

# Chapter 7

## Growing Up in New Zealand: A Prebirth Cohort Study of Child Wellbeing and Development



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**Abstract** *Growing Up in New Zealand* is the contemporary prebirth longitudinal cohort study established to understand what shapes developmental trajectories for the current generation of New Zealand children in the context of their diverse families and broader social environments. The study provides population-relevant evidence relevant to the Developmental Origins of Health and Adult Disease paradigm by collecting detailed social and biological information to understand what shapes early development to understand what works to give every child the best possible start to life.

The cohort of 6853 children engaged in the *Growing Up in New Zealand* longitudinal study from before their birth are broadly generalisable to all contemporary births in New Zealand. Of particular importance is that the cohort of children represent the ethnic diversity of the current generation of New Zealand children and the socio-demographic characteristics of their diverse families.

From the development phase onwards, *Growing Up in New Zealand* has created partnerships with policymakers across multiple government sectors to facilitate the collection of relevant information and enable the timely translation of the research findings. Policy relevance and utility is a key goal for *Growing Up in New Zealand*, and to date the evidence from the cohort has informed policies in the perinatal period in areas such as maternity care, breastfeeding, immunisation and parental leave and return to work in the postnatal period.

**Keywords** Longitudinal study · Birth cohort · Recruitment and retention · Child health and wellbeing · Developmental trajectories · Life course epidemiology · Policy translation

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## Abbreviations

CAPI	Computer-assisted personal interview
CATI	Computer-assisted telephone interview
DCW	Data collection wave
DOHAD	Developmental Origins of Health and Disease
GUINZ	Growing Up in New Zealand
NZ	New Zealand

## 7.1 Introduction

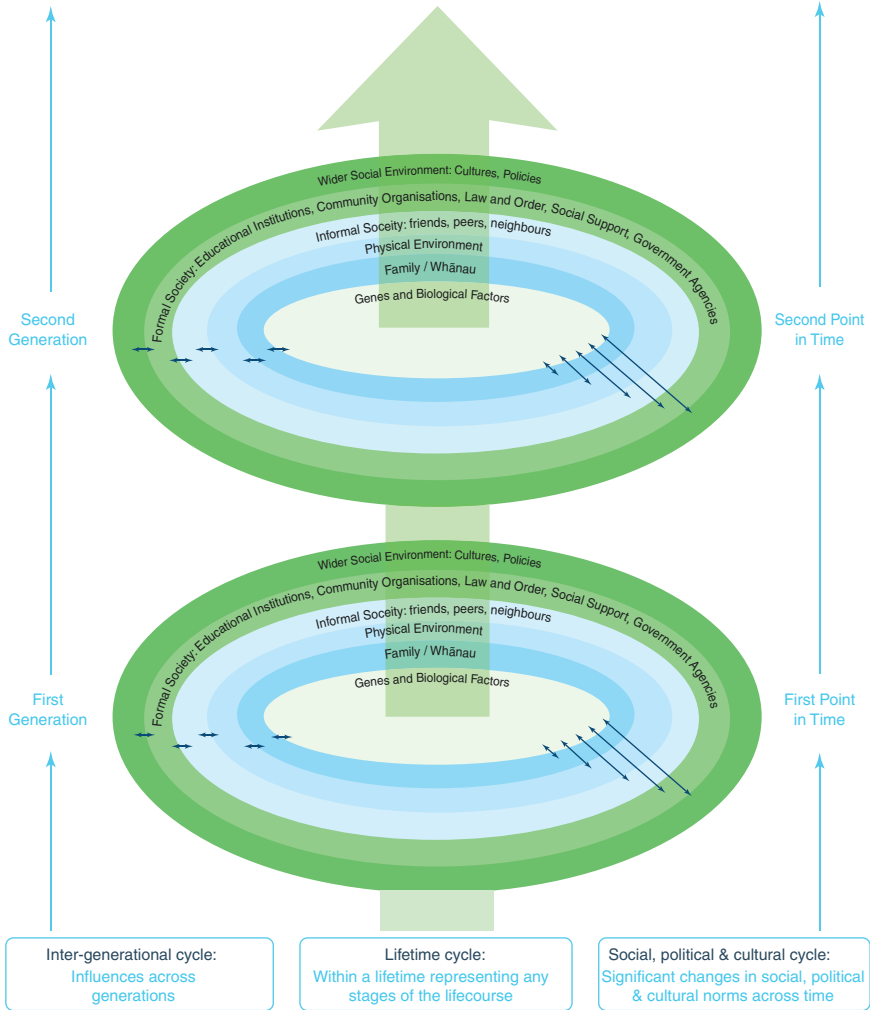
*Growing Up in New Zealand* is a longitudinal, multi-disciplinary prebirth cohort study designed specifically to understand what shapes developmental trajectories for contemporary New Zealand children growing up in the context of their diverse families in dynamic interaction with their multiple environments in the twenty-first century. The study's explicit objective is to be translational; that is, to provide population-relevant evidence about what influences children's wellbeing, to inform the evaluation and implementation of cross-sectorial policy initiatives that can improve the health and wellbeing of all New Zealand children. In terms of application to the Developmental Origins of Health and Disease, the study has specifically focussed on collecting detailed information to understand what shapes development in the critical first thousand days of children's lives to understand what works best to optimise the wellbeing for all children and to give everyone the best possible start to life.

