

A BETTER START

E Tipu e Rea

Improving the potential for all young New Zealanders

FUTURE
STRATEGY
2019 - 2024



Glossary and acronyms

hauora	health and well-being
He Awa Whiria	Braided Rivers model
hui	meeting
IDI	Integrated Data Infrastructure. one of Stats NZ large integrated research databases of microdata (units of a population, such as individuals, households, or businesses).
iwi	iwi form the largest social units in Māori culture
Kāhui	Māori advisory group for the Challenge
Kāhui Ako	A Community of Learning. A group of education and training providers that form around children and young people's learning pathways, and work together to help them achieve their full potential.
kaumātua	elder
kaupapa Māori	theory and praxis stemming from being and operating as Māori to bring about transformation through research
mātauranga	education and learning
mātauranga Māori	the knowledge, comprehension, or understanding of everything visible and invisible existing in the universe
OECD	Organisation for Economic Co-operation and Development
period one /first period	the funding period, 2015 - 2019
period two /second period	the funding period, 2019 – 2024
tamariki	children
te ao Māori	Māori world view
tikanga	correct procedure, custom, habit, protocol
Vision Mātauranga	MBIE policy. The Vision Mātauranga policy unlocks the science and innovation potential of Māori knowledge, resources and people
waiora mo te mātauranga	our research approach
whānau	family/families an extended family or community of related families who live together in the same area
whanaungatanga	process of building relationships

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Our goal is to find better ways to predict, prevent and intervene so children have a healthy weight, are successful learners and adolescents are emotionally and socially well-adjusted

Section 1: Long-term view

The objective of A Better Start: E Tipu e Rea is to improve the potential for all young New Zealanders to lead a healthy and successful life. To achieve this, the Challenge is researching improved methods and tools to predict, prevent and intervene so children have a healthy weight, are successful learners and adolescents are emotionally and socially well-adjusted.

Long-term our goals are to reduce by 15% the children who have an unhealthy weight, reduce by 15% the children not achieving the reading milestones at Year 1 and reduce by 15% the number of young people experiencing a significant mental health issue. The Challenge's approach to predict and prevent poor health and well-being outcomes in early childhood, to engage with communities in research co-design and bring together different disciplines and to take a holistic approach. A further enabling research theme Big Data informs interventions through the Integrated Data Infrastructure (IDI) and longitudinal cohorts.

Challenge Priorities

Our three major themes will continue and have been re-titled in positive, non-deficit language:

- Healthy Weight (previously obesity),
- Successful Learning (previously literacy) and
- Resilient Teens (previously adolescent mental health).

Big Data remains an enabling theme across the three major themes helping to focus efforts on areas of highest impact.

Our focus will be on three cross-Challenge priorities: equity, impact, and strengthening our three research themes through greater integration. To reinforce and braid together current research the Challenge has two cross-cutting research priorities for the second period of its mission, Sleep and Life course. Projects will be designed to enhance existing research outcomes by creating further theme linkages within the Challenge, and collaborations with other National Science Challenges, New Zealand research institutes and international collaborators.

Our work is committed to supporting the enhancement of Māori knowledge, resources and people through the Vision Mātauranga framework. Our He Awa Whiria - Braided Rivers model will guide us to integrate knowledge from differing sources so they intersect in mutually inclusive domains flowing forward to progress the well-being of our tamariki and whānau.

The Challenge will continue developing a cohesive and logical progression of strategically focused research projects that will best enable us to meet our 10-year performance indicators. Extension and completion of period one research projects will lead into new projects in the second period, culminating in translational research to ensure that successful interventions can be scaled as well as supported and delivered by key stakeholders and end-users.

Our Challenge priorities

- ✓ *Equity of outcomes*
- ✓ *Deliver impact*
- ✓ *Integrate current themes*

Section 2: Five year strategy

Developing the 2019-2024 Strategy

To prepare for the second period, we undertook further consultation on the direction of research, how to build on it and how to translate research into impact. This consultation informed the 2019-2024 strategy. The Strategy has addressed the central question of how to continue to support the aspirations of our communities and give effect to the Vision Mātauranga policy (MoRST, 2007) in our research and operations. The Challenge completed widespread engagement with scientists, stakeholders, end-users and communities at the end of 2017. We shared findings from Challenge research activities, discussed potential second period research priorities and sought to bring in new researchers and stakeholders to contribute to meeting A Better Start's objective. The process involved two major coordinated activities: consultation with scientists, stakeholders and communities, and in-depth engagement with key stakeholder organisations.

Consultation workshops

The Directorate and science leadership team hosted seven science and stakeholder workshops around the country. The workshops included Māori and Pasifika workshops that sought specific community and cultural perspectives to science planning and delivery. The workshops were a crucial step to ensure meaningful stakeholder engagement and participation through the building of trust and mutual understanding.

Through the workshops we sought to:

- Work with communities, stakeholders and end-users crucial to delivering impact. Without their involvement our important research findings are unlikely to be implemented.
- Ensure the Challenge engaged with the country's most talented researchers in our theme areas. Refreshing and extending expertise is crucial to maintain research excellence. This has led to a doubling of the number of researchers involved in the Challenge and considerable expansion of disciplines within theme teams.

In-depth engagement

The Directorate met with key stakeholders critical to widespread delivery and impact of research to seek their input on relevance, innovation and potential for scaling. These key stakeholders include the Iwi Chairs Whānau Ora group; Ngāti Whātua kī Orākei; Ngāi Tūāhuriri (Ngāi Tahu); the Ministry of Health's Child Health Advisor and Emerging Health Technology Group, the Ministry of Education, the Virtual Health Information Network, the

Ministry of Education's Christchurch community projects leader; Plunket Chief Strategy and Performance Officer and Plunket National Advisor Policy and Advocacy, the Children's Commissioner, Kids First Kindergarten CEO; Le Va, Te Rau Matatini, Youthline Manukau Head of Science and Principal of One Tree Hill and Tamaki, Tangaroa and Papakura Colleges, Principals in the Christchurch Linwood Community of Learning, (Kāhui Ako) and Principals of the Waitemata Kāhui Ako in Auckland; Christchurch Pasifika Advisory Group; Christchurch Child Health Community practitioners; Hawkes Bay stakeholder community (Ngāti Kahungunu, Decile 1-10 primary school principals, Decile 1 early childhood education centres, Hawkes Bay District Health Board Child Health team, Hawkes Bay Community Fitness Board) and many others.

From the consultation process the Challenge summarised the following areas of feedback:

- **Culturally responsive:** Giving effect to Vision Mātarauanga further enhances our themes and has guided the development of research capability within the teams and the co-creation and co-design of research with stakeholders and communities. We have developed management guidelines to measure co-creation of funded projects and included a Vision Mātauranga assessment framework as part of the evaluation of research projects. There was a strong call for a Māori and Pasifika-led research investment. The Strategy 2019-2024 outlines a key initiative in this space.
- **Strengths-based approach:** A recurring point made by stakeholders, notably Māori and Pasifika is to avoid deficit thinking, labelling and framing. Using conventional health and education terminology is alienating and disengaging for these communities. We have re-titled the three major themes Healthy Weight (previously obesity), Successful Learning (previously literacy) and Resilient Teens (previously adolescent mental health) to lead strengths-based thinking and process throughout the Challenge.
- **A child is a member of a whānau and a community:** A common refrain at our seven consultation workshops was that child-focused research must be more inclusive. Any interventions that focus on a child may have a positive effect on the whānau and community in which they live that we should recognise and measure. While our 10-year performance indicators focus on children, the benefits of intervention may be substantively larger and should be measured.
- **Better integration:** While there was evidence of integration of the themes in the first period, a discussion with an MBIE leaders group (the MBIE Science Board Chair, Deputy Chief Executive of the Labour, Science and Enterprise group of MBIE and the Prime Minister's Chief Science Advisor) in 2017 suggested that "It is important that when reporting a clear story is told around how the various research themes weave together to deliver against the mission of the Challenge." Integration of the Challenge research themes is one of our Challenge priorities for the second period and is discussed in detail later in this section (entitled 2019-2024 Priorities in Approach).

Our Future Strategy has been developed with this feedback in mind.

Strategy 2019-2024: Building on momentum

Our stakeholders endorsed the three health, learning and well-being themes as significant and of continuing relevance. The consensus was that they should continue into the next phase (Figure 1). This was further informed by a Challenge-commissioned independent analysis of New Zealand’s aligned research landscape across the three theme areas that found only a small quantum of HRC-funded research was aligned to the Challenge research focus on prediction, detection and early intervention in our three themes.

Therefore our focus in the prediction and prevention space offers the greatest impact to addressing these national-scale issues. The analysis of aligned research has also enabled the Challenge to have confidence that it has consulted with or interacts with, the key aligned research teams and organisations nationally. With significant momentum on a clear research pathway, changing themes or research priorities at this mid-point would prevent delivery of our performance indicators. Consultation endorsed the need for A Better Start’s 2019-2024 Strategy to build on the research pathway created in the first period.

