

## Moving for good?

Patterns of early childhood residential mobility, unmet healthcare needs, and child health in Aotearoa New Zealand

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## Table of Contents

Acknowledgements.....	1
Author biographies .....	2
Executive summary.....	6
Introduction .....	11
Context.....	11
Residential mobility .....	11
Health inequities.....	12
Access to services.....	13
Racism .....	14
Our framing of residential mobility .....	15
The current study.....	17
Methods.....	20
Data and sample .....	20
Residential mobility .....	21
Factors potentially associated with residential mobility .....	21
Child unmet healthcare needs and health outcomes.....	24
Analysis .....	25
Research Question 1: What are children’s experiences of residential mobility across early childhood?.....	25
Research Question 2: Which children are more likely to experience, or which factors are associated with, different types of residential mobility patterns?.....	27
Research Question 3: Are these patterns of residential mobility associated with children’s unmet health care needs?.....	27
Research Question 4: Are these patterns of residential mobility associated with children’s health at 8 years, and does unmet need attenuate this association? .....	28
Findings .....	29

Overall sample demographics.....	29
Research Question 1: What are children’s experiences of residential mobility across early childhood? .....	33
Trajectories of Residential Mobility .....	33
Research Question 2: Which children are more likely to experience, or which factors are associated with different types of residential mobility patterns?.....	43
Change in housing tenure across the waves by trajectory .....	45
Multivariate regression modelling.....	53
Factors associated with the likelihood of being in different trajectories.....	53
Research Question 3: Are these patterns of residential mobility associated with children’s unmet healthcare needs?.....	57
Early childhood residential mobility trajectories and unmet healthcare needs .....	58
Number of completed Wellchild check-ups at 54-months.....	58
Completed B4 School checks at 54-months.....	59
Research Question 4: Are patterns of residential mobility associated with children’s health at 8 years, and does unmet need influence this association?.....	59
Parent-rated health.....	60
Number of different types of acute illnesses experienced at 8 years .....	61
Maternal experiences of racism, residential mobility, unmet child health needs and child health outcomes .....	61
Discussion .....	63
Predictors of residential mobility trajectories .....	64
Residential mobility trajectories and unmet healthcare needs at 54-months.....	65
Residential mobility trajectories and child health at 8 years.....	65
Interpersonal racism, structural racism, residential mobility and child healthcare and health outcomes .....	66
Implications / Policy opportunities .....	66

Limitations and future directions..... 67

References ..... 71

Appendix ..... 76

**Executive summary**

International research has demonstrated links between residential mobility in childhood, and adverse health, social, educational, and physiological outcomes in children. Aotearoa New Zealand (hereafter Aotearoa) is a highly mobile population, with particularly high levels of residential mobility among young people. This is correlated with structural and societal factors such as housing tenure, income, maternal education, and ethnicity. Because high levels of residential mobility are associated with both poorer health outcomes *and* markers of socioeconomic disadvantage (that are in themselves associated with poorer health outcomes and disproportionately experienced by tamariki Māori and Pacific children in Aotearoa), it is possible that residential mobility may be exacerbating existing child health inequities. One pathway through which this may occur is via unmet healthcare needs. Some international evidence suggests that children experiencing high levels of residential mobility are less likely to receive routine childhood immunisations. In Aotearoa, residential mobility has been associated with incomplete B4 School checks (a key general practitioner visit assessing children's health and development prior to primary school entry), although it is unclear the extent to which these findings may have been influenced by other sociodemographic factors that are also associated with barriers to accessing healthcare. Furthermore, there is little research evidence on whether and how the specific timing and frequency of residential mobility across early childhood influences both unmet healthcare needs and child health outcomes.

**This study therefore sets out to answer four primary research questions:**

1. What are children's experiences of residential mobility across early childhood?
2. Which factors are associated with different types of residential mobility patterns?
3. Are patterns of residential mobility associated with children's unmet health care needs?
4. Are these patterns of residential mobility associated with children's health at 8 years, and does unmet need explain part of this association?

Using longitudinal data from *Growing Up in New Zealand*, over 5,000 children were followed from antenatal (data collected in 2009/10) through to when they were 8-years old (2018) to examine experiences of residential mobility across early childhood (through to 54-months) and how these may influence unmet healthcare need and child health outcomes (at 54-months and 8-years).

Social sequence analysis was applied to examine patterns of residential mobility across early childhood by grouping together children with similar residential mobility experiences. Multinomial regressions were used to explore whether sociodemographic factors, such as maternal education attainment, household income, and family structure, were associated with children's residential mobility trajectories. A further set of regression models examined whether residential mobility trajectories were associated with children's unmet healthcare need and their health. At each study wave information on the number of residential moves since the prior wave was collected. Children not moving house between waves were categorised as 'stability.' One move was considered 'low mobility,' two moves were classed as 'high mobility', while three or more moves were considered 'very high mobility.'

### **12 percent of children experienced a transition from relative stability in the earliest years to high or very high residential mobility**

Overall, experiences of residential mobility appeared to cluster over early childhood in ways that produced six different trajectories:

- *No moves:* Over one-third (36%) of the cohort did not move house across the study period.
- *Stability with increasing residential mobility:* One-fifth (20%) of children in the cohort experienced this relatively stable trajectory. At each study wave, more than 60% of children in this trajectory had not moved house at all since the previous wave, indicating a consistent level of residential stability within this trajectory. However, while approximately one-third of children moved house at least once at each study wave, the proportion of children moving two or more times increased substantially between the 24-month and 54-month waves. By the 54-month wave almost one-third of children in this trajectory had moved two or more times.
- *One school-age move:* Fifteen percent of children in the cohort did not experience any residential mobility, until the 54-month wave, where all children in this trajectory moved house once.
- *Consistently low residential mobility:* Eighteen percent of the cohort experienced continuous low levels of residential mobility across the study period. At each study wave, approximately 65% of children in this trajectory had moved house once between waves. This group differs from the 'one school-age move' group in that a high proportion of children moved house once at each wave.
- *Transition to high residential mobility:* Eight percent of the cohort experienced this trajectory. Although 63% of children in this trajectory had not moved by the 9-month wave a transition to

high levels of residential mobility occurred from the 24-month wave, where more than 70% of children had moved house at least once. At 54-months less than 10% of this trajectory was in the same house as the previous wave, and 72% of children had moved house two or more times. This trajectory differs from the '*stability with increasing residential mobility*' trajectory in that the proportion of children not moving house between waves is substantially reduced over time, and by the 54-month wave a much higher proportion of children had moved house two or more times.

- *Transition to very high residential mobility*: For 4% of the cohort a more extreme transition was experienced. By the 54-month wave 96% of children in this trajectory had moved three or more times, with no children living in the same house as the previous study wave.

### **Predictors of residential mobility trajectories**

Trajectories of lower residential mobility were associated with markers of socioeconomic advantage such as :

- homeownership
- greater maternal education
- older maternal age
- two-parent households
- and household income.

On the other hand, compared to the most stable 'reference' trajectory, children who experienced a transition to very high residential mobility were:

- more likely to have younger mothers
- more likely to have a mother with a disability
- more likely to experience changes in family structure
- 2.6 times more likely to have mothers without secondary school qualifications
- 5.4 times more likely to live in private rental accommodation
- And were twice as likely to live in public rented accommodation (90% CI).

Although not statistically significant, children in this highly mobile trajectory were more likely to have mothers who identified as Māori.



**Experiences of higher residential mobility were associated with unmet healthcare need**

Compared to the most stable reference trajectory, children with less stable residential mobility experiences tended to have completed a lower number of Wellchild checks by the 54-month wave. This negative association was strongest for children experiencing a *transition to very high residential mobility* but was also present for children in trajectories where a *transition to high residential mobility* occurred, and trajectories of *consistently low residential mobility*. A negative association (at the 90% CI level) was also identified for children in the trajectory experiencing *stability with increasing residential mobility*. A similar pattern was identified when the B4 School check was examined. Compared to the stable reference trajectory children who experienced any of the other trajectories were less likely to have completed or scheduled the B4 School check at the 54-month wave. This association was strongest for children experiencing a *transition to very high residential mobility*, who were 64% less likely to have completed or scheduled the B4 School check.

**Early childhood residential mobility trajectories were not associated with child health at 8 years**

Overall, associations between residential mobility trajectories and parent-rated child health or acute illness were not strong. Any associations were either attenuated once socioeconomic characteristics were controlled for, or if the association remained it was weaker than the association between socioeconomic characteristics and child health. Negative associations between parent-rated health and experiences of both a *transition to very high residential mobility* and a *transition to high residential mobility* were identified, however these associations did not persist when sociodemographic and housing tenure variables were included in the models. The number of different types of acute illness experienced was associated with a trajectory of *stability with increasing residential mobility*. This association persisted (but decreased in statistical significance) when sociodemographic and housing tenure variables were included in the regression model.

**Overall, this research confirms previous findings that many young children in Aotearoa are not residentially stable. Our finding that experiences of higher residential mobility were associated with unmet healthcare need also indicates that the health system needs to better account for residential mobility when providing healthcare services.**

**Policy implications**

These findings offer several important implications for policy. It indicates that stable housing has benefits for children's access to healthcare and, to a lesser extent, child health. Policies should ensure that all children have access to stable housing. Public health interventions and healthcare delivery should also recognise that residential mobility may disrupt children's access to healthcare. Models based on an assumption of residential stability will not work for everyone, and risk increasing healthcare access inequities and health inequity. Residential stability, and patterns of relatively stable housing, are associated with markers of socioeconomic advantage. Policies should therefore address socioeconomic inequities facing children and their families. There has been a small but noticeable shift towards 'other' forms of accommodation tenure, which appears to be associated with an increase in residential mobility between the 54-month and 8-year study waves. Further research is needed, but the increase in 'other' forms of accommodation tenure may be associated with housing unaffordability, and a lack of available public and private rental housing. Although beyond the scope of this research, the current health system reforms – including the establishment of Te Whatu Ora and Te Aka Whai Ora, and disestablishment of District Health Boards – provide a potential opportunity to address the findings of our report more systematically. This could include through developing strategies to address the disruption that high residential mobility can have on childhood access to health services.

## **Introduction**

### *Context*

Much is known about non-Aotearoa populations from international research examining how residential mobility impacts children's health, social, educational, psychological outcomes (1-5). Less is known, however, about whether residential mobility is associated with poorer health and their access to health services in Aotearoa (6, 7). This matters because, despite free health care for children 13 years and under, families in Aotearoa still report unmet need for primary health care, indicating inequities in access to services also being driven by factors beyond the health system, such as a lack of available transportation. While the association between poor housing conditions in NZ and poor health outcomes in children is well-documented (8-10), the impact that residential mobility, net of these household conditions, has on child health and the ability to access health services is unknown.

This study aims to fill this knowledge gap in Aotearoa by using data from *Growing Up in New Zealand* - Aotearoa's most contemporary and ethnically and socioeconomically diverse longitudinal birth cohort study - to identify patterns of residential mobility in early childhood, find out which children are more likely to experience different types of residential mobility patterns, and the extent to which these influence unmet healthcare needs and child health outcomes. This study provides insight into the residential mobility contexts of children in Aotearoa, how these contexts are associated with unmet need for healthcare, and how this relates to child health outcomes.

### *Residential mobility*

Rates of residential mobility vary internationally, although appear to be higher in NZ than other countries (11). Some population subgroups, particularly young children, experience higher rates of residential mobility. Among the GUINZ sample, in the five years before pregnancy, 85% of families had moved at least once, while 32% of children had moved between being 9-months old and their second birthday (12). Residential mobility is strongly influenced by structural and societal factors. Residential mobility is more common among families living in rented accommodation, lower income households, families where maternal education is lower, and among Māori and Pacific children (6, 7). Parents with more advantages, on the other hand, can leverage their resources to provide stable, quality housing, which in turn can influence health outcomes. Importantly, housing stability influences the ability of families to effectively interact with services, such as health care. Recent research (6) using a national

cohort of 0-4 year olds developed from the Statistics New Zealand Integrated Data Infrastructure (IDI) indicates that 69% of children in this age group had moved house, with 12% moving four or more times.

The most recent and extensive research into childhood residential mobility in the Aotearoa context comes from Dr. Kim Nathan (13). Her PhD thesis, published in 2021, outlines several key findings

- A linear association between residential mobility and increased socioemotional and behavioural difficulties at 4 years.
- Residential mobility at 2 years old is associated with an increased risk of adverse health outcomes including all cause hospitalisations, between 2 and 4 years of age.
- Residential mobility at 4 years associated with adverse health outcomes including all cause hospitalisations and incomplete immunisation status at 5 years.

Robertson et al. (7) used the IDI to examine residential mobility for a national cohort of NZ born children aged 0-3 years, finding very high levels of residential mobility for Māori and Pacific children that were - for the vast majority - occurring in areas of high-deprivation. Most moves were also into areas of greater socioeconomic deprivation, and once in 'deprived areas' Māori and Pacific children were less likely to leave them.

### *Health inequities*

While poor quality and overcrowded housing has been shown to directly contribute to health inequities for Māori and Pacific people in NZ (14, 15), international evidence suggests that high levels of residential mobility may also have a negative impact on child health, behavioural and emotional problems, adverse adolescent outcomes, and reduced continuity of healthcare (16). A meta-analysis of *international research focusing on childhood residential mobility and health outcomes* indicates that higher levels of residential mobility are associated with worse health outcomes, although the effect was smaller for physical compared to mental health problems (17). The majority of included studies came from the USA. Yet a key insight that can be extrapolated to the NZ is that associations varied across different developmental and mobility periods, suggesting that residential mobility can have a different impact depending on when it occurs. Furthermore, the impact of residential mobility is more strongly observed when outcomes are measured in adolescence or adulthood than in childhood. Simsek et al. (17) also note that the effect of residential mobility is substantially attenuated when family background (such as parental socioeconomic status, marital status, and ethnicity) and co-occurring adverse life events are

controlled for. An earlier systematic review of childhood residential mobility and health outcomes (16) found that residential mobility was associated with higher levels of behavioural and emotional problems, adverse adolescent outcomes, and reduced continuity of healthcare. There is a substantial body of international research literature which reports associations between residential mobility and: negative adolescent social behaviour (18); increased 'internalising' behaviour among children, particularly for trajectories of rental accommodation (19) poorer psychosocial functioning (20); poorer child development indicators at age 5 (21); poorer mental health outcomes in adolescence and early adulthood (22); and preventable hospitalisations (1). Taken together, this evidence suggests that high levels of residential mobility appear to be a potentially 'negative life event' with health and wellbeing implications for children and young people.

NZ has significant and persistent socioeconomic and ethnic health inequities, especially between Māori and non-Māori (23), including for children (24). Population health inequities are systematic, avoidable and unfair disparities caused by different levels of access and exposure to the social determinants of health such as poverty and education (25). Poorer outcomes for Māori have been linked to the ongoing effects of colonisation and the failure of mainstream policies and services to cater to the needs of Māori. The ongoing impacts of colonisation, including racism, have resulted in lower and declining rates of home ownership among Māori and Pacific people (26, 27). Reid (28) states that health is 'shaped by historical events that are embodied in or impact on the way our bodies grow, develop and age' (p. 152). Housing and differential access to healthcare are two key social determinants of health for Māori (29), and policy towards improving housing and social conditions for Māori is necessary for achieving health equity and part of the government's responsibilities under Te Tiriti o Waitangi.