## 7.2 Research Design

The conceptual framework for *Growing Up in New Zealand* is based on a life course epidemiological framework. Such a framework considers influences on development through multiple contexts and how proximal and distal influences accumulate, overlap and also change over time to impact wellbeing [1–4].

The 6853 children in the *Growing Up in New Zealand* cohort are central to all data collections, but the conceptual framework recognizes that they only develop in dynamic interaction with their families, communities and wider physical environments and societal contexts over time. This conceptual approach acknowledges the growth in understanding of early child development in the last few decades, including the emergence of the Developmental Origins of Health and Disease (DOHAD) paradigm, with the increasing recognition in particular of the importance of the first thousand days of life, including the antenatal and pre-pregnancy periods, for setting developmental pathways that will potentially shape outcomes into adulthood.

The model therefore incorporates the notion that the development of all children begins from before they are born (intergenerational continuity) as well as the notion



**Fig. 7.1** Conceptual framework of Growing Up in New Zealand

that each life course outcome is the result of a complex interplay between the individual’s biology and their proximal and distal environments over time [5] (Fig. 7.1).

In particular the *Growing Up in New Zealand* study:

- Describes antenatal and intergenerational influences on child development (recruiting in pregnancy and beginning data collection before birth).
- Emphasises the importance of early life data (in particular the first thousand days of development).
- Includes data collected independently from fathers (and partners) from before birth.
- Takes an interdisciplinary and life course approach to child development.

### 7.3 Cohort Description

The cohort of children engaged in the *Growing Up in New Zealand* longitudinal study is generalizable to all contemporary births in New Zealand according to the key demographic characteristics of child ethnicity, parental markers of socioeconomic status and urban/rural residential mix. A cost-efficient, geographical sampling frame is used to recruit the children via their mothers and mother's partners in pregnancy [6]. The postnatally determined final sample size of 6853 children provides adequate explanatory power to undertake robust life course analyses with children who identify as Māori, in particular (approximately one in four of New Zealand births), as well as analyses for those identifying as Pacific and Asian, as well as across the population of all children [7]. Importantly a large proportion of the cohort children identify with more than one ethnic group and ethnic identity is likely to change over time as other developmental trajectories also evolve.

### 7.4 Research Questions

The overarching objective of the longitudinal study is to determine what factors shape developmental life course trajectories for a contemporary cohort of New Zealand children, as well as within key subgroups of children.