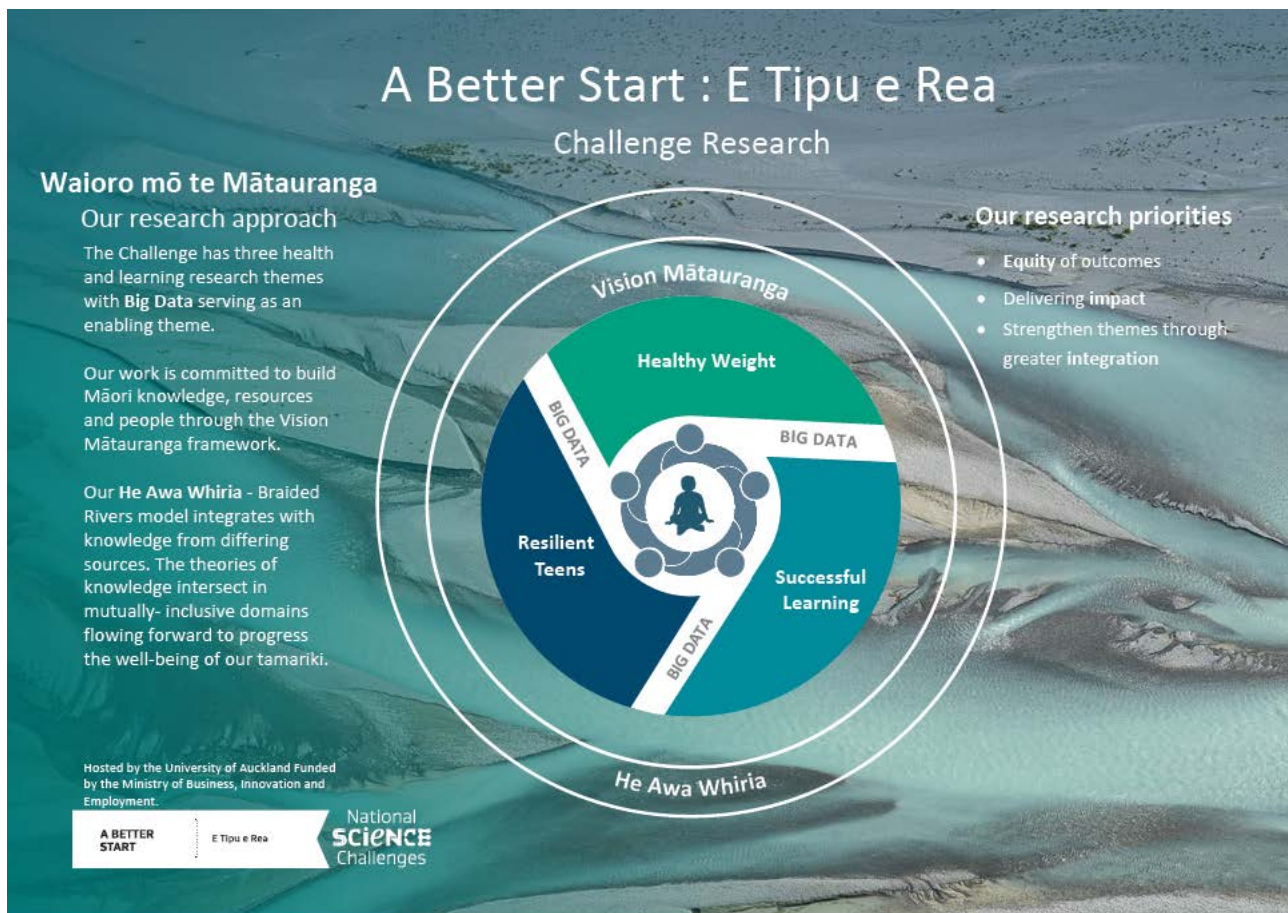


Figure 1: A Better Start: E Tipu e Rea Challenge Research

The importance of these three themes is reflected in government initiatives and position papers in recent years and within new strategies. The Ministry of Health have recognised childhood obesity as a major health problem and established a Childhood Obesity Plan (2015) that included a national referral pathway for 4 to 5 year-old children via the B4 School Check who are overweight or obese. A recent report from the Education Review Office (ERO, 2018) on primary schools in New Zealand noted that raising expectations of our children's early literacy success in Years 1 and 2 at school was a critical area to be addressed. More effective assessment and interventions in Year 1 will help to meet this need. In these areas Challenge researchers have complementary research priorities that focus on early detection and prevention and early intervention.

A recent report from the Prime Minister's Chief Science Advisor entitled *Improving the Transition: Reducing Social and Psychological Morbidity During Adolescence* (2011) raised concerns about mental health issues in the period when young people move from childhood to adulthood. The platform of research advanced within our Resilient Teens theme directly addresses the importance of early detection and management of youth mental health problems as highlighted in the Chief Science Advisor's report. By bringing together the outcomes of the extensive consultation and engagement, the Directorate and theme leaders reviewed the research approach and focus for research in the second period of the mission. The Challenge's Board Science Advisory Panel, Kāhui, Pasifika advisory group and supported the approach to form the strategy and all endorse this strategy.

Assembling research expertise

We are also building momentum in assembling the best minds and research expertise in our field through expansion of our expert scientists in our research teams as well as through collaborative opportunities nationally and internationally. In Section 4 we outline the depth of expertise across our teams and how senior researchers are mentoring and supporting the development of emerging and future researchers, particularly encouraging teams to focus on growing the pool of Maori and Pasifika research expertise through scholarships and stipends.

A Better Start Strategy 2019-2024

Challenge approach

The iterative and rigorous consultation and engagement process ensures our Strategy 2019-2024 leverages on the learnings and outcomes from the first research period, and responds to new perspectives arising from close engagement with the research sector communities and public sector and NGO policy advisers. The process has triggered a refresh in research teams and in our Science Advisory Panel.

Our Strategy 2019-2024 outlines three cross-Challenge research priorities: equity, impact, and strengthening our research themes through more integration. To reinforce and braid together current research the Challenge has two new cross-cutting research priorities for the second period of its mission, Sleep and Life Course. Big Data remains an important enabling theme across all research activity. Our work is committed to support the achievement of the potential of Māori knowledge, resources and people through the Vision Mātauranga framework. Our He Awa Whiria - Braided Rivers model guides how we integrate knowledge from differing sources so they intersect in mutually-inclusive domains flowing forward to progress the well-being of our tamariki.

The NZ Gazette Notice (2017) objective states that A Better Start will improve the potential of young New Zealanders to have a healthy and successful life. This objective continues to inform the evolution of our strategy, and includes a restating of our major aspirational performance indicators that measure our progress to increase the proportion of children (notably Māori and Pasifika and those from less affluent families) that have a healthy weight, are successful learners and adolescents are emotionally and socially well-adjusted.

Key measureable targets:

- **Healthy Weight**

By June 2024: At 4-5 yrs of age a ≥15% reduction in the prevalence of overweight and obesity in children

- **Learning Success**

By June 2024: At 5-6 yrs of age a ≥15% increase in attainment of age expected early literacy achievement¹

- **Resilient Teens**

Improvement in the mental health and social functioning of vulnerable adolescents. ≥15% improvement in at least 2 of the 3 indicator areas. These are increased secondary school function (improved school retention, reduced school absences), a reduction in Emergency Department or Accident and Emergency Clinic presentations with self-harm and a reduction in self-reported symptoms of depression and anxiety and substance abuse within communities using the intervention.

- **Big Data**

By June 2024: 3 interventions fully modelled and published in peer reviewed journals. This is economic modelling of the health and income return on investment for each intervention to assist Government and next users allocate resources to childhood education and health.

Research priorities

Equity of outcome: This means that Challenge research is first viewed through the lens of whether it supports the equity of outcome for all tamariki. Our research should deliver more than general improvement for all so is focusing on equity of outcome. The approach is very strongly supported, particularly by communities and stakeholders. This approach can be most effectively achieved by a higher proportion of Māori, Pasifika and less affluent children, families and communities in research design, planning and over-sampling of priority study populations. This approach will be applied to projects across all themes. A key driver for equity is the Challenge's commitment to a strengths-based approach for how research is conceived and designed, in Challenge engagement with whānau and communities, and in the dissemination of research findings. A key initiative reflecting this is the decision by the Board to designate specific funding (\$2 million) for Māori and Pasifika-led research aligned to the strategic research themes. The MBIE Governance Group (Gluckman, Hayes and Sticks) suggested we be, "*mindful that the balance of building these relationships is appropriate compared to time spent on the research projects*". What has become very apparent in the first period is that it takes time and effort to grow relationships with communities and end users yet without meaningful relationships the research will not have

¹ Original KPI referred to "national reading standards"

traction nor uptake by communities. We will continue to be committed to investing time and effort into building and strengthening relationships.

Delivering impact: In developing our Strategy 2019-2024 we acknowledge that research excellence and publication of research in quality journals rarely leads to widespread sustained positive change. The Challenge priority on delivering impact stresses strong policy-maker and community engagement, a phase of dedicated research to impact activity in period two, rigorous progress monitoring and feedback, and a focus on the need to be agile and responsive in order to modify research to meet goals. This priority is outlined in detail in Section 3.