#### *Access to services*

A potential mediating factor between residential mobility and children's health could be unmet need for comprehensive primary health care. An estimated 194,000 children in NZ aged 14 years and younger experienced unmet need for primary health care in the past year (24). There are various factors that influence health care access. For instance, the likelihood of experiencing barriers to health care was higher for tamariki Māori (24%) and Pacific children (27%) (vs. 20% of all children) (24). While primary health care is free for young children, barriers relating to transportation, a lack of available services, poor quality (including discriminatory) care, and the challenges of complex or chaotic lives, exist and make accessing care difficult for whānau (30). Moreover, experiences of ethnic discrimination are

associated with lower child healthcare utilisation (31). Residential mobility may also affect health care access, but we know less about this, and the specific impact of residential mobility on primary care access has not been explored in the NZ context. Recently published research using GUiNZ data has found that 4.7% and 5.5% of children experienced barriers in accessing a GP at 24m and 54m respectively. Barriers to accessing a GP were more prevalent for Māori and Pacific compared to New Zealand European Children, while children who experienced such barriers before 2 years old were twice as likely to be hospitalised by 54 months. This association was strongest for Māori (OR 2.18) and Pacific (OR 2.01) children, with no statistically significant association for New Zealand European children. Another recent paper examining the completeness of B4 School checks using population linked administrative data found a linear stepwise association between residential mobility and an increased likelihood of incomplete B4 School checks (32). However, sociodemographic factors that are associated with residential mobility - such as living in rental accommodation, socioeconomically deprived areas, larger households, having younger mothers, and identifying as Māori or Pacific - were also associated with incomplete B4 School checks. This research does not therefore demonstrate the impact of residential mobility above and beyond other sociodemographic factors. International research on the relationship between residential mobility and childhood vaccination uptake is inconclusive, with results indicating decreased vaccination coverage for residentially mobile children in the UK (33) Bangladesh (34), China (35), and India (36) but not Finland (37) or Wales (38). High levels of residential mobility in Aotearoa have been highlighted as a factor that is likely to limit the effectiveness of public health programmes (39) as high levels of population 'churn' limits health programme engagement and participation, while disrupting programme evaluation. It has been argued that high rates of residential mobility should be a key consideration in the design, funding, implementation, and evaluation of health promotion campaigns (39). High levels of childhood residential mobility may undermine the delivery of targeted programmes for children living in areas of high socioeconomic deprivation in the UK (21). Given the impact that experiences of racism have on access to housing, access to healthcare, and health outcomes, we include maternal experiences of racial discrimination as a control variable in our models that examine the association between residential mobility trajectories, unmet healthcare needs, and child health outcomes.

### *Racism*

There is a strong and growing body of evidence linking experiences of racism and racial discrimination with poorer health outcomes. Internationally, racism is recognised as a social determinant of health (40)

which impacts health outcomes by increasing the likelihood of experiencing adverse social conditions such as unemployment, and unsafe housing (41). These in turn pattern access to the resources that are required to stay healthy and access healthcare (42). A systematic review of the impact of racism on health found associations with poorer mental health, general health and physical health, which were not moderated by age, sex, birthplace or education level (40). Racism also impacts the health and wellbeing of young people. A systematic review identified statistically significant associations between mental health outcomes and racial discrimination in children and young people (<18 years), primarily from research from the USA (43). A more recent systematic review (44) summarised evidence on the association between maternal experiences of racism, vicarious racism, and child health. While most studies were from the USA, statistically significant associations were reported with child socioemotional problems and mental health. Longitudinal research from Australia shows the impact of racial discrimination on Indigenous children aged 5-10 years old, with primary carer and child experiences of racism associated with poorer child mental health, sleep difficulties, obesity, and asthma (45). In Aotearoa, racism is associated with negative measures of health and wellbeing in adults (46) and maternal experiences of racism are associated with prenatal stress, prenatal depression and postnatal depression (47). Caregivers of Indigenous Māori and Asian children are more likely to report experiences of racism, and vicarious racism via caregiver experience was associated with unmet need for children's healthcare and dissatisfaction with the child's medical provider (31)

### *Our framing of residential mobility*

It is important to conceptualise and operationalise residential mobility as accurately as possible. Some methodological and conceptual issues relating to the framing, conceptualisation and quantification of childhood residential mobility have been raised in the research literature. Previous research has identified linear associations between residential mobility and adverse outcomes in Aotearoa (6), suggesting that operationalizing mobility as a binary "moved vs stayed" will mask important differences in the experiences of highly mobile children and implying that measures examining the cumulative number of moves may be more useful (13). While the international childhood residential mobility literature lacks a consistent definition of "high" mobility (13), thresholds of '3 or more' moves have often been used as indicators of high residential mobility (6). In addition, Garboden et al. (48) argue that different forms of mobility have different impacts on child outcomes, and that it is important to distinguish the timing and frequency of residential moves. They note that imprecisely operationalizing these variables risks conflating different forms of mobility which have distinct effects on child outcomes.

Coley and Kull (20) also emphasise the importance of both the timing and frequency of residential mobility, highlighting that ‘cumulative instability’ had the greatest impact on children’s cognitive and psychosocial skills. This points to the importance of assessing the impact that different trajectories of residential mobility in early childhood have on child outcomes, a research question that has not been tested in the context of child health in Aotearoa. Finally, it is important to recognise that the contexts associated with residential mobility are likely to be a key factor in the impact that such mobility has on child outcomes (17).

In light of these issues, our research attempts to more precisely examine the impact of residential mobility *trajectories* in early childhood. Early childhood residential mobility trajectories are developed by examining mother’s reports of the number of times a child has moved house at three points in time: the 9-month study wave; the 24-month study wave; and the 54-month study wave. These trajectories account for differences in the frequency and timing of childhood residential moves.

Drawing on Gillespie’s (49) definition of ‘household mobility’, and consistent with most of the health and social literature, we define residential mobility as any residential relocation within NZ<sup>1</sup>, regardless of distance. We therefore considered the following residential mobility categories:

- Stability: 0 moves reported between data collection waves
- Low residential mobility: 1 move reported between data collection waves
- High residential mobility: 2 moves reported between data collection waves
- Very high residential mobility: 3 or more moves reported between data collection waves

While it is important to consider the context and or reason for moves, unfortunately data related to the reason that families moved house was not collected until the 8 year study wave, and is therefore unable to be included in this study’s residential mobility trajectories. However, we do consider the timing and frequency of moves alongside additional information such as area-level socioeconomic deprivation, and housing tenure at each study wave to help contextualise these patterns and trajectories of early childhood residential mobility.

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<sup>1</sup> Although there is a high level of international mobility between Aotearoa, Australia and the Pacific Islands, international residential mobility is beyond the scope of this project.



### *The current study*

To enhance our understanding of a child's exposure to different contexts that shape their development and wellbeing across the early life-course, this study uses data from *Growing Up in New Zealand* (GUiNZ). GUiNZ is Aotearoa's<sup>2</sup> most contemporary longitudinal study, following over 6,000 children and their parents from antenatal through to adolescence, with the goal of understanding how children's experiences shape their development and wellbeing and, in turn, how families can best be supported by policies and services. In this study, we draw from the first five major data waves—interviews when mothers were pregnant with the study children, and when children were 9-months, 2-years, 4.5-years, and 8-years old. Antenatal data were collected between 2009-2010, with the most recent 8-year wave data collected in 2018.

To examine how children's access to resources across different contexts changes over time and shapes their development and wellbeing, this study answers four key questions:

1. *What are children's experiences of residential mobility across early childhood?*

We use social sequence analysis to examine how experiences of residential mobility cluster at the population-level from antenatal through to when children are 4.5 years old (54 months).

2. *Which children are more likely to experience, or which factors are associated with different types of residential mobility patterns?*

We answer this question using multinomial regression analysis, examining how sociodemographic factors, such as household income and ethnicity, and other events such as family structure changes, are associated with differential likelihood of experiencing certain patterns of residential stability.

3. *Are these patterns of residential mobility associated with children's unmet health care needs?*

Using OLS and logit regressions, we examine whether these residential mobility trajectories, net of potential confounds or sociodemographic factors associated with these trajectories, are associated with children's unmet healthcare needs when they are 4.5 years old. Unmet healthcare need is conceptualised in four ways:

- a. Number of study waves where unmet need for a GP was reported by 54 months

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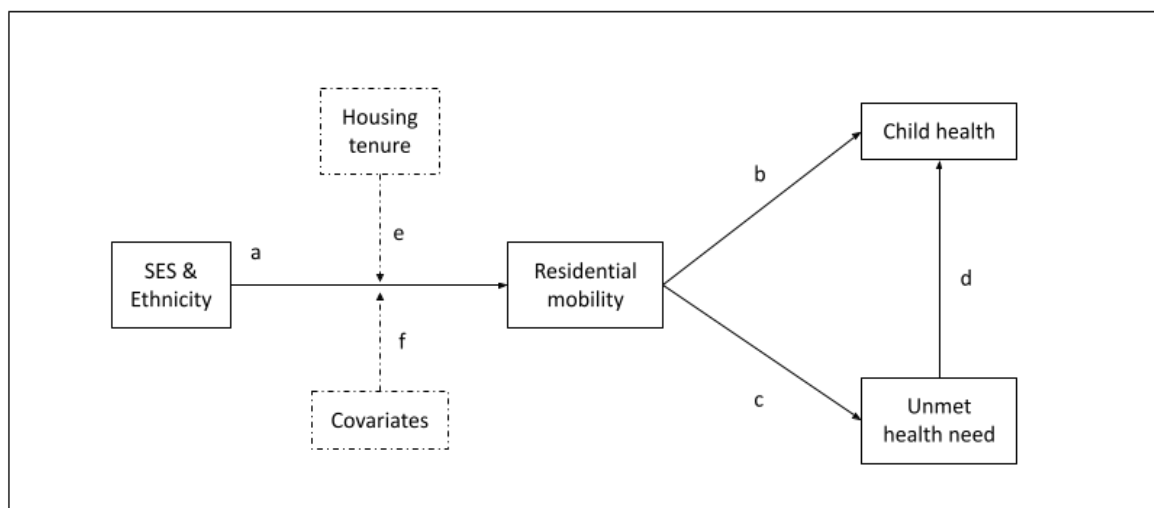
<sup>2</sup> Although the GUiNZ sample is largely representative of Aotearoa as a whole, it is important to note that participants were initially drawn from the Auckland and Waikato regions only, and therefore caution should be exercised when generalising results to the national level.

- b. Number of completed Wellchild check-ups by 54 months
  - c. Whether B4 School checks were completed or scheduled by the 54 months collection wave
  - d. Whether scheduled childhood immunisations were completed by 54 months
4. *Are these patterns of residential mobility associated with children's health at 8 years, and does unmet need attenuate this association?*

Using OLS regressions we examine whether there is any association between residential mobility and children's health, and whether this is influenced by differences in reports of unmet health care needs across the different residential mobility trajectories.

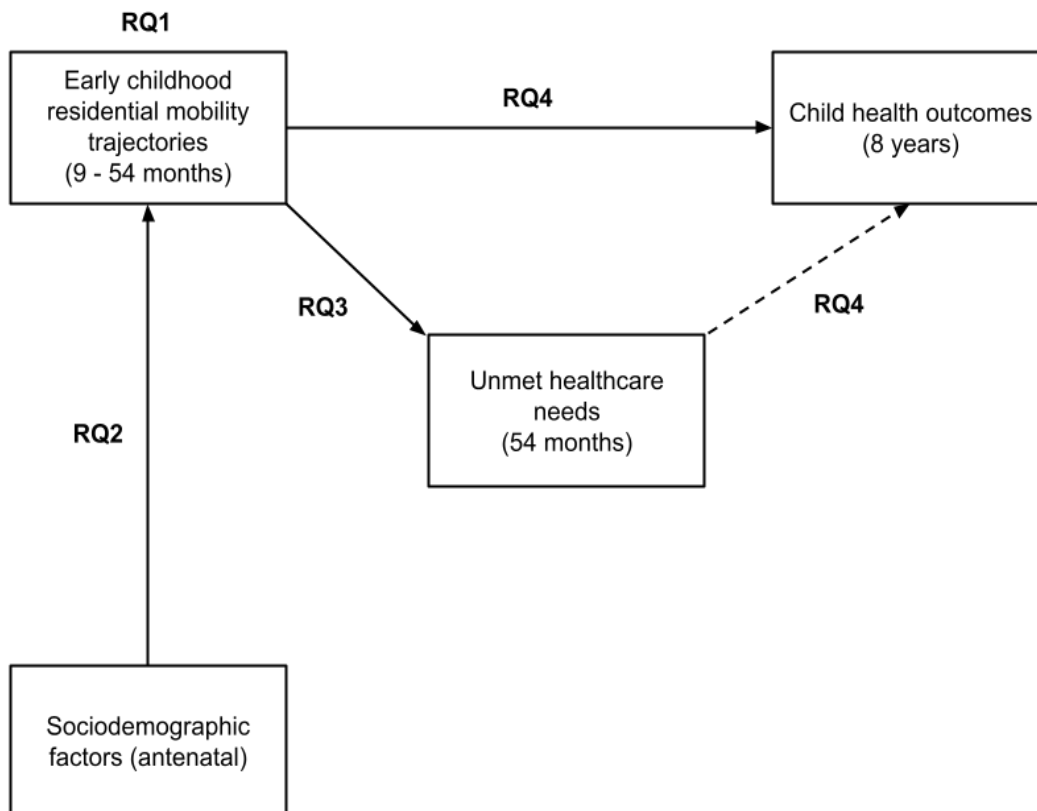
Figure 1 represents the conceptual model guiding this study. We posit that socioeconomic status (area-level socioeconomic deprivation and ethnicity in our study) influences residential mobility (pathway a), which are in turn associated with children's health (pathway b) and unmet health need (pathway c). Unmet health need also subsequently influences child health (pathway d). We argue that the relationship between socioeconomic position and ethnicity and residential mobility is partially mediated by the resources that are provided by SES and being NZ European/Pākehā, living in safe neighbourhoods, and having higher incomes, and factors that are predictive of more housing stability, such as homeownership (pathways e and f).

Figure 1. Conceptual model guiding the research study



The relationship between the four research questions in our study is outlined below in Figure 2. Answering these research questions will help us to understand more about different patterns of residential mobility in early childhood in Aotearoa, factors associated with these mobility patterns, and the relationship between residential mobility patterns and both children's unmet healthcare needs and health outcomes. Taken together, this study will shed light on the ways that residential mobility experiences accumulate across early childhood and for whom, and provide evidence for how these experiences shape population-level differences in children's health and unmet need for healthcare. In turn, these insights can highlight when, in early childhood, support is needed from policy and practitioners to make sure all children in Aotearoa can access healthcare and key social determinants of health such as housing.

Figure 2. The relationship between research questions



## Methods

### *Data and sample*

Data come from GUiNZ, Aotearoa's most contemporary and ethnically and socioeconomically diverse birth cohort longitudinal study. In 2009/10, over 6,000 pregnant women were interviewed at the baseline wave (i.e., antenatal wave) and have been re-interviewed at multiple points throughout early to middle childhood. Although the original cohort was drawn from pregnant mothers in the Auckland and Waikato regions, the cohort is ethnically and socioeconomically diverse and has been found to be broadly representative of Aotearoa births in terms of sample's sociodemographic profile (50). For this study, we use data from the major study waves, when parents were interviewed during the antenatal period, and when their children were 9-months, 2-years, 4.5-years (i.e., early childhood years), and 8-years old (i.e., middle childhood), representing five data waves in total. Importantly, GUiNZ collects information on families' experiences across multiple housing, health, and socioeconomic domains, such as housing tenure and residential mobility, parent-rated health, unmet need for a GP, maternal employment, and neighbourhood deprivation at each wave. Hence, it provides a unique opportunity to examine children's experiences of residential mobility, access to healthcare, and child health during early childhood.

The final analytical sample for this study consists of 5,006 children whose parent(s) were surveyed at each major wave (dropping 1,804 children [26.3%] from the original cohort of 6,853), and where the primary caregiver was always the same mother from the antenatal wave (excluding a further 43 children [0.6%]). A comparison of sociodemographic characteristics at the antenatal wave between those in the final analytical sample and those excluded from the study is provided in Table A7 in the Appendix.

