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KickStart Breakfasts and Indicators of Child Health in Linked Administrative Data

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Disclaimer

The results in this report are not official statistics; they have been created for research purposes from the Integrated Data Infrastructure (IDI) managed by Stats New Zealand.

The opinions, findings, recommendations and conclusions expressed in this report are those of the authors, not Stats New Zealand, MSD, Oranga Tamariki, Motu Economic and Public Policy Research or the Ministry of Education,.

Access to the anonymised data used in this study was provided by Stats New Zealand in accordance with security and confidentiality provisions of the Statistics Act 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular person, household, business or organisation. 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 data in the IDI. Further detail can be found in the [Privacy impact assessment for the Integrated Data Infrastructure](#) available from www.stats.govt.nz.

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Glossary of Māori language terms

For the benefit of international readers, the Māori language (Te Reo Māori) is an official language of New Zealand. Māori terms are commonly used within the English language to describe Māori concepts and to name organisations and programmes. This glossary provides an explanation of some key Māori terms and names used in this report.

The source used for many of the definitions is Te Aka Māori-English English-Māori Dictionary online: <https://maoridictionary.co.nz/>. Translations given are those most relevant to the use within this paper.

Hauora	health
Kaupapa Māori.....	Māori approach, incorporating the knowledge, skills, attitudes and values of Māori society
Kura	school
Kura kaupapa Māori.....	school operating under Māori custom and using Māori as the medium of instruction
Manaakitanga	hospitality, kindness, generosity, support - the process of showing respect, generosity and care for others
Māori	Indigenous peoples of Aotearoa New Zealand
Oranga tamariki.....	health or wellbeing of children
Tamariki	children
Teina	younger brother (of a male), younger sister (of a female), cousin (of the same gender) of a junior line, junior relative
Tuakana-teina	relationship between an older (tuakana) person and a younger (teina) person in teaching and learning in the Māori context
Tiakitanga	guardianship, caring of, protection, upkeep
Tuakana.....	elder brother (of a male), elder sister (of a female), cousin (of the same gender from a more senior branch of the family)
Whānau	extended family, family group
Whakawhanaungatanga	process of establishing relationships, relating well to others

Executive summary

About KickStart

The KickStart Breakfast programme was established in 2009 as a partnership between Fonterra and Sanitarium. School communities run KickStart Breakfast clubs, and Fonterra and Sanitarium supply milk and Weet-Bix breakfast cereal.

As part of its response to the 2012 report of the Expert Advisory Group to the Commissioner for Children on solutions to child poverty, the Government co-funded an expansion of KickStart, allocating funding over five years, July 2013 – June 2018. Further funding for 2018/19 was received in Budget 2018.

The funding allowed KickStart to be offered to schools and kura five days per week instead of two. It also made the programme available to all decile 1-10 schools and kura, where previously it had only been available in decile 1-4 schools and kura.

Uptake of KickStart increased as a result of the expansion, mainly via an increase in the number of days per week breakfasts were served in already participating decile 1-4 schools and kura.

Uptake is highest among primary schools and kura. Māori and Pacific children make up the majority of students aged under 13 in the schools and kura receiving KickStart.

Participating schools and kura are overwhelmingly positive about KickStart and its delivery. The perception of staff is that the programme has positive effects on their students' health and wellbeing, engagement with the school or kura, and relationships with one another and with staff.

The existing evidence base

International evidence is that eating a healthy breakfast can lead to improvements in academic performance, appears to improve overall diet quality, and may protect against weight gain.

Existing New Zealand evidence establishes that school breakfast programmes reduce student hunger. Small New Zealand studies suggest provision of milk in schools increases the proportion of children meeting recommended guidelines for dairy intake and improves bone health.

Results from international and New Zealand studies assessing whether school feeding programmes have positive impacts on other student outcomes are mixed, but generally positive.

Evidence from research on dairy consumption and child health suggest that school food programmes that boost dairy intake could have positive effects on a range of measures of child health, with the potential to improve oral and bone health in particular.

What this study adds

This study was commissioned to provide a quantitative assessment of the impact of the KickStart programme on students' outcomes. The Statistics New Zealand Integrated Data Infrastructure was used in this study.¹

Informed by the existing evidence base, and by the data available, we focussed on measures of students' oral and bone health.

We found that after controlling for a range of other factors, students aged under 13 enrolled in schools and kura with higher uptake of KickStart – measured in terms of the average number of breakfasts served per student, per week across three school years – were significantly less likely than their peers to have hospital outpatient visits for dental surgery.

The average number of breakfasts served per student captures variation in the number of days per week schools and kura elected to take up KickStart breakfasts for their students, and variation in the proportion of students they elected to feed on those days.

An increase in exposure amounting to one additional KickStart breakfast per student, per week, was associated with a 1.2 percentage point reduction in the likelihood of students having a hospital outpatient visit for dental surgery in the current year's enrolment. Given the average annual rate of such events over the study sample is 8.6 percent, this represents about a one-sixth reduction.

We are unable to draw conclusions about the degree to which reduced outpatient visits for dental surgery were caused by KickStart alone. Many other programmes offering food and resources in schools and kura were expanding alongside KickStart. In addition, schools and kura that have higher levels of KickStart uptake may have been more likely to have adopted initiatives such as bans on sugary drinks. Their students may also have been among those who benefited most from efforts to improve the accessibility of oral health services to children in lower socioeconomic areas.

However, there are plausible mechanisms that could link KickStart and reduced hospital outpatient visits for dental surgery. For example, the breakfasts may have improved the quality of students' diets and reduced consumption of sugary food and drinks. This would suggest the potential for wider benefits including reduced obesity, improvements in learning, and reductions in health disparities.

The limited information available through existing linked de-identified administrative data meant that we were unable to examine some of these wider potential benefits. Data on attainment, in particular, are only available for older secondary school students. With less variation in secondary schools' uptake of KickStart (very few secondary schools served a high number of breakfasts per student per week), we did not attempt to study outcomes for older students.

No clear association was found between increased exposure to KickStart and administratively sourced measures indicative of bone fractures in students aged under 13.

¹ The Integrated Data Infrastructure is a collection of de-identified linked administrative and survey data made available for approved research under strict conditions.
<https://www.stats.govt.nz/integrated-data/integrated-data-infrastructure/>

There are a number of opportunities for further research on programmes providing food in schools and kura. These include designing robust impact studies to assess a wider range of impacts from any programme enhancement or expansion. Opportunities also exist to work with school communities to strengthen administrative data-based studies, with the addition of information collected directly from consenting schools and kura, students and families and whānau. Qualitative research could seek the views of students, families and whānau on KickStart and other food programmes in their schools and kura.

1 Introduction

This report examines the KickStart Breakfast programme, and associations between exposure to the programme and selected health outcomes for students based on linked administrative data.

The KickStart programme and its expansion

KickStart provides free breakfasts in New Zealand schools and kura. Schools and kura join the programme voluntarily, electing whether some or all students receive the breakfasts, and the number of days per week the breakfasts are served. Participation requires the approval of the principal, but the initiation of the decision to join the programme can be driven by a range of people, including teaching staff, school boards, members of the local community, and students themselves.

The school's community provides bowls, spoons, a central location, and people to run their KickStart Breakfast club. Some clubs are run by volunteers from the local community or by the teaching staff. Others involve the older students running a club for the younger students, a tuākana-teina model.

The breakfasts comprise of Weet-Bix, a fortified breakfast cereal, delivered by Sanitarium, and Anchor Lite² milk, delivered by Fonterra. Schools and kura place their delivery orders through a website administered by Fonterra at the end of each term, indicating the number of days per week they plan to run their club and the number of students they plan to feed in the following term. Weet-Bix is then delivered at the start of the following term in bulk for the school or kura to manage. Milk is delivered at the start of the term and then fortnightly, with provision for additional milk to be delivered if schools and kura run out. Schools and kura have their own systems for storage, and for anticipating and monitoring student attendance.

KickStart was established in 2009 as a partnership between Fonterra and Sanitarium. Initially the programme supplied breakfasts for up to two days a week in decile 1-4 primary, intermediate and secondary schools and kura. At the time, school deciles were used to indicate the extent to which schools and kura drew their students from low socio-economic communities, and to inform levels of school funding. Decile 1 schools and kura were the 10 percent of schools and kura with the highest proportion of students from low socio-economic communities. Decile 10 schools and kura were the 10 percent of schools and kura with the lowest proportion of these students.

In 2013, Fonterra and Sanitarium developed a proposal to expand the programme and, with the contribution of government funding, the programme was made available for up to five days per week, and offered to all decile 1-10 schools and kura, and to Teen Parent Units and students in Alternative Education.

² Anchor Lite milk has fat content of 1.5 percent. Choice of Anchor Lite is informed by NZ Dietary Guidelines from the Ministry of Health which advise that from the age of two years, low-fat dairy products are best for children (Ministry of Health, 2012).

Expansion was phased.

- Phase 1 (from term 3, 2013) involved expanding the offering to five days a week for all decile 1-4 schools and kura. The primary focus was on expanding the number of breakfasts in existing breakfast clubs and opening the programme to other decile 1-4 schools and kura wishing to join the programme.
- Phase 2 (from term 1 2014) involved expanding the offering to higher decile schools and kura. The primary focus was on meeting the needs of targeted students, and setting guidance and rules for distributing the available funding and resources to those most in need in the newly eligible higher decile schools and kura.

Overview of the study

This study was commissioned to provide a quantitative assessment of the impact of KickStart on students' outcomes. It used linked and de-identified administrative data to examine uptake of KickStart by schools and kura before and after the expansion. Informed by the existing evidence base, and by the data available, it focused on the association between exposure to the programme and administratively sourced indicators of oral and bone health outcomes for students.

It used linked and de-identified administrative data to examine uptake of KickStart by schools and kura before and after the expansion, and the association between exposure to the programme and administratively sourced indicators of oral and bone health outcomes for students.

With the introduction and expansion of KickStart, the average number of breakfasts served per student, per week in schools and kura increased. In multivariate analysis that controls for a number of other factors, we find enrolling in schools and kura with a higher number of breakfasts served per student, per week is associated with lower rates of hospital outpatient visits for dental surgery. It is unclear how much of that improvement is due to KickStart. This is because the study was unable to control for a host of other programmes and initiatives, including healthy eating policies adopted by schools and kura, other programmes providing food and resources, and changes in access to preventive oral health services.

This report is structured as follows.

- Section 2 describes the origins of the Government's decision to co-fund KickStart. It reviews satisfaction with the operation of KickStart reported by schools and kura, and perceptions of change for students as a result of the programme. It provides an overview of the existing evidence base on breakfast consumption, the impacts of school feeding programmes, and associations between dairy product intake and children's health. Section 2 also describes the relationship between KickStart and two other national programmes that provide food and other resources in schools and kura: Fonterra's Milk for Schools programme and KidsCan. The section also provides an overview of other school-based programmes that potentially influence the health and wellbeing of students.
- Section 3 describes the quantitative study, including the linked administrative data drawn upon, KickStart uptake, and results of multivariate analysis that explored associations between students' exposure to KickStart and administratively sourced indicators of oral and bone health.

- Section 4 discusses the results and limitations that need to be considered when interpreting the study findings.
- Section 5 sets out our conclusions.

2 Background

Origins of the Government funding contribution

The Government's funding contribution to help expand KickStart formed part of its response to the 2012 report from the Expert Advisory Group to the Commissioner for Children on solutions to child poverty (Expert Advisory Group on Solutions to Child Poverty, 2012). One of 78 recommendations made in the report was that government should implement a collaborative food in schools programme, commencing with decile 1-4 primary and intermediate schools.

Living in poverty can be a barrier to learning at school. Poor children often come to school hungry, which affects their ability to learn. A Ministry of Health survey found that 20.1% of New Zealand households with school-age children did not have enough food for active and healthy living. This percentage significantly increased for Pasifika and Māori families, large families, and those from the lowest socioeconomic groups ... Children in low-income households are also more likely to have higher cholesterol intake and eat fewer healthy foods than their peers in higher income households ... Organisations like KidsCan, Fonterra and Sanitarium currently provide food in some New Zealand schools. However, we believe that central government has a responsibility to provide leadership and resources to assist schools through a national strategy for food in ECEs and schools in low-decile neighbourhoods. (Expert Advisory Group on Solutions to Child Poverty, 2012, p60)

This recommendation was identified as an initial priority for immediate attention at relatively low cost. Children and young people who participated in a consultation that informed the work of the Expert Advisory Group had supported the idea of food in schools, and highlighted the need for programmes not to stigmatise or cause shame (Egan-Bitran, 2012).

In early 2013, a working paper released by the Office of the Children's Commissioner identified elements of good practice for school nutrition programmes as follows:

- Food provided must be of good nutritional quality
- Programmes should get to children who need them
- Programmes should involve children, families, whānau, and communities in the school
- Programmes should avoid stigmatisation, dependence, and waste
- Programmes should take account of different cultural practices and requirements
- Programmes should take a health-promoting and a whole-school approach, and be integrated into curriculum learning. (Children's Commissioner, 2013, p12).

The working paper advocated for a framework in which schools established partnerships with local businesses and communities to deliver school food programmes tailored to the needs and aspirations of their school community. Government would provide guidance on best practice, administrative support, and partnership funding that supported business and community cash or in-kind contributions.

This proposed framework informed the decision to co-fund the KickStart expansion. Government advice noted this was an opportunity for the Government to capitalise on

private sector and community energy and innovation.³ Contribution of funding was agreed by Cabinet in April 2013 as part of the Vote Social Development Budget Package.⁴ The expansion was on the basis of a 50/50 public/private funding split over five years, 1 July 2013 – 30 June 2018.^{5 6} Further government funding of \$1.2 million for year 2018/19 was provided in Budget 2018.