Specifically, the objectives of the *Growing Up in New Zealand* study are:

- To map the developmental trajectories for a cohort of New Zealand children as a group, and within Māori, Pacific and Asian subgroups in particular, in order to identify the main causal pathways, and the links between them, across multiple levels of influence (political, social, cultural, intergenerational, familial and individual) for outcomes in key social, developmental and health domains across the life course.
- To provide a description of cross-sectional outcomes (in several domains) at key points in the life course of the developing child and to enable comparisons between and within subgroups and against international populations.
- To focus on factors and trajectories, across multiple levels of influence, that confer resilience and optimise development, rather than focusing solely on risk factors for poor outcomes.
- To identify critical or sensitive periods in development, and levels of influence, that will inform policies directed at optimising the development of every child born in New Zealand.

### 7.5 Data Collection Waves (2008–2016)

Trajectories of early life development from before birth are recognised as critical for influencing the ongoing health, wellbeing and resilience of children and their families in the DOHAD paradigm as well as in life course epidemiology. Accordingly

five significant data collection waves have been conducted within the first 5 years of the children's lives to provide detailed information about the children's early development. Each data collection wave of *Growing Up in New Zealand* seeks age-appropriate information across the six interconnected domains: family and whānau; neighbourhood, environment and societal context; education; health and wellbeing; psychological and cognitive development; and culture and identity. Methods to collect domain-specific evidence acknowledge the unique New Zealand population and environmental context, particularly the unique opportunity *Growing Up in New Zealand* has to examine the factors which contribute to the wellbeing of Māori whānau in New Zealand in the twenty-first century.

Traditional methods of computer-assisted telephone interviews (CATI) and computer-assisted personal interviews (CAPI) have been augmented by linkage to information from routine datasets throughout the early data collection waves. In addition, electronic and text contact, incentives, competitions and the use of social media support information gathering. The longitudinal information collected to date (up to December 2016), using multiple methods, includes the following.

### **7.5.1 Face-to-Face Interviews**

Face-to-face interviews conducted as computer-assisted personal interviews (CAPI) have been utilised for:

- The antenatal data collection wave (DCW) in 2009–2010 with the pregnant mother (most often in the last trimester of her pregnancy) and with her partner (almost always the biological father).
- The 9-month DCW with the child's mother and her partner (2010–2011).
- The 2-year DCW with the child's mother and her partner (2011–2012), which also involved direct observations and developmental and anthropometric assessments of the children at 2 years of age.
- The 4-year DCW with the child's mother (completed in 2014–2015), which also involved direct observations and developmental and anthropometric assessments of the children at 4.5 years of age.

### **7.5.2 Telephone Interviews**

Telephone interviews are conducted as computer-assisted telephone interviews (CATI).

- These occurred when the children were aged approximately 6 weeks, 35 weeks, 16 months, 23 months, 31 months and 45 months.

The telephone interviews provide valuable, age-appropriate information that enhances the data collected face-to-face.

### 7.5.3 Data Linkage

- Linkage between the *Growing Up in New Zealand* data and routinely collected perinatal health records was undertaken in 2012.
- Parental consent for linkage to routine education and health data up to the age of 7 years was obtained at the 4-year face-to-face interview.

All questionnaires used in the field are made available on the *Growing Up in New Zealand* website ([www.growingup.co.nz](http://www.growingup.co.nz)) once a data wave collection is completed in the field. Biological samples were obtained from the children around the time of birth (dried blood spots) and also at the preschool interview (saliva samples for DNA extraction and bacterial swabs for colonisation information).

The data collection mode and timing is summarised in Table 7.1.

A summary of the information collected is provided in Table 7.2. Longitudinal information is collected to provide measures of child development as well as proximal and distal broader familial, societal and environmental influences. Information is collected to inform trajectory development rather than cross-sectional status per se, and collection of information is only repeated when sufficient change is expected to have occurred at the population level to justify this.