Strengthening themes through better integration: Big Data, the Vision Mātauranga approach and He Awa Whiria - Braided Rivers model approach underpin and integrate the three health, learning and well-being themes.

Big Data will provide large scale and intricate analyses of associations between childhood measures and theme outcomes to help to inform intervention strategies. In addition, the Big Data researchers will establish relevant baseline measures to assess our 10-year performance indicators and explore national childhood data collection points to further inform the effectiveness of scaled interventions. Big Data will also lead a project to measure the economic benefits of early interventions.

The two new cross-cutting research priorities, Sleep and Life Course, are designed to enhance existing research outcomes by creating further linkages and collaborations within the Challenge, with other National Science Challenges and New Zealand research institutes and international collaborators. Sleep is an important component to a healthy weight, successful learning and emotional and social well-being. A pilot sleep intervention study currently underway will inform sleep interventions across themes in period two. The consultation process has also led to research teams being strengthened by international research collaborators across the theme areas. For more detail on research teams and partnerships see Section 4.

Vision Mātauranga

A key part of our strategy is a continuation and strengthening of focus in our approach to embed the Vision Mātauranga policy across all areas of the Challenge;

- Strategic advice
- Commitment to funding Māori-led research
- Vision Mātauranga guidance for Challenge researchers
- Capacity and capability building of Māori researchers
- Consciousness of data sovereignty aspirations

Strategic advice At a governance and advisory level the Kāhui provides strategic guidance to the Directorate and the Board on a te ao Māori view. The Science Advisory Panel has been refreshed for period two to include members that bring a Māori lens to the Challenge's research projects. The Māori members of the Board continue to provide their perspective at governance level.

New funding commitment The best example of this stronger focus is a major new funding commitment of approximately \$1 million for research led by Māori researchers and stakeholders and undertaken with Māori communities that will be aligned with our mission and 10-year key performance indicators.

In preparation for this initiative, our Board have commissioned Māori experts to develop a strategic “think Piece” that will provide recommendations on the most appropriate process for researchers to access the funding stream. This initiative is in addition to and complements the strong commitment to Māori researchers and communities planned in strategic research across all themes.

Vision Mātauranga guidance for researchers In May 2018, the Challenge Directorate and theme leaders held a successful wānanga to consolidate the principal strategies to better embed Vision Mātauranga by Challenge-funded researchers into period two.

From this gathering, a position paper has been finalised to guide our researchers on how to expand on purposeful, mutually beneficial, and accountable engagements with Māori at a range of levels in period two. The position paper defines and describes two functional frameworks: (i) He Awa Whiria and (ii) Initiative, Benefits, Representation, Legislative, Accountability (IBRLA) as well as a tracking tool He Poutama Whakamana. He Awa Whiria guides the integration of two streams of knowledge, Western science and mātauranga Māori. Included within this framework, is a recognition of Indigenous knowledges and space for kaupapa Māori research as a distinct work stream wherein Kaupapa Māori researchers engage with critical issues in ways intended to impact on Māori advancement. The IBRLA framework (Bishop, 1996) is a clearly marked guide to establish and sustain power-sharing relationships throughout the research process. He Poutama Whakamana (Macfarlane, 2018) is designed to help researchers track their own progress and that of the research on cultural awareness and to understand responsiveness techniques. The paper draws attention to the impact the three Treaty of Waitangi principles have on the research process, the importance of Māori leadership and how it is to be made palpable throughout the entire research process.

Capacity and capability All of the Challenge themes have a specific focus on delivering equity of outcomes for Māori communities and to grow the numbers and capabilities of Māori researchers. Many teams have included students at Masters and Doctoral level in period one and we are expecting greater momentum in period two. The Māori-led research investment fund will also provide leadership opportunities for senior Māori researchers to be named as Principal Investigators.

Data sovereignty aspirations A key example is the continuing discussion the Big Data researchers have with representatives of Te Mana Raraunga, the Māori Data Sovereignty Network. The Network advocates for Māori data sovereignty at a national level and asserts that data is a living tāonga that is of strategic value to Māori. Part of the Challenge’s work is to help realise the aspirations Māori researchers have to use the IDI and to work to develop a Māori research agenda to inform the work programme in period two.

Collaborating with National Science Challenges

Life Course Project A collaborative mechanism has been agreed in principle with the two health and well-being National Science Challenges, Healthier Lives and Ageing Well. This initiative focuses on a life course perspective on health and well-being throughout the life span to intervene and reduce the impact of illness through early detection and prevention.

The work will capture synergies across the three Challenges to form an approach to achieve a long, healthy, well-adjusted and productive life by examining early risk factors and associations for later disease, together with prevention of major illnesses and methods to quantify the health and economic benefits of avoidance of non-communicable disease. The work will use the internationally-leading life course research expertise in New Zealand, and our near-unique integrated national-level health and social sector data, available through the Statistics NZ Integrated Data Infrastructure.

The three Challenges have agreed to:

- Equally fund a research investment (approximate total \$1.5 million initially).
- A jointly appointed science advisory group that will provide expert opinion on which research would return the most benefit for the objectives of all three Challenges and provide recommendation to each of the Challenge governance groups who must agree on the work to be supported.
- A combined Challenge Life Course Conference He Ora te Whakapiri and follow-up strategy workshop. The conference will be led by A Better Start on behalf of the three Challenges.

Building Better Homes National Science Challenge has also signaled an interest into possibly contributing added funding and research ideas into the combined life course project.

NZ-China Non-Communicable Diseases Research Collaboration Centre (NCD CRCC) A Better Start are co-holders, with the NSC Healthier Lives leading, and Ageing Well contributing to an MBIE grant to establish the NZ-China NCD CRCC. The Memorandum of Understanding (MOU) involves three NZ universities (University of Auckland, University of Otago, and AUT) but this may expand further in the second period.

In 2017, the NCD CRCC signed MoUs with four leading Chinese research institutions - highlighting the growing collaborations between New Zealand and Chinese health researchers. The signing took place during a week-long visit to New Zealand with the delegation visiting Auckland, Wellington, Christchurch and Dunedin to hold discussions with more than 50 NZ researchers.

The four Chinese institutions signing the MoUs with the NCD CRCC are Huashan Hospital, Shanghai Mental Health Centre, the Fudan University School of Public Health and the Children's Hospital of Zhejiang University School of Medicine. Researchers from the Chinese Academy of Sciences and Capital University Tongren Hospital also took part in the visit. More recently, on a visit by senior Chinese clinician scientists a research collaboration was established with Professor Jun Fen Fu from the Children's Hospital of Zhejiang University School of Medicine. Professor Fu has several large cohorts of regional and national childhood data (the largest is >500,000 children) relating to obesity and health risks that A Better Start's Healthy Weight team will analyse with her over the next two years. In particular, these data sets will be used to test the prediction model developed by the Healthy Weight team. Application will be made through the CRCC to support reciprocal travel planned over the next two years. One of our Challenge researchers, awarded a China Collaboration grant, is taking the lead on the relationship on behalf of our Healthy Weight team. As the working relationship develops, we will look to explore opportunities to include our other themes.

Challenge research themes 2019-2024

The consultation with scientists, stakeholders and end-users over the last 18 months contributed to and helped inform early planning by theme leaders for strategic projects for the second period. The following section provides a brief overview of each theme's preparation and early development of project ideas.

Healthy Weight

No single approach will lift the percentage of children with a healthy weight. Without suitable interventions, the number of overweight or obese infants and young children globally (currently estimated at 41 million) will increase to 70 million by just 2025 (WHO, 2016). New Zealand is no exception; one-third of NZ youngsters just 4 years of age are overweight

or obese (Shackleton et al., 2017). Notably, two-thirds of all obese 4 year olds children are Māori or Pasifika (Shackleton et al., 2017).

The Healthy Weight theme aims to reduce the prevalence of early childhood obesity, notably in Māori and Pasifika tamariki and those from less affluent families through prevention and early treatment. Thus our programme of work will address a number of the 34 recommendations stemming from the 2016 World Health Organisation Report on Ending Childhood Obesity (WHO, 2016).

The Healthy Weight team consists of researchers from five institutions in New Zealand together with collaborators in the US, China and UK that encompass at least seven different research disciplines. The team have expanded considerably since the start of the first period with half of the team new to the Challenge adding new skills that include; a systems based approach to research, new technology (integrated camera assessment of behaviours and interventions), new biology (sleep physiology) and additional emerging and mid-career Māori and Pasifika researchers. By assembling a team of leading NZ researchers working in collaboration with invested stakeholders and end-users (including Plunket, Tamariki Ora nurses, Ngāti Whātua kī Orākei, Moana Research, Ngāti Kahungunu, Te Taiwhenua Mananui Collective, Hawkes Bay DHB, Sport Hawkes Bay) projects will be developed that encompass different ways of working across a wide range of intervention initiatives to deliver change.