Overall, those in the analytical sample were more advantaged than those excluded due to attrition or a change in the primary caregiver across almost all measures. For example, they had higher household incomes at antenatal (18.0% of the analytical sample had annual household incomes \$50,000 or less vs. 42.9% of those who left the study), were more likely to live in homes their family owned (58.8% vs. 33.4%), and their mothers had higher levels of educational attainment (44.9% with a university degree vs. 20.8% in the excluded sample). The analytical sample mothers were also less likely to live in high deprivation neighbourhoods (5.6 average decile vs. 7.3 average decile). In addition to differences between the analytical sample and those who left the study, a comparison between the analytical sample and New Zealand 2013 Census data is presented in Table A8 in the Appendix. Similarly, these findings show that the analytical sample for this study are more likely to have mothers who identify as

NZ European/Other ethnicity than the ethnic composition of women aged 20-39 living in the Auckland/Counties Manukau/Waikato District Health Boards in the Census (62% vs. 52%) and less likely to identify as Pacific (10% vs. 13%) or Asian (13% vs. 33%). The analytical sample had similar rates of children with mothers identifying as Māori (15% vs. 14%). The analytical sample was more consistent with the Census in terms of child ethnicity when compared with babies for the whole of New Zealand (vs. the three DHBs from where the GUINZ sample was recruited). The analytical sample was consistent with the Census in terms of sex composition (49% female; 51% male). Overall, these findings suggest that the children excluded from the sample because of non-response or not meeting the inclusion criteria were more vulnerable to experiencing disadvantaged contexts compared to the analytical sample and, thus, the estimates we present are likely an undercount of children's experiences in more disadvantaged contexts which are associated with higher levels of residential mobility and may also be more conservative in terms of associations between residential mobility and disadvantaged contexts.

#### *Residential mobility*

As noted in the previous section, residential mobility is examined using mother's reports of the number of times a child has moved house at three points in time: the 9-month study wave; the 24-month study wave; and the 54-month study wave. The number of times a child moved was then assigned to one of four categories of residential mobility: Stable (0 moves); Low (1 move); High (2 moves); or Very high (3 or more moves). Social Sequencing Analysis (SSA), explained in more detail in the *analysis* section, was then used to identify common patterns of residential mobility in early childhood, where the timing and number of moves experienced were similar for a group of children. The advantage of using SSA is that the timing of moves can be incorporated into the residential mobility measure, rather than being limited to a cumulative count of total moves across the entire study period.

#### *Factors potentially associated with residential mobility*

To understand which children were more likely to experience differences in residential mobility trajectories, we explored a wide range of factors, including child, maternal, family, and geographic characteristics. First, information about primary independent variables of interest, 1) socioeconomic position; and 2) ethnicity, are presented. These two variables are two of the most prominent stratifiers in terms of population-level child health in New Zealand. These variables, outlined in greater detail below, will be based on the mother's self-reported information. This is because we expect that the causal mechanisms through which socioeconomic position and ethnicity operate are largely a result of

how these factors influence a mother's ability to navigate through systems that affect her child. For example, a mother's ability to secure high quality, stable housing is likely a function of her own ethnicity rather than her child's (i.e., landlord racism towards letting to Pākehā vs. Māori mothers), and her ability to use her 'social capital' (i.e., whiteness) to get the health appointments that her child needs.

*Socioeconomic position* is often measured using the New Zealand Index of Socioeconomic Deprivation measure (NZDep). This is a measure of area-level socioeconomic position derived from nine variables that reflect eight dimensions of deprivation. NZDep provides an ordinal deprivation score from 1 (least deprived) to 10 (most deprived) for each small area unit (meshblock) in New Zealand (51). There are two issues that suggest NZDep may be unsuitable as the only measure of socioeconomic deprivation in this research. Firstly, NZDep is a time-variant measure that is calculated every five years using the most recent census data. Secondly, since NZDep is an area-based measure it potentially raises issues of ecological fallacy, whereby individuals are attributed the 'deprivation profile' of the community that they live within regardless of their individual circumstances. Furthermore, NZDep includes housing-related variables such as home ownership and overcrowding which may influence analyses. Instead, we propose to use maternal education as an indicator of socioeconomic status, with maternal education offering both conceptual and empirical advantages over other measures of SES, such as household income. Conceptually, maternal education is one of the strongest predictors of parenting behaviours (52) and, in line with status attainment models, is thought to offer parents both human and social capital that they can parlay into managing their children's health, such as navigating healthcare bureaucracy and using their social and cultural capital to advocate for their needs within the system (53). In this way, we might anticipate that maternal education might act as a "buffer" between residential instability and their children's unmet healthcare needs, or that the impact of not having their children's healthcare needs met are less detrimental for their children's health (54). Empirically, while many parents do go on to accrue more education after having children, compared to measures such as income or the NZ individual deprivation index, there is relative stability in educational attainment and it's less likely to be endogenous to both residential mobility and the outcomes being examined—both important factors for longitudinal analysis and for disentangling potential causal effects.

*Maternal ethnic identification* is an important variable to consider. Unfair and avoidable ethnic differences in health outcomes are the starkest and most persistent health inequities in Aotearoa. Ethnic health inequities are driven by systemic racism and differential access to the social determinants of

health - differences that in Aotearoa are strongly shaped by a legacy of colonisation. We therefore expect that there will be ethnic differences in barriers to accessing healthcare and housing trajectories, and that childhood experiences of these barriers will be shaped by maternal ethnicity.

*Child characteristics* included gender and age deviation from the interview wave. Child gender was a binary variable measured at the 9-month wave (1 = female; 0 = male). Age deviation between the wave age and the actual age of the child interview was measured in months and was included to account for variation in interview age across the sample and the impact this has on the child health outcomes examined in the study.

*Maternal characteristics* included ethnicity, educational attainment, maternal age, disability, maternal employment, maternal migrant status, and experience of racial discrimination. Although mothers could list multiple ethnic identities, in this report we present mutually-exclusive prioritised ethnicity for ease of interpretation in the multivariate regression models. Ethnicity was categorised into five groups in prioritised order (1) Māori; 2) Pacific; 3) Asian; 4) all other ethnicities except for NZ European/Pākehā; 5) NZ European/Pākehā). Educational attainment at antenatal is represented by four variables (1 = No secondary school/NCEA qualifications; 2 = Secondary school/NCEA qualifications only; 3 = Diploma/trade certificate; 4 = University degree or more). Maternal age is a continuous variable measured in years ranging from 18 through 41<sup>3</sup>. Maternal disability is categorised as whether a mother has 0 = No disability or 1 = A long term disability lasting more than 6 months. Maternal employment is categorised into four groups (0 = Not in the labour force; 1 = Employed full time; 2 = Employed part-time; and 3 = Unemployed). Maternal migrant status is characterised as 0 = Born in New Zealand; 1 = Moved to New Zealand between 0-18 years; and 2 = Moved to New Zealand after age 18 years. Experience of racial discrimination is measured at the antenatal wave as a binary classification (0 = No experience of racial discrimination; 1 = Victim of a racially motivated attack, or has experienced racial discrimination from a health professional, in employment, when renting or buying housing, in the justice system, from financial institutions, or in the education system).

*Household and family factors* include information about housing tenure (1 = homeownership; 2 = private rental; 3 = public rental; 4 = 'other' form of accommodation tenure), household income (a continuous

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<sup>3</sup> Maternal-age is top-coded in the data at 41 years for confidentiality purposes.

scale ranging from 1 = less than \$20,000 per annum through to 7 = \$150,000 or more per annum), whether the household was a two-parent family (1 = yes; 0 = no), whether there was a change in family structure between waves (from two-parent family to single-parent family, or vice versa; 1 = yes; 0 = no)<sup>4</sup>, the number of siblings at antenatal (continuous), and whether there were other, non-parental adult household members (1 = yes; 0 = no) in the home. Information about housing tenure can provide some contextual information surrounding childhood residential mobility. For instance, Australian research (19) indicates that housing trajectories with continuous rental occupancies (rather than continuous homeownership, or a trajectory towards or away from homeownership) were associated with poorer behavioural outcomes.

*Geographic factors* captured whether the family lived in a rural area (1 = rural; 0 = urban) and the district health board where they were located at the antenatal wave, collapsed into three categories: 1) Auckland/Waitemata; 2) Counties Manukau; 3) Waikato. Area-level socioeconomic deprivation is captured consistently across the waves using the NZDEP index that measures neighbourhood-level deprivation using nine socioeconomic variables, including the proportion of working-age adults in the area receiving a means-tested benefit, the proportion of adults without any educational qualifications, and/or without access to a telephone or car (55). 'Neighbourhood' is measured at the meshblock level (approximately 30-60 households) —the smallest standard administrative geographic area measured by Statistics New Zealand. The index is standardised across meshblock areas in Aotearoa and can be used to indicate whether someone lives in a low-deprivation neighbourhood or a high-deprivation neighbourhood using a 1-10 scale, with each point on the scale representing 10% of area meshblocks (e.g., NZDEP = 10 contains the most deprived area meshblocks and NZDEP = 1 contains the least deprived area meshblocks).

#### *Child unmet healthcare needs and health outcomes*

To understand whether experiences of early childhood residential mobility are associated with unmet healthcare needs and child health we examined various measures of unmet need and health outcomes.

*Unmet healthcare needs at 54 months* are captured through variables that relate whether or not children have received routine scheduled preventative healthcare. These included the number of

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<sup>4</sup> Not measured for the antenatal wave because there was no prior wave.



scheduled 'Wellchild' check-ups completed up to the 54 month study wave (a continuous scale ranging from 0 to 9 check-ups), and whether or not the B4 School check was complete (0 = not complete or booked; 1 = completed or booked).

*Child health at 8 years* is captured through two variables: Parent-rated general physical health, acute illness, and respiratory infections. Children's general physical health was assessed at each wave through a question that asked mothers "In general, how would you say your child's health is?" Answer options were on a 5-point scale ranging from 1 = poor through 5 = excellent. This subjective physical health measurement has been shown to have a high correlation with more objective measures of physical health (56). The number of different acute illnesses - which may be more responsive to immediate temporal circumstances - that a child experienced was measured on a continuous scale from 0 to 3. This represented how many of the following 3 types of illnesses a child had experienced in the past year: (1) gastroenteritis; (2) chest infections or other respiratory illnesses; and (3) ear infections. A separate measure of respiratory illness counted the number of different types of respiratory infections that a child had experienced in the previous 12 months on a continuous scale from 0 to 5. While the acute illness variable is likely to be an undercount of the *number of times* that acute and respiratory illnesses were experienced by children, the way that these survey questions were asked does not permit a total count of illness or infection to be measured.

### *Analysis*

*Research Question 1: What are children's experiences of residential mobility across early childhood?*

We use Social Sequence Analysis (SSA) to examine how experiences of residential mobility cluster at the population-level from antenatal through to when children are 4.5 years old. This approach considers the temporal ordering of residential mobility experiences across the life-course, identifying 'clusters' of experiences. For example, some children may experience consistently high residential mobility across each wave. Another group of children may move several times in their first two years, but then stay in the same house thereafter. SSA provides the advantage of accounting for when a particular event or intensity of experience happens—a crucial element for pinpointing sensitive periods where mobility may be greater or inequities wider. SSA groups children into trajectories based on similar experiences of residential mobility across the time period. Data are analysed so that certain class solutions can be compared to determine how the data best 'fit' a certain number of trajectories. All children are assigned within a trajectory. While all children with a trajectory will have similar experiences of residential

mobility, they may not be identical. For example, all children in the very high residential mobility trajectory across the early life-course may have high mobility compared to the rest of the sample, within that trajectory some children may experience three or more moves between the 2- and 4.5-year wave, while others just two moves. Social sequence analysis is a statistical approach that can be used to examine how certain experiences, such as different residential mobility profiles, are experienced more or less at different points in time, or change over time, and in what ways. For example, children may experience always being in profiles with low levels of residential mobility, or experience low levels of residential mobility in the earliest years but higher mobility in later years. Pairwise dissimilarities are computed between 'sequences' or trajectories of experiences, with a clustering process applied to the dissimilarities to determine the appropriate sequence solution to group children's trajectories of experiences (58). To simplify the interpretation of the sequences and enable the sequences to be constructed longitudinally, residential mobility within each wave was grouped into four categories: (1) zero moves; (2) one move; (3) two moves; and (4) three or more moves. The sequence analysis was applied to the four-category classification at each wave, with the number of classes that best fit the data identified through several statistical model fit statistics. Class membership is assigned based on the highest conditional probability across each subgroup/class for each child (57). The SSA was conducted using the TraMineR statistical package in R (Gabadinho et al., 2011), with the small amount of item-level missing data retained using FIML. To preview, we found that the appropriate number of trajectories was six sequences, whereby one group always experienced 'stable' housing (zero residential mobility), another two typified consistently low levels of residential mobility, one group experienced stability until the 54-month wave, and two groups experienced a transition from low to high or very high residential mobility.<sup>5</sup>

Analytically, social sequence analysis is an appropriate approach for categorising trajectories of experiences in a more empirically manageable way. Social sequence analysis is a useful tool for moving from identical experiences to clustering children into similar experiences that make interpretation and use of these trajectories more empirically manageable and theoretically meaningful. A limitation of this approach, however, is that grouping 'like' but not identical experiences potentially creates statistical noise in the groupings. An example of this noise, and to preview from our findings, is that those children

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<sup>5</sup> We fit the data from two through ten class sequence solutions, using the Point Biserial Correlation, Hubert's Gamma, and Average Silhouette Width statistics, among others, to select the sequence solution which best fit the data. The results of this selection procedure, including fit statistics, are presented in Table A6 in the appendix.

always experiencing very high levels of residential mobility were grouped with those who experienced very high residential mobility in most waves (i.e., spending one or two waves with very high mobility over the time period). It is possible that always having very high residential mobility versus having experienced a period of residential stability might have a differential association with unmet healthcare needs and child health outcomes. In this way, it is likely the disparities in child outcomes between the most and least residentially mobile trajectories in our analyses are more conservative than had we split this very high residential mobility group into two groups.

*Research Question 2: Which children are more likely to experience, or which factors are associated with, different types of residential mobility patterns?*

Using the social sequence analysis groups created in Research Question 1, we next examined whether there were specific sociodemographic characteristics at the child (e.g., gender, age deviation), mother (e.g., ethnicity, educational attainment, age, employment, disability, migration status, experiences of racism), family and household (e.g., housing tenure, household income, family structure, adult household members, other siblings) and geographic level (e.g., area-level socioeconomic deprivation, region, rurality).

Three multinomial regressions were performed to determine the relative likelihood of experiencing different trajectories of residential mobility compared to the most stable class when including: (1) sociodemographic factors; (2) sociodemographic factors and housing tenure; and (3) sociodemographic factors, housing tenure, and maternal experiences of racism. Multinomial regressions were performed in Stata, with the suite of “mi estimate” commands used to conduct multiple imputation on the small amount of item-level missing data in the model covariates and estimate model coefficients (between 0.0% to 19.6% item-level missing across all independent variables) and estimate the coefficients across the 100-imputed datasets. All covariates were measured at the antenatal wave, aside from siblings and child age deviation which were both measured at the 54-month wave, and child gender which was measured at the 9-month wave.

*Research Question 3: Are these patterns of residential mobility associated with children’s unmet health care needs?*

The third research question used both ordinary least squares (OLS; for continuous or scale outcomes) and logit (for binary outcomes) regression models to examine whether these residential mobility

trajectories were associated with children's unmet healthcare needs when they are 4.5 years old. Models were estimated three times for each outcome: once with no covariates in the models, once with covariates from Research Question 2 - but excluding housing tenure, and finally with all covariates including housing tenure. This step was taken to examine whether there was evidence to suggest that some of the association between latent trajectories and unmet healthcare needs for children might be due to differences in factors that identify who is most likely to experience different residential mobility trajectories (as uncovered in Research Question 2) and that are also associated with child outcomes. Similar to Research Question 2, the models were estimated using Stata and the small amount of item-level missingness (0.0-11.8% item-level missing across the independent variables) was addressed through multiple imputation.