Cohort retention rates have remained very high compared with similar international cohort studies and compared to predicted rates when the study was designed. Less than 4% of the baseline cohort have opted out of the longitudinal study altogether over the first five data collection waves. Rates of completion of each data collection wave are slightly lower than this, however, given that some families skip a particular collection wave but still agree to remain in the cohort for future contact and data collection.

For example, information was collected for over 90% of cohort (6156 children) at the 54-month or 4-year data collection point (7% skips). This high retention rate has occurred in the face of great residential mobility of the families, half of whom

**Table 7.1** Data collection mode and timing

Child age	Antenatal	Perinatal	< 9 months	9 months	< 2 years	2 years	< 4 years	4.5 years
CAP <sup>a</sup>	✓			✓		✓		✓
CAT <sup>b</sup>			✓		✓		✓	
Child <sup>c</sup>		✓				✓		✓
Data linkage		✓	✓	✓	✓	✓	✓	✓
Bio sample <sup>d</sup>		✓						✓

<sup>a</sup>CAP<sup>a</sup> computer-assisted personal interview

<sup>b</sup>CAT<sup>b</sup> computer-assisted telephone interview

<sup>c</sup>Child measurement

<sup>d</sup>Saliva samples, throat/nasal/skin swabs, dried blood spots, cord blood (subsample)

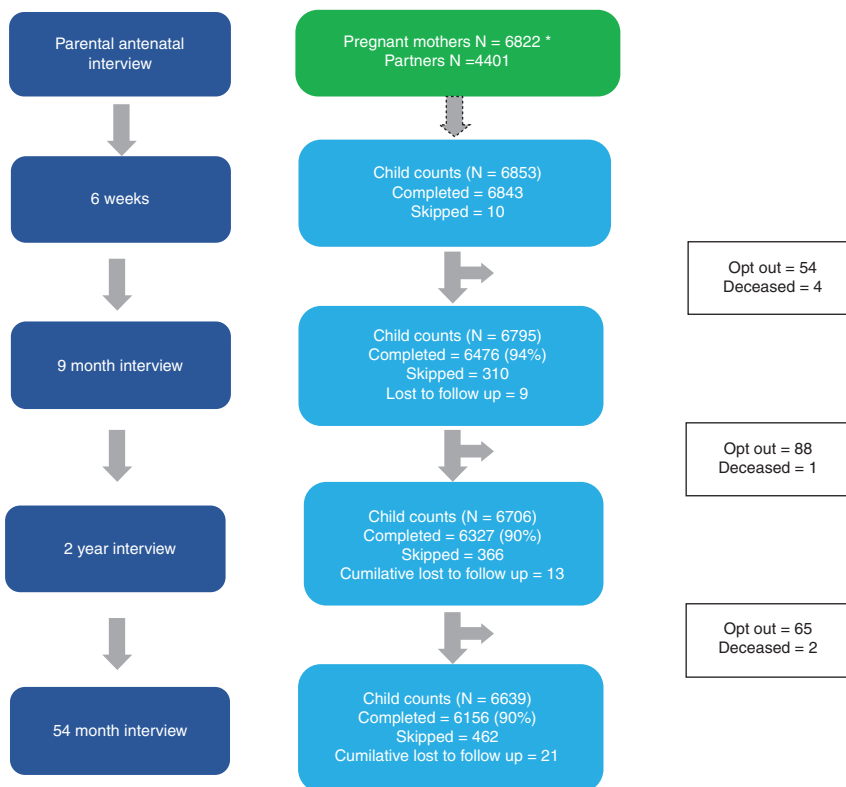
**Table 7.2** Summary of overarching constructs measured throughout *Growing Up in New Zealand*