In 2014, the Office of the Children’s Commissioner released best practice guidelines for school food programmes developed by an independent working group (Children’s Commissioner, 2014). Like the earlier working paper, these guidelines emphasised the:

- schools and kura tailoring their programmes to meet their school community’s needs and aspirations
- development of partnerships in programme delivery
- need to avoid stigma
- benefits to be gained from integrating food programmes into the culture of the school and school nutrition policy.

These themes were reiterated in Education Review Office effective practice guidance (Education Review Office, 2017).

Satisfaction with KickStart and change for students reported by schools and kura

Each term, schools and kura participating in KickStart respond to a series of web survey questions as they place their orders for the following term. Responses to these questions indicate high levels of satisfaction with KickStart, and overwhelmingly positive views about the impact of the breakfasts. In term 3 of 2016, 81 percent of schools and kura invited to participate in the survey provided responses, and 95 percent of these schools and kura were very satisfied with the programme. Regular scorecards show high rates of retention of schools and kura in the programme.⁷

Comments about impacts on their students show a range of perceived benefits:

Breakfast Club has considerably improved children’s health and oral hygiene. Their attendance, appearance and attitude have contributed to this result. What an amazing turn about!

Breakfast has brought on improved concentration, on-going stamina and success levels, manners and a decrease in negative playground behaviour.

³ SOC (13) 30 refers.

⁴ CAB Min (13) 12/6(24) refers.

⁵ Government funding was subject to a cap of \$9.5 million over the five years of the agreement. Joint governance for the partnership was provided by Fonterra, Sanitarium and the Ministry of Social Development (MSD). In 2017, MSD’s funding and governance role transferred to Oranga Tamariki.

⁶ Funding and governance of KickStart moves back to MSD on July 2018.

⁷ <https://kickstartbreakfast.co.nz/news#> retrieved 21 June 2017.

Students are more alert. The social interaction of eating together is also very positive.

Children enjoyed the social element of the Breakfast Clubs. They would dine and chat with each other. We found this a very good thing for students who struggled to make good behaviour choices.

The breakfast club is going stronger and stronger. The tamariki are still the ones running it with the teachers supervising.⁸

Similar perceptions of change for students are reported in an evaluation of a new school breakfast initiative in Victoria, Australia (MacDonald, 2017).

Existing quantitative evidence

Breakfasts

A recent overview of systematic reviews (Gerritsen and Wall, 2017) found consistent evidence that eating a healthy breakfast daily in childhood can lead to improvements in academic performance, and regular frequency of eating (three or more times a day) may be related to lower body size in children and adolescents. Eating a healthy breakfast daily appears to improve diet quality overall and may protect against weight gain, but is not associated with weight loss.

New Zealand's 2002 National Children's Nutrition Survey surveyed children aged 5-14 about their food habits and physical activity. Older children within this age group, those living in the most deprived areas, and Pacific and Māori children were the least likely to usually eat breakfast at home. Skipping breakfast at home was associated with a higher Body Mass Index (BMI), a lower likelihood of meeting recommendations for fruit and vegetable consumption, and more consumption of unhealthy snack foods. Results suggested the need for greater efforts to increase breakfast consumption for older children from more deprived backgrounds, whether at home or through schools (Utter et al., 2007).

In the 2015/16 Health Survey, 85 percent of children aged 2–14 years had eaten breakfast at home every day in the past week, slightly down from 87 percent in 2011/12 and 88 percent in 2006/07. Children living in the most socioeconomically deprived areas were less likely to eat breakfast at home every day than children living in the least deprived areas after adjusting for age, sex and ethnic differences – with rates of 77 percent and 90 percent respectively. Information on breakfasts eaten in school programmes was not collected (Ministry of Health, 2016).

Not eating breakfast can be related to poverty and food insecurity at home, but children from a range of backgrounds sleep in, or prioritise socialising over eating (Children's Commissioner, 2014), or are restricted in their ability to make healthy choices by the food that is provided by their parents or that is affordable (Education Review Office, 2016). Teachers perceive higher levels of need for food in their schools than either principals or school boards (New Zealand School Trustees Association, 2013).

⁸ <https://kickstartbreakfast.co.nz/> retrieved 21 June 2017.

Food in schools

Provision of food in school settings addresses a social need and improves the daily lives of those children who would otherwise start the school day hungry. Research on child development and health strongly suggests that it also has the potential to improve health and education outcomes for children and adolescents through a range of mechanisms. These include improved nutrient intake, cognition, behaviour and attendance (Children's Commissioner, 2013; Canterbury District Health Board, 2014). Depending on their design, programmes also have the potential to improve whakawhanaungatanga – to foster more positive relationships between teachers and students, and between schools and families and whānau (Children's Commissioner, 2013).

However, the international evidence base evaluating the impacts of school food programmes is not conclusive (Children's Commissioner, 2013), and few studies have focused on programmes for adolescents whose uptake of, and attendance at, breakfast programmes can be low (Canterbury District Health Board, 2014). Identifying the causal effect of school food programmes is difficult due to methodological challenges in controlling for the factors that cause some students and not others to elect to participate. Studies of the United States School Breakfast Program have tended to fail to convincingly address this problem (Bhattacharya et al., 2006).

A Cochrane review of the effectiveness of school feeding programmes in improving the physical and psychosocial health of disadvantaged students found mixed (but generally positive) results for high-income countries. Results from across high- and low-income countries suggest school meals may have small physical and psychosocial benefits for disadvantaged students. The Cochrane review recommended that further well-designed studies be undertaken, with a focus on reporting results stratified by the socio-economic status of participating children (Kristjansson et al., 2007). Recent quasi-experimental studies estimate positive impacts on student achievement from healthier school lunches (Anderson et al., 2017) and from the availability of the School Breakfast Program (Frisvold, 2015). A review of studies from developing countries found relatively consistent positive effects on energy intake, micronutrient status, school enrolment, and attendance, but less conclusive evidence of impacts on growth, cognition, and academic achievement (Jomaa et al., 2011).

A New Zealand randomised controlled trial of school breakfast programmes found that they are effective in reducing student hunger (Ni Mhurchu et al., 2012). Findings from two recent small studies suggest provision of milk in schools increases the proportion of children meeting recommended guidelines for dairy intake (Wall, 2016) and improves bone health (Kruger et al., 2017). See Box 1 for more details of these studies.

Dairy product intake

Reviews find consistent evidence that dairy intake has positive associations with dental health in children (Dror and Allen, 2014; Rugg-Gunn and Woodward, 2017) and with bone health and growth (Dror and Allen, 2014; Rozenberg et al., 2016). Children in a New Zealand study with a history of milk avoidance had significantly lower total body bone mineral content, were shorter, and were more likely to experience prepubertal bone fracture than age-matched controls (Goulding et al., 2004; Black et al., 2002).

Due to the observational nature of most of the available studies (few involve randomised controlled trials), the quality of the evidence for a positive impact on bone health in children is categorised as moderate (Weaver, 2014).

Box 1: New Zealand studies examining the impact of food in schools

- A stepped wedge cluster randomised controlled trial of schools that took up either low-fat milk and Weet-Bix or a Red Cross Breakfasts in Schools programme for up to five days a week in 2010 found a statistically significant decrease in children's self-reported short-term hunger. There were no positive impacts on outcomes such as school attendance, academic achievement, sense of belonging at school, or behaviour. Children participated in the programme for between four and 38 percent of school days the breakfasts were available. The researchers concluded that more frequent programme attendance may be required to influence these outcomes (Ni Mhurchu et al., 2012).
- A study conducted in the first year of operation of Milk for Schools in Auckland enrolled 511 children at nine primary schools when Milk for Schools began in the region in 2013. The study followed up with 379 of the children in 2014 when they were in years 5 or 6. The proportion of students consuming at least two servings a day of milk or milk products rose from 85 percent in 2013 to 93 percent in 2014. The proportion meeting this guideline in the weekends also rose. After adjustment for age, there was no statistically significant increase in BMI over a two year period. The study included one school in quintile 1 (deciles 1-2) and two schools in each of the quintiles 2, 3, 4 and 5 (Wall, 2016).
- A subsequent, as yet unpublished, study followed 118 5-10 year old Manawatū children participating in the Milk for Schools programme for a year. Compared with a control group recruited from schools that did not participate in Milk for Schools, children who regularly drank milk as part of the programme had the same increase in weight and height, but had significantly improved bone health, and were more likely to consume the recommended number of servings of dairy on weekdays (Kruger et al., 2017; Massey University, 2017).

Studies tend to find either no association or an inverse association between dairy intake of children and adolescents and the likelihood of being overweight or obese (Dror and Allen, 2014; Dror, 2014). In a review of prospective cohort studies, children and adolescents with higher levels of dairy consumption were less likely to be overweight or obese some years later. Paradoxically, they had higher gains in BMI, possibly reflecting increased lean body mass, including improved bone mass, alongside reduced body fat (Lu et al., 2016). There is a range of possible explanations for why dairy product intake in children is not positively, and may be inversely, associated with body fat. However the mechanisms are yet to be confirmed (Dror and Allen, 2014). There is insufficient evidence to determine whether an inverse association might apply with all types of dairy products, whole and skim milk in particular, pointing to the need for further studies (Lu et al., 2016). Several studies have suggested that higher milk-fat consumption is associated with lower rates of obesity in children (Vanderhout et al., 2016).

Recent meta analyses suggest that in adult populations there is an inverse association between the amount of dairy consumption and the risk of developing type 2 diabetes

(Gao et al., 2013; Aune et al., 2013). Studies examining associations with metabolic function for children and adolescents are lacking (Dror and Allen, 2014).

While research on dairy consumption and child health suggests that school food programmes that boost dairy product intake could have positive effects on a range of measures of child health, the balance of benefits for New Zealand's Māori, Pacific and Asian populations from programmes that do this by promoting high levels of milk consumption is less clear. Lactose intolerance, which can result in gastrointestinal symptoms, is largely genetically determined. Rates are high among Asian peoples, and two studies reported in the 1980s (Wyeth et al., 2007) and a more recent study of Christchurch adults (Upton and George, 2010) suggest that people of Māori and Pacific origin have a higher prevalence of lactose intolerance than people of New Zealand European origin. Upton and George (2010) found that of the 30 survey participants self-identifying as being either Māori or Polynesian, nine were lactose intolerant. Prevalence of symptoms would be expected to be lower in childhood, and children with lactose intolerance can usually tolerate small amounts of dairy products. Prevalence data for New Zealand children are lacking (Wyeth et al. 2007).

Other programmes and services

As noted in the introduction, isolating the causal impact of KickStart quantitatively is not feasible. Reasons for this are:

- the wide range of initiatives providing food, other resources and health-related supports in schools and kura, some of which were expanding their operation over the same time period
- our inability to source information that would allow us to fully take these into account.

The remainder of this section provides an overview of these initiatives.

Milk for Schools

Around the same time that KickStart was expanded, Fonterra independently began offering free milk to schools and kura with students in years 1-6 through the Milk for Schools programme. Milk for Schools was piloted in Northland from mid-March 2012. National roll-out began in Southland towards the end of Term 1 2013, and progressed northwards over the following year on a region-by-region basis. The programme reached Auckland at the beginning of term 4 2013, and the Chatham, Stewart, and Great Barrier islands in term 1 2014.⁹

Currently 70 percent of primary schools and kura participate in Milk for Schools. Schools and kura order milk through a website. They determine how many students to order milk for, up to a maximum of one 200ml pack per student, five days a week (the number of days per week is limited to a maximum of four days a week for full primary schools and kura extending the programme to their year 7 and 8 students). Schools and kura have their own systems for storing and distributing the milk.¹⁰

⁹ See <https://www.fonterramilkforschools.com/news/> for details of the roll-out.

¹⁰ See <https://www.fonterramilkforschools.com/about/frequently-asked-questions/#1>

It is possible that the introduction of this programme had the effect of reducing the level of new uptake of KickStart following its expanded offering. In addition, schools and kura with year 1-6 students receiving KickStart may have taken up Milk for Schools as well.

KidsCan

KidsCan was established in 2005, providing non-perishable food and items such as raincoats and shoes to low-decile schools and kura. In 2013, the Government agreed to increase¹¹ its financial contribution to the KidsCan programme, and allocated \$1.1 million funding over three years.¹²

In March 2014, in the light of lower than anticipated first year spending on KickStart, the scope of the funding allocated to expand KickStart was widened to include support for the general wellbeing of children in schools.¹³ This included a responsive and flexible fund for the supply of items such as clothing, toothbrush kits, feminine hygiene products, and head lice treatment. As a result of this decision, some of the unspent monies allocated to KickStart have contributed additional funding to KidsCan programmes.

In 2015, KidsCan was active in 500 decile 1-4 primary, intermediate and secondary schools across New Zealand (KidsCan, 2016). From 2012, EasiYo became a KidsCan partner and KidsCan began the supply of powdered yoghurt to schools (KidsCan, 2013). At the end of 2015, 467 (46 percent) of decile 1-4 schools were receiving non-perishable food through KidsCan – 246 (24 percent) were supplied with EasiYo.¹⁴

Other programmes with the potential to improve health

Several other national programmes have the potential to improve the health of students.

- Since the late 1990s, Health Promoting Schools facilitators funded by the Ministry of Health have supported schools to identify and develop solutions to address the needs they prioritise as being important, link to services, and take action. Actions taken by schools include healthy eating initiatives and water-only policies (HPS National Schools Survey Report, 2016).
- Since the mid-2000s, the Ministry of Health has funded and progressively expanded the Fruit in Schools programme which provides a piece of fresh produce for each child for each school day in low-decile schools (Ball and Watts, 2015). Prior to 2009, when schools joined Fruit in Schools, they undertook to use an Health Promoting Schools approach to promote student health and wellbeing more broadly (Boyd, 2011).
- Following an initial pilot in 1993, Enviroschools has grown and in 2014-15 was active in 31 percent of schools and kura (Toimata Foundation, 2015). School gardens and orchards established under this and other programmes contribute to the food consumed by students in many schools and kura.