*Research Question 4: Are these patterns of residential mobility associated with children's health at 8 years, and does unmet need attenuate this association?*

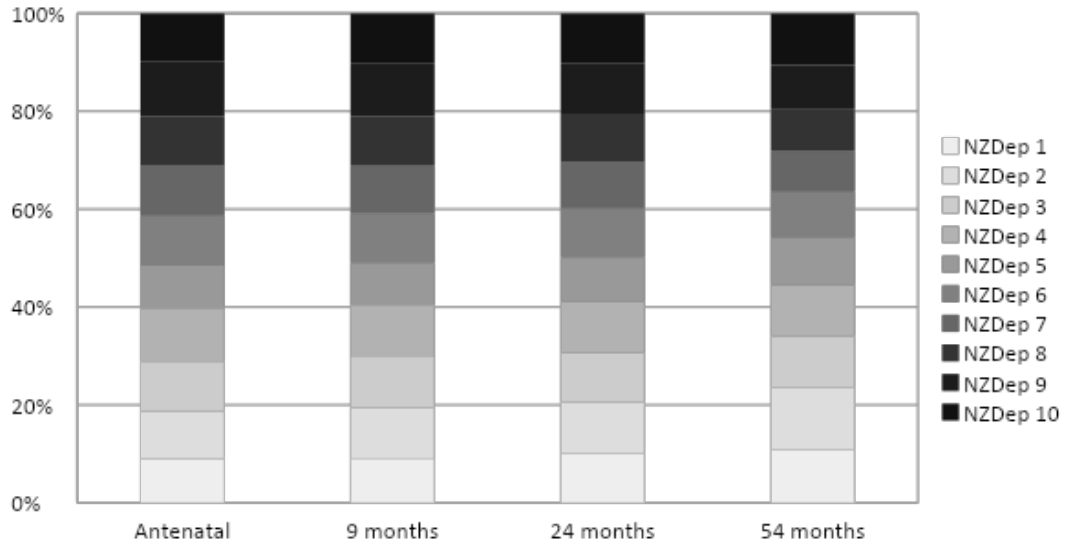
Using OLS regression, we examined whether patterns of residential mobility were associated with two child health outcomes at 8 years: parent-rated health, and the number of different types of acute illness experienced. Models were estimated four times for each outcome: (1) without controls; (2) with the inclusion of sociodemographic factors; (3) with the additional inclusion of housing tenure; and (4) with the additional inclusion of the number of complete Wellchild check-ups as a measure of healthcare access that may influence child health outcomes independently from residential mobility, sociodemographic, and housing tenure variables.

## Findings

### *Overall sample demographics*

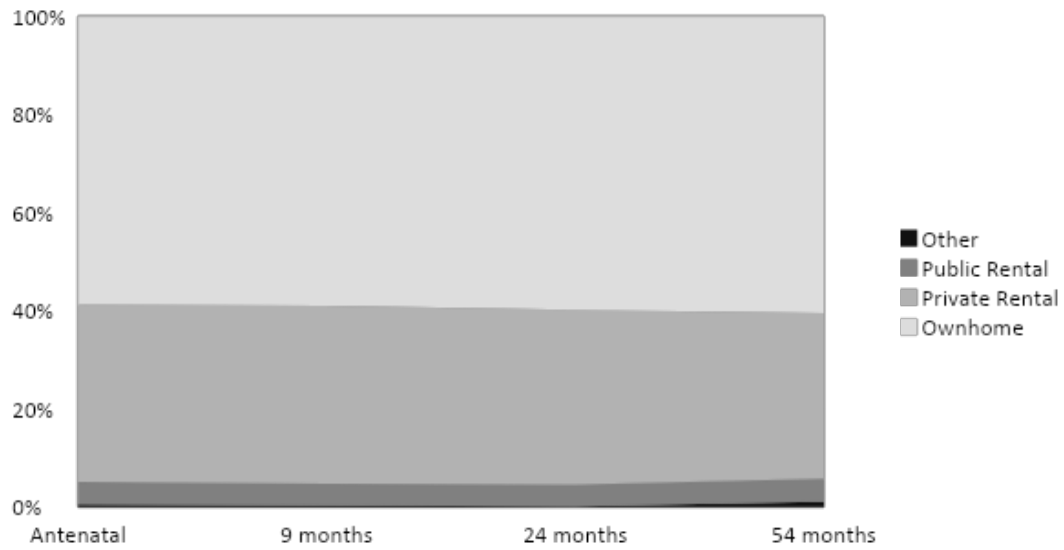
As a first step we describe the sample demographics. Overall, most children in the study sample had mothers who, at the antenatal wave, identified as European (57%). A further 16% identified as Māori, 10% as Pacific, 14% as Asian, and 3% identified as MELAA & Other ethnicities. These figures are based on prioritised ethnicity, where individuals can identify with more than one ethnic group, but each individual is assigned a single ethnicity according to the following prioritisation: Māori, Pacific, Asian, Other, European. Most mothers had a diploma or higher level qualification. Only 4.6% had no qualifications, with an additional 20.7% having secondary school qualifications only. A diploma was held by 29.8% of mothers, a further 26.3% had bachelors' degrees, and 18.5% had a higher degree (44.8% with degree or higher). At the antenatal collection wave most, mothers lived in homes that were family owned (63.9%). At the 9 month collection wave, children were fairly evenly distributed among area-level socioeconomic deprivation deciles, with each decile containing between 8.5% and 10.7% of children in the sample. The proportion of children living in areas classed as Quintile 1 (low socioeconomic deprivation) was slightly lower than might be expected (19.4%), while the proportion of children living in areas classed as Quintile 5 (high socioeconomic deprivation) were slightly higher than might be expected (21.0%) under an even distribution. Figure 3 below displays the proportion of children (or mothers at antenatal) living within each of the 10 deprivation deciles at each study wave. It appears that, over time, there is a small shift towards a higher proportion of children living in areas with low levels of socioeconomic deprivation. Over the same period the proportion of children living in areas of high socioeconomic deprivation appears to have decreased, although to a smaller extent. This suggests that there may be some 'upward socioeconomic mobility' among children and their families across the study period, although this may also relate to patterns of non-response in the cohort. Figure 4 below outlines the housing tenure experiences of the total sample across the study period. The proportion of children living with each type of housing tenure remains largely similar across the study period, with slight increases in the proportion of children living in family-owned homes and 'other' forms of accommodation tenure. While most children did live in a family-owned home, a substantial proportion lived in private rental accommodation. Overall, the average number of changes in housing tenure across the study period was 0.4, suggesting that most children did not experience a change in housing tenure. Information about area-level socioeconomic deprivation and housing tenure over time for each residential mobility trajectory is presented in Table A9 and Table A10 in the appendix. Sample characteristics, by housing tenure, are presented in Table A11 in the appendix.

Figure 3. Area-level socioeconomic deprivation over time for the total sample



NB: NZDep 1 refers to the 10% of areas in Aotearoa with the lowest levels of socioeconomic deprivation, while NZDep 10 refers to the 10% of areas in Aotearoa with the highest levels of socioeconomic deprivation.

Figure 4. Housing tenure over time for the total sample

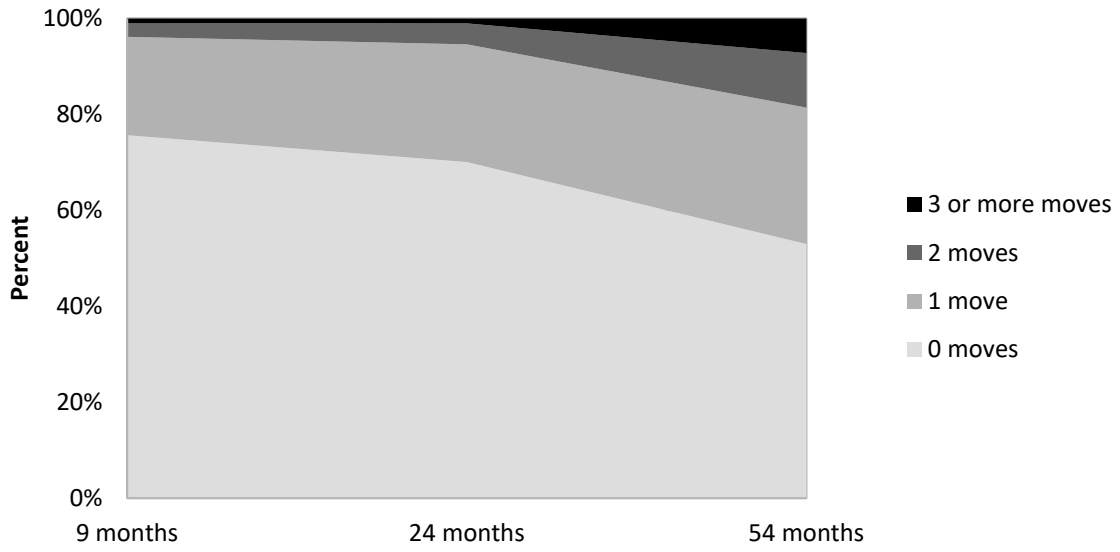


Next, we describe the patterns and trajectories of children's experiences of residential mobility from 9-months through to 54-months. For ease of analysis, we have categorised residential mobility into four groups:

- Stability: No residential moves between data collection waves
- Low mobility: One residential move between data collection waves
- High mobility: Two residential moves between data collection waves
- Very high mobility: Three or more residential moves between data collection waves

Figure 5 presents the proportion of children in each of these four groups at each study wave. Overall, most children experience residential stability or low mobility between each of the study waves, with between 4% (at 9-months) and 19% (at 54-months) of children experiencing high or very high residential mobility between data collection waves. High and very high levels of residential mobility appear to have become more common over time, with the proportion of children in this group growing from 4-5% during earlier data collections waves to 19% and 14% at 4.5 years and 8 years respectively, although this may partly be a function of the increased time period between these data collection waves. The proportion of children experiencing just one move between study waves remained fairly constant at between 21% (9 months) and 29% (54-months). Conversely, the proportion of children experiencing residential stability – that is, no moves between study waves – decreased from a high of 71% (9 months) to a low of 54% (54-months).

Figure 5. Experiences in residential mobility across time





*Research Question 1: What are children's experiences of residential mobility across early childhood?*

*Trajectories of Residential Mobility*

Using these same four residential mobility categories (stability, low mobility, high mobility, very high mobility), Social Sequence Analysis (SSA) was applied to examine patterns of residential mobility experiences among children across the study period from 9 months through to age 4.5 years (54 months). Six trajectories emerged and are presented in Figures 6a through to 6f.<sup>6</sup> These trajectories are:

- T1: No moves ( $n=1,781$ ; 36%)
- T2: Stability with increasing residential mobility ( $n=1,002$ , 20%)
- T3: One school-age move ( $n=728$ , 15%)
- T4: Consistently low residential mobility ( $n=892$ , 18%)
- T5: Transition to high residential mobility ( $n=414$ ; 8%)
- T6: Transition to very high residential mobility ( $n=189$ ; 4%)

Beginning with the most residentially stable trajectory group – ‘no moves’ – which represented 36% of the cohort, were those children who always experienced housing stability. Children in this trajectory did not experience any residential mobility across the time points. Children in this residentially stable trajectory were more likely to:

- have New Zealand European mothers (60%)
- have a mother with a university degree or higher (47%)
- live in their own home (78%)
- and have a very high family income above \$150k (19%).

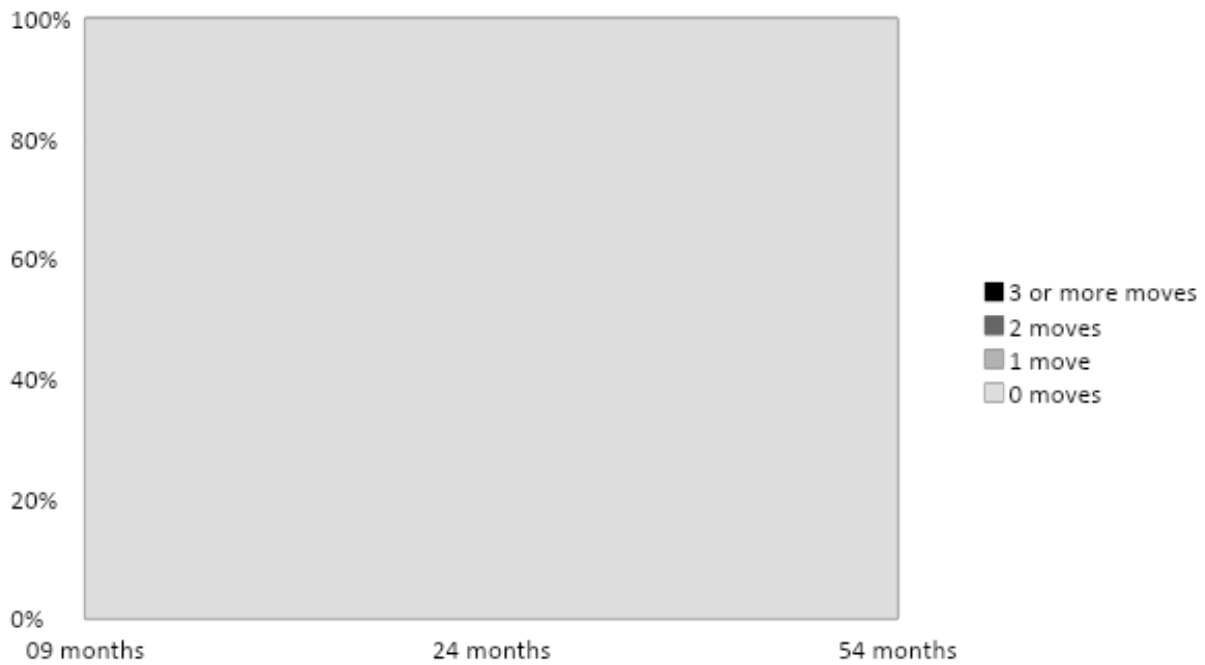
Figures 6a – 6e visualise residential mobility for each of the trajectory groups. The y-axis on each visualisation represents the proportion of children (0% - 100%) within a residential mobility category. The residential mobility category is based on the number of moves each child made since the previous study wave (i.e., 0 moves through to 3 or more moves). The x-axis indicates the relevant study wave (9-months through to 54-months). Each residential mobility category is represented by a different shade of grey. The lightest grey areas represent the proportion of children who did not move at all since the previous study wave, a slightly darker shade represents the proportion of children moving once,

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<sup>6</sup> Table A4 in the appendix provides information, by trajectory type, on the proportion of children in each residential mobility category at each study wave.

followed by the proportion of children moving two times, while the darkest areas represent the proportion of children who moved 3 or more times since the previous study wave. It should be noted that any changes over time in the proportion of children in each of the residential mobility categories should not be assumed to be a monotonous increase or decrease. Figure 6 visualises residential mobility for the 'No moves' trajectory, indicating that 100% of children in this trajectory group did not move house at any of the study waves.

Figure 6a. Trajectory 1: No moves (n= 1,781; 36%)

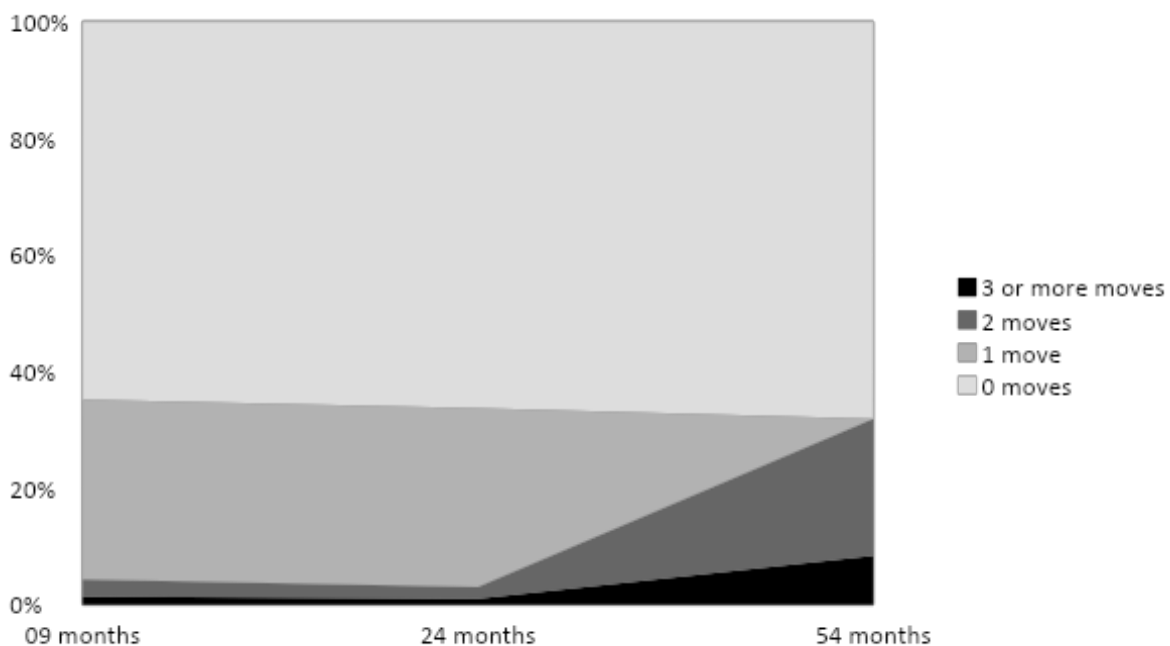


The second trajectory – 'stability with residential mobility' – which summarises the experience of 20% of the sample. At the 9 month wave, most of the children in this group had not moved house (65%) with a further 31% having moved just once. Although around two-thirds of children did not move house at all at each wave, the residential mobility of children in this trajectory *who did move house* increased across the study period, with almost one-third of children moving house two or more times by the 54 month wave. Children in this trajectory were more likely to:

- have a mother who identified as New Zealand European (63%)
- have a mother with a university degree or higher (47%)
- live in a private rental at the antenatal period (44%)
- and have very high household income of \$150k or higher (19%)

On average, children in this trajectory experienced 1.4 changes in residential mobility categories across the study period. This may indicate that, while overall levels of residential mobility were low, children were likely to change from experiences of housing stability to mobility or move between the different categories of residential mobility during the study period. Figure 6b displays the pattern of residential mobility experience for children in this trajectory group.