Child characteristics	Distal social environments
<ul style="list-style-type: none"> <li>• Early life injuries</li> <li>• Size at birth and perinatal health</li> <li>• Child anthropometry</li> <li>• Psychosocial and cognitive development</li> <li>• Behaviour and temperament</li> </ul>	<ul style="list-style-type: none"> <li>• Neighbourhood (physical location, integration, access to services, informal support available)</li> <li>• Transport and access to local services</li> <li>• Early childhood education</li> <li>• Well child checks</li> <li>• Interaction with social services</li> </ul>
Proximal social environments	Macro environmental factors
<ul style="list-style-type: none"> <li>• Family structure, including parents, siblings and extended family</li> <li>• Child’s home physical and social environment</li> <li>• Parental physical and mental health</li> <li>• Household deprivation</li> <li>• Parental stress and support</li> <li>• Parent-child interaction</li> <li>• Ethnic identity</li> <li>• Safety practices in the home</li> </ul>	<ul style="list-style-type: none"> <li>• Continuity of access to primary health care services</li> <li>• Healthcare cost</li> <li>• Parental labour force status</li> <li>• Early childhood education</li> <li>• Family support measures including any family taxation relief or benefits</li> <li>• Housing tenure</li> <li>• Residential mobility</li> </ul>

have moved between each data collection wave. Of the 6156 children with completed interviews at the age of 4 years, 4165 (68%) were identified as NZ European, 1522 (25%) as Māori, 1263 (21%) as Pacific and 1027(16%) as Asian, with multiple ethnicities identified for nearly half of the cohort. Attrition bias has been minimal with respect to key parameters of ethnicity and socioeconomic status (see Fig. 7.2). Biological samples were obtained from the cohort at 4 years of age [8], saliva samples for genetic analyses were collected from 4975 (81%) and consent for linkage to healthcare data obtained for 5637(92%) of the children.

## 7.6 Utilising the Longitudinal Information

Longitudinal data collected to date from the children and their families provide information regarding child-specific factors, familial factors, extended family and wider social networks (the proximal social environment), informal and formal supports (the distal social environments) and the wider societal, cultural, economic and policy context (the macro-environmental factors) that shape contemporary New Zealand child developmental trajectories. From the development phase onwards, *Growing Up in New Zealand* has created partnerships with policymakers across multiple sectors to facilitate the relevance of and the translation of the research findings. Policy relevance and utility is a key goal for *Growing Up in New Zealand*. This is achieved through (1) specific translational objectives and research questions, (2) engagement with policymakers throughout the design phase and (3) continued and ongoing engagement with policymakers at all steps of data collection and dissemination. This engagement is mediated by the *Growing Up in New Zealand* policy



**Fig. 7.2** Cohort retention rates. *Notes.* \*Complete antenatal interview data (1) ‘Skipped’ refers to a mother unable to provide information at a specific data collection point but still intending to complete subsequent data collection waves. (2) ‘Lost to follow-up’ refers to a participant who could not be contacted at this specific DCW. (3) ‘Opt out’ refers to a participant who has specifically indicated that they no longer wish to participate in the study; where this is a mother, her participant child or children are therefore opted out. (4) Percentage of ‘completed’—the denominator for completed DCWs is the total live births determined at the 6-week call ( $N = 6853$ )

forum, a multi-agency reference group of senior policy advisors representing the New Zealand Families Commission/Social Policy Research Evaluation Unit, Statistics New Zealand, Office of Ethnic Affairs, Te Puni Kokiri, Ministries of Health, Justice, Social Development, Women’s Affairs, Pacific Island Affairs, Education and the Office of the Children’s Commissioner. This forum meets several times a year to review data collection plans and data analysis and inform reporting and translation of research and policy outputs.