- **Equity:** We will ensure that groups subject to inequity are intricately involved at all stages of the research, working alongside researchers to identify issues and develop solutions that meet the needs and aspirations of those groups, that can then be implemented and evaluated in an appropriate manner.
- **Impact:** Evidence is mounting that comprehensive early intervention programmes to prevent childhood obesity offer the most promise for reducing the global pandemic. These include preventative approaches addressing maternal and infant health through pregnancy and beyond (Taylor et al., 2017) and all-of-community approaches designed to broaden capacity to make a real difference to the health and well-being of tamariki and whanau (Owen et al., 2018). From the start, all projects will be designed with translation and scalability in mind in order to allow implementation within a reasonable time frame. Inclusion of representatives from Well Child providers, schools, communities and relevant ministries within planned projects will ensure changes to policy have the potential to be integrated at speed.
- **Integration:** Behaviours crucial for healthy weight management – nutrition, physical activity and sleep – also have a pivotal role to play in enhancing capacity for learning and ensuring resilience (Martin et al., 2018; Lavoie et al., 2016), highlighting the natural integration between the three main themes of A Better Start. Proposed projects will be developed across themes and outcomes will address multiple theme areas to provided added value to all initiatives. Big Data remains an important enabling platform for the Healthy Weight theme.
- **Early prevention and intervention:** Experience is limited in early childhood obesity prevention, although prevention is generally considered a more strategic approach than treatment (Reilly et al., 2017). Our approach will focus on multifaceted obesity prevention initiatives in infancy and early childhood, while also acknowledging the need to ensure comprehensive treatment options. Our research precedes and therefore complements the B4 School Check initiative to detect overweight and obese children subsequently referred on to medical care.
- **Additionality:** Childhood obesity interventions using researcher driven single initiatives have been shown to be relatively ineffective (Water et al., 2011). Increasing the number of children with healthy weight will take a whole-of-society approach involving all 'actor' groups including governments, civil society, communities, institutions, and

parents, working in synergy towards a common goal. In period two, we will take a multi-pronged approach and trial different intervention approaches as they arise through co-design processes to ensure improved engagement and more successful long-term outcomes. This work will add considerably to the New Zealand health landscape given the scarcity of current research addressing intervention approaches to early childhood obesity (Taylor, 2017).

- **Innovation:** Although much of the planned research will focus on low risk impact research innovative higher risk research will be included in the second period. This will include testing novel approaches to early childhood obesity that have arisen as part of our period one work. We have developed an obesity prediction model which identified children at high risk of later child obesity from information present at birth, or within the first year of life. Although other prediction models exist internationally, these have never been applied in a meaningful way as part of an intervention (Ziauddin et al., 2018). Interventions will also target sleep, a behaviour not typically considered as part of effective weight management. However, recent New Zealand research has demonstrated that brief sleep interventions in infancy can reduce childhood obesity by as much as 50% in 5-year-old children (Taylor et al., 2018).

Resilient Teens

Our aim is to provide equitable access to early intervention for youth, using a wellness framework that aligns with Hauora Māori philosophies. We know that health risk behaviours and poor emotional health cluster (Hallfors et al., 2004) and that Māori youth are three times more likely, and Pasifika youth two times more likely to experience poor emotional and social well-being (Noel et al., 2013). Overall, twenty percent of New Zealand youth have significant psychosocial difficulties (Clark et al., 2013). Mental and substance use disorders explain the bulk of disease burden in young people aged 12 to 25 years (Gore et al., 2011) and represent a key risk factor for suicide, the rates of which are highest in New Zealand for the 15 to 19 year old age group of all OECD countries, with Māori youth being disproportionately at risk (Ministry of Health, 2016)

Our approach aligns with international advocacy for youth and indigenous focused models (Tylee et al., 2007) that integrate mental health with positive indigenous health, social and cultural messages to respond to research that says up to 80% of young people are not receiving the support they need (Mariu et al., 2012). We have an evidence base that gives us confidence that we can provide effective support (Weisz et al., 2017, Ebert et al., 2015); our strategy is to increase the reach and accessibility of evidence-based support via a digital platform that integrates both screening and intervention tools which are available anywhere, anytime.

There has been some change and expansion to our team who represent a range of disciplines (psychiatry, psychology, education, computer science, Māori studies, population health, and statistics), and Universities (Auckland, Massey, Otago, Victoria). Importantly, we have established a new relationship with Ngā Pae o te Māramatanga, and we will maintain our relationships with Māori (iwi - Tainui, Te Rau Matatini, and VOYCE²) and Pasifika (Le Va), and other indigenous communities in both Australia and Canada in the suicide prevention area. We have established relationships

² An NGO, **Voice of the Young and Care Experienced**

with Orygen, The National Centre of Excellence in Youth Mental Health, the Black Dog Institute and the National Health and Medical Research Council Centre of Research Excellence in Mental Health and Substance use.

- **Equity:** Our programme of work is based on strong relationships with stakeholders to ensure co-design of the research. We work with schools and communities where there are large populations of Māori and Pasifika young people. In period two we will respond to the need for kaupapa Māori research, and build new partnerships with iwi who want a digital platform to deliver effective support for rangatahi, whilst acknowledging indigenous data sovereignty issues (Jansen, 2016). Our approach to ensuring equity of access and outcome for youth starts with joint (Māori and Pākehā) theme leadership and continues this bi-cultural approach throughout the projects. Additionally our intention in the second period is to include Kaupapa Māori research that will allow Māori solutions to be generated through Māori processes.
- **Impact:** An 'always on' digital platform will be used to supplement and extend existing mental health care in primary care services, rural communities and in schools, as has been the goal of recent government initiatives. The key issue for the second period centres on implementing our digital platform in a way that engages youth sufficiently to achieve a 'therapeutic dose' of the evidence-based interventions. We will use an implementation science approach (Fixen et al., 2005); including exploration of barriers and enablers to implementation within a participatory action design framework, which will facilitate stakeholder investment in the digital platform. The digital platform strategically aligns with the health information platform being developed by the Technology and Digital Services business unit in the Ministry of Health, and we will cultivate our relationship with this group, other relevant groups and individuals in the Ministry of Health and with the Ministry of Education.
- **Integration:** Our framework for the digital platform facilitates integration with existing face-to-face services, extending the range of tools and methods of delivery within the mental health/health system, a system that is acknowledged as being unable to meet the overall need for services currently. The programme of research within this theme is integrated via use of the digital platform, with a view to having projects that represent implementation of the digital platform in different settings. The digital platform has a wider focus than mental health alone, with cross theme collaboration enabling further interventions to be developed to address, for example, literacy, learning, healthy sleep and weight. We will continue to leverage co-funded work that will allow integration of parent-focused interventions. The aim is to ensure that the digital platform can incorporate interventions that address issues facing youth in New Zealand, including those developed by current and future collaborators, for example Te Rau Matatini and Le Va.
- **Additionality:** Cross-discipline and cross-institution collaboration facilitates integration of a very broad range of youth focused wellness interventions. This is transformative and represents a significant advance on the development of single digital interventions typically focused on a narrowly defined single issue. Ensuring the digital platform enables sequential and concurrent digital intervention trials will provide a pipeline of development of innovative interventions that keep pace with technology and with the issues that youth face. As such, the platform has been designed to take advantage of the strongly innovative Kiwi culture allowing IT initiatives to be tested. This platform will provide easy access to rapid online testing and allow us to make the most of the creativity of New Zealanders. A significant feature of the long-term and strategic approach to this program of research, possible due to the integration of Big Data in the Challenge, is the ability to enable long term monitoring and tracking of outcomes.

- **Innovation:** The ‘always on’ digital platform, provides a sustainable infrastructure enabling cost-effective delivery and monitoring of wellness interventions. Being nimble is important to ensure we capitalise on the rapid pace of technology, including use of innovative methods for rapid testing (Mohr et al., 2015) but will be balanced with incremental and strategic research approaches using robust methods to evaluate the effectiveness of interventions within an implementation science framework (such as stepped wedge and cluster randomised trials).
- **Prevention:** The digital platform is intended to achieve early engagement with adolescents who have issues that concern them prior to the development of overt mental health disorders. A key priority is Māori rangatahi, justifying the need for Kaupapa Māori approaches to be available through the digital platform. The platform will provide accessible information to ensure that the most appropriate support to prevent the onset and escalation of psychological or mental health issues. Prevention of mental health disorders and early effective intervention will inevitably lead to a better outcome for youth and rangatahi.
- **Extension:** The building of a multi-component, multi-purpose digital platform takes time. There are iterative early components of the platform developed in period one that will be further developed, added to, tested and refined in period two.
- **Building capacity:** In partnership with Ngā Pae o te Māramatanga (Professor Linda Nikora) we will build capacity and grow Māori expertise through Māori Masters, PhD and Post-doc students recruited within projects and through ongoing development of Māori and Pasifika researchers within the team. Proposed investment in a Kaupapa Māori research project will also enable indigenous research capacity building at an iwi and national level.

Successful Learning

Despite the urgent need to improve New Zealand’s early literacy achievement rates, this topic has not featured prominently on the national research agenda. In the last 15 years, there has only been one other larger scale controlled intervention study focused on improving Year 1 literacy outcomes (Chapman, Arrow, Braid, Tunmer, & Greaney, 2018). The novelty of the approach taken by the successful learning theme from a national and international perspective also lies in its focus on multiple interacting variables that need to be addressed to ensure early reading success for all tamariki. To improve the literacy outcomes of New Zealand children the wider context of teaching practice, health and education specialist services, whānau engagement, preschool experiences and culturally responsive teaching practice need to be considered.