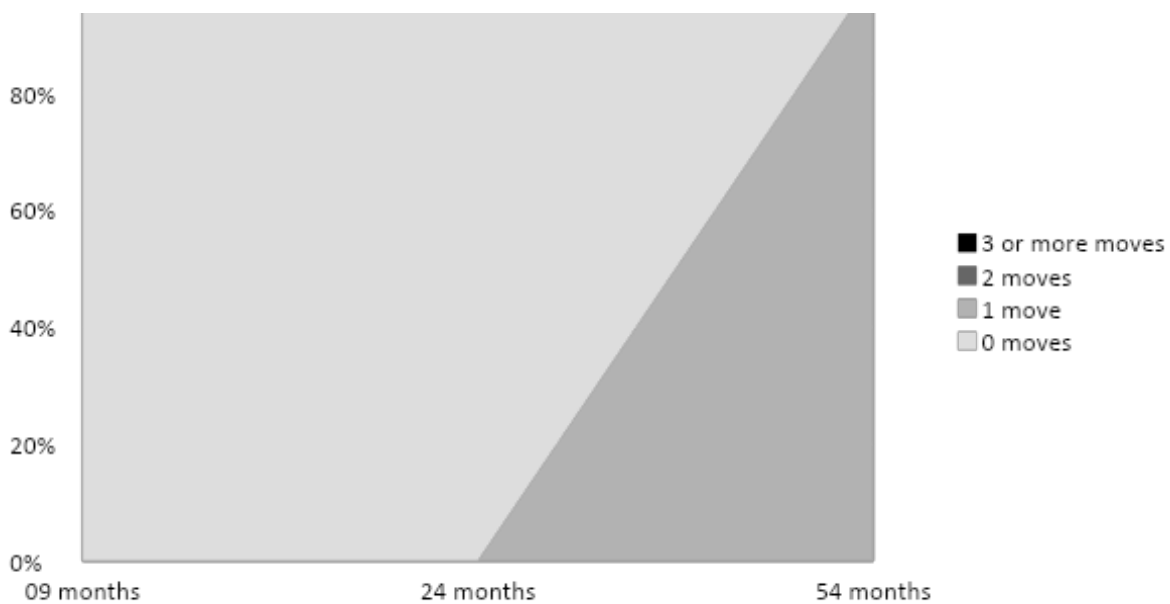
Figure 6b. Trajectory 2: Stability with increasing residential mobility (n=1,002, 20%)



A third trajectory - 'one school-age move' - outlined in Figure 6c, was also typified by high levels of residential stability among the cohort of 728 children (15% of the sample). Up to the 24 month study wave all children in this cohort had not moved house at all. However, between the 24 month and 54 month study waves, all children moved house once. This may be an indication of schooling-related house moves, with parents moving to be closer to schools (or changing zones) as their children approached school-age. Levels of home ownership were slightly above the overall sample (62%), and children in this trajectory were more likely to:

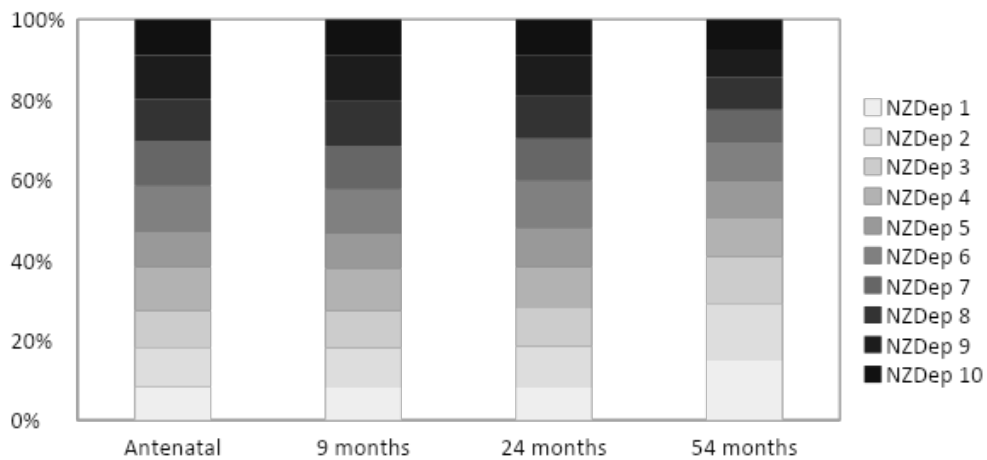
- have a mother who identified as NZ European (59%), or Asian (16%)
- have a mother with a university degree or higher (51%)
- and have high (\$70-100k, 28%), or very high household income (>\$150k, 18%).

Figure 6c. Trajectory 3: One school-age move (n=728, 15%).



As Figure 6ci below indicates, within this trajectory there also appears to be a quite substantial shift towards residing in areas of lower deprivation at the 54 month study wave. This suggests that residential mobility within this trajectory is more likely to be associated with 'positive' or 'aspirational' moves.

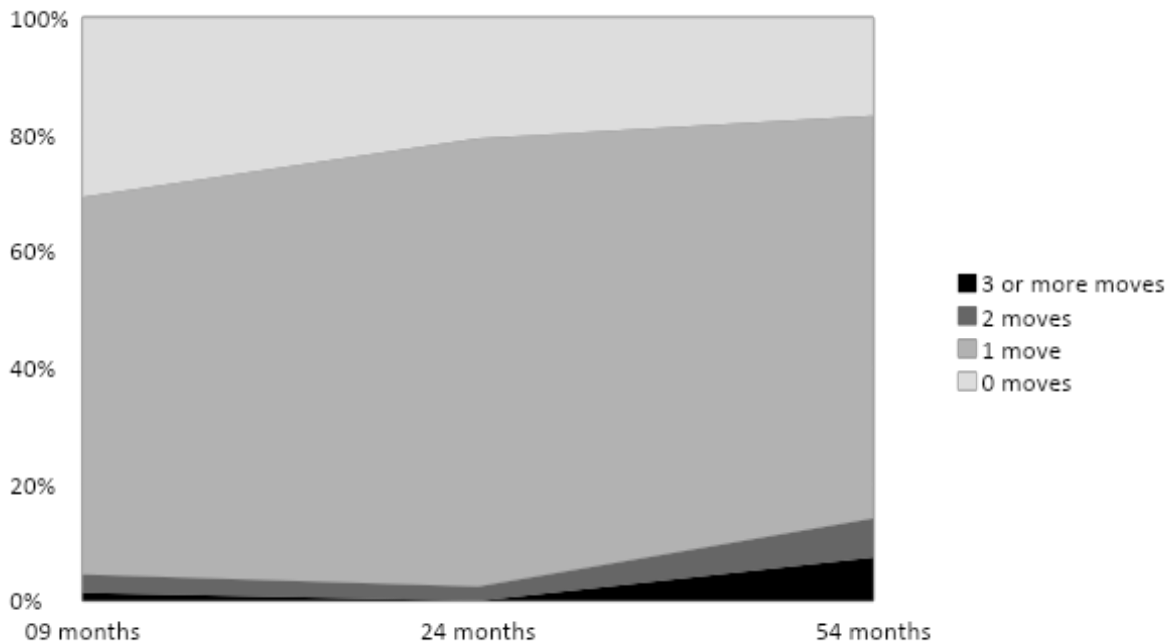
Figure 6ci. Area level socioeconomic deprivation over time among children experiencing one school-age move



The fourth trajectory presented is one of ‘continuously low residential mobility’ among 892 children (Figure 6d). At all time-points more than 65% of children experienced one move. While this overall pattern of low level of residential mobility remained fairly constant throughout the study period, there was some variation in the proportion of children in this trajectory who did not move at each wave, as well as the proportion who moved house two or more times at each wave. For instance, at the 9-month study wave, 31% of children within this trajectory had not moved house, with 65% moving just once. Only 4% of children in the trajectory had moved house two or more times. However, the proportion of children who did not move dropped to 21% at the 24-month wave and dropped again to 17% at the 54 month wave. Over the same period the proportion of children experiencing higher levels of residential mobility more than doubled from 3% at 9 months to 7% at 54 months. On average, children in this trajectory moved between residential mobility categories 1.1 times. Children in this trajectory were more likely to:

- have a mother who identified as Māori (17%)
- have a mother with a NCEA (23%) or a Diploma (31%)
- live in a private rental at the antenatal period (56%)
- and have lower levels of household income <\$50k (22%).

Figure 6d. Trajectory 4: Consistently low residential mobility (n=892, 18%).



The children in the trajectories presented in Figure 6e and Figure 6f tended to have higher levels of residential mobility than the other trajectories with at least 10% (and up to 99%) of children having moved 2 or more times at any particular study wave. The fifth trajectory (Figure 6e) – ‘transition to high residential mobility’ - indicates a shift from relative stability at the 9 month wave - with most children (63%) having never moved and a further 26% only moving once – to high levels of mobility at the 54 month wave where 72% of children respectively had moved house two or more times. Experiences of residential mobility within this trajectory, which includes 414 children (8% of the sample), appear to fluctuate substantially, with an average of 1.8 changes in residential mobility categories across the period. The most dramatic shift occurred at the 54 month wave, where less than 10% of children had experienced residential stability since the previous wave. Children in this trajectory were more likely to:

- have a mother who identified as Māori (21%) or Pacific (12%)
- have a mother with no secondary school qualifications (7%), NCEA (24%) or a Diploma (31%)
- have a younger mother, with a median maternal age of 28 (at antenatal)
- live in a single-parent household (13%)
- live in a household with other adults (37%)

- live in a private rental (53%) at the antenatal period
- have lower levels of household income <\$50k (26%)
- and live in areas of high socioeconomic deprivation at the antenatal wave (NZDep Q5, 26%).

Figure 6e. Trajectory 5: Transition to high residential mobility (n=414; 8%)

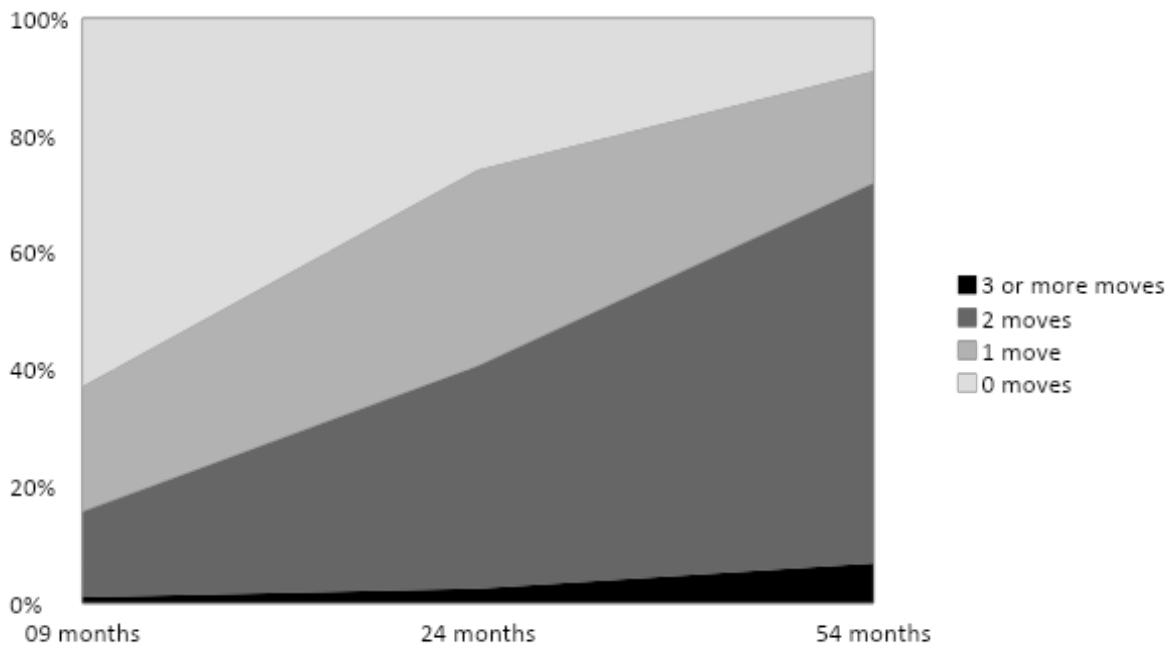
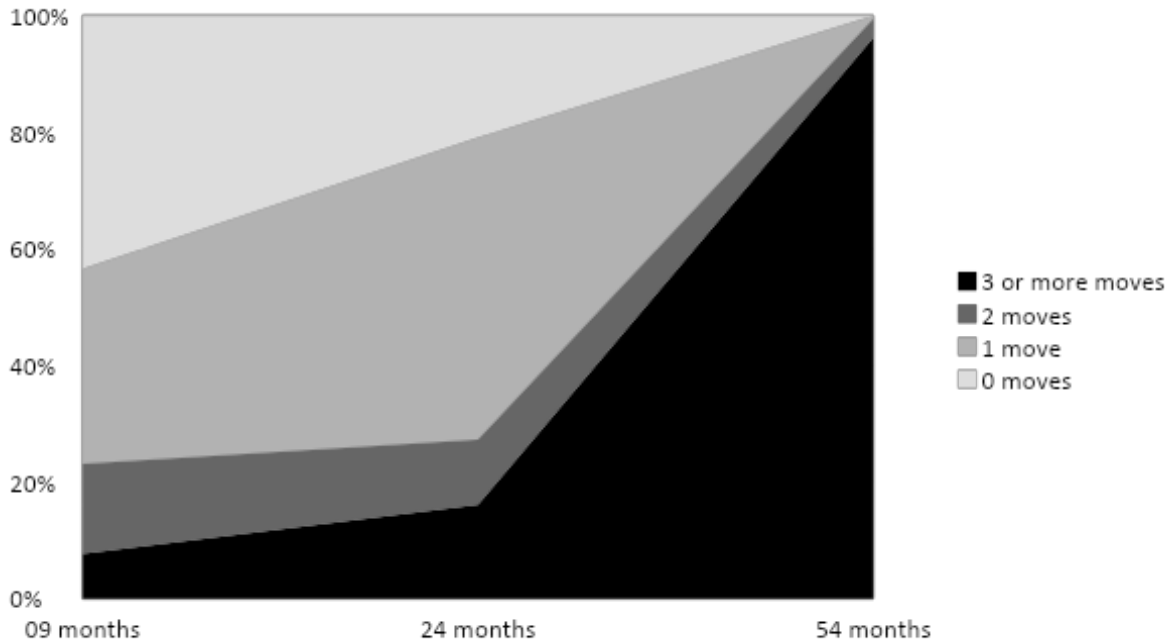


Figure 6f outlines the experiences of children in the sixth trajectory – ‘transition to very high residential mobility’. In Trajectory 6, levels of residential mobility were moderate during the 9-month study wave, before increasing during the 24 and 54 months study waves. At the 9 month wave, while 43% of children had not moved house, and a further 34% had moved just once, almost a quarter (23%) had moved two or more times. By the 24-month wave only 21% of children had not moved, with over half (52%) moving once and 27% moving two or more times. A substantial shift occurred at the 54-month study wave, with extremely high levels of residential mobility experienced. No children remained in the same house, just half a percent moved once, and 96% moved three or more times. Children in this trajectory were more likely to:

- have a mother who identified as Māori (32%)
- have a mother with no secondary school qualifications (17%), NCEA (25%) or a Diploma (36%)
- have a younger mother, with a median maternal age of 27 (at antenatal)
- live in a single-parent household (15%)

- live in a household with other adults (41%)
- live in a private rental (58%) or public housing (10%) at the antenatal period
- have lower levels of household income <\$50k (26%)
- and live in areas of high socioeconomic deprivation at the antenatal wave (NZDep Q5, 30%).