Analyses applied to the longitudinal information respect the temporal nature of the information and the highly correlated, repeated measures of both child development and the broader environment collected at different points in time. The advantage of having repeated measures on the same group of individuals is significant as it allows analyses to identify changes in an individual’s status over time, as well as



to highlight what conditions or factors have contributed to change, noting that this change may reflect either improvement or worsening of exposures or outcomes. The repeated information also allows an understanding of what factors and environments contribute to stability of exposure and chronicity of either good or poor outcomes. Applying this methodological approach means that the information from the cohort is able to inform when, how, what and for whom strategies should be optimally targeted to improve wellbeing and give every NZ child a better start to life. This repeated information on the same individuals, their families and their environmental contexts is not readily available from routine administrative datasets alone.

The longitudinal information provides a valuable and unique research resource to investigate DOHaD concepts and to inform policy and research. The longitudinal data resource was (and continues to be) designed to have utility for multiple users including researchers, policymakers and other stakeholders. It is intended to be used widely without jeopardising the privacy, confidentiality or continuing involvement of the longitudinal study participants.

Researchers external to the *Growing Up in New Zealand* team are able to apply to use anonymised datasets for bona fide research. There is a detailed and well-defined application process that involves approval for access by a Data Access Committee, which is guided by a Data Access Protocol, to ensure that external applicants and all data access requests comply with a set of strict criteria intended to protect the anonymity of participants (according to existing study ethical agreements and participant consents), and which protect the long-term sustainability of the study.

## 7.7 Next Steps

The longitudinal research is ongoing and is expected to continue until the children are at least 21 years of age. Planning for a data collection wave in 2017, when the children are 8 years old, is underway. The 8-year data collection will be the first face-to-face collection of information since the children entered formal schooling (after their fifth birthday in New Zealand), so it represents an important transition in their lives, a transition that will critically shape their future developmental outcomes, adult wellbeing and engagement with wider society. The 8-year data collection plans include a school module as well as mother-and-child interviews and direct observations of development and wellbeing and repeat biological sampling.

It is anticipated that data collections will continue every 2–3 years, to capture key transitions such as puberty and adolescence, transition to secondary education and then transition to advanced training, tertiary education and/or labour force participation. These regular data collections will also ensure that the early life longitudinal information will have maximal utility to inform what shapes developmental trajectories to adulthood for children growing up in New Zealand today.

## 7.8 Making a Difference and Demonstrating Impact

*Growing Up in New Zealand* has deliberately sought to use information in as timely a way as possible and has delivered a greater number of outputs in the first 5 years than historical New Zealand longitudinal studies and many contemporary international cohort studies. Given the longitudinal nature of data collections, it is also imperative that in the early years of a longitudinal study, the recruitment and the retention strategies create a robust foundation for the information that will be collected over time, and there are few shortcuts to achieve this [5, 9–13].

The rich information that has been generated from the preschool data collections has already provided a valuable resource for multiple researchers to investigate key research questions relating to early life development and potential risks or protective factors for later life health and wellbeing. For example, by the time the children enter formal schooling, they are ‘digital natives’, and the environments they are growing up in are vastly different from those of the previous generations in New Zealand. The cohort children are less likely to live in a nuclear family (69%) and more likely to be living in an extended family environment (20%) than with only one parent (5%). Their families are highly mobile (one in four moved in their first year of life, a further one in three before their second birthday and one in two again before they were 5 years old). Only half are living in homes that their families own. Their mothers are more likely to be working than were mothers in previous generations, but families with young children are still more likely to be experiencing greater hardship in terms of material deprivation than other New Zealanders. The children are also likely to be multilingual, with one in three having at least one parent who was not born in New Zealand. Obesity is common in the cohort with almost 15% overweight or obese by the time they enter primary school (up from 10% when they are 2 years old). Obesity is already more common in Maori and Pacific children than in NZ European or Asian groups, although no groups are immune. A genetic variant (CREBRF) has also been identified within the cohort, most commonly in Māori and Pacific children, that is not related to birth weight but which is related to differential postnatal growth rates and could represent a different response in these children to the same environments.