¹¹ In 2013, KidsCan was receiving \$150,000 per annum from Government and more substantial amounts from business (Children's Commissioner, 2013).

¹² CAB Min (13) 16/19 refers.

¹³ CAB Min (14) 11/4 refers.

¹⁴ Personal correspondence, Julie Chapman, KidsCan, 21 August 2017.

- Building on the successful Achievement in Multi-cultural High Schools (AIMHI) programme (Ministry of Health, 2009), the Ministry of Health has funded school-based health services in decile 1 and 2 secondary schools, teen parent units and alternative education facilities since 2009. In 2014, the Prime Minister’s Youth Mental Health Project extended the service to decile 3 secondary schools.¹⁵

Appendix A describes these programmes in more detail, and examines their history, and available evaluations. All available qualitative evaluations point to the individual programmes being well received and perceived as having positive impacts on students’ wellbeing. The few evaluations to date that have sought to quantify the difference these programmes make have also tended to find positive results.

Other programmes with the potential to improve learning, school engagement and well-being

The time period over which KickStart was introduced and expanded coincided with other innovations in school-based services with the potential to interact with, or confound, the impact of KickStart. Programmes included the piloting and roll-out of the Ministry of Education’s Positive Behaviour for Learning programmes (Ministry of Education, 2015), and other programmes introduced as part of the Prime Minister’s Youth Mental Health Project (Superu, 2015). The KickStart expansion also overlapped with the expansion of the Social Workers in Schools programme to all decile 1-3 schools and kura with year 1-8 students (Wilson et al., forthcoming), and Starpath, a school-wide intervention project in Auckland and Northland aimed at enabling more students from lower-decile secondary schools, especially Māori and Pacific students, to progress to degree-level study (Kiro et al., 2016). Some of the outcomes sought by these programmes (improved student wellbeing, learning and school engagement) overlap with those potentially influenced by KickStart and other food in schools programmes.

Community- and school-specific initiatives

In addition to national programmes, a range of not-for-profit service providers deliver food to schools and kura in their local communities. Many schools and kura also have their own responses to student hunger (New Zealand School Trustees Association, 2013), which in some cases predate KickStart, Milk for Schools and KidsCan (Counties Manakau District Health Board Schools Accord, 2008). Similarly, schools and kura may have independently initiated healthy nutrition policies that focus on eliminating sugary drinks. A study of Yendarra Primary School in South Auckland, which implemented such a policy, found students had significantly fewer dental caries than students in surrounding schools (Thornley et al., 2017a).

Reorientation of Child and Adolescent Oral Health Services

New Zealand publicly funds basic oral health services for children from birth until their 18th birthday. The majority of dental services for children up to school year 8 (age 12–13 years) are provided by dental therapists within the Community Oral Health Service provided by District Health Boards (Ministry of Health, 2016). More complex dental

¹⁵ <https://www.beehive.govt.nz/speech/new-guide-improve-school-based-health-services-launched>

services that are outside the scope of practice of dental therapists are provided by dentists contracted by District Health Boards to undertake this work on referral from the Community Oral Health Service. Treatment under general anaesthetic is provided by hospital dentists during inpatient or outpatient visits. Hospital dentists also provide services for children who are more difficult for Community Oral Health Service dental therapists to treat (eg students with special needs and students with behavioural difficulties).

Since the late 2000s, child and adolescent oral health services have undergone major changes to implement a strategy announced in 2006 focused on prevention and early detection of oral health disease. This strategy aimed to improve oral health and reduce oral health inequalities between ethnic and socio-economic groups. Changes included efforts to site new Community Oral Health Service clinics in a manner that improved accessibility for children in lower socioeconomic areas (ESR, 2016).

3 KickStart uptake and indicators of child health

Data sources and measures

The analysis presented in the remainder of this paper was primarily based on data held in the Stats NZ Integrated Data Infrastructure (IDI), a collection of de-identified linked administrative and survey data made available for approved research (Statistics NZ, 2017). The research did not fall within the scope of Health and Disability Ethics Committee Review. The research team sought independent ethical review from Dr Barry Smith, a member of the Health Research Council Ethics Committee.

Measures of KickStart uptake

IDI data were augmented by information on which schools and kura participated in KickStart over time supplied by Fonterra. These data included term-by-term data on whether a school or kura received KickStart, the number of days per week breakfasts were served and number of students who consumed breakfast each day. As a summary measure of uptake, we calculated the average number of breakfasts that were consumed per student per week across each school year ('KS per student-week').¹⁶

Study students

The study population comprised of domestic students enrolled in New Zealand schools and kura based on records in Ministry of Education's ENROL data held in the IDI.^{17,18} We limited the study to those students who were present in New Zealand for the full school year, or time spent out of the country in the year was less than 15 days.¹⁹ The purpose of excluding students who spent time overseas was to ensure that all students in the study had a chance of being recorded as having the outcomes of interest in New Zealand administrative data. We also required the student to be able to be linked to the 'spine' of the IDI.²⁰ This allowed MoE records for the student to be linked with records from other administrative systems (Black, 2016).²¹

¹⁶ We did not have accurate exact data on the number of days per week schools received KickStart before term three 2013. However monitoring data show that 95 percent of schools receiving KickStart over this period received the breakfasts for the maximum possible two days per week. We impute this number of days per week across all participating schools.

¹⁷ We dropped records for a very small number of students for whom MoE demographic data were not available from the Ministry of Education 'student_personal' file in the IDI.

¹⁸ International students and students on Government-approved exchange schemes were excluded.

¹⁹ Periods absent from the country were established using Ministry of Business, Innovation and Employment border movements data summarised in the IDI Person_overseas_spell file.

²⁰ The IDI spine includes individuals who were either (i) present in tax data from 1999; (ii) present in births data from 1920; or (iii) present in visa data from 1997. Visa data include any person accepted for a visa to enter New Zealand, other than on a visitor's or transit visa.

²¹ Of the domestic students in our study sample, 97.4 percent were able to be linked to the IDI spine.

Data were organised into student-school-year observations, each of which represented a spell of enrolment in a distinct school in a school year.

Outcomes

We focused on three administratively sourced indicators able to be measured using the IDI that have the potential to be influenced by KickStart:

- hospital outpatient visits for dental surgery (an indicator of improved oral health)
- ACC claims for fracture or fracture/dislocation (an indicator of improved bone health)
- outpatient and emergency department (ED) visits for orthopaedic surgery (an indicator of improved bone health).

Box 2 provides details of the administrative data sets in the IDI drawn upon in the study and outcome variable derivation.

Box 2: Outcome variable derivation

For each student-school-year observation, we defined enrolment start and end dates for enrolment at the relevant school in the year based on Ministry of Education ENROL data (Statistics NZ 2015a):

- Start date was set to the approximate start of the school year (5 February) or the recorded start date of the enrolment spell (where the spell of enrolment started within the year).
- End date was set to the approximate end date of the school year (15 December) or the recorded end date of the enrolment spell (where the spell of enrolment ended within the year).

Where students enrolled in more than one school in the year, they had more than one student-school-year observation for that year.

Records from the Ministry of Health's National Non-admitted Patient Collection (Ministry of Health, 2017) were then used to derive indicators of whether an outpatient visit for dental surgery or outpatient or ED visit for orthopaedic surgery occurred between the start and end date for each student-school-year observation. Only visits recorded as attended were considered. Details of the specialty or service to which the student had been assigned were used to determine whether the visit was for dental surgery or orthopaedic surgery.²²

Records from ACC injury claims data (Statistics NZ, 2015b) were used to derive an indicator of whether an ACC claim for a fracture occurred between the start and end date for each student-school-year observation. Claims where the accident date fell within the spell were considered. ACC claim for fracture was taken to occur where the primary diagnosis for the claim was 'fracture' or 'fracture/dislocation'.

Evidence points to a range of other outcomes that might be associated with KickStart which were not able to be examined given the limits to the data available from the IDI.

²² National Non-admitted Patient Collection data do not include ICD codes relating to the event.

These include school attendance, body size, BMI, and nutrient intake. Academic achievement could be examined using the IDI, but only for older students.

Controls for student characteristics and background

Measures of student characteristics and background were derived from a range of sources. Age, ethnic groups and gender were derived from MoE information held in the IDI.²³ Up to three ethnic groups are recorded for each school student (Statistics NZ, 2015a). The most common combinations were derived from these data, yielding a 'single/combination' categorisation of ethnic groups (Statistics NZ, 2004).

The length of time supported by a main benefit before age five²⁴ was included as a proxy for the student's exposure to poverty and its persistence in their early years. Parental benefit receipt has a strong association with child poverty (Perry 2017a) and measured material deprivation (Perry, 2017b). In the Dunedin study cohort, childhood exposure to poverty was associated with poorer health in later life, including poorer dental health (Poulton et al., 2002).

A measure of contact with child welfare services prior to reaching school age was derived from Child Youth and Family (CYF)²⁵ data. This indicated whether a report of concern or 'notification' was recorded by CYF in respect of the child by age five.²⁶ Early adversity, including abuse and neglect, is associated with a range of measures of subsequent health and life opportunities (Gilbert et al., 2009; Metzler et al, 2017). In the New Zealand setting, coming to the attention of CYF has associations with a range of adverse administratively recorded health and other outcomes over the early lifecourse (Templeton et al., 2016).

Other control variables

School-level data from published directories of schools and kura was taken into the IDI to be combined with other study data. These directories provide information on a range of school characteristics. School decile provides a measure of neighbourhood disadvantage. Other variables indicate the rural-urban status of the school, school-type (eg a contributing, full primary, intermediate, secondary, or composite school), and whether a kura kaupapa Māori. We controlled for these characteristics as they were in 2013. The size of the school roll was derived using enrolment data.

Information on which schools and kura were participating in the following national programmes was able to be sourced, and were taken into the IDI and included in the study.²⁷

²³ These came from the 'student_personal' file which collates demographic information entered in the ENROL system by schools.

²⁴ Derived from MSD Benefit Dynamics data (Wilson and Soughtton, 2009) in the IDI.

²⁵ Over the period covered by this study this was the New Zealand child welfare agency. CYF's functions transferred to the Ministry for Children – Oranga Tamariki in 2017.

²⁶ Police Family Violence notifications were excluded from the measure. Instability in administrative processes resulted in a large increase and subsequent decrease in these notifications (Mansell et al., 2011; Centre for Social Research and Evaluation, 2012; MSD, 2014).

²⁷ School-level data on schools' participation in other national programmes, including Heath Promoting Schools, KidsCan, and Milk for Schools were unable to be included in the study.

- Fruit in Schools (data provided by the Ministry of Health)
- Social Workers in Schools (data provided by MSD)
- Positive Behaviour for Learning (data provided by Ministry of Education – we combine data across Positive Behaviour for Learning School-Wide and Positive Behaviour for Learning Restorative Justice to create an indicator of whether the school had either of these Positive Behaviour for Learning programmes).

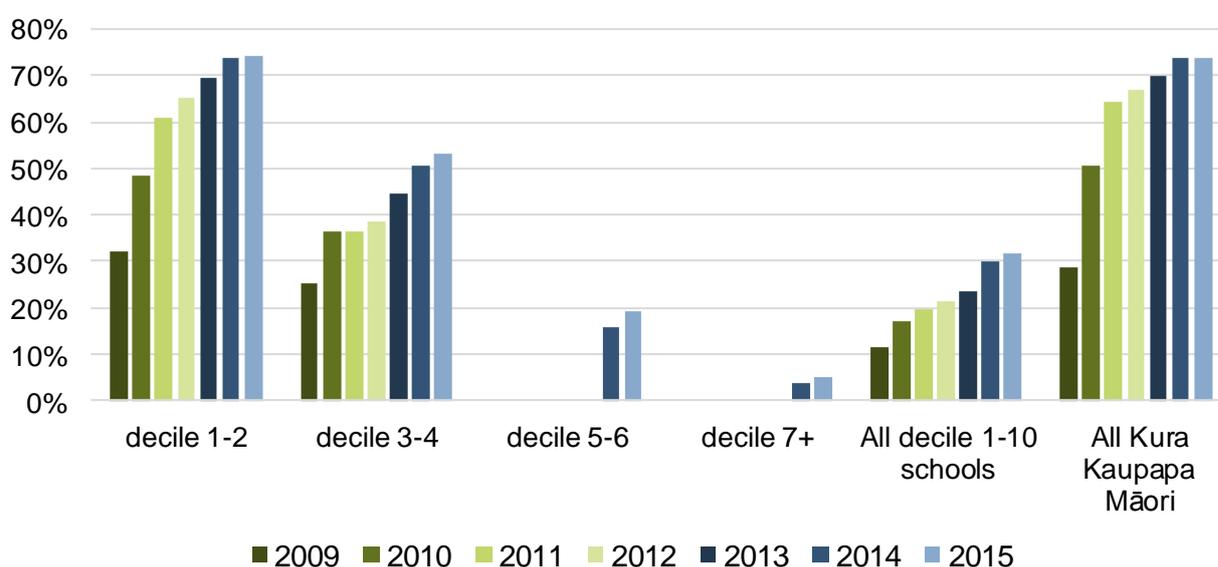
We also derived an indicator of the District Health Board that predominantly served students at the school.²⁸

Uptake of KickStart

Figures 1-3 show time trends in uptake of KickStart across different groups of schools and kura that were in operation in 2013, categorised by their school decile in that year and whether or not they were a kura kaupapa Māori. Seven in ten kura kaupapa Māori were decile 1-2.²⁹

Relatively few schools and kura that were ranked decile 5 or higher first enrolled in the programme following the 2013-14 expansion, and those that did tended to serve breakfasts to a smaller proportion of their students than the existing decile 1-4 KickStart schools and kura. The main contributor to increased numbers of breakfasts served following the expansion was an increase in the number of days per week breakfasts were served in existing decile 1-4 KickStart schools and kura.