Figure 6f. Trajectory 6: Transition to very high residential mobility (n=189; 4%).



A sub-analysis was undertaken to examine whether experiences of very high residential mobility for children in Trajectory 6 differed by residential tenure. It was hypothesised that a large proportion of the children experiencing three or more moves at the 54 months study waves could live in less secure housing, such as private rental properties. However, as figures 7a, 7b, 7c, and 7d below indicate, the overall trajectory profile was very similar regardless of housing tenure at each study wave – although residential mobility was lower in the earlier study waves for children living in family owned homes or public rental accommodation. It is also important to note that no children lived with 'Other' forms of accommodation tenure until the 54 month wave, and that all of these children then experienced 3 or more residential moves between the 24 month and 54 month data collection waves.



Figure 7a. Residential mobility among homeowners within Trajectory 6 – Transition to very high residential mobility

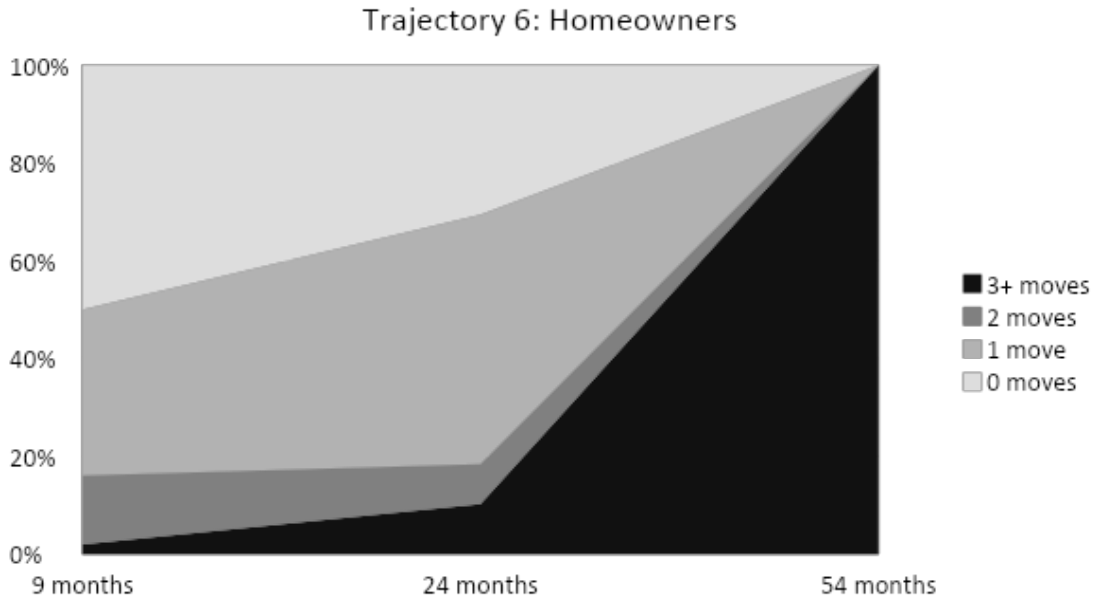


Figure 7b. Residential mobility among private renters within trajectory 6 – Transition to very high residential mobility

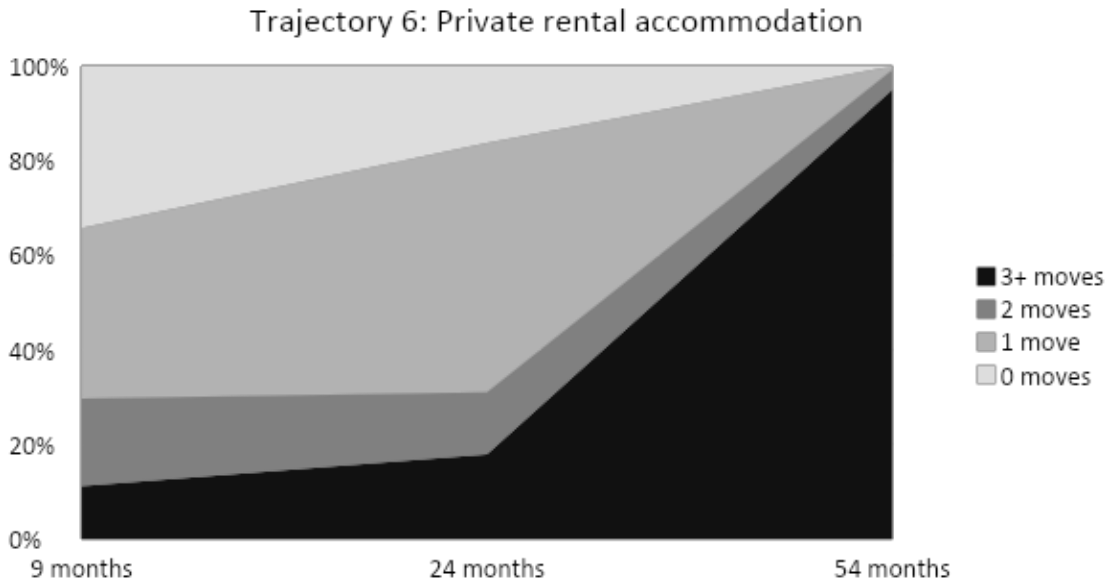


Figure 7c. Residential mobility among public renters within trajectory 6 – Transition to very high residential mobility

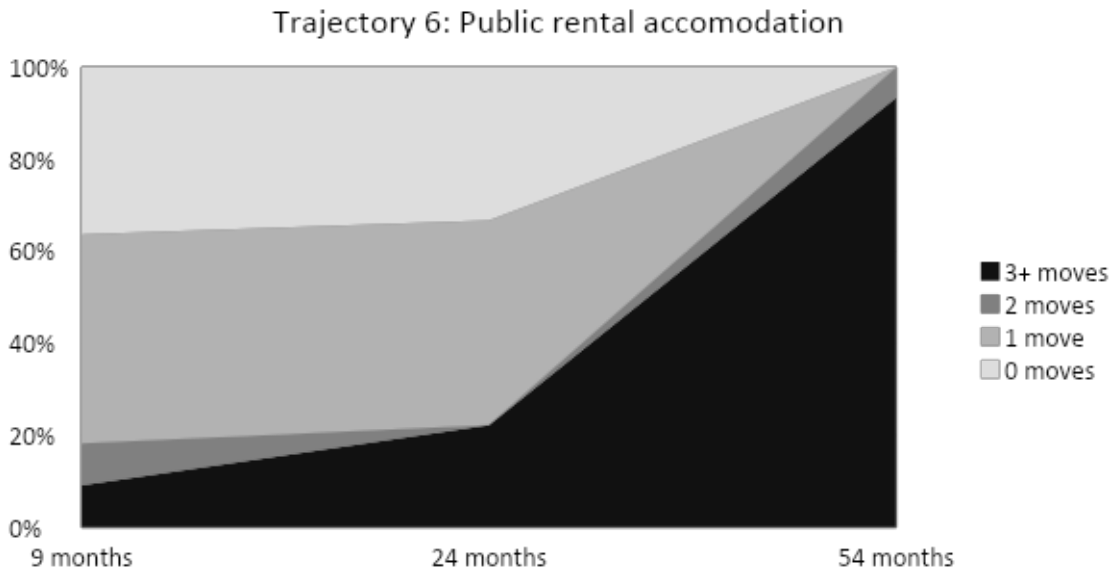
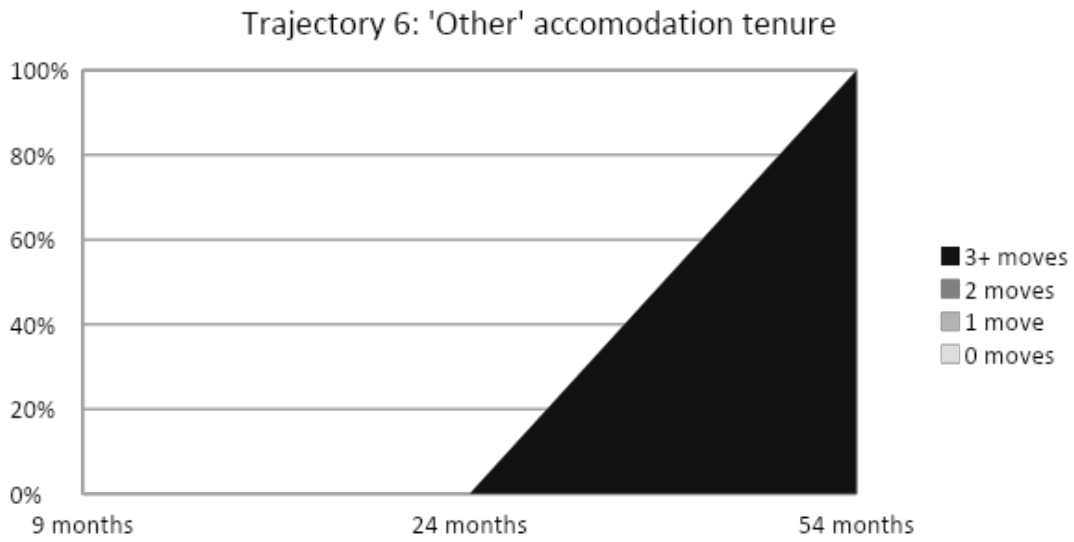


Figure 7d. Residential mobility among children living with 'other' accommodation tenure within trajectory 6 – Transition to very high residential mobility



*Research Question 2: Which children are more likely to experience, or which factors are associated with different types of residential mobility patterns?*

To understand whether certain sociodemographic characteristics and housing circumstances are associated with residential mobility trajectories, we first examined the characteristics of each trajectory cohort, before undertaking a multinomial regression analysis. The distribution of selected sociodemographic characteristics and housing circumstances across the total sample, and each residential mobility trajectory cohort are outlined in Table A1 in the appendix. Although some of these characteristics have been outlined in the previous section which describes each of the residential mobility trajectories, it is also useful to directly compare each trajectory with other trajectories, and with the average of the total sample.

Overall, it is apparent that the more 'stable' residential mobility trajectories (such as T1 – *no moves*, T2 – *stability with increasing residential mobility*, and T3 – *one school-age move*) tend to be associated with higher levels of socioeconomic advantage. For instance, children experiencing Trajectories 1, 2, and 3 were more likely at the antenatal collection wave to:

- have a mother with a university degree or higher (47%, 47% and 51% respectively)
- have a two-parent household (96%, 94%, and 95% respectively)
- have a mother who lived without non-family adult household members (80%, 75%, 80% respectively)
- and were more likely to have a household income of \$100k or higher at the antenatal wave (44%, 45%, and 46% respectively).

These children also tended to have slightly older mothers (average maternal age of 33, 31 and 31 respectively for T1, T2, and T3). Children in Trajectories 1 and 3 were also more likely to have mothers who lived in family-owned houses at the antenatal stage (78%, 62%), and experience residential stability (no moves) at the 9 month and 24 month study waves (100%). Children in Trajectories 1, 2 and 3 were also more likely to have a mother who identified as NZ European (60%, 63%, and 59% respectively), and less likely to have a mother who identified as Māori (13%, 15%, and 14% respectively).

Children in T4 (characterised by relatively low, but consistent, levels of residential mobility) were:

- less likely (than the total sample) to have a mother with a university degree or higher (41%)

- less likely to be homeowners (38%) and more likely to live in private rentals (56%) or 'other' forms of housing tenure (1.2%) at the antenatal wave
- less likely to have not moved house by the 9 month study wave (31%) and were more likely to have moved once (65%)
- more likely to have lower household income levels at the antenatal wave (4% were less than \$20k, and 6% were between \$20k-30k)
- less likely to live in areas of low socioeconomic deprivation (NZDepQ1 = 16%)
- more likely to live in a single parent household (13%)
- and more likely to have mothers living with other household members at the antenatal wave (37%).

For the most part, similar (but exacerbated) patterns of sociodemographic characteristics were observed for children in the highly mobile residential mobility trajectories T5 (*transition to high residential mobility*) and T6 (*transition to very high residential mobility*). Children in Trajectories 5 and 6 were, at the antenatal wave:

- less likely to have mothers with university degrees or higher (38%, 22%)
- have a single-parent household (13%, 15%)
- have mothers that lived with other non-family household members (37%, 41%)  
have a lower household income (8% and 14% less than \$30k respectively)
- and more likely to live in an area of high socioeconomic deprivation (NZDepQ5 = 26%, 30%).

Housing tenure at the antenatal wave for T5 and T6 was less likely to be homeownership (41%, 32%) and more likely to be private rental accommodation (21%, 34%), public rental (15%, 15%), and 'other' forms of housing tenure (1%, 8%). Children in Trajectories 5 and 6 were more likely to have moved more than two times before the 9 month study wave (16%, 23%) and were very likely to have moved two or more times by the 54 month wave (72%, 99%). These children were also more likely to have mothers who identified as Māori (21%, 32%), but less likely to have NZ European mothers (51%, 49%), or, for trajectory 6, Asian (7%). The mothers of children in Trajectories 5 and 6 also tended to be younger, with an average age of 28 and 27 respectively. These mothers were also more likely to have been born in New Zealand (71%, 81%) and less likely to have moved to New Zealand as an adult (19%, 14%).

Overall, it appears that more 'stable' residential mobility trajectories appear to be associated with higher levels of 'advantage', including higher levels of maternal education, home ownership, household income, lower levels of neighbourhood deprivation, a two-parent family structure, and the associated advantages that come with having a mother who identifies as New Zealand European. On the other hand, it seems that the highly mobile residential mobility trajectories tend to be associated with higher levels of 'disadvantage', such as lower maternal education, insecure housing tenures, lower household income, higher neighbourhood deprivation, a higher likelihood of a single-parent family structure, and the associated disadvantages that come with having a mother who identifies as Māori.

#### *Change in housing tenure across the waves by trajectory*

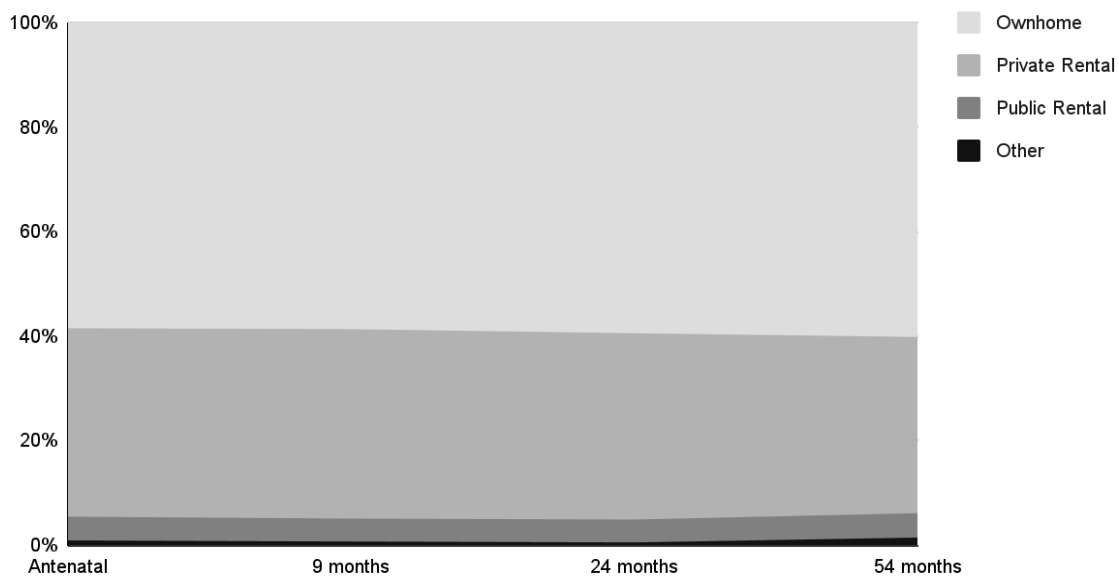
We also explored whether changes in housing tenure experiences across the study waves were similar or different for each of the residential mobility trajectories. Figures 8a to 8g visualise the proportion of children at each study wave who live in their own homes (lightest grey), private rental properties (light grey), public rentals (darker grey), or in accommodation under other forms of tenure (black).