The rich longitudinal information from the families has provided evidence to inform policy change including the recent changes to New Zealand’s paid parental leave policy and to the introduction of the ‘Warrant of Fitness’ for rental properties, given the high proportion of young children who now grow up in families apparently destined to be lifelong renters (almost half of the cohort). Information has also been provided to inform early identification of children who are most vulnerable to adversity and early life poor outcomes from the time of their birth. This has led to suggestions about how to more accurately target the way health-related services are provided to the most vulnerable families from the perinatal period (before their children are born), to avoid downstream issues before they arise and optimise these children’s start to life. Importantly, the longitudinal information collected directly from the families and children provides opportunities to identify factors that create

resilience in the face of adversity for the most vulnerable children [14]; in other words, to identify what *is* working for children and families in contemporary New Zealand society and how we can apply this to ensure all New Zealand children have the opportunity to thrive and flourish. (All outputs can be viewed at the study website: [www.growingup.co.nz](http://www.growingup.co.nz).)

## 7.9 Conclusion

*Growing Up in New Zealand* continues to collect multidisciplinary information to determine what influences early development for contemporary New Zealand children, and how early life characteristics are related to wellbeing and development in later life. The intent is to ensure that this longitudinal evidence informs cross-sectoral strategies to improve the health and wellbeing of all future New Zealanders. The voices of the children themselves are now adding value to the collection of information as they move into early adolescence. Every child in the cohort has a unique story to tell, and each contributes to the collection of rich longitudinal information over time. By following the lives of these ordinary New Zealand children and their families, and telling their stories, there is a real opportunity to make an extraordinary difference for all New Zealand children and inform population relevant ways to give every child the best possible early start to life and therefore the best chance of a healthy life course.

### Appendix: Domain-Specific Research Questions for Growing Up in New Zealand

1. What are the developmental pathways that determine the health status of children across the life course from antenatal development to early adulthood?
2. How does an individual's biological profile, and the environment in which they grow, mutually interact over time to influence development?
3. What are the key determinants of the developmental trajectories that lead to behavioural, emotional and social competence in childhood and adolescence, and what precipitates either continuity or change in these trajectories?
4. What biological and environmental factors impact on cognitive ability, and how do these factors influence developmental outcomes and trajectories over the life course?
5. How do the multiple levels of self, family, environment and educational context and composition influence and affect educational and developmental outcomes over time?
6. What factors influence academic motivation, perceived academic competence and educational achievement across the life course, in particular at key transition points?

7. How does the quality of family/whānau dynamics including sibling, parent-child, inter-parental and relationships with extended family influence children's development over time?
8. How do children's experiences of family/whānau life vary, and what factors confer resilience or present risks to their development, in diverse family forms and during periods of family transition?
9. How involved are fathers in children's lives, and what are their influences over time on children's development?
10. How are culture and ethnic identity understood and 'shaped' for children and their families, and what developmental trajectories are associated with cross-cultural parental and child ethnicities across the life course?
11. What influences do the physical, social and cultural environments have on children and their families' cultural experiences and identities in terms of holistic development?
12. What are the key features (social networks, infrastructure and physical environment) of neighbourhoods and communities which impact on an individual's development over time?
13. What role do neighbourhoods and communities have in mediating the associations between family circumstances, dynamics and social conditions (SES) and child development? How does geographic mobility influence this effect?
14. How important is engagement of the family and child with key social services and institutions—including health, education and social service providers—in affecting child outcomes? What factors in the social and family environment facilitate effective engagement?
15. How are diverse social and economic contexts expressed in family values, practices, beliefs and resources? How are child outcomes shaped by the effect of these social contexts on family values, practices, beliefs and resources?
16. How are child outcomes affected by the nature of their parents' workforce participation, and what factors both internal and external to the family modify these effects?
17. What effects do mass media, communications and new technologies have on children's health and development, and what factors in the family and social environment modify these effects?
18. How do New Zealand policies affect the social and economic positioning of the cohort families/whānau, what stressors or enablers do they create and how do they impact on child development?

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