Figure 1: Percentage of schools and kura receiving KickStart, by decile



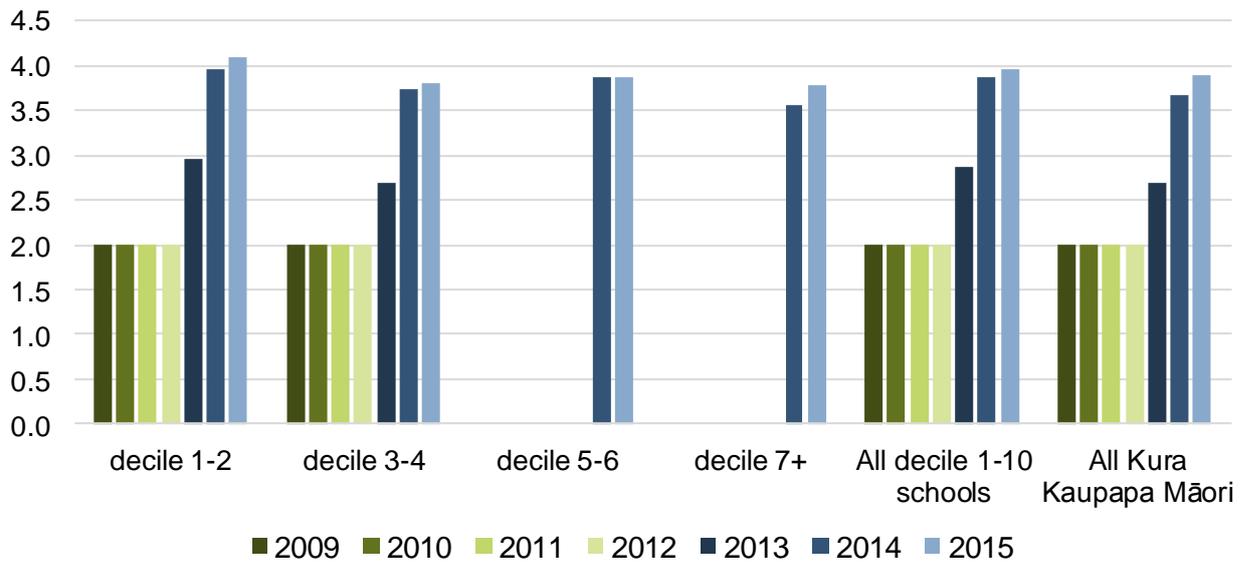
Sources: KickStart data supplied by Fonterra; School counts from Ministry of Education published School Directories.

Note: A very small number of schools and kura that were decile 5+ in 2013 received KickStart prior to 2014. Data for these schools and kura is not presented.

²⁸ Derived from outpatient data for the students enrolled at the school.

²⁹ Source: Schools Directory. <https://www.educationcounts.govt.nz/data-services/directories/list-of-nz-schools>. Downloaded 15 October 2017.

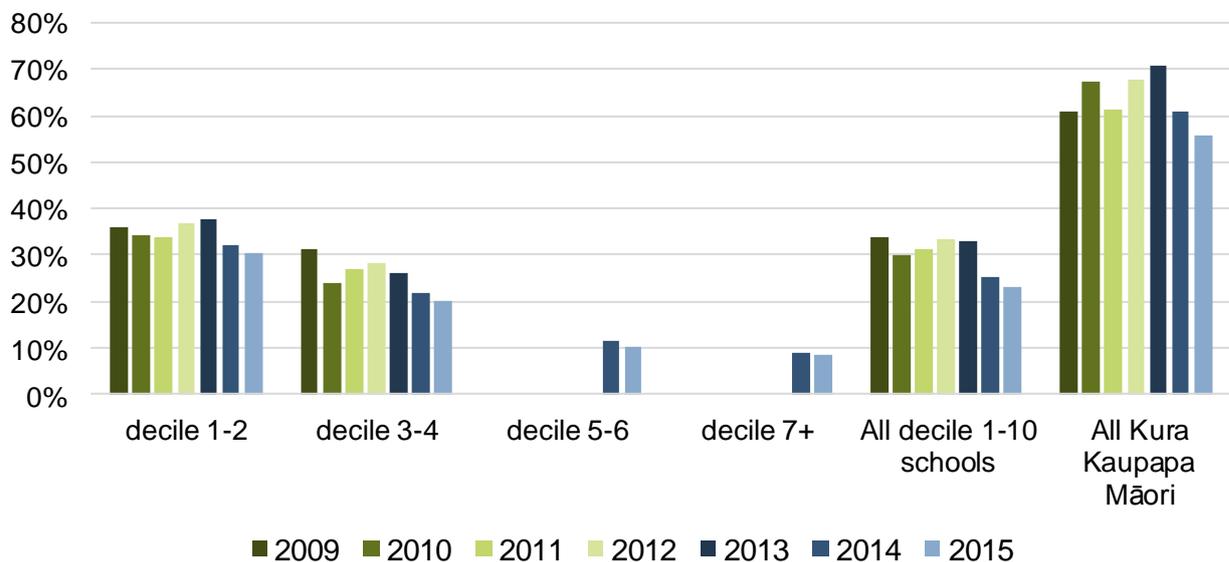
Figure 2: Mean days per week KickStart served in participating schools and kura, term 3, by decile



Source: KickStart data supplied by Fonterra.

Note: A very small number of schools and kura that were decile 5+ in 2013 received KickStart prior to 2014. Data for these schools and kura is not presented.

Figure 3: Mean percentage of students consuming KickStart in participating schools and kura, by decile



Sources: KickStart data supplied by Fonterra; Student counts from Ministry of Education ENROL data in the IDI.

Notes: A very small number of schools and kura that were decile 5+ in 2013 received KickStart prior to 2014. Data for these schools and kura is not presented. Data for a very small number of schools and kura with a student count < 6 is excluded from the calculations of means.

Table 1 shows the profile of decile 1-10 schools and kura in operation in 2013, by their level of KickStart per student-week in 2014. Overall, 30 percent of decile 1-10 schools and kura received KickStart at some time in 2014, eight percent served one or more breakfast per student per week, and two percent served more than three breakfasts per student per week.

Compared with schools and kura overall, schools and kura serving more than one KickStart per student-week were more likely to have a small roll, to be decile 1-3, a full primary (years 1-8) or composite (years 1-15) or other school type, and to be a rural school. Secondary and intermediate schools and kura that participated in KickStart tended to serve less than one breakfast per student per week.

We expect that in smaller schools and kura it is more feasible to set up and run a breakfast club that feeds a large proportion of students. Smaller rural schools and kura may also be more able to access support from the wider community. The large size of many intermediate and secondary schools may have made it less feasible to elect to provide breakfasts for most or all students. Another possible explanation for low uptake by these schools and kura is a tendency for school breakfast attendance rates to be low among adolescent students (Canterbury District Health Board, 2014).

Kura kaupapa Māori made up three percent of schools and kura overall, 17 percent of schools and kura with 1-3 KickStart per student-week, and 28 percent of schools and kura with more than three KickStart per student-week. The high representation of kura kaupapa Māori among schools and kura with high take-up may reflect the low socio-economic status of students, a focus on students' holistic wellbeing or hauora (Education Review Office 2017), or cultural practices of manaakitanga (caring for) and tiakitanga (guardianship). These practices are likely to mean that kura kaupapa Māori would tend to offer KickStart to all students if they participated in the programme – if breakfast was to be offered to one student, it would be offered to all.

Table 1: Characteristics of schools and kura by KickStart uptake in 2014, decile 1-10 schools and kura in operation in 2013 (standard deviations in italics)

Characteristic	School's KickStart per student-week in 2014				
	All schools	None	Up to 1	1-3	More than 3
Mean roll	300 <i>312</i>	304 <i>318</i>	362 <i>313</i>	103 <i>84</i>	68 <i>55</i>
Proportion in each school decile:					
1	0.107 <i>0.309</i>	0.041 <i>0.198</i>	0.214 <i>0.410</i>	0.403 <i>0.490</i>	0.431 <i>0.495</i>
2	0.100 <i>0.300</i>	0.043 <i>0.204</i>	0.223 <i>0.416</i>	0.278 <i>0.448</i>	0.255 <i>0.436</i>
3	0.099 <i>0.299</i>	0.059 <i>0.236</i>	0.201 <i>0.401</i>	0.181 <i>0.385</i>	0.196 <i>0.397</i>
4	0.097 <i>0.297</i>	0.079 <i>0.269</i>	0.166 <i>0.372</i>	0.076 <i>0.266</i>	0.078 <i>0.269</i>
5	0.101 <i>0.301</i>	0.111 <i>0.314</i>	0.096 <i>0.295</i>	0.028 <i>0.164</i>	- -
6+	0.495 <i>0.500</i>	0.666 <i>0.472</i>	0.100 <i>0.300</i>	0.035 <i>0.184</i>	- -
Proportion with each school type:					
Primary (years 1-8)	0.430 <i>0.495</i>	0.454 <i>0.498</i>	0.304 <i>0.460</i>	0.556 <i>0.497</i>	0.588 <i>0.493</i>
Contributing (years 1-6)	0.307 <i>0.461</i>	0.314 <i>0.464</i>	0.323 <i>0.468</i>	0.222 <i>0.416</i>	0.137 <i>0.344</i>
Intermediate (years 7-8)	0.048 <i>0.213</i>	0.040 <i>0.196</i>	0.087 <i>0.281</i>	0.014 <i>0.117</i>	- -
Composite (years 1-15)	0.056 <i>0.230</i>	0.046 <i>0.210</i>	0.052 <i>0.221</i>	0.160 <i>0.366</i>	0.157 <i>0.364</i>
Secondary (years 9-15)	0.092 <i>0.289</i>	0.078 <i>0.268</i>	0.164 <i>0.370</i>	0.014 <i>0.117</i>	0.039 <i>0.194</i>
Secondary (years 7-15)	0.039 <i>0.195</i>	0.038 <i>0.192</i>	0.057 <i>0.232</i>	- -	- -
Other school type	0.027 <i>0.163</i>	0.030 <i>0.170</i>	0.013 <i>0.113</i>	0.035 <i>0.183</i>	0.078 <i>0.269</i>
Proportion with each rural-urban status:					
Urban	0.539 <i>0.499</i>	0.554 <i>0.497</i>	0.568 <i>0.495</i>	0.333 <i>0.472</i>	0.255 <i>0.436</i>
Minor urban	0.179 <i>0.383</i>	0.148 <i>0.355</i>	0.279 <i>0.448</i>	0.236 <i>0.425</i>	- -
Rural	0.282 <i>0.450</i>	0.297 <i>0.457</i>	0.153 <i>0.360</i>	0.431 <i>0.495</i>	0.706 <i>0.456</i>
Proportion Kura Kaupapa Māori	0.029 <i>0.168</i>	0.011 <i>0.103</i>	0.028 <i>0.164</i>	0.174 <i>0.379</i>	0.275 <i>0.447</i>
Number of schools	2,514	1,776	543	144	51
% schools	100%	71%	22%	6%	2%

Notes: Data sources are as described above.

Students' exposure to KickStart

To explore whether there is an association between students' exposure to KickStart and administratively sourced indicators of oral and bone health for students, we focussed on students aged under 13 years. This is the age group for whom Table 1 suggested there would be the most variation in exposure as a result of differences in school uptake.

For the descriptive analysis, where students enrolled in multiple schools and kura in the year, we selected the student-school-year observation for the school they were enrolled in for the longest in the year for the analysis and weighted by the length of the enrolment spell. Results were similar when all student-school-year observations weighted by the length of the enrolment spell were included.

Table 2 examines the characteristics of the schools and kura and students across all such student-school-year observations (n = 3,085,656) in the period of the study (2009-2015).

Consistent with Table 1, compared with overall, students aged under 13 in schools and kura with higher levels of KickStart uptake were more likely to be enrolled in small schools and kura, low-decile schools and kura, full primary, composite or other school types, kura kaupapa Māori, and rural schools and kura. Their schools and kura were also more likely to receive Fruit in Schools and have Social Workers in Schools and kura (both these programmes are targeted at low-decile schools and kura), and to be a school where Positive Behaviour for Learning School-Wide or Positive Behaviour for Learning Restorative Justice had been introduced between 2009 and 2015.

Those with enrolment spells in schools and kura with higher levels of KickStart uptake were also more likely than average to be Māori or belong to a Pacific ethnic group. Consistent with the expected association between levels of need and take-up of the programme, they were the most likely to have come to the attention of CYF prior to starting school, and had spent a higher than average number of years supported by a main welfare benefit prior to starting school.