Overall, we can see that:

- Most of the total sample lived in their own home, and this remained constant across the study period.
- Overall, there was relatively little change in residential tenure status across the total sample.
- However, this differed by residential mobility trajectory.
- Children in 'less mobile' trajectories T1 (*no moves*), T2 (*stability with increasing residential mobility*), and T3 (*one school aged move*) experienced fewer changes in housing tenure.
- Home ownership was more common in these 'less mobile' trajectories.
- Children in 'more mobile' trajectories T4 (*consistently low residential mobility*), T5 (*transition to high residential mobility*), and T6 (*transition to very high residential mobility*) experienced more changes in housing tenure (between 0.7 and 1.0 changes on average).
- Children in these more mobile trajectories were more likely to live in private rental accommodation, with this proportion increasing for T5 and T6.
- Interestingly, while private accommodation tenure was also high for T4, the pattern over time differed, and a shift to increased home ownership was observed.

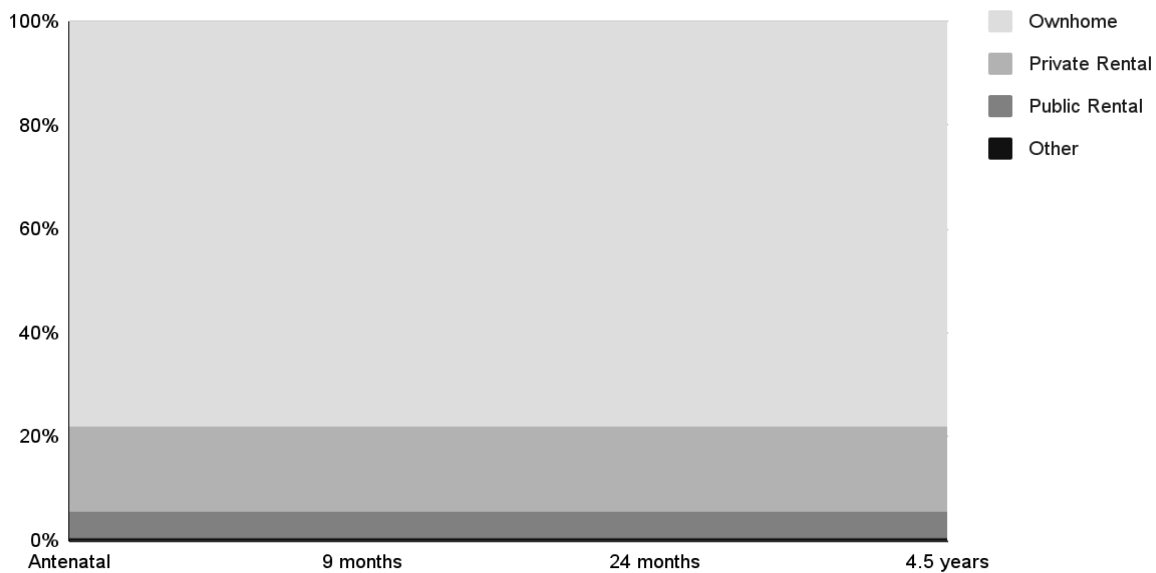
Figure 8 displays the total study sample, and indicates that, for the most part there is very little fluctuation in housing tenure across the study period. The proportion of children living in their own homes, or in public rental housing, remained largely constant over the study period (e.g. at the antenatal wave 59% of mothers lived in their own homes, and at the 54-month wave this increased slightly to 61% of children living in their own homes). Overall, there was an average of 0.4 ( $SD=0.6$ ) tenure changes (e.g. from private rental to home ownership) across the study period, suggesting little change in residential tenure status.

*Figure 8a. Total sample tenure experiences across study waves (average of 0.4 tenure changes)*



In Figure 8b, the tenure experiences of children in Trajectory 1 – *no moves* - reveals that this group of children has higher levels of home ownership (78%) and is less likely to live in private rental accommodation (16%). The proportions of children living under each form of housing tenure remain stable across all waves, and there were no children who changed tenure type between the antenatal and 54-month waves. This reflects the overall very high levels of housing stability among this trajectory.

Figure 8b. T1 No moves - tenure experiences across study waves (0 tenure changes)



A different pattern emerges in Figure 8c, where the residential tenure experiences of children in Trajectory 2 – *stability with increasing residential mobility* - are displayed. Among children in this trajectory, there were an average of 0.4 ( $SD=0.5$ ) changes in residential tenure across the study period. Figure 8c indicates that this was likely to be a change from private rental to home ownership. Rates of home ownership increased from 53% at the antenatal wave to 65% at the 24-month wave, before settling at 60% at the 54-month wave. These changes corresponded with a decrease in the proportion of children living in private rental accommodation - from 44% at antenatal to 31% at the 24-month wave, and then back up to 36% at the 54-month wave. The proportion of children living in public rental and 'other' forms of accommodation tenure remained constant at 3% and 0.1% respectively (although this increased to 0.2% for 'other' tenure during the 9-month and 24-month waves). Figure 8c therefore suggests that most of the changes in residential tenure among this trajectory are likely to be children moving from private rentals to their own homes, or vice versa.

Figure 8c. T2 Increasing residential mobility - tenure experiences across study waves (average of 0.4 tenure changes)

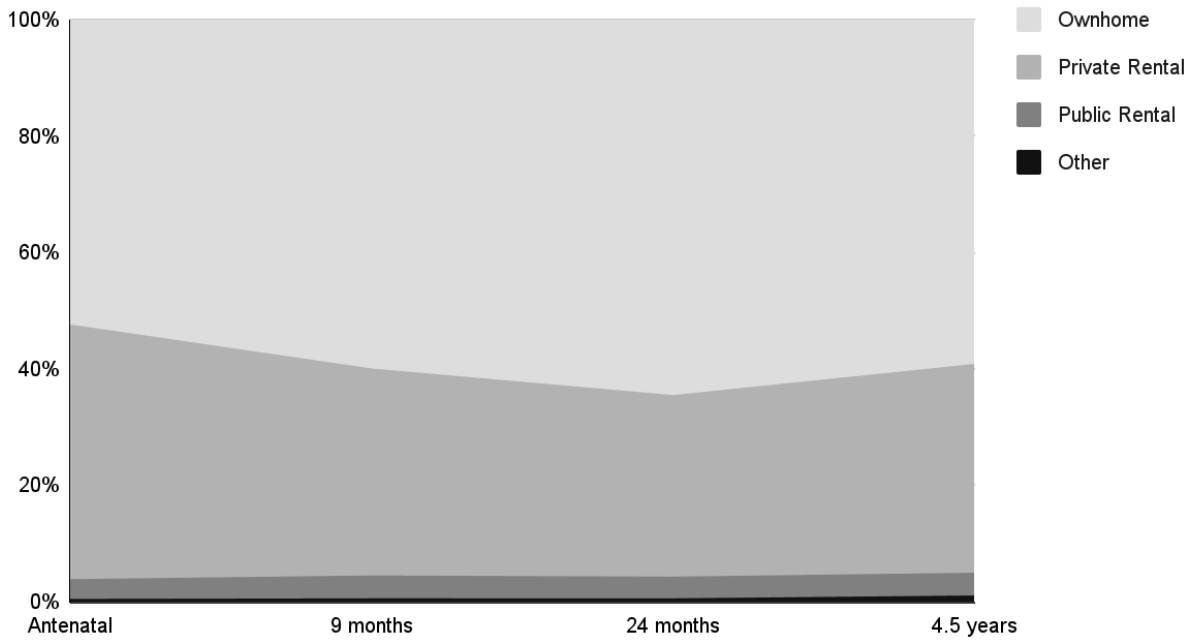
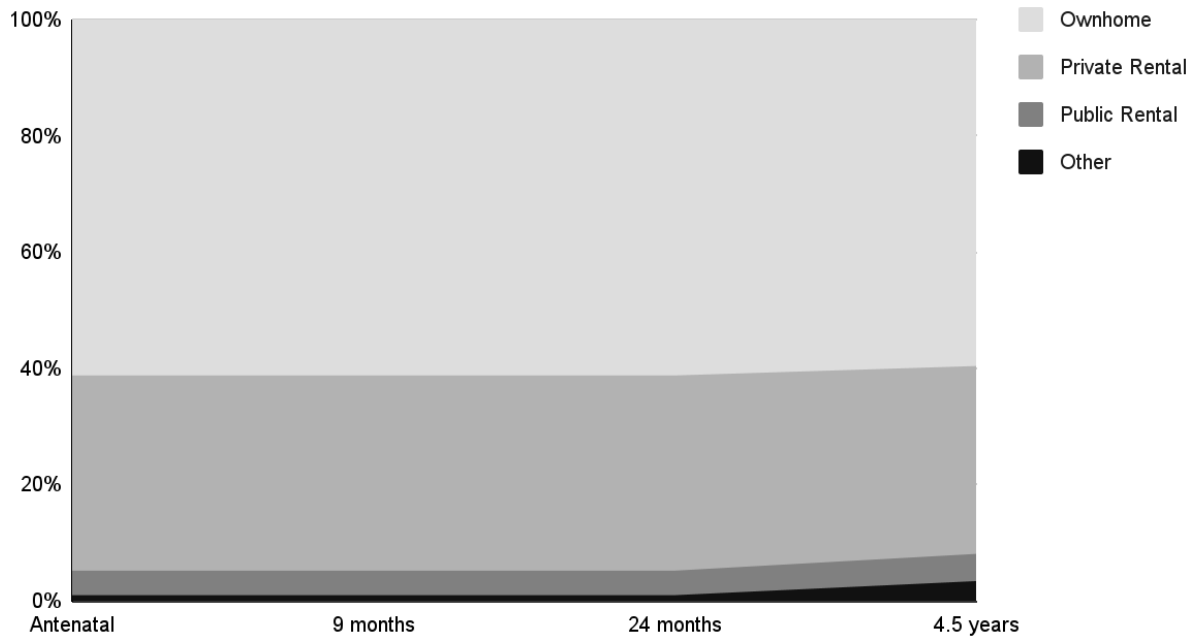




Figure 8d outlines the experiences of residential tenure for children in Trajectory 3 – *one school-age move*. There was an average of 0.3 ( $SD=0.5$ ) tenure changes among this group, and the proportion of children living in accommodation under each type of tenure remained relatively constant across the study period. There was a slight decrease in the proportion of children living in family-owned homes at the 4.5 year wave (from 62% at antenatal down to 60%). However, the proportion of children living with ‘other’ forms of housing tenure increased from 0.6% at the antenatal, 9-month, and 24-month waves to 3% at the 54-month wave. The proportion of children living in private rentals remained fairly constant, with a slight reduction from 34% to 32% across the period. Similarly, public rental tenure remained fairly constant, with a slight increase from 4% to 5% over the study period.

Figure 8d. T3 One school-age move - tenure experiences across study waves (average of 0.3 tenure changes)



Children in Trajectory 4, who experienced *consistently low residential mobility*, were more likely to experience a change in their residential tenure type, with an average of 0.8 changes in tenure ( $SD=0.8$ ) across the study period. Figure 8e indicates that while the proportion of children living in family-owned homes is lower than in the total sample, this steadily increased between the antenatal (38%) and 54-month (47%) collection waves. The proportion of children living in private rental accommodation was high, peaking at 61% at the 9-month wave, before declining at the 24-month and 54-month waves to 48%. As with other trajectories, the proportion of children living in public rented accommodation remained relatively constant across the study period, staying at around 4%. A small proportion of mothers lived in accommodation under 'other' forms of tenure at the antenatal wave (1%), this had declined to 0% by the 24-month wave, before returning to 1% at the 54-month wave.

Figure 8e. T4 Consistently low residential mobility - tenure experiences across study waves (average of 0.8 tenure changes)

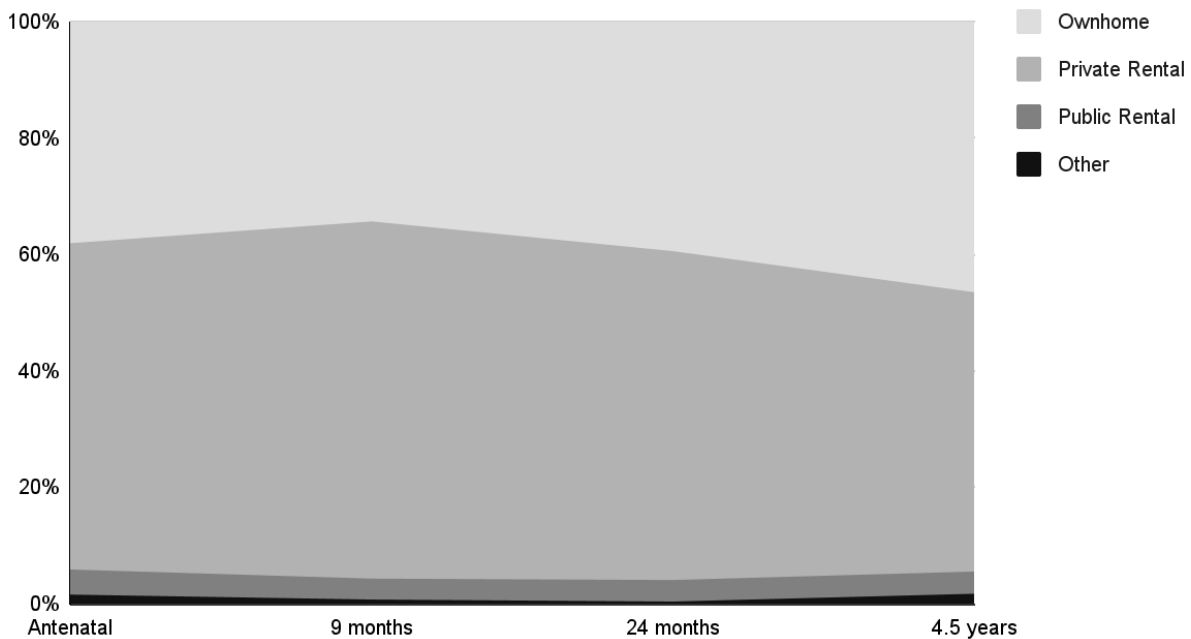
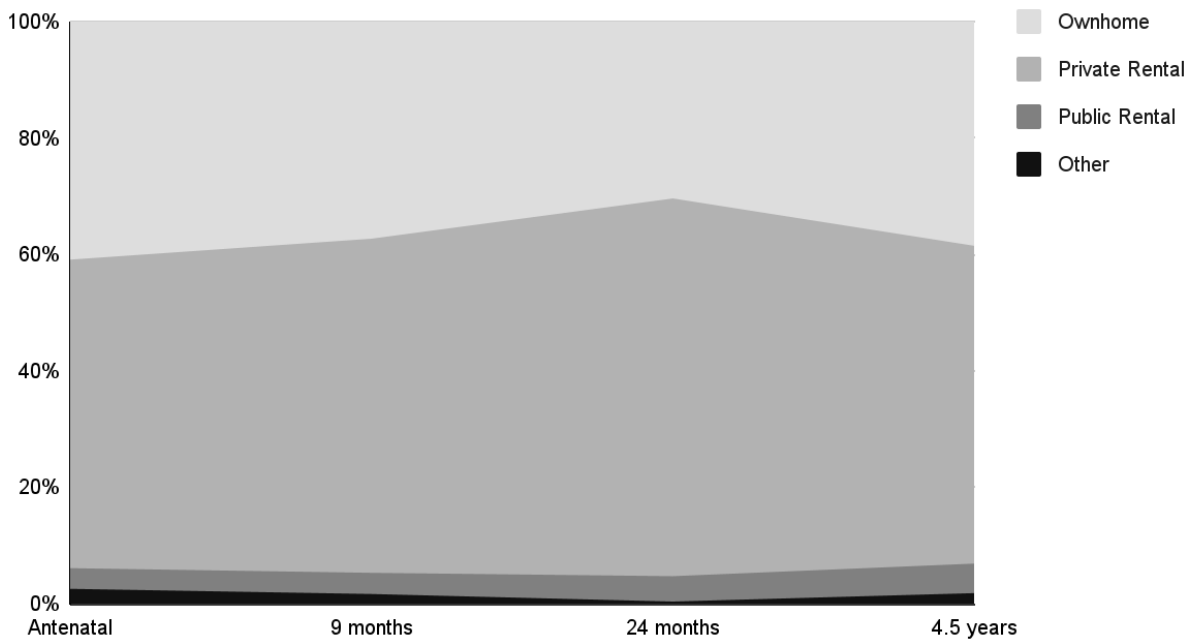


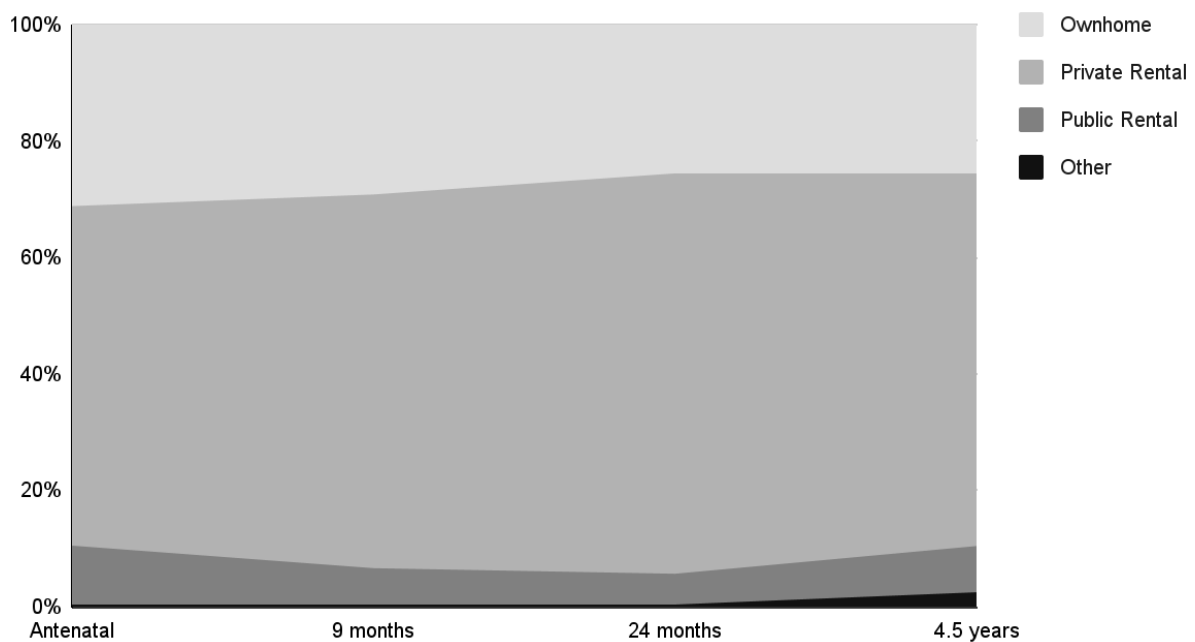
Figure 8f outlines housing tenure over time for children in Trajectory 5 who experienced a *transition to high residential mobility*. On average, children in this trajectory changed tenure 0.7 times ( $SD=0.8$ ) across the study period. The proportion of mothers and children living in family-owned homes decreased from 41% at antenatal to 31% at the 24-month wave, before increasing again to 39%. This trend was mirrored by an increase in the proportion of mothers and children living in private rental accommodation, from 53% at antenatal to 65% at the 24-month wave, and then back down to 55% at the 54-month wave. The proportion of mothers and children living in public rental accommodation increased slightly from 3.5% to 5% across the study period, while the proportion living with 'other' forms of accommodation tenure mostly fluctuated at around 1% to 2%, although this declined to zero at the 24-month wave.

Figure 8f. T5 Transition to high residential mobility - tenure experiences across study waves (average of 0.7 tenure changes)



Finally, Figure 8g displays housing tenure over time for children who experienced a *transition to very high residential mobility* (T6), and who on average changed tenure type 1.0 ( $SD=0.9$ ) time across the study period. Home ownership levels fell from 32% at antenatal to 26% at the 24- and 54-month study waves. Across the same period the proportion of mothers and children living in private rental accommodation increased from 58% at antenatal to a high of 69% at the 24-month wave, before declining slightly to 64% at the 54-month wave. The proportion of mothers and children living in public rental accommodation was the highest of all trajectories, but declined from 10% at antenatal down to 5% at 24-months. This proportion then increased to 8% at the 54-month wave. There were no mothers or children living in ‘other’ accommodation tenures between the antenatal and 24-month waves, but by the 54-month wave 2% of children in Trajectory 6 lived with ‘other’ forms of tenure.

Figure 8g. T6 Transition to very high residential mobility - tenure experiences across study waves (average of 1.0 tenure change)



*Multivariate regression modelling*

Given the findings of previous research it is unlikely that the probability of being in different residential mobility trajectories, and experiencing different socioeconomic and environmental contexts, is spread evenly across the population. We apply multinomial logistic regression to examine whether certain sociodemographic characteristics increase the likelihood of children being exposed to relatively stable, or highly mobile, residential mobility trajectories during early and middle childhood. A regression analysis has been used because this allows for the interpretation of the potential likelihood of specific factors net of each other.

Table A2 in the appendix presents the results of the multinomial regression analysis. Relative risk ratios are provided, which are an estimate of the probability that a child/family with certain characteristics is a member of a specific trajectory, compared to children experiencing *no moves* (T1). Similarly, when interpreting the relative risk ratios for factors that are categorical, relative risk ratios should be interpreted as the relative probability of membership in that particular trajectory compared to the reference category. For example, in the case of mother's ethnicity, the ratios should be interpreted as the relative probability of Māori/Pacific/Asian/Other – non-dominant ethnic groups – being in a trajectory compared to the dominant group (NZ European/Pākehā). The presentation of these findings cannot, however, reveal whether there are statistical differences in the probability of different trajectory membership between the other non-reference groups, for example whether children with Māori mothers are more likely to experience one trajectory versus another compared to children with Pacific mothers.

*Factors associated with the likelihood of being in different trajectories*

Table A2 presents the results of three models predicting the likelihood of being in a particular trajectory based on a families' socioeconomic characteristics, housing tenure, and maternal experiences of racism compared to the reference category. Model 1 includes socioeconomic characteristics only. Model 2 also includes housing tenure, while Model 3 adds maternal experiences of racism. Model 1 explains approximately 5% of the variance in early childhood residential mobility trajectories. Model 2 explains approximately 8% of variance residential mobility trajectories, while adding maternal experiences of racism did not influence the Pseudo R<sup>2</sup> value of Model 3.

Housing tenure at antenatal appears to be an important predictor of children's early childhood residential mobility trajectories. Including housing tenure in the model increased the Pseudo R<sup>2</sup> value from .047 to .075 and attenuated several associations between residential mobility trajectory and sociodemographic characteristics. Living in private rental accommodation (compared to the reference of homeownership) at the antenatal wave was associated with being in less stable residential mobility trajectories, compared to the stable reference trajectory. For instance, mothers of children who experienced *consistently low residential mobility* (T4) were more than six times more likely to live in private rental accommodation than the mothers of children in the stable reference trajectory. A similar association was observed for the mothers of children who experienced *transitions to high and very high residential mobility* (T5 & T6) who were respectively 4.9 and 5.4 times more likely to live in private rental accommodation at the antenatal wave. Living in public rental accommodation was more likely for the mothers of children who experienced *consistently low residential mobility* (1.6 times higher), and who experienced a *transition to very high residential mobility* (2.1 times higher). Since the total number of mothers who lived in 'other' forms of accommodation tenure at the antenatal wave was small, this is likely to have influenced the strong association with less stable residential mobility trajectories and large effect sizes that were noted. These results have therefore not been interpreted here but are still presented in Table A2 in the appendix.

Maternal ethnicity was associated with children's residential mobility trajectories, with the children of Pacific and Asian mothers generally less likely to experience less stable housing trajectories than the children of NZ European/Pākehā mothers. Although not statistically significant, the children of Māori mothers were more likely to have less stable housing trajectories, and experience *transitions to high or very high residential mobility* (T5 & T6). However, these differences were largely attenuated when housing tenure was included in Model 2, and reduced further when maternal experiences of racism were included in Model 3. To provide further detail about this variable, maternal experiences of racism were statistically significantly associated (at the 10% CI) with a *transition to high residential mobility* (T5). The attenuation in the effect of maternal ethnicity on residential mobility trajectory tells us that housing tenure and racism both matter for children of Māori mothers and their experiences of residential mobility and especially experiences of transitions to high or very high residential mobility. These experiences are shaped by differences in residential mobility, housing tenure, and the socioeconomic characteristics that provide access to stable and secure housing - and therefore influence children's residential mobility trajectories - which are in turn shaped by structural racism.

Maternal age also appears to be associated with children's residential mobility trajectories, with younger mothers more likely to have children that grow up in less stable trajectories. This association is strongest for the trajectory with a *transition to very high residential mobility* (T6) and less strong for the trajectory associated with relative stability (T3 *one school-age move*). Maternal education levels were associated with two particular trajectories. Compared to the reference of a university degree or higher, mothers with a secondary school/NCEA qualification only or a diploma/trade certificate were less likely to have children that in the trajectory experiencing *one school-age move*. On the other hand, the children of mothers who had no secondary school qualifications were three times more likely to be in the most mobile trajectory, T6. This association remained even when housing tenure was controlled for in Model 2, although the risk ratio reduced to 2.6 times. Maternal migrant status was not significantly associated with residential mobility trajectories. An association between mothers moving to NZ as an adult and children growing up in a trajectory of *consistently low residential mobility* was statistically significant at the 10% CI level but did not remain statistically significant once housing tenure and maternal experiences of racism were included in Models 2 and 3.

There were not strong associations between maternal employment and children's residential mobility trajectories. However, the mothers of children in consistently low residential mobility trajectories were less likely to be employed part time (compared to the reference category of not being in the labour force), while the mothers of children in the trajectory experiencing stability but with increasing residential mobility were less likely to work full time. Household income appears to be associated with residential mobility trajectories in Models 2 and 3, but not in Model 1. This suggests that once differences in housing tenure and experiences of racism are controlled for, household income at the antenatal wave is a predictor of a child's residential mobility trajectory. Compared to the reference trajectory (T1, *no moves*) all other trajectories except the most mobile (T6, *transition to very high residential mobility*) were associated with higher levels of household income.

For two residential mobility trajectories (T4 - *consistently low mobility*; and T5 - *transition to high mobility*) a significant association with two-parent family status at antenatal was identified in Model 2, once housing tenure was controlled for. Children in T4 and T5 were less likely to be in a two-parent family structure. The number of changes in family structure over the study period that a child experienced were more consistently associated with residential mobility trajectories. Compared to the

stable reference trajectory, children who experienced changes in family structure were more likely to be other types of residential trajectory - with a higher likelihood for the least stable trajectories. This association attenuated slightly once housing tenure was controlled for, but remained statistically significant for all but T3 (*one school-age move*). Children who experienced a *transition to very high residential mobility* (T6) were two times more likely to experience changes in family structure, even after controlling for differences in housing tenure and maternal experiences of racism. Age-deviation at interview wave was associated with being in a trajectory other than the stable reference trajectory, while living in a rural area was less common for children in trajectories T2, T3, T4, and T5. Additionally, less stable trajectories were less likely to live in the Counties Manukau DHB region.

While direct comparisons between different residential mobility trajectories (other than with the reference group) have not been made, it is useful to summarise the sociodemographic characteristics that predict the likelihood of a child experiencing two quite different residential mobility trajectories: T3 - children who experienced *one school-age move* that appears to be 'aspirational'<sup>7</sup>; and T6 - children who experienced a *transition to very high residential mobility*. Children in the relatively stable T3 tended to have more markers of advantage. For instance, compared to the reference stable trajectory they were more likely to have slightly younger mothers, mothers with a university or higher degree, a higher household income, and were 2.5 times more likely to live in private rental accommodation and 7.6 times more likely (90% CI) to live with 'other' accommodation tenure. On the other hand, children in the trajectory that experienced a *transition to very high residential mobility* (T6) tended to have more markers of disadvantage. These children were, compared to the stable reference trajectory, more likely to: have younger mothers; have a mother with a disability; experience changes in family structure; and were 2.6 times more likely to have mothers without secondary school qualifications; and 5.4 times more likely to live in private rental accommodation, and twice as likely to live in public rented accommodation (90% CI).

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<sup>7</sup> As previously noted, the distribution of children across NZDep categories shifted towards lower levels of neighbourhood deprivation at the 54-month wave, suggesting that many moves within this group were to wealthier areas with lower levels of socioeconomic deprivation.



*Research Question 3: Are these patterns of residential mobility associated with children's unmet healthcare needs?*

To understand whether residential mobility, and specific residential mobility trajectories were associated with poorer children's unmet healthcare need we first examined these outcomes in a bivariate table (see Table 1), before undertaking OLS and logit regression modelling. It appears that children in less stable trajectories that experienced a *transition to high/very high residential mobility* (T5 & T6) were more likely to have had fewer Wellchild check-ups and have not completed a B4 School check by the 54-month wave.

*Table 1. Unmet healthcare need by residential mobility trajectory*

Unmet healthcare needs at 54-months	Total		Stability (T1)	Increasing RM (T2)	One school-age move (T3)	Consistentl y Low RM (T4)	Transition to High RM (T5)	Transition to very High RM (T6)
	n	%	%	%	%	%	%	%
Number of Wellchild checks completed by 54-month wave <sup>^</sup>								
All 9	1,183	23.6%	23.5%	22.2%	25.8%	23.2%	23.9%	25.9%
7-8	3,473	69.4%	71.0%	71.6%	67.7%	68.0%	65.9%	62.4%
5-6	258	5.2%	4.3%	4.3%	4.9%	5.8%	7.7%	9.5%
<=4	92	1.8%	1.2%	2.0%	1.5%	2.9%	2.4%	2.1%
B4 School checks at 54-months								
Complete (or booked)	3836	77.0%	80.3%	76.6%	77.1%	74.0%	75.9%	64.3%
Not complete	1145	100.0%	19.7%	23.4%	22.9%	26.0%	24.1%	35.7%

<sup>^</sup> Note that this variable is analysed in the regression models as a continuous variable, but is grouped here for ease of presentation

We conducted OLS and logit regression models examining whether children’s residential mobility trajectories were associated with unmet healthcare need as indicated by the number of Wellchild check-ups completed by 54-months, and whether or not the B4 School check had been completed (or booked). The findings from this analysis are presented in Table A3 and Table A4 in the appendix. For each outcome examined, the models were run three times. First, without controls (i.e. just examining associations between residential mobility trajectories and unmet healthcare needs), secondly with the inclusion of sociodemographic factors (examined in RQ2, such as maternal education, ethnicity, age, and family structure), and third, with the additional inclusion of housing tenure. By doing so, we can understand the net effect of residential mobility trajectories on children’s unmet healthcare needs. We are also able to provide some insight into how much the association between residential mobility trajectories and unmet healthcare needs may be explained by other factors, such as maternal education or housing tenure. Statistically significant results are denoted in the tables as follows: \*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ ; +  $p < 0.1$

*Early childhood residential mobility trajectories and unmet healthcare needs*

*Number of completed Wellchild check-ups at 54-months*

OLS regression was used to examine the association between residential mobility trajectories and the number of completed Wellchild check-ups, and therefore coefficients indicate the direction and strