89%	1.88%	0.70%	0.48
Age	-0.48%	-0.67%	-0.29%	0.10%	<0.001
Sex (M=1)	0.77%	0.13%	1.42%	0.33%	0.02
Past unjustified absence	59.40%	53.34%	65.47%	3.05%	<0.001
Māori (Yes=1)	-1.10%	-1.94%	-0.27%	0.42%	0.01
Pacific (Yes=1)	-0.62%	-1.74%	0.50%	0.56%	0.28
Other (Yes=1)	1.58%	0.35%	2.81%	0.62%	0.01

Table A15: Term 3, most underserved 50% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	1.84%	-0.76%	4.44%	1.31%	0.16
Treatment	0.83%	-0.44%	2.09%	0.64%	0.20
Age	-0.96%	-1.15%	-0.76%	0.10%	<0.001
Sex (M=1)	0.82%	0.03%	1.62%	0.40%	0.04
Past unjustified absence	44.16%	32.89%	55.43%	5.68%	<0.001
Māori (Yes=1)	-1.92%	-2.80%	-1.04%	0.44%	<0.001
Pacific (Yes=1)	-0.32%	-1.46%	0.81%	0.57%	0.57
Other (Yes=1)	1.89%	0.80%	2.98%	0.55%	<0.001

Table A16: Term 4, most underserved 50% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-0.49%	-7.71%	6.73%	3.62%	0.89
Treatment	0.48%	-1.11%	2.07%	0.80%	0.55
Age	-0.47%	-1.28%	0.35%	0.41%	0.26
Sex (M=1)	-0.39%	-1.11%	0.33%	0.36%	0.29
Past unjustified absence	43.53%	30.90%	56.16%	6.33%	<0.001
Māori (Yes=1)	-1.05%	-2.04%	-0.05%	0.50%	0.04
Pacific (Yes=1)	0.01%	-1.48%	1.50%	0.74%	0.99
Other (Yes=1)	0.43%	-0.91%	1.77%	0.67%	0.53

Table A17: Term 1, most underserved 25% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-12.64%	-18.07%	-7.21%	2.73%	0.00
Treatment	-1.11%	-3.85%	1.63%	1.38%	0.42
Age	-0.02%	-0.37%	0.33%	0.17%	0.90
Sex (M=1)	0.23%	-0.76%	1.22%	0.50%	0.64
Past unjustified absence	49.91%	37.64%	62.18%	6.17%	<0.001
Māori (Yes=1)	-1.61%	-3.12%	-0.10%	0.76%	0.04
Pacific (Yes=1)	-1.64%	-3.80%	0.52%	1.09%	0.14
Other (Yes=1)	2.63%	0.70%	4.56%	0.97%	0.01

Table A18: Term 2, most underserved 25% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-3.01%	-6.70%	0.68%	1.86%	0.11
Treatment	**0.87%**	**-1.10%**	**2.84%**	**0.99%**	**0.38**
Age	-0.78%	-1.06%	-0.50%	0.14%	<0.001
Sex (M=1)	0.94%	-0.05%	1.93%	0.50%	0.06
Past unjustified absence	63.38%	57.09%	69.66%	3.16%	<0.001
Māori (Yes=1)	-0.41%	-1.81%	0.99%	0.70%	0.56
Pacific (Yes=1)	-0.92%	-2.85%	1.00%	0.97%	0.34
Other (Yes=1)	1.09%	-0.59%	2.77%	0.85%	0.20

Table A19: Term 3, most underserved 25% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	3.20%	-0.14%	6.53%	1.68%	0.06
Treatment	**1.64%**	**0.01%**	**3.28%**	**0.82%**	**0.05**
Age	-1.22%	-1.48%	-0.96%	0.13%	<0.001
Sex (M=1)	0.90%	-0.17%	1.98%	0.54%	0.10
Past unjustified absence	44.94%	34.71%	55.18%	5.15%	<0.001
Māori (Yes=1)	-1.31%	-2.49%	-0.13%	0.59%	0.03
Pacific (Yes=1)	-0.61%	-2.43%	1.20%	0.91%	0.50
Other (Yes=1)	1.58%	0.18%	2.97%	0.70%	0.03

Table A20: Term 4, most underserved 25% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	1.69%	-6.95%	10.33%	4.33%	0.70
Treatment	**1.32%**	**-0.81%**	**3.45%**	**1.07%**	**0.22**
Age	-0.90%	-1.83%	0.03%	0.47%	0.06
Sex (M=1)	-0.21%	-1.29%	0.86%	0.54%	0.69
Past unjustified absence	45.50%	31.99%	59.02%	6.78%	<0.001
Māori (Yes=1)	-0.36%	-2.01%	1.28%	0.82%	0.66
Pacific (Yes=1)	0.51%	-1.60%	2.63%	1.06%	0.63
Other (Yes=1)	0.52%	-1.32%	2.37%	0.92%	0.57

Table A21: Term 1, most underserved 10% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-12.18%	-20.28%	-4.07%	4.07%	<0.001
Treatment	**-0.43%**	**-4.58%**	**3.73%**	**2.09%**	**0.84**
Age	-0.06%	-0.59%	0.47%	0.27%	0.81
Sex (M=1)	1.20%	-0.43%	2.83%	0.82%	0.15
Past unjustified absence	43.92%	26.44%	61.40%	8.78%	<0.001
Māori (Yes=1)	-3.15%	-5.54%	-0.75%	1.21%	0.01
Pacific (Yes=1)	-3.68%	-7.60%	0.24%	1.97%	0.07
Other (Yes=1)	0.89%	-2.15%	3.94%	1.53%	0.56

Table A22: Term 2, most underserved 10% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	-5.19%	-12.60%	2.23%	3.73%	0.17
Treatment	**0.58%**	**-2.83%**	**4.00%**	**1.72%**	**0.74**
Age	-0.95%	-1.50%	-0.39%	0.28%	<0.001
Sex (M=1)	1.44%	-0.21%	3.09%	0.83%	0.09
Past unjustified absence	66.61%	57.14%	76.08%	4.76%	<0.001
Māori (Yes=1)	1.96%	-0.96%	4.89%	1.47%	0.19
Pacific (Yes=1)	-0.45%	-3.62%	2.71%	1.59%	0.78
Other (Yes=1)	2.20%	-0.34%	4.75%	1.28%	0.09

Table A23: Term 3, most underserved 10% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	2.21%	-3.72%	8.15%	2.99%	0.46
Treatment	**2.57%**	**-0.09%**	**5.22%**	**1.34%**	**0.06**
Age	-1.22%	-1.66%	-0.78%	0.22%	<0.001
Sex (M=1)	1.24%	-0.69%	3.16%	0.97%	0.20
Past unjustified absence	47.85%	35.42%	60.27%	6.25%	<0.001
Māori (Yes=1)	-1.05%	-3.28%	1.18%	1.12%	0.35
Pacific (Yes=1)	-2.82%	-5.85%	0.20%	1.52%	0.07
Other (Yes=1)	0.37%	-2.23%	2.98%	1.31%	0.78

Table A24: Term 4, most underserved 10% ākonga, main effects model results

Variable	Estimate	95% CI Lower	95% CI Upper	Cluster robust SE	p-value
(Intercept)	8.27%	-3.45%	20.00%	5.87%	0.16
Treatment	**4.06%**	**0.80%**	**7.32%**	**1.63%**	**0.02**
Age	-1.51%	-2.75%	-0.28%	0.62%	0.02
Sex (M=1)	-1.08%	-3.76%	1.60%	1.34%	0.43
Past unjustified absence	47.67%	30.58%	64.77%	8.56%	<0.001
Māori (Yes=1)	-3.11%	-6.02%	-0.20%	1.46%	0.04
Pacific (Yes=1)	0.00%	-3.74%	3.74%	1.87%	1.00
Other (Yes=1)	-1.23%	-3.79%	1.33%	1.28%	0.34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