The Successful Learning team consists of researchers from four institutions in New Zealand (University of Canterbury, University of Otago, University of Auckland, AUT University), together with international advisory experts in the UK, USA and Australia. The researchers’ expertise encompass six research disciplines: education, psychology, speech-language therapy, public health, Māori kaupapa, and oral health.

Children’s early reading success is a powerful predictor of their subsequent reading achievement and education outcomes, which in turn is linked to health well-being and more positive societal outcomes (Schoon, Parsons, Rush, & Law, 2010; St Clair, Pickles, Durkin, & Conti-Ramsden, 2011; Stanley, Petscher, & Catts, 2018).

- **Equity:** Inequitable outcomes in literacy achievement are present for Māori learners, Pasifika learners and learners who come from less affluent backgrounds (Mullis, Martin, Foy, & Hooper, 2017). Research will be based in communities with relatively high proportions of those groups likely to experience inequity in learning outcomes. The inclusion of stakeholders as core members of the research teams, commitment to culturally responsive

practices and co-construction of prevention/intervention initiatives will be key elements across the programme of research that contribute towards closing the literacy achievement gap.

- **Impact:** A clear pathway to implementation will be embedded throughout the programme of research. A larger-scale examination of the effectiveness and efficiency of early literacy intervention for children in their first year at school based on a pilot project in period one will deliver impact on national outcomes in early reading achievement in period two. Resources within the community will continue to be utilised to support the research and ensure sustainability (e.g., Kidsfirst kindergartens, primary school teachers, the National Library of New Zealand, school services and community nurses).
- **Early intervention:** Improving literacy and cognitive flexibility in preschool and year 1 school children focuses on early intervention to promote successful learning. It precedes current reading intervention model (e.g., reading recovery) where children are first identified at 6 years for intervention. Early interventions to promote successful learning will be more effective in promoting learning than attempting to catch up through remedial learning in later school years.
- **Integration:** Economic modelling will be utilised in collaboration with the Big Data team to gauge the potential impact of the Year 1 literacy intervention if taken up at a national level. Given the association between literacy achievement and psychosocial variables (Chapman & Tunmer, 2003), there is also scope to collaborate with the Resilient Teens team to examine the impact of the intervention on children's self-perception as well as reading outcomes. Similarly, the association between sleep and children's learning (Quach, Hiscock, Canterford, & Wake, 2009) provides a novel opportunity to evaluate the impact of sleep interventions on children's language/learning development.
- **Additionality:** There is opportunity to better understand the importance of children's cognitive flexibility and factors that may promote improved cognitive flexibility for early literacy and learning success in children at risk for learning challenges. The Cognitive Flexibility Theory was introduced by Spiro and Jehng (1990). They stated that cognitive flexibility is the ability to restructure knowledge in order to adapt and make use of it in different settings and situations. Innovation in cognitive flexibility assessment that allows evaluation of this skill in linguistic and non-linguistic domains across languages (English, Māori and Samoan) may be possible. Novelty is also included in the development of approaches to support early literacy development across languages in children who are learning within Māori-English and Samoan-English bilingual education contexts.

Big Data

As an enabling theme, the Big Data team seeks to maximize New Zealand's rich data resources and infrastructure to develop a better understanding for the three health, learning and well-being themes of the paths towards good outcomes for children and insight on how pathways towards poor outcomes can be disrupted. Our over-arching aim is to determine what works, for whom and under what conditions.

The Big Data team is at the forefront of quantitative health and social policy research in New Zealand. The team cross four institutions, includes international collaborators and a range of disciplines extending from health and education through to economics and bioinformatics. Current team members based at the University of Otago and University of Auckland, have close connections with the Virtual Health Information Network, together with advisory experts in Canada, the UK, USA and Australia. Our research team's research expertise encompass six areas: economic modelling and

microsimulation, Māori and Pasifika health and well-being, mental health, administrative datasets and longitudinal studies.

Data sovereignty, the right to access, to use and have governance and control over data, is a significant issue for Māori and Pasifika people's. The Big Data research team are in regular communication with members of Te Mana Raraunga, the Māori Data Sovereignty Network with one of its members part of our wider Big Data team to help realise the aspirations Māori researchers have to use the IDI and to work to develop a Māori research agenda.

- **Equity:** A key goal for our research is to better understand inequities in health, well-being and learning particularly in Māori, Pasifika children and from less affluent families. Such analyses will help inform the Challenge theme interventions providing a greater understanding of how things can be made better for those who have benefitted the least from New Zealand's wealth and prosperity.
- **Impact:** Understanding the drivers of success, and the factors that inhibit it, is vital to making good policy decisions inform interventions with intelligent design. Critical to this, will be the health and economic modelling of Challenge interventions to assess the short and long-term value of interventions. The Big Data team will continue to undertake informative association studies in collaboration with the Challenge theme teams that have the potential to inform Government and public policies. A current example of such an association is the relationship between antibiotic use in pregnancy or infancy being associated with obesity at age five years. NZ has one of the highest rates of antibiotic usage in the OECD. Such data may assist the Ministry of Health's approach to antibiotic prescribing in pregnancy and infancy.
- **Integration:** Our team works closely with the other themes within the Better Start Challenge. They bring clinical and policy expertise and we bring intimate knowledge of the data and the analytical techniques to extract maximum value from the rich data resources available in the IDI. In addition, we are working with experts from other National Science Challenges to develop the best techniques to conduct life course research.
- **Additionality:** We are leveraging existing data (including Well-Child/Plunket and community level data) to add important data into the IDI and working with Government agencies to determine where additional data can be systematically captured. It will be important for the Challenge to be able to assess the impact of community, regional and national interventions. This can only be achieved by establishing regional and national baseline data and outcome parameters. The Challenge's 10-year performance indicators cannot be assessed without this fundamental data.
- **Innovation:** Our work seeks to push the forefront of data analytics – particularly as this relates to microsimulation and life course modelling. However, we believe significant value can be derived from conducting a wide range of conventional epidemiological and economic analysis on existing data.

Section 3: Delivering impact

Our focus

- ✓ *Wide reach*
- ✓ *Integrated themes*
- ✓ *Agile research*
- ✓ *Ongoing engagement*
- ✓ *Modelling for scale and effectiveness of interventions*

A key principle for the National Science Challenges is to not just deliver excellent quality research but also to facilitate research outcomes to support positive change. In order to achieve this A Better Start has embedded a cross-Challenge focus on research reviews and stakeholder and policy engagement to map out clear paths to impact.

Wide reach

The three main themes were selected because for each of them about a third of all children are affected. When taken together, across the areas, more than 50% of all children would potentially benefit from impacts delivered from Challenge research. Our approach: prediction, early detection and responsive intervention, delivers the optimum returns for public investment in evidence-based policy change.

Integrated themes

The potential reach of Challenge research is enhanced by the considerable overlap of conditions. Big Data analyses and other research suggests that there is considerable overlap in the characteristics of children with poor literacy and unhealthy weight in 5 year old NZ children and that these cluster with poor social and emotional health. The Challenge has developed quick and efficient ways of working across disciplines as well as interactions with Māori and Pasifika communities. Our team is at the forefront of analytical developments in examining big data for policy with our Big Data team already contributing as a child and family node in the Virtual Health Information Network which works across universities, the Ministry of Health and Statistics NZ.

Agile research

Across the Challenge it would be unrealistic to assume that every hypothesis proposed across all themes will be proven. While a disproven hypothesis informs future science, it does not easily translate to positive societal change. In the second period, the Directorate and theme leaders will have a strong focus on being agile and nimble. Through the constant review of performance indicators, the Challenge can decide on the need to modify the direction of research and/or seize new opportunities to deliver a potential impact.

Engaging with communities and policy makers

Most research is ultimately published but only rarely does it lead to widespread sustained positive societal change. Impact comes from new scientific discovery translated into action by engagement with the science community, policy makers, whānau and communities. For A Better Start, this engagement started early with the research teams seeking to answer questions of importance set by the national-scale public and research sector consultation at the outset of the Challenge. It also involved co-designing the research in a way that that

meets community aspirations increasing the likelihood of knowledge translation and impact.

In the first period, the Challenge has confirmed the critical importance of the three theme areas with policy makers and key stakeholders and researchers have made strides to define and begin to answer the key questions facing effective prevention and intervention. Our extensive network of investigators are actively involved with policy development and recommendations in forums from North and South Island DHB alliances focused on obesity prevention and management to Ministries of Health and Education advisory groups, and the government's Child Well-being Strategy Reference Group. The Directorate will continue this important function in the second period, particularly with critical governmental end-users, the Ministry of Health and Education. We also are actively engaged with Plunket, a non-governmental organisation that delivers most of NZ's Well Child services that leads to direct effect on day to day care of most young children in NZ.