Table 2: Characteristics of students and schools and kura by KickStart uptake in 2014, where student aged under 13, 2009-2015 (standard deviations in italics)

Characteristics of school	All student- School's KickStart per student-week in 2014				
	school-year observations	None	Up to 1	1-3	More than 3
Mean roll	391	399	395	173	100
	<i>234</i>	<i>238</i>	<i>218</i>	<i>115</i>	<i>61</i>
Mean KickStart-per-student-per-week 2009-15	0.082	0.003	0.208	0.994	1.926
	<i>0.308</i>	<i>0.046</i>	<i>0.272</i>	<i>0.832</i>	<i>1.660</i>
Proportion in each school decile:					
1	0.085	0.025	0.235	0.454	0.589
	<i>0.279</i>	<i>0.155</i>	<i>0.424</i>	<i>0.498</i>	<i>0.492</i>
2	0.090	0.044	0.227	0.267	0.188
	<i>0.287</i>	<i>0.204</i>	<i>0.419</i>	<i>0.443</i>	<i>0.391</i>
3	0.078	0.043	0.184	0.192	0.157
	<i>0.269</i>	<i>0.203</i>	<i>0.388</i>	<i>0.394</i>	<i>0.364</i>
4	0.087	0.064	0.172	0.056	0.052
	<i>0.282</i>	<i>0.244</i>	<i>0.377</i>	<i>0.229</i>	<i>0.222</i>
5	0.094	0.095	0.102	-	-
	<i>0.291</i>	<i>0.293</i>	<i>0.302</i>	-	-
6+	0.566	0.729	0.080	-	-
	<i>0.496</i>	<i>0.444</i>	<i>0.165</i>	-	-
Proportion with each School type:					
Primary (years 1-8)	0.363	0.378	0.298	0.454	0.458
	<i>0.481</i>	<i>0.485</i>	<i>0.457</i>	<i>0.498</i>	<i>0.498</i>
Contributing (years 1-6)	0.455	0.458	0.461	0.353	0.232
	<i>0.498</i>	<i>0.498</i>	<i>0.498</i>	<i>0.478</i>	<i>0.422</i>
Intermediate (years 7-8)	0.101	0.086	0.163	0.025	-
	<i>0.301</i>	<i>0.280</i>	<i>0.369</i>	<i>0.157</i>	-
Composite (years 1-15)	0.045	0.041	0.042	0.151	0.226
	<i>0.207</i>	<i>0.198</i>	<i>0.200</i>	<i>0.358</i>	<i>0.418</i>
Secondary (years 7-15)	0.028	0.028	0.031	-	-
	<i>0.165</i>	<i>0.166</i>	<i>0.173</i>	-	-
Other school type	0.008	0.008	0.005	0.016	0.084
	<i>0.089</i>	<i>0.090</i>	<i>0.067</i>	<i>0.126</i>	<i>0.277</i>
Proportion with each rural-urban status:					
Urban	0.718	0.737	0.686	0.496	0.368
	<i>0.450</i>	<i>0.440</i>	<i>0.464</i>	<i>0.500</i>	<i>0.482</i>
Minor urban	0.163	0.134	0.249	0.278	0.054
	<i>0.369</i>	<i>0.341</i>	<i>0.433</i>	<i>0.448</i>	<i>0.226</i>
Rural	0.117	0.126	0.065	0.226	0.578
	<i>0.321</i>	<i>0.332</i>	<i>0.246</i>	<i>0.418</i>	<i>0.494</i>
Proportion Kura Kaupapa Māori	0.011	0.004	0.014	0.129	0.362
	<i>0.104</i>	<i>0.062</i>	<i>0.118</i>	<i>0.335</i>	<i>0.480</i>

Notes: Sample selects one observation per student year, as the longest spell in a school. All estimates are weighted by the fraction of school year in a school. Data sources are as described above.

Table 2 continued:

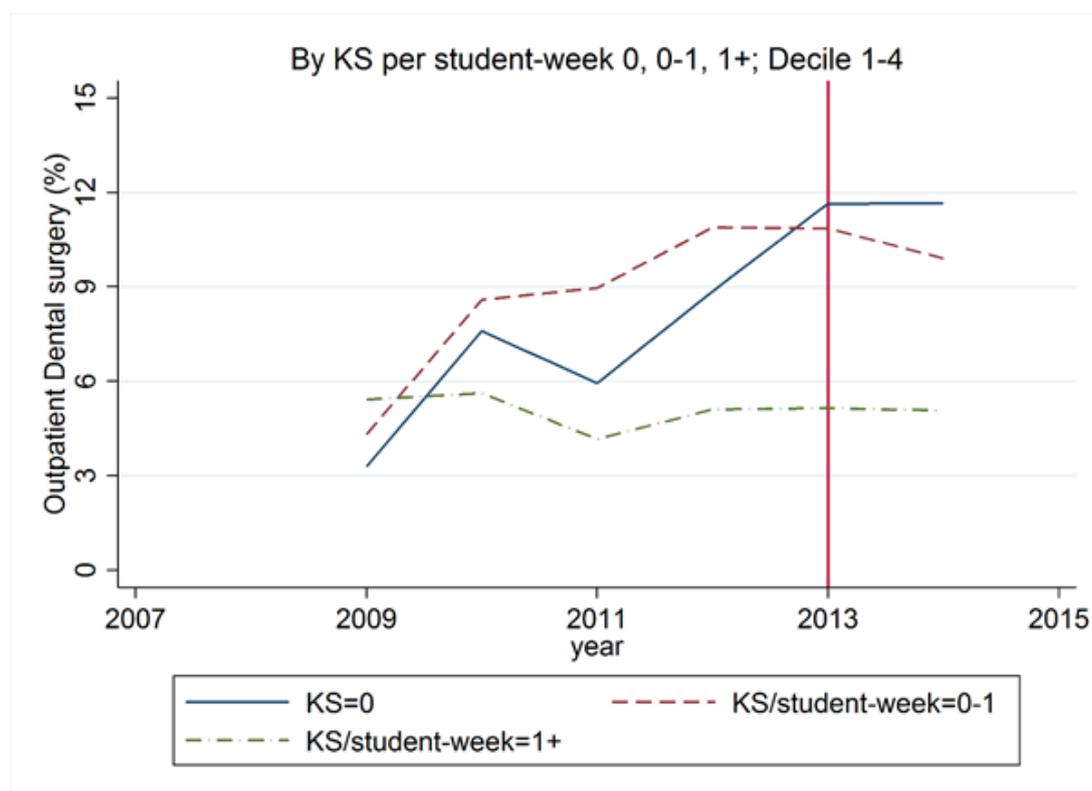
Other services and characteristics of students	All student-school-year observations	School's KickStart per student-week in 2014			
		None	Up to 1	1-3	More than 3
Proportion with other services 2009-15:					
Fruit in schools	0.176 <i>0.381</i>	0.062 <i>0.242</i>	0.476 <i>0.499</i>	0.783 <i>0.412</i>	0.812 <i>0.391</i>
Social Workers in Schools	0.201 <i>0.401</i>	0.085 <i>0.278</i>	0.542 <i>0.498</i>	0.596 <i>0.491</i>	0.642 <i>0.479</i>
Positive Behaviour for Learning	0.117 <i>0.321</i>	0.068 <i>0.251</i>	0.273 <i>0.445</i>	0.210 <i>0.407</i>	0.152 <i>0.359</i>
Proportion of students female	0.487 <i>0.500</i>	0.488 <i>0.500</i>	0.484 <i>0.500</i>	0.489 <i>0.500</i>	0.482 <i>0.500</i>
Proportion of students in each single/combination ethnic group:					
European	0.546 <i>0.498</i>	0.631 <i>0.483</i>	0.310 <i>0.463</i>	0.179 <i>0.383</i>	0.099 <i>0.299</i>
Māori	0.164 <i>0.370</i>	0.106 <i>0.308</i>	0.306 <i>0.461</i>	0.514 <i>0.500</i>	0.783 <i>0.412</i>
Pacific	0.084 <i>0.278</i>	0.054 <i>0.226</i>	0.180 <i>0.384</i>	0.148 <i>0.355</i>	0.013 <i>0.112</i>
Asian	0.073 <i>0.261</i>	0.083 <i>0.276</i>	0.049 <i>0.215</i>	0.023 <i>0.150</i>	0.001 <i>0.031</i>
Other	0.018 <i>0.132</i>	0.020 <i>0.139</i>	0.013 <i>0.112</i>	0.009 <i>0.093</i>	0.002 <i>0.044</i>
Māori + European	0.058 <i>0.235</i>	0.055 <i>0.227</i>	0.071 <i>0.256</i>	0.060 <i>0.238</i>	0.066 <i>0.249</i>
Māori + Pacific	0.016 <i>0.125</i>	0.011 <i>0.102</i>	0.031 <i>0.174</i>	0.037 <i>0.189</i>	0.024 <i>0.154</i>
Other combination/not recorded	0.041 <i>0.198</i>	0.042 <i>0.200</i>	0.040 <i>0.196</i>	0.029 <i>0.169</i>	0.012 <i>0.109</i>
Proportion of students with CYF notification before age 5	0.098 <i>0.297</i>	0.074 <i>0.262</i>	0.164 <i>0.370</i>	0.204 <i>0.403</i>	0.250 <i>0.433</i>
Mean benefit years before age 5	1.108 <i>1.785</i>	0.835 <i>1.593</i>	1.871 <i>2.051</i>	2.234 <i>2.065</i>	2.642 <i>2.038</i>
Mean rate of outcomes 2009-15:					
Outpatient visit for dental surgery	0.086 <i>0.280</i>	0.088 <i>0.284</i>	0.082 <i>0.274</i>	0.043 <i>0.202</i>	0.071 <i>0.257</i>
ACC claim for fracture	0.035 <i>0.184</i>	0.037 <i>0.188</i>	0.030 <i>0.170</i>	0.025 <i>0.155</i>	0.025 <i>0.155</i>
Outpatient/ED visit for orthopaedic surgery	0.028 <i>0.164</i>	0.028 <i>0.164</i>	0.029 <i>0.167</i>	0.026 <i>0.159</i>	0.024 <i>0.153</i>
Total observations	3,085,656	2,303,937	686,175	80,019	15,522
% observations	100%	75%	22%	3%	1%
Total schools	2,139	1,551	423	129	39
% schools	100%	73%	20%	6%	2%

KickStart uptake in 2014 and time trends in outcomes

Figures 4 to 6 show descriptive data for schools and kura on mean KickStart per student-week in 2014 and time trends in the proportion of students aged under 13 in the school or kura who had the outcomes of interest in the current year's spell of enrolment. We focus on students enrolled in decile 1-4 schools and kura as these were the schools and kura able to access KickStart throughout the period. Time trends suggest an association between higher KickStart uptake and reduced hospital outpatient visits for dental surgery among students (Figure 4). Associations with measures of bone health are less clear (Figures 5 and 6).

Appendix B provides these series separately for decile 1-2 and decile 3-4 schools and kura.

Figure 4: KickStart (KS) uptake in 2014 and student's hospital outpatient visits for dental surgery, decile 1-4 schools and kura, students aged under 13



Sources: KickStart data supplied by Fonterra; Student data from Ministry of Education ENROL data in the IDI; Ministry of Health's National Non-admitted Patient Collection data in the IDI. Outcome data for the first six months of 2015 are included in the analysis but not displayed.

Figure 5: KickStart (KS) uptake in 2014 and ACC claims for fracture, decile 1-4 schools and kura, students aged under 13

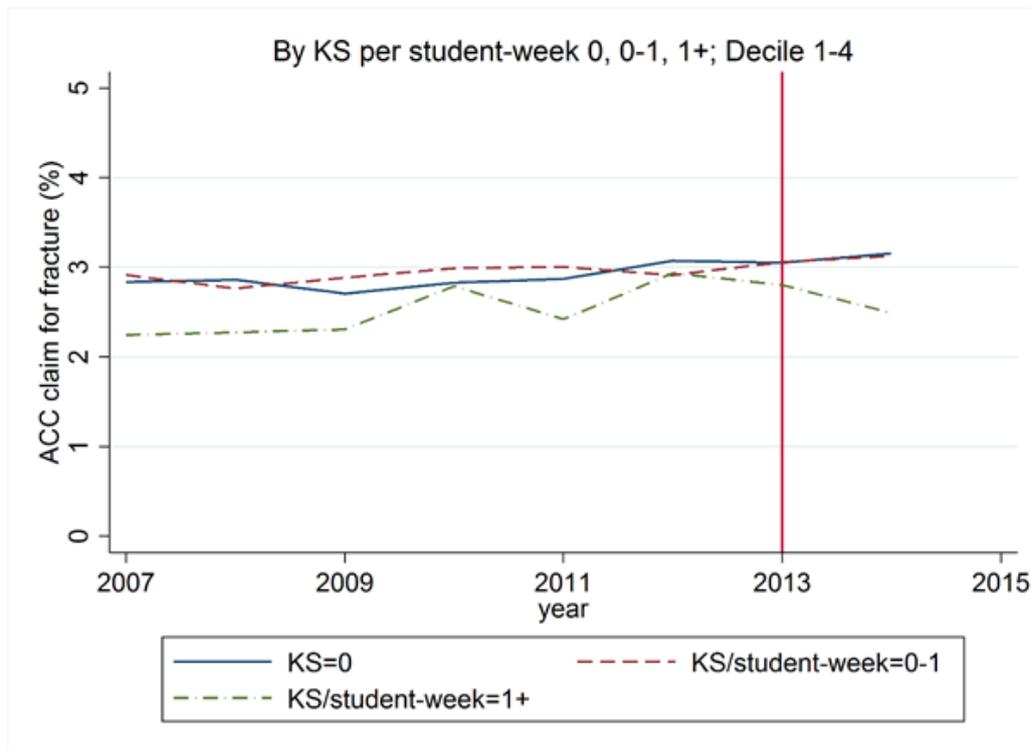
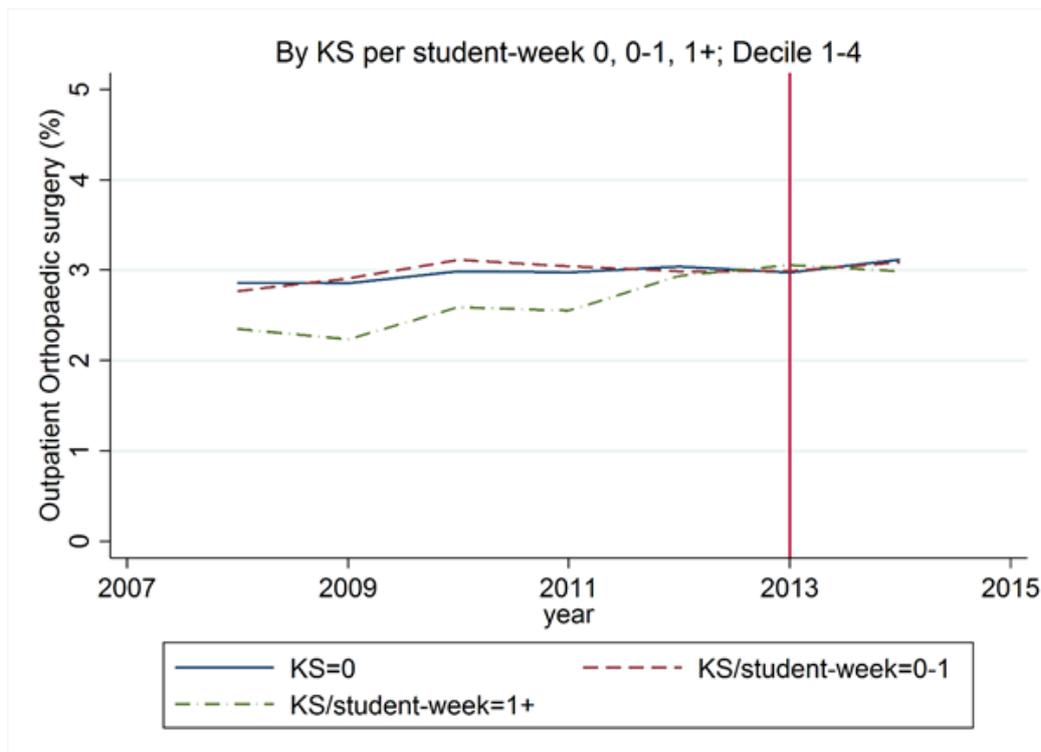


Figure 6: KickStart (KS) uptake in 2014 and outpatient and ED visits for orthopaedic surgery, decile 1-4 schools and kura, students aged under 13



Sources: KickStart data supplied by Fonterra; Student data from Ministry of Education ENROL data in the IDI; Ministry of Health’s National Non-admitted Patient Collection data in the IDI (includes ED visits); ACC claims data in the IDI. Outcome data for the first six months of 2015 are included in the analysis but not displayed.

Multivariate analysis

Multivariate analysis was applied to student-school-year observations over the period 2009-2015.

Model specification

A range of alternative linear model specifications was applied to explore associations between KickStart and the probability of outpatient visit for dental surgery. Associations were broadly consistent across specifications that:

- included all students' spells of enrolment each year in the regression and weighted these by spell length (thus giving more weight to outcomes for students with higher levels of school transience) versus including only the longest spell
- considered KickStart exposure in its component parts (ie whether KickStart was received in the school, the days per week breakfasts were served, and proportion of students in the school served each day) rather than KickStart per student-week as a summary measure
- considered outcomes as a function of the current school's current year's KickStart uptake versus an accumulation of exposure over schools and kura enrolled in over three school years
- considered outcomes as a function of the current school's average uptake of KickStart over the whole of the 2009-15 period
- controlled for school-level fixed effects
- controlled for student-level fixed effects.³⁰

In all of the regressions, measures of the degree to which students were exposed to KickStart had a significant and quantitatively meaningful negative association with outpatient visits for dental surgery.

Results are presented for our preferred regression which controlled for school-level fixed effects intended to capture those observed factors that were constant at the school level over the period, such as the district health board that primarily served the students, school type, and whether a kura kaupapa Māori. Controls for school-level fixed effects also potentially capture unobserved fixed differences between schools and kura (such as school climate and level of health-promoting activity).

This regression modelled the probability of a student having the outcome of interest in a year as a function of two measures of exposure: the average value of a flag indicating whether the student's schools and kura in the current and two preceding years participated in KickStart ('three-year KickStart school enrolment'); and the average KickStart per student-week in the schools and kura they were enrolled in across the three years ('three-year KickStart per student-week')

We hypothesised that the three-year KickStart school enrolment variable would capture both exposure to the programme and the selection of schools and kura with higher levels of student need into the programme. For this reason the three-year KickStart per

³⁰ Results are available from the authors on request.

student-week variable measuring the average intensity of the KickStart programme that the student was exposed to, having enrolled at some point in a KickStart school, was our primary exposure variable of interest.

The preferred regression was applied to a sample that selected one observation per student per year – the longest spell in a school – and weighted by the fraction of school year in a school. Estimated standard errors were clustered at the school-year level.

Results

Results are shown in Table 3. Estimates show the percentage point change in the proportion of students with the outcome associated with each variable, and are interpreted as follows:

- for categorical variables (eg ethnic group), percentage point change is relative to a category omitted from the regression (European)
- for flags (eg CYF notification before age 5), percentage point change is relative to the null category (no CYF notification before age 5)
- for mean values (eg three-year KickStart school enrolment; three-year KickStart per student-week; mean benefit years before age 5), percentage point change is for a one unit change (eg mean three-year KickStart school enrolment = 1 versus 0; one additional KickStart breakfast per student per week; one additional year supported by benefit).

Column 1 of Table 3 shows the results for hospital outpatient visits for dental surgery. These show a negative but non-significant association with the three-year KickStart school enrolment measure. The association with the three-year KickStart per student-week is negative and significant at the five percent level. Among students who enrolled in KickStart schools and kura, an increase in exposure amounting to one additional KickStart breakfast per student per week averaged over three years is associated with a 1.2 percentage point reduction in the likelihood of an hospital outpatient admission for dental surgery in the current year's spell of enrolment. Given the average annual rate of such events over the study sample is 8.6 percent, this represents about a one-sixth reduction.

Results show that gender, ethnic group, time supported by benefit before starting school and the presence of the Social Worker in Schools programme in the school are other factors associated with rates of hospital outpatient visits for dental surgery. Estimates for remaining control variables (calendar year and age) are available on request. Rates of hospital outpatient visits for dental surgery generally increased with calendar year.

Columns 2 and 3 of Table 3 show regression results for the two measures of bone health. In these regressions, the three-year KickStart school enrolment measure intended to capture the selection of schools and kura with higher levels of student need into the programme has a significant negative association with both outcomes. The three-year KickStart per student-week measure of intensity of exposure to the programme given enrolment in KickStart schools and kura has a positive but non-significant association with both the outcomes.

Table 3: Selected regression coefficients (standard errors in brackets)

	(1)	(2)	(3)
	Outpatient visit for dental surgery	ACC claim for fracture	Outpatient/ED visit for orthopaedic surgery
Three-year KickStart school enrolment	-1.030 (0.770)	-0.318** (0.074)	-0.132+ (0.073)
Three-year KickStart per student-week	-1.244* (0.556)	0.0836 (0.078)	0.095 (0.078)
Female student	0.076** (0.026)	-0.174** (0.023)	-0.297** (0.020)
Single/combination ethnic group (European omitted):			
Māori	0.199** (0.054)	-0.874** (0.037)	-0.314** (0.035)
Pacific	0.038 (0.063)	-1.612** (0.047)	-0.646** (0.045)
Asian	0.231** (0.060)	-2.374** (0.045)	-1.242** (0.036)
Other	0.106 (0.101)	-1.263** (0.080)	-0.551** (0.070)
Māori + European	0.146* (0.070)	-0.348** (0.049)	-0.136** (0.044)
Māori+ Pacific	-0.204* (0.096)	-1.097** (0.077)	-0.400** (0.079)
Other combination or not recorded	0.0546 (0.074)	-0.959** (0.054)	-0.438** (0.048)
CYF notification before age 5	0.094+ (0.051)	-0.0232 (0.036)	0.180** (0.037)
Mean benefit years before age 5	0.069** (0.010)	-0.059** (0.007)	0.052** (0.007)
Social Workers in Schools	-2.400** (0.540)	0.235** (0.055)	-0.036 (0.052)
Positive Behaviour for Learning	0.774 (0.604)	0.021 (0.052)	-0.135** (0.047)
Log total school student count	-0.632 (1.327)	0.172 (0.116)	-0.060 (0.099)
Constant	3.508 (7.681)	0.458 (0.672)	1.453* (0.571)
Total observations	3,085,656	3,085,656	3,085,656
R-squared	0.292	0.009	0.008

Notes: Estimates show the percentage point change in the proportion of students with the outcome associated with each variable.

** Significant at the one percent level

* Significant at the five percent level

+ Significant at the 10 percent level

Estimated standard errors are clustered at the school-year level.

Interaction effects

The regression estimates in Table 3 assume the associative effects of KickStart to be constant across all students. However, in practice, KickStart may be expected to have differential effects on students for at least two reasons. First, not all students within a KickStart school are likely to receive KickStart, and the data only identifies the schools and kura receiving KickStart, not which students participated in the programme. Thus, if the more disadvantaged students receive the breakfasts, effects are likely to be greater for such students. Second, irrespective of within-school targeting, if KickStart is randomly allocated to students within a school, the effects of receiving a KickStart breakfast are likely to be greater for those students who wouldn't otherwise have had breakfast.

One way to try to examine such differential effects is to interact the KickStart variables in the regression with observable characteristics that may either proxy for student disadvantage (so either greater propensity to receive or to benefit from KickStart) and then extend the regression to include these interaction variables.

The regression estimates in Table 3 also assume that the associations are constant over the period 2009-2015. We are interested in whether effects might have been greater from 2013, the period over which KickStart schools and kura with year 1-6 students could receive Milk for Schools and EasiYo in addition to a greater number of days of KickStart breakfasts. Interacting the KickStart variables with whether the year was pre- or post-2013 gives an indication of whether this was the case.

In results from regressions that include a variety of interactions, the interpretation of the coefficients on the interacted variables is that each represents the effect of KickStart for that subgroup relative to the omitted group. In practice, with multiple interactions with two KickStart dimensions (ie both the KickStart school enrolment and the KickStart intensity variables) that are additive across the sub-groups defined by the characteristics, this makes interpretation a non-trivial exercise.

Nonetheless, there are some suggestive patterns. For example, for hospital outpatient visits for dental surgery, the coefficients on the year being 2013 or later interacted with KickStart school enrolment is negative and significant suggesting a stronger negative association with outpatient visits for dental surgery after KickStart was expanded, Milk for Schools was fully rolled out, and EasiYo was available through KidsCan. We find significant negative coefficients on the Pacific student and mean benefit years before age five variables interacted with KickStart school enrolment suggesting greater than average reductions in outpatient visits for dental surgery.

We find significant negative coefficients on the Māori student variables interacted with KickStart school enrolment, but significant positive coefficients on Māori student variables interacted with the measure of KickStart intensity, making these interactions difficult to interpret.³¹ These mixed interaction effect results for Māori do not change the main findings from the study, which are that increased exposure to KickStart was associated with a reduction in outpatient visits for dental surgery (Table 3), and that most of the students who had the highest levels of exposure to KickStart were Māori (Table 2).

³¹ Results are available from the authors on request.

4 Discussion

Results from this study are consistent with an existing evidence base that suggests a positive association between dairy intake and oral health in children (Dror and Allen, 2014). We see no evidence of a significant association between KickStart intensity and the two administrative indicators of fracture. One possible explanation is that KickStart intensity had no association with bone health. Another is that students who received more KickStart were more active as a result of increased energy intake. Falls may have increased at the same time as the likelihood of fracture upon falling was reduced as a result of improvements in bone health. Consistent with this explanation, the general patterning of results is suggestive of higher rates of fracture among more nutritionally advantaged students.

We find a general pattern of increasing hospital outpatient visits for dental surgery over the study period which may reflect a number of possible drivers. It is likely to be due, in part, to the effect of increased reach of preventive oral health services over the period revealing previously unmet need for more complex dental treatment in some population groups. Between 2006/07 and 2015/16, the proportion of children aged 1-14 years who had visited a dental health care worker in the last 12 months increased. Māori children had a larger relative increase than other ethnic groups.³² At the same time, changes in clinical practice and in treatment preferences and tolerance may have caused more procedures that would formerly have been conducted by dental therapists under local anaesthetic to be conducted in hospital settings under general anaesthetic. A trend towards treating rather than removing severely decayed teeth may have also increased the likelihood that children had repeat visits to hospital dental services.

It is unclear whether changes in oral health for some population groups might also have contributed. In the 2015/16 National Health Survey, children living in the most deprived areas were 2.4 times as likely to have had a tooth removed due to decay, abscess or infection in the last 12 months as those living in the least deprived areas, after adjusting for age, sex and ethnic differences (Ministry of Health, 2016).³³ Data on the change in the proportion of children with teeth removed in the last 12 months between 2006/07 and 2015/16 are not available. While there was no statistically significant change comparing 2011/12 and 2015/16 (Ministry of Health, 2016), it is unclear whether rates increased for some population groups comparing 2006/07 and 2011/12 – 2015/16.

While we were unable to determine whether increased exposure to KickStart caused reduced hospital outpatient visits for dental surgery against the backdrop of increasing visits over time, it is useful to consider possible mechanisms that could potentially link the two.

- KickStart may have improved the nutritional quality of the breakfasts consumed by students. This mechanism is suggested by a study by Bhattacharya et al. (2006) which examined the United States School Breakfast Program. With a study design

³² 82 percent of Māori children had visited a dental health care worker in the past 12 months in 2015/16, compared to 74 percent in 2006/07 (Ministry of Health, 2016).

³³ In 2015/16 3.5 percent of children had teeth removed in the past 12 months (5.8 percent of children in the most socioeconomically deprived areas compared with 1.3 percent of children in the least deprived areas) (Ministry of Health, 2016).

that controlled for selection effects, they found that the School Breakfast Program increased healthy eating scores, reduced the percentage of calories from fat, improved the nutritional quality of the calories consumed, and reduced the prevalence of vitamin and mineral deficiencies.

- The effect of the breakfasts may have been to displace consumption of unhealthy snack foods, including sugary food and drinks, as suggested by the cross-sectional study conducted by Utter and colleagues (2007).
- Reduced pressure on home budgets as a result of KickStart may have allowed families and whānau to purchase higher quality foods to eat at other times of the day and week. Such spillover effects are suggested by the Bhattacharya et al. (2006) study, which found that both adults and preschool children had healthier diets and lower percentages of calories from fat when the School Breakfast Program was available to school-aged children in the household.

If Kickstart caused improvements in diet and caused sugary food and drinks to be displaced, this would suggest that benefits might also include reduced obesity and improvements in learning, health and development (Thornley et al., 2017a), including reductions in rheumatic fever (Thornley et al., 2017b). Māori and Pacific children make up the majority of students aged under 13 years in schools and kura receiving KickStart, suggesting potential benefits in reduced health disparities. A possible direction for further research is working with a sample of school communities to explore these possible wider health benefits, informed by better information on other programmes offered in those schools and kura. With consent, data collected directly from schools and kura, students and their families and whānau could be combined with baseline health, development and biometric data collected at the students' Before School Check in the IDI for quantitative study of a range of outcomes.

A qualitative study that seeks the views of students and families and whānau on KickStart and other services in their schools and kura would also be useful. This could explore, for example:

- whānau involvement in the breakfast clubs in kura kaupapa Māori (and whether it operates as a whānau breakfast model)
- whether programmes are successful in avoiding stigma
- whether services provide practical support that families and whānau value
- whether, at the same time as school staff experience a greater sense of connection to their students through the sharing of a daily meal, families and whānau experience a reduction in connection
- whether there are impacts on students' sense of autonomy and independence.

While school food programmes remain a part of the response to child poverty, it will be important to be open to reviewing their nutritional content to promote maximum health benefits across the programmes as scientific consensus and dietary guidance evolves.

In the light of evidence on the higher prevalence of lactose intolerance among Māori, Pacific and Asian populations, other food options (lactose-free milk, unsweetened yoghurt or hard cheese, for example) may better meet the needs of those children with genetic pre-disposition to, or symptoms of, lactose intolerance, while still maintaining calcium intake (Di Rienzo et al., 2013).

There are a number of considerations for governments to weigh when considering the degree to which anti-poverty programmes should focus on in-kind assistance, including food and other resources delivered through schools and kura, and on increasing family incomes through cash transfers (Boston and Chapple, 2014). International research increasingly points to increased family incomes as having a causal positive impact on outcomes for children. Evidence is strongest for cognitive development and school achievement, and for social and behavioural development, but is more mixed for children's physical health (see Cooper and Stewart, 2013 and Boston and Chapple, 2014 for reviews).

Possible areas for future research include: exploring the role of family income in improving child health and learning in our context; identifying a range of effective policies for improving health and learning;³⁴ and building the evidence base on the comparative benefits and costs of investing in the wellbeing of children and young people via their family and whānau, versus through their school.

Strengths and limitations

Studies based on administrative data have the benefit of drawing on a longitudinal data source unaffected by non-response bias, and a large, and in our case comprehensive, sample of the populations of interest (Connelly et al., 2016; Currie, 2013). A further strength of this study is that we explored associations between the availability of KickStart at the school level and children's outcomes. In this way we avoided the difficulty of controlling for the individual-level selection effects that are encountered when comparing outcomes for the particular students who participate in a breakfast programme with those who do not (Bhattacharya et al., 2006).

Against these benefits, a number of limitations need to be considered when interpreting the results. IDI data linking is generally probabilistic. Some errors are inevitable in this process. The data used capture information collected or generated in the process of administering government services, and inevitably they will embody any errors in measurement, reporting and recording that occur in those processes.

The administrative source of the data also means they are often imperfect proxies for the underlying conditions of concern (Connelly et al., 2016; Hughes, 2015). We use ACC claims data and data on health service use as our indicators of outcomes. Rather than real changes in outcomes for individuals, differences between groups and changes over time could reflect differences in access to and affordability of services, the configuration of private and public services, and data capture systems.

Given the limits to what can be measured using administrative data, we were unable to assess whether KickStart was associated with an increase in the likelihood that school students started the day with a nutritious breakfast, reduction in student hunger, improvement in attendance or increase in academic attainment (for most age groups). And at the time of writing, the IDI offered no measures of whānau, or whānau wellbeing (Kukutai, Sporle & Roskrug, 2017). It could not be used to quantitatively assess, for example, whether whakawhanaungatanga was improved in kura kaupapa Māori or other schools and kura. Nor could it be used to explore whether strengthened tuakana-teina

³⁴ Innovations elsewhere include <https://www.doubleupfoodbucks.org/>.

relationships were a factor in reducing behavioural problems or improving teaching and learning within a cultural context and in te reo Māori.

IDI data are a potentially rich source of information for programme evaluation, but because they sometimes fail to capture many of the important outcomes social programmes are designed to achieve, their use in a process of identifying those programmes that should be continued and those that should be discontinued needs to be tempered.

We included only two control variables for events earlier in students' lifecourse likely to be associated with their health in their school years. Both have limitations. We control for administratively recorded reports of concern, but these capture only some of the abuse and neglect that occurs (Gilbert et al., 2012). Incidence may also be influenced by structural drivers including poverty and bias (Metzler et al., Slack et al., 2017; Cram et al., 2015), and by policies and programmes that affect community reporting (Mansell et al., 2011; Vaithianathan et al., 2016). We proxy exposure to poverty based on students' time spent supported by welfare benefits before age 5. But children whose parents work represent a substantial minority of children in poverty (Perry, 2017a), and proxies for exposure to poverty inclusive of these children would be a useful addition, as would measures of student transience.

A wide range of lifecourse measures can be constructed from the IDI, including measures of maternal health in pregnancy, birth outcomes, family socio-economic circumstances around the time of birth, and health service usage in children's early years. Future studies would be strengthened by the development of a richer set, informed by theory and evidence, and wise to the potential for what is measured in administrative data to reflect factors other than the underlying condition of interest.

While we controlled for school-level fixed effects, which in most schools and kura would include water fluoridation in the school catchment, we did not control for the small number of cases where water fluoridation status changed over the period of the study.

In addition, we did not control for access to and uptake of preventive oral health services provided by the Community Oral Health Service, or for changes in the focus of those services which have included efforts to increase participation of pre-schoolers, to increase the frequency of visits among high-risk children, and to increase topical fluoride varnish application particularly in areas without water fluoridation. Following the post-2006 re-orientation of services, improvements in oral health measures recorded in Community Oral Health Service data have been greatest in areas without fluoridation, (Moore and Poynton, 2015), possibly as a result of these efforts.

We have noted that the complexity of the wider service environment prevented us from drawing causal conclusions from the associations found. A factor that further limits causal inference is the potential for unobserved selection bias at the school level in a voluntary programme like KickStart. We are unlikely to have adequately controlled for the factors that, eg caused some schools and kura to take up KickStart for all their students five days a week, some to take the programme up for a small minority of students a few days a week, and others to not take up the offer of the programme at all. If one of the explanations for high take-up among kura kaupapa Māori is a commitment to hauora, for example, this commitment might also make these kura more likely to have also implemented other healthy eating policies and services.

5 Conclusion

Schools and kura are overwhelmingly positive about the KickStart programme and report positive effects on students' health and wellbeing and engagement with school. Our analysis of linked administrative data shows that after controlling for a range of confounders, students enrolled in schools and kura with higher uptake of KickStart – measured in terms of the average number of breakfasts served per student per week across three school years – are significantly less likely than their peers to have hospital outpatient visits for dental surgery. While plausible causal mechanisms exist, we are unable to draw conclusions about the degree to which this association reflects the causal impact of KickStart.

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Appendix A

Fruit in Schools

The Ministry of Health-funded Fruit in Schools programme has operated in low-decile schools and kura since 2005. The programme provides a piece of fresh produce for each child for each school day. Participation by schools and kura is voluntary. The majority of schools and kura invited to participate agree to take part.

Initially, funding was only secured until 2009 (Boyd et al, 2009). The programme was introduced in three phases, beginning in late 2005, early 2006 and late 2006 and targeting mainly decile 1 schools and kura. Following the recommendations of a Health Select Committee report on obesity and type 2 diabetes in 2007, Fruit in Schools was extended to decile 2 primary schools and kura, decile 1 and 2 intermediate schools and kura. On ongoing funding was also secured. At the time, Fruit in schools had a large education and promotion component which funded extra Health Promoting Schools (HPS) support and teacher release for teachers to implement a whole school plan to promote healthy eating, physical activity, sunsmart behaviours, and smokefree lives.

An early evaluation of Fruit in Schools indicated this programme had a positive impact on schools' and students' approaches to healthy lifestyles. Over time, Fruit in Schools students were more likely than a group of comparison students to have either maintained their initially positive health-related practices, or made small positive improvements (Boyd et al., 2009).

In 2009, the model changed to fruit provision with no extra HPS support (schools and kura could join HPS and get the usual support that other schools and kura access). A study of Fruit in Schools conducted in 2014 included a survey of principals in participating schools and kura. Principals reported a range of benefits, including: feeding hungry children:

- reducing stigma and promoting a sense of equality between students
- improving children's ability to concentrate
- improving attendance and engagement.

All respondents said Fruit in Schools contributed to positive attitudes among pupils about eating fruit and vegetables (Ball and Watts, 2015).

Health Promoting Schools

Prior to 2009, when they joined Fruit in Schools, schools and kura undertook to use a Health Promoting Schools approach to promote student health and wellbeing more broadly (Boyd, 2011). Health Promoting Schools is an international 'settings-based' approach where the whole school community works together to address the health and wellbeing of students, staff and their community in a way that fits their own school context. The Health Promoting Schools approach was first introduced in New Zealand in 1997 as a pilot and following evaluation was expanded nation-wide (Health Promoting Schools National Schools Survey Report, 2016).

Health Promoting Schools facilitators from District Health Boards support school communities to identify and develop solutions to address the needs they prioritise as being important, and link to appropriate health and social services to take action.

Examples of actions taken by schools and kura as part of Health Promoting Schools include water-only policies introduced in response to concerns about high consumption of sugary drinks and high rates of tooth decay among students, and breakfast, lunch and healthy eating programmes to respond to student hunger and unhealthy lunches (Health Promoting Schools National Schools Survey Report, 2016).

The programme is funded by the Ministry of Health and currently operating in 62 percent of schools and kura,³⁵ although levels of activity vary (Health Promoting Schools National Schools Survey Report, 2016) and involvement is not consistent (Education Review Office, 2016). An impact evaluation found that when school effectiveness, leadership effectiveness, whānau engagement and Health Promoting Schools facilitator effectiveness are combined, Health Promoting Schools is associated with positive student outcomes in attendance, stand-downs and suspensions, and achievement in reading (Leeson, 2017).

KidsCan

KidsCan is a charitable trust established in 2005 that aims to help disadvantaged children in low-decile schools and kura in years 1-13 to improve their participation in education. It operates several programmes:

- targeted food at school for financially disadvantaged children
- quality footwear, socks and raincoats for children
- the Nit Buster programme to prevent and treat head lice
- the Orchards in Schools programme, aimed at involving children in the planting and growing of fruit trees.

At the end of 2015, KidsCan was active in 530 decile 1-4 schools and kura across New Zealand and had operating revenue of \$12.3m (KidsCan, 2016).

An initial investigation into the first year of raincoat distribution and the first weeks of food distribution by KidsCan found the items were overwhelmingly well received by children, parents, and teachers, and noted reports of improvements in children's self-esteem and school attendance (KidsCan, 2007). These findings were echoed in later studies of KidsCan raincoat and shoe distribution (Bern and Murphy, 2010; KidsCan, 2010). A later study of food distribution noted reports of improvements in behaviour, concentration, and attendance (KidsCan, 2011).

School gardening programmes

School gardening programmes are supported through a range of organisations and initiatives, including Enviroschools, Garden to Table, HPS and KidsCan. In 2014, 31 percent of schools and kura participated in Enviroschools and virtually all of these schools and kura had school gardens, which contributed to the food eaten by students (Toimata Foundation, 2015). While not specific to any of these programmes, analysis of data from New Zealand's nationally representative survey of secondary school students found that school gardens were associated with lower BMI and reduced fast food

³⁵ Personal correspondence, Therese Ireland-Smith, Cognition Education.

consumption. These programmes appeared to be most beneficial for students living with poverty (Utter et al., 2016).

Local community-based initiatives

A range of not-for-profit service providers deliver food in schools and kura programmes. Many schools and kura had their own school-based responses to student hunger that predated the KickStart expansion. Some initiatives have been operating for many years. Others have begun operations very recently. The following listing outlines just some of the local community-based initiatives operating:

- Angelslight Breakfast Club, operating in Papakura (established in 2001)³⁶
- St Vincent de Paul's school lunches, operating in Hamilton (from around 2010)³⁷
- Martinborough Breakfast Club, providing breakfasts and lunches in Martinborough (established in 2010)³⁸
- Tribal Huks sandwich supply, operating in Ngaruawahia (starting in 2011)³⁹
- Food for Life school lunches, operating in Whangarei (from around 2012)⁴⁰
- Feed the Need school lunch programme which provides hot lunches in winter months to schools and kura in Manurewa and Takanini, Auckland (established in 2012)⁴¹
- Eat My Lunch, operating in Auckland and Hamilton (established in 2015)⁴²
- The Koha Shed Aotearoa and The Kai Kitchen, operating in South Taranaki (established in 2015)⁴³
- Fill their Lunchbox school sandwich programme operating in Christchurch (established in 2015).⁴⁴

School based health services

Nine secondary schools were part of the Healthy Community Schools initiative which introduced health and social work services in 'Achievement in Multi-cultural High Schools' (AIMHI schools) (Ministry of Health, 2009). An evaluation of the initiative found

³⁶ See <https://sites.google.com/a/touchsub.info/papakura-christian-services-trust/ministries/angels-light>

³⁷ See <http://www.stuff.co.nz/waikato-times/news/68283043/maggys-catering-feeds-hungry-kids>

³⁸ See http://www.nzherald.co.nz/wairarapa-times-age/news/article.cfm?c_id=1503414&objectid=11104449

³⁹ See <http://www.dailymail.co.uk/news/article-3151806/Meet-violent-gang-members-extensive-criminal-records-making-500-sandwiches-day-needy-schoolchildren.html>

⁴⁰ See <http://www.eventfinda.co.nz/venue/food-for-life-community-cafe-whangarei>

⁴¹ See <https://www.feedtheneed.co.nz/index.php/what-we-do/winter-boost-programme/>

⁴² <http://www.stuff.co.nz/business/better-business/82108968/Eat-My-Lunch-help-feed-hungry-children>

⁴³ See <http://www.stuff.co.nz/taranaki-daily-news/news/south-taranaki-star/68250609/koha-shed-keeps-hawera-children-fed> ; <http://www.thekaikitchen.co.nz/index.html>

⁴⁴ See <https://www.pledgeme.co.nz/projects/4440-fill-their-lunchbox-help-alleviate-nz-child-poverty>

significant improvements in staff views about school climate when compared with staff in non-participating schools with a similar socio-economic profile. AIMHI students expressed greater satisfaction with school and felt there was greater support for their achievement and for ethnic diversity than their peers in comparison schools (Anderson et al., 2008).

A later evaluation concluded that school-based health and social work services in AIMHI schools played a significant role in improving service access and improving the health and welfare of students. Students and staff expressed increasingly positive views on the services and their willingness to use them as the services bedded in. Time series analysis suggested that compared with their peers in other decile 1 schools, AIMHI students had better school engagement and achievement (Ministry of Health, 2009).

Building on the success of this initiative, the Ministry of Health has funded school-based health services in decile 1 and 2 secondary schools, teen parent units and alternative education facilities since 2009. In 2014, the Prime Minister's Youth Mental Health Project extended the service to decile 3 secondary schools.⁴⁵ Budget 2018 provided funding for further expansion to decile 4 secondary schools.

In analysis of data from New Zealand's nationally representative survey of secondary school students, better school health and welfare services were associated with improved student health and wellbeing outcomes in areas such as depression, suicide risk, sexual health, alcohol misuse and school engagement (Denny et al., 2014).

Support for disruptive students were associated with reduced truanting behaviours. However, the strength of these associations was modest, suggesting a need for targeted intensive interventions in order to improve outcomes for students with the highest levels of emotional and behavioural difficulty (Denny, 2011).

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⁴⁵ <https://www.beehive.govt.nz/speech/new-guide-improve-school-based-health-services-launched>

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Appendix B

Figure B1: Schools' KickStart uptake in 2014 and hospital outpatient visits for dental surgery, students aged under 13

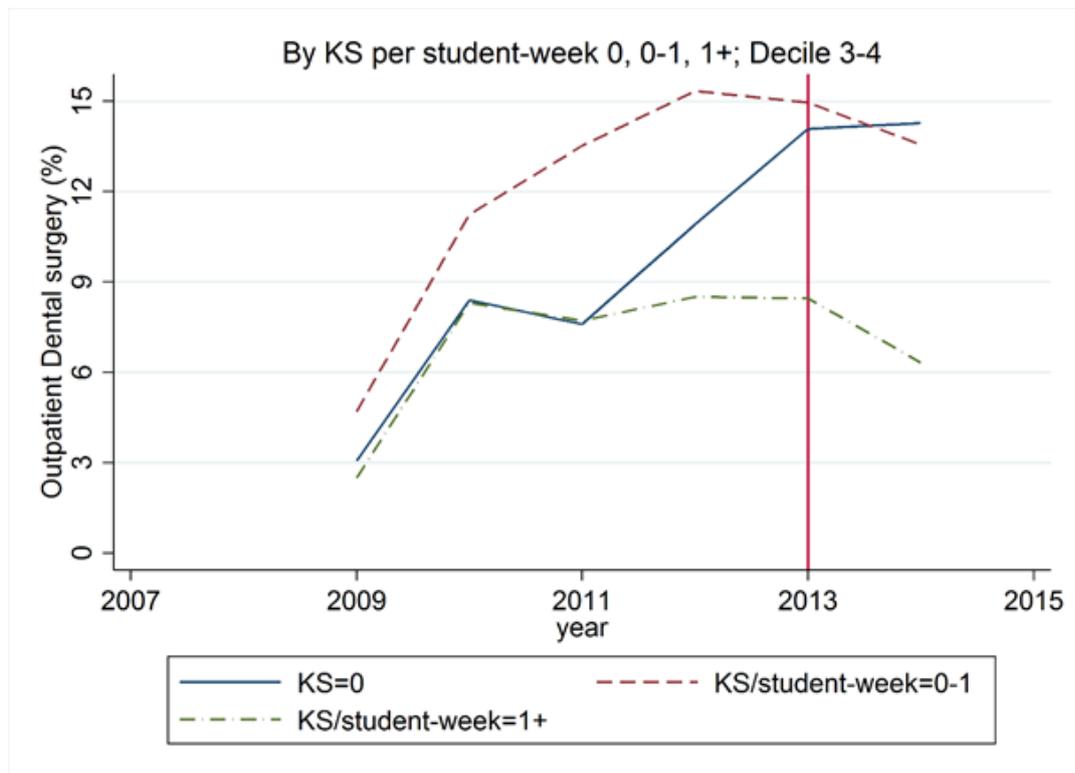
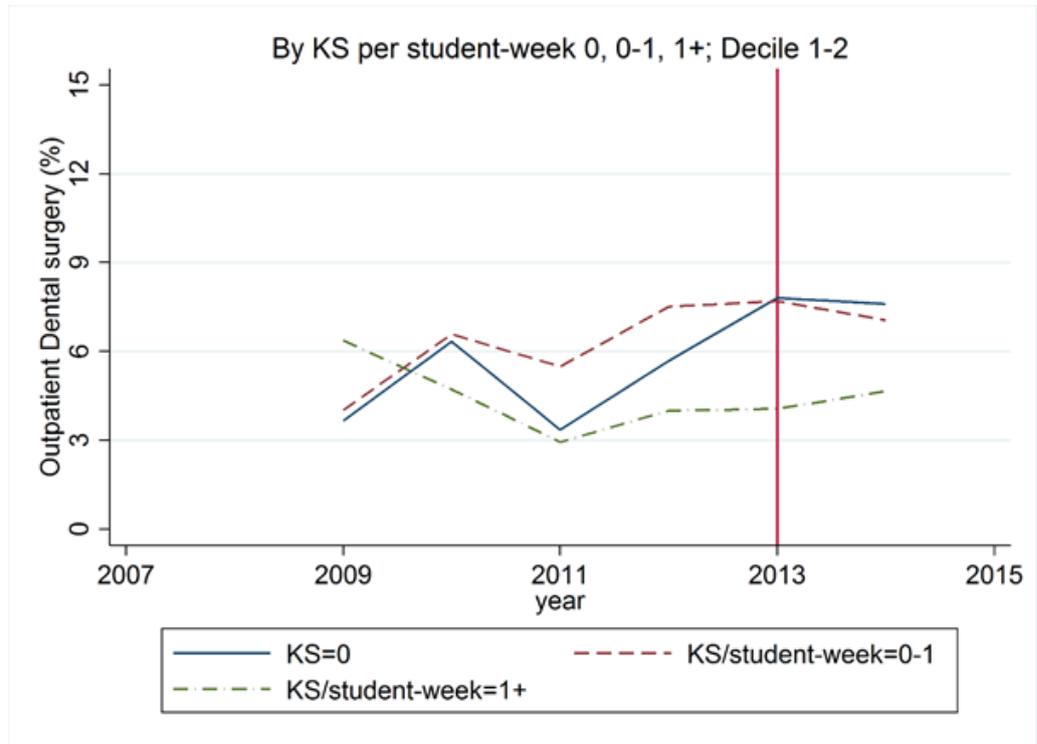


Figure B2: Schools' KickStart uptake in 2014 and ACC claims for fracture, students aged under 13

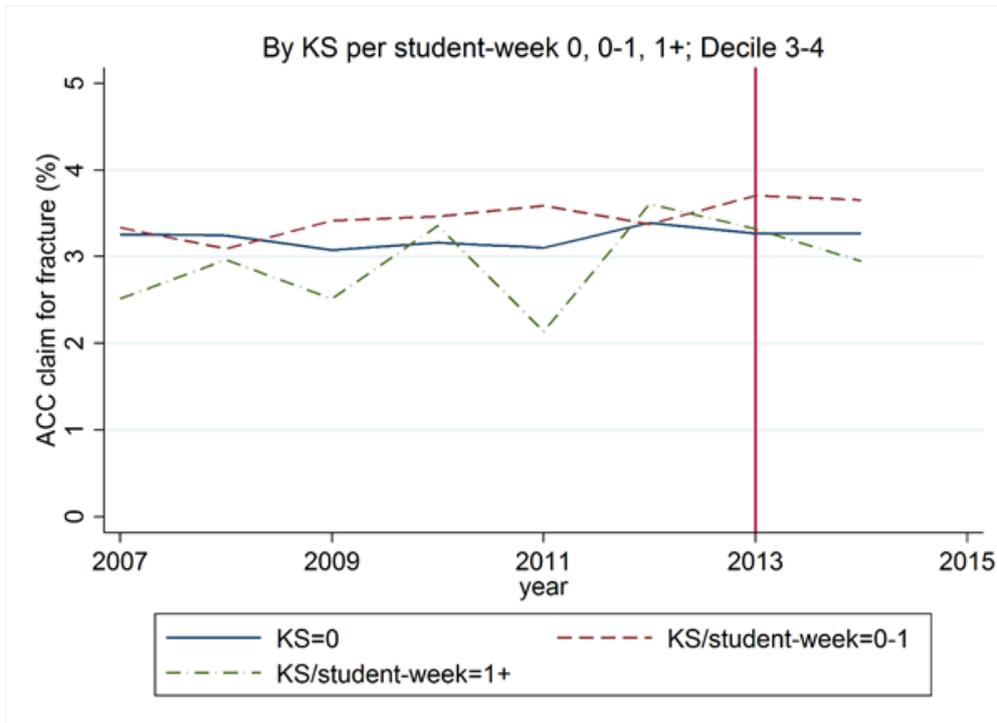
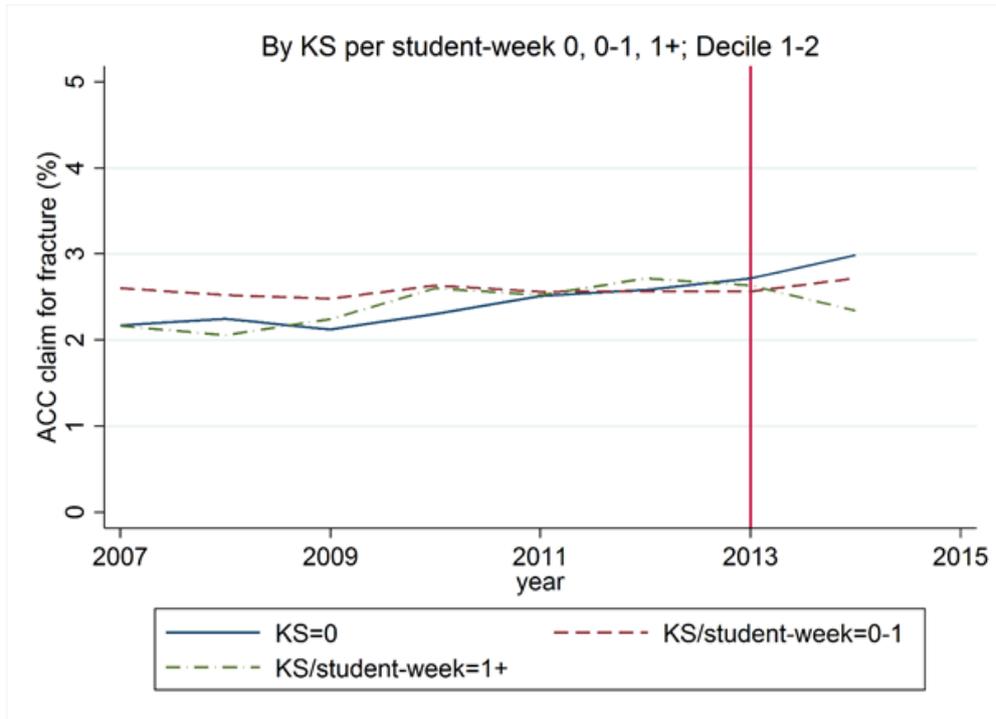


Figure B3: Schools' KickStart uptake in 2014 and hospital outpatient and ED visits for orthopaedic surgery, students aged under 13