Our team includes active researchers and clinicians involved with undergraduate and postgraduate student teaching and supervision and who have or do take the lead in professional societies, e.g. the previous president of the Paediatric Society of NZ, Chair of the National Australasian Paediatric Endocrine Network and the Ministry of Education cross-sector Advisory group, the Director of the Werry Centre for Infant Child and Adolescent Mental Health, the former Chair of the NZ Branch of the Faculty of Child and Adolescent Psychiatry. The learnings from the Challenge perspective informs all of these activities and will continue to impact on future generations of scientists and teachers.

Life course modelling and micro-simulation

We have demonstrated the usefulness of "big administrative data" to describe and follow outcomes over time, and also to find previously unsuspected environmental influences that might well provide effective points of action for example, curtailing early antibiotic use to prevent obesity. Longitudinal studies have informed us about the significant long-term consequences of early poor literacy, obesity and mental health. For instance, the Christchurch longitudinal study has estimated that about 70% of adolescents with poor mental health continue to have ongoing issues in adult life with marked economic consequences (Fergusson, Boden, & Horwood, 2007). Similar data exist regarding health consequences of early unhealthy weight (Bjerregaard et al., 2018; Global, 2016).

These studies have overwhelmingly demonstrated that earlier action is ultimately the most cost-effective approach to improving outcomes. However, we do not fully understand which interventions are going to be most effective and under what circumstances. We also don't know how enduring they will be. We will address these challenges by using longitudinal, whole of government, whole of population data. We believe this will allow us to disentangle the protective and risk factors that impact everyone, from those that may have strong effects on some, but not others. A better understanding of how policies or interventions work and how scalable they are, have significant implications for policy and programme design and implementation.

The Challenge has developed expertise and proficiency in using the IDI and we are using this unique and rich data source to understand the trajectories towards good and poor outcomes. Furthermore, we are discovering how to influence these trajectories to encourage better outcomes. By developing expertise in life course modeling and the use of microsimulation models the Challenge will identify the most cost-effective way of delivering policies, interventions and programmes. There is also an emphasis in examining the life course trajectories of Māori and Pasifika communities.

Section 4: Excellent science

Delivering excellent science through;

- ✓ *Research teams and partnerships*
- ✓ *Scientific framework for intervention*
- ✓ *Embracing Vision Mātauranga and He Awa Whiria Braided Rivers*

Expanding the concept

Science excellence is multidimensional, dynamic and influenced by cultural perspectives. It is therefore important in considering how our programme of research will be of excellent quality to appreciate the complexities inherent in the concept of “science excellence.”

High ranking journal publications based on our research findings will represent excellence at one level, improving the healthy weight, early literacy success, and social and emotional well-being of children and adolescents participating in our studies will provide evidence of excellence at another level. The long term, intergenerational benefits that will accrue to children, families, communities and our society through uptake of our successful interventions will also demonstrate our research excellence.

Yet for others, our delivery of research excellence may be perceived by how we engage and value their participation in our research processes, our demonstration of cultural confidence and competence in undertaking our research, particularly within Māori and Pasifika communities, or our processes for sharing our research findings back to the communities in which we are working. All of these aspects of science excellence that we have focused on during the first period of our Challenge will continue to be of central importance in our delivery of our next five year research programme.

Research quality assurance processes for our five year strategy include: (a) Independent governance from our Challenge Board; (b) Strategic advice from our Kāhui and Pasifika Advisory groups; (c) Input from stakeholders from around the country through planned consultation hui; and (d) Evaluation and comment from our expert international Science Advisory Panel. In addition, our regular project reporting framework monitors progress towards planned milestones and objectives. Our track record of meeting or exceeding our key performance indicators for the first period provides evidence of delivering high quality science towards the Challenge objective.

Three specific areas of science excellence that our five year strategy addresses are:

- Research team and partnerships
- Contributions to science quality
- Contributions to Vision Mātauranga.

Research team and partnerships

Delivery of research excellence requires constructive and collaborative styles of leadership and the building of a research culture where researchers and research partners are valued, respected and enjoy being part of our Challenge. Building such a culture has been an important part of our success in the first period.

The collaborative and inclusive working style of the Directorate, theme leaders, and researchers working within our project teams provides a very strong base from which to extend our team to deliver the Challenge objective and outcomes in the next five year period.

Project leaders for the second five year period will be predominantly high profile New Zealand researchers who are world leaders in their respected fields of research with extensive national and international networks to leverage international research collaborations and partnerships with research organisations. Our researchers come from seven of the eight NZ universities in NZ, non-governmental organisations, District Health Boards as well as NZ researchers at overseas institutions.

Our five year strategy also develops the leadership capabilities of less experienced researchers through mentoring from senior researchers and support of expert advisors and advisory groups for their projects. In addition, most projects have the support of at least one international expert to support the science planning, implementation, and mentoring of emerging researchers within our teams. The University of Canterbury Child Well-Being Research Institute will fund at least five of our international experts to visit New Zealand during the second tranche (for a period of between 1- 3 months for each visit and funded through the UC Erskine Fellowship Scheme). Part of these international expert visits will include seminars for our doctoral students and public lectures.

A planned contestable funding round within the first 18 months of the Challenge will allow for the introduction of new research teams into the Challenge. We expect this to build on the success of our co-funded round in the first period and be valued at approximately \$2.4 million. We have also committed \$2 million for the development of further projects to be led by Māori and Pasifika researchers within the Challenge themes. This will expand the number of new teams as well as increasing Māori and Pasifika research expertise working with the Challenge. Our five year strategy includes further professional learning opportunities initiated in the first period to continue to develop the skills of our researchers to deliver Challenge objectives and outcomes.

These opportunities include:

- Workshops to continue to advance researchers' cultural competencies and confidence and understanding of Vision Mātauranga from multi-disciplinary perspectives
- Pasifika cultural workshops (building on talanoa with community Pasifika leaders initiated in the first period) to further develop researchers understanding of Pasifika aspirations for their children's well-being
- Challenge level symposia to allow for cross theme collaborations and understanding of multi-disciplinary perspectives addressing research plans
- Funding support to ensure our researchers can participate in significant national hui focused on children's well-being, or Māori or Pasifika events relevant to our Challenge themes
- The Challenge will also take advantage of our Universities' existing programmes for support and mentoring of doctoral students and emerging researchers including workshops in statistical analyses, publication support, research ethics, presentation skills, cultural responsive research practices, and constructive styles of working across disciplines.

Science excellence within this Challenge requires strong engagement with community. We have established robust relationships with relevant stakeholders and communities in the first period and that will be further developed in the next five year research period.

Contributions to science quality

The five year research plan will deliver a diverse portfolio of research to address the Challenge's objective and outcomes. A primary focus of the Challenge is intervention research to improve the healthy weight, literacy learning and social and emotional well-being of our children and youth. These interventions align to a rigorous scientific framework for intervention research discussed below.

The Intervention Research Framework. McBride (2016) discussed the scientific importance of the Intervention Research Framework for developing and testing innovative interventions to both advance research knowledge and to have an impact on individuals and communities. The value of researchers building positive relationships with relevant practitioners, communities, and policy makers at each stage within this framework is emphasised.

The framework has four main phases.

- Notification (descriptive and predictive studies to identify causes, risk factors and protective factors e.g., studies in the Big Data theme)
- Development (co-construction of research design and pre testing interventions e.g., community co construction of multilevel intervention in the Healthy Weight theme)
- Assessment (efficacy, effectiveness and efficiency studies e.g., larger scale controlled interventions in the Successful Learning Theme and Resilient Teens theme)
- Dissemination (understanding translational impact of intervention e.g., a focus for all themes in the latter part of the five year strategy).

Projects will be planned across the five year research strategy that are consistent with this framework to support intervention science excellence. Involvement of our community partners in research co-design is a key strategy in each of these phases of the research intervention framework

The diverse range of the intervention studies at each of the notification, development and assessment phases of the Research Intervention Framework will lead to research in the latter part of the five year research strategy focusing on the translational impact, policy development and evaluation of wider uptake of the intervention work. The building of strong relationships with community, iwi, Māori and Pasifika groups, our stakeholders and policy makers and the rigour of the science methodologies implemented in each of the themes will help ensure the science advanced through the science plan influences the changes necessary to improve the health, education and well-being of our children and youth.

There are a number of international and national experts involved in our project advisory groups who will contribute to the delivery of science excellence. Project expert advisors include; world leader in reading development (Professor William Tunmer, Massey University); international expert in early home literacy practices (Professor Laura Justice Ohio State University, USA); leader in vocabulary development in children with oral language difficulties (Emeritus Professor Ilsa Schwarz, University of Tennessee, USA); experts in healthy weight and/or sleep; Professor Keith Godfrey (University of Southampton), Professor Dean Beebe (Cincinnati Children's Hospital), Professor Leann Birch (University of Georgia), Professors Ian Paul, Dr Jen Savage (Penn State University), Professor Jodi Mindell (Children's Hospital of Philadelphia) and Professor Melissa Wake (University of Melbourne), Professor Harriet Hiscock (Monash University). These and other experts will continue supporting our work into the second period. Our independent international Science Advisory Panel

will provide feedback regarding the science quality of proposed projects and the importance of project direction within the five year strategy.

Contributions to Vision Mātauranga

Delivery of research excellence in a manner that embraces Vision Mātauranga will feature strongly in the five year research plan in several ways:

He Awa Whiria - Braided Rivers model approach will underpin all of the science in the next five years of research. The braiding of scientific findings from previous relevant indigenous and Māori studies with other scientific works will inform the rationale and design of the science. In addition, Māori Kaupapa methodologies will be braided throughout the projects, often in novel ways such as the braiding of Māori participatory research with randomised control intervention design in the Resilient Teens theme. A well-established model of Māori well-being Te Whare Tapa Whā (Durie, 1994; Rochford, 2004) will also be utilised to frame studies within the research portfolio.

Researchers who identify as Māori (affiliate with iwi) are represented at all levels of the research plan- from Principal investigators, associate investigators, emerging researchers and doctoral students. They are supported by our Vision Mātauranga Theme Leader and Kāhui. In addition, they have strong connections and relationships within their local rūnanga to support their work within communities.

Engaging whānau in interventions that focus on children's well-being is of critical importance. The next five year plan will build upon the first period's investigations of effective and authentic involvement of whānau (Macfarlane, Gillon et al 2018) and previous work learning from whānau as to what supports their engagement in research (Hall et al 2015).

Science excellence in relation to whānau involvement will include;

- building trust and positive relationships with whānau
- valuing and respecting whānau and community contributions to our research findings and research outputs
- adopting strengths based language and approaches to discussing children's progress in studies
- ethical research processes of informed consent
- use of mana enhancing questionnaires and survey designs
- sharing research findings with whānau and community

The detailed planning of the science in this five year plan will be informed by the tools and concepts outlined in A Better Start's Position Paper (adapted from Bishop, 1996).

Our focus

- ✓ *Continuity of leadership*
- ✓ *Stability*
- ✓ *Strategic advice*
- ✓ *Fair and transparent*

Section 5: Challenge decision-making

Accountability and representation

There will be no major changes to the governance, advisory and management structures. Since the commencement phase in 2015, the arrangements for decision-making and accountability have developed and evolved providing the Challenge with a solid foundation from which to operate in the first period. We will continue monitoring and refining these as needed over the next five year period.

The Board

Board membership has remained stable through the first period with one resignation (Professor Jane Harding, the host representative) in 2015. All other members have accepted reappointments through to the end of the first period. Our Chair, Pat Snedden, has committed to continuing his leadership role with the Challenge and has confirmed his availability for the second five year period and is aiming for continuity of Board members where practicable.

Directorate and management

The Challenge Directorate will remain, led by Professor Wayne Cutfield (University of Auckland) supported by Co-Directors Professor Barry Taylor (University of Otago) and Professor Gail Gillon (University of Canterbury) (Figure 2).



Figure 2. A Better Start Director and co-Directors (left to right).

The three principal Universities (Auckland, Otago, and Canterbury) are working collaboratively, sharing facilities and support to engage with and conduct community-based research. The in-kind administrative support received from the host university, the University of Auckland, has been invaluable and the Challenge operations will remain hosted by the Liggins Institute. Support is provided by Liggins Institute in the way of 0.5FTE project administrator, and host support from the Research Operations Centre including financial oversight and contracting advice and support. The operations team will remain, with an increase in the Operations Manager FTE to align with the increase in research coordination.

Science Leadership Team

In 2017, the Science leadership structure was reconfigured to enable the appointment of Theme Leaders. These include; Associate Professor Rachel Taylor (Healthy Weight), Associate Professor Brigid McNeill (Successful Learning), Associate Professor Sarah Hetrick and Dr Tania Cargo (Resilient Teens), Dr Richard Audas (Big Data) and Vision Mātauranga (Professor Angus Macfarlane).

The Theme Leader structure provides;

- Additional science input and expertise
- Leadership opportunity for senior researchers in respective fields
- Distinct separation of the Directorate from science project-level planning to manage conflicting interests

Advisory Groups

The Challenge set up a Kāhui and Pasifika Advisory Group to provide advice to the Directorate. Operationally, these groups have been providing advice both to the Directorate and the Board as the Chair has standing invitations for all members to attend Board meetings and have access to all Board Papers. This has facilitated frequent, open and robust dialogue on Māori and Pasifika perspectives as attendees are called on for individual opinions with the aim of consensus decision-making approach.

The original Science Advisory Panel membership tenure ended in January 2018. A refreshed panel was approved by the Board in early 2018 with the existing Chair, Professor Ken Ong, remaining for continuity with the addition of seven new members, each with expertise reflecting at least one of the three major theme areas and enabling theme, Big Data and Vision Mātauranga. The Science Advisory Panel have provided input into our science strategy, having input into the main themes and priority setting. They will continue to work alongside us providing the Directorate and Board with independent advice and recommendations on scientific rigour and fit within the funding envelope in early 2019. Early Science Advisory Panel feedback has endorsed the direction and fit of proposed programmes of work commenting that they look ambitious, strong and relevant with a contemporary and justifiably important focus. We envisage a closer working relationship in the second period with the Science Advisory Panel meeting on a quarterly basis.

It is envisaged that Professor Ken Ong and an independent research contractor, Robin Olds will co-Chair the final science project assessment meeting, making recommendations to the Board for investment decision-making purposes. This creates a well-defined separation and managing the potential conflict of interests between funding decisions and the allocation of strategic science investment from the Directorate.

The planned joint Contestable Round(s) with Cure Kids will follow a similar assessment process held in 2017, with an agreed and jointly appointed independent science panel to preside over the assessment of the science proposals and

Vision Mātauranga assessment panel. It is likely that we will call on members of our Science Advisory Panel to Chair and/or participate on the committees.

Challenge structure

The Challenge structure remains similar to the first period, with an expansion of the science leadership group as mentioned previously. Figure 3 illustrates the Challenge's child-centred approach and braiding of knowledge from differing sources reflected within the structure.

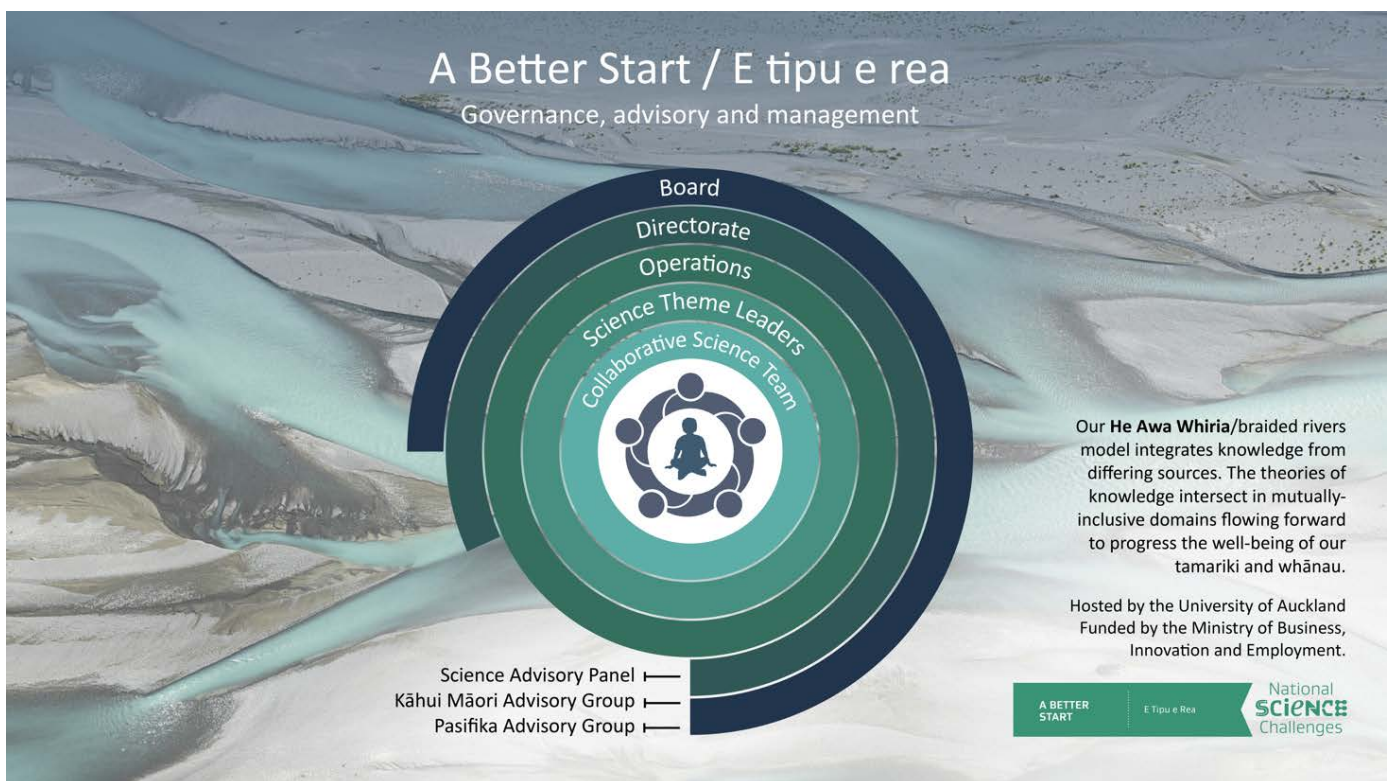


Figure 3: A Better Start governance and management structure

Our approach

- ✓ *Clear phases*
- ✓ *Cohesive projects*
- ✓ *Paths to impact*

Section 6: Proposed investment approach

Strategic research emphasis

In the first period the Challenge made a commitment to predominantly invest in strategic research investments (more than 85% of research investment) in the Challenge theme areas. This provided the greatest opportunity to deliver a logical sequence of integrated research that was multidisciplinary and evolved towards meeting the Challenge 10-year performance indicators. Contestable research projects were selected that were closer to translation.

In period two A Better Start intends to continue to predominantly invest in strategic research rather than contestable funding. The Challenge Directorate's considered view is that a strategic funding approach is an important point of difference from traditional contestable funding in attempting to achieve a multidisciplinary, cohesive sequence of research projects.

Strategic research investments

Period two envisages three phases planned by strategic research investments (Figure 4).

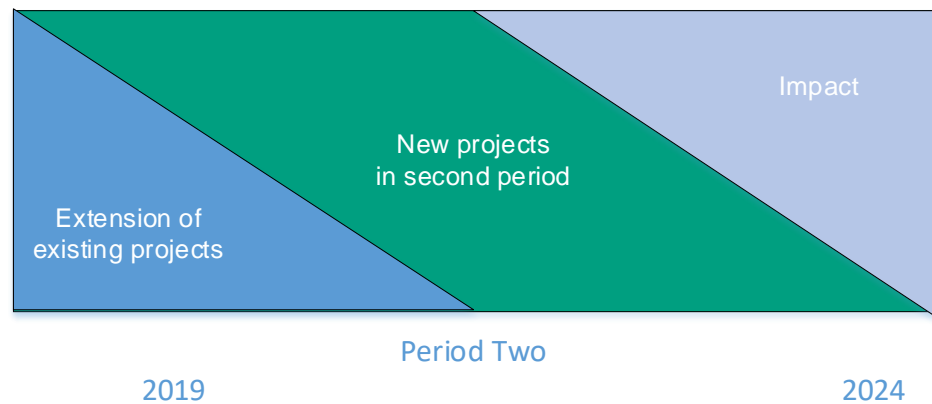


Figure 4: Three phases of strategic research investments

There will be the completion of sequential research undertaken in period one that from the start of period one had been planned to extend into period two or were new observations that merited extending into period two.

If the hypotheses of projects from period one are proven, the research will further evolve to meeting the goal to ultimately build interventions that can be implemented. The second phase of research is new research initiatives that add synergy to work undertaken in phase one that will continue to deliver outcomes relevant to the 10-year performance indicators. The third phase will be to work with stakeholders to translate research to impact.

Co-funded and contestable research

The Challenge has been successful at obtaining co-funding and leveraged research income. From the beginning of 2017 until the middle of 2018 >\$3.1 million of co-funding and leveraged funding has been secured by Challenge researchers for Challenge projects. For period two we will continue to seek funding opportunities in the broad domains in which we have already been successful; other research funding organisations, businesses and philanthropy.

Māori and Pasifika-led research investment

A major new funding commitment of up to \$2 million has been set aside in period two to fund high quality Māori and Pasifika-led projects. The Board has commissioned Māori and Pasifika research experts to develop a strategic “Think Piece” that will provide recommendations for A Better Start on the most appropriate process for researchers to access the funding stream.

NSC collaborative research investment

A collaborative project has been agreed in principle with the two health and well-being National Science Challenges, Healthier Lives and Ageing Well. The three Challenges have agreed to equally fund a research investment (approximate total \$1.5 million initially). This initiative will focus on a life course perspective on health and well-being throughout the life span to intervene and reduce the impact of illness through early detection and prevention.

Indicative five year budget

The indicative budget presented in Table 1 for the period 2019 – 2024 is based on our original submission (Appendix 1) for Tranche 1 funding (October 2015) of \$20.5 million for the second period should this be approved by the Science Board in October 2018.

The allocation between research activity and non-research activity remains the same between the indicative period two budget at original submission and now. However, there have been changes within the non-research activity to reflect actual expenditure in period one, as well as reallocation of science investments to include focus areas for Māori and Pasifika-led research and collaborations with other Challenges.

NSC A Better Start ALL 1 July to 30 June years* (assuming \$~4.1M pa)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Total
Central administration and management	170	170	170	170	170	850k
Governance and Advisory	30	30	30	30	30	150k
Science Leadership	430	430	430	430	430	2,150k
Communications and stakeholder engagement	150	150	150	150	150	750k
Sub-total non-research activity	\$780	\$780	\$780	\$780	\$780	\$3,900k
Research Funding						
• Strategic Investments	2,500	2,500	2,500	2,500	2,500	12,500k
• Māori and Pasifika-led research	400	400	400	400	400	2,000k
• NSC collaborative research	100	100	100	100	100	500k
• Open Contestable Investments	240	240	240	240	240	1,200k
Contingency Funds	80	80	80	80	80	400k
Sub-total research activity	\$3,320k	\$3,320k	\$3,320k	\$3,320k	\$3,320k	\$16,600k
Total	\$4,100k	\$4,100k	\$4,100k	\$4,100k	\$4,100k	\$20,500k

Table 1: Indicative budget for A Better Start, NSC 2019 - 2024

Blue sky ideas✓ *Virtual reality learning*✓ *Rewiring preschool behavior***Section 7: Scenario planning**

A Better Start proposes two new areas of research that would extend the Challenge's research domains with novel approaches to common issues facing children growing up in the digital age.

- Virtual reality learning
- Rewiring preschool behaviour

Virtual reality learning

Exploring the benefits of Virtual Reality and Augmented Reality devices in parent educational programmes focused on enhancing their child's learning and healthy well-being. Education is a key component of all interventions that are likely to be tested in period two of A Better Start. Involving parents in their young children's educational development and health care is of critical importance. Despite the value of parent training programmes, there are many barriers to meaningful engagement of parents in such programmes.

At the forefront of technological developments that are driving global change for our future is the rapid development in interactive learning technologies such as augmented reality (AR) and virtual reality (VR). Recent advancements in virtual human interactive devices are increasing the accessibility, affordability, and potential value of these devices in a variety of learning contexts (Blyth, 2018, Fertlemen et al, 2018, Pappa et al, 2018). Latest research focuses on how such devices can shape positive human behaviour changes, particularly when individuals are facing more challenging interpersonal situations or when individuals show higher levels of anxiety (Mast et al. 2018). To date, such research has focused on adults in work and medical environments. Our priority is to extend the use of VR and AR into educational and health care contexts involving parent educational programmes. To our knowledge, this is the first investigation into potential benefits of VR and AR for children via shaping parent behaviours. Our strategy is to explore the use of VR and AR for parent education focusing on developing their young children's early learning, behaviour, and healthy well-being.

Rewiring preschool behaviour

Behavioural and emotional problems are common (12-20%), difficult to understand and challenging for parents to manage (Furniss, 2006; Skovgaard 2010). These problems can evolve from early childhood into antisocial and emotional disorders in childhood and adulthood that can be socially disabling. They are as common in preschool as school aged children. Currently our mental health focus, within the Resilient Teens theme, focuses on early adolescent intervention of emotional disorders. An opportunity to focus on early childhood behaviour complements and adds depth to A Better Start Challenge's priority for early intervention and prevention of childhood conditions typically targeted early in childhood as with healthy weight and successful learning. Disruptive behaviour problems in preschool children are significant risk factors for, and potential components of, neurodevelopmental and mental health disorders. However, problematic levels of disruptive behaviour, specifically when accompanied by functional impairment and/or significant distress, should be identified because early intervention can improve outcome trajectories. A priority is to examine strategies to improve self-regulation of preschoolers through a range of caregiver behaviours and environmental regulatory cues.

It is now recognised that many children with disruptive behaviour have a disrupted sleep pattern. We know that good sleep has direct effects on brain development and may be an effective intervention modality in these situations.

Environmental stimuli such as maternal emotional support can improve behaviour in young children. This is through neurophysiological processes via maturation of a preschool child's rapidly developing inhibitory control behavior (Swingler, 2018). Our strategy will include novel and impactful research that will incorporate studying epigenetic contributions to emotional, physical, cognitive, and motor development of preschoolers; physiological concomitants of childhood temperament; and early risk and resiliency factors related to child psychopathology. A signature feature of this research is the breadth and depth of assessment during key periods of development.

Contact Information

Wayne Cutfield

Director

Phone 09 923 4476

Email w.cutfield@auckland.ac.nz

Cathrine Waetford

Research Operations Manager

Phone 09 923 8061

Mobile 027 4044 758

Email cathrine.waetford@abetterstart.nz

Eleanor Surtida

Research Operations Administrator

Phone 09 923 1966

Email b.surtida@auckland.ac.nz

Challenge Host Information

The University of Auckland

Liggins Institute

Phone 09 373 7999

Email contact@abetterstart.nz

www.abetterstart.nz

Contract ID: UOAX1511

MBIE Sector Manager Lead: Hannah Walker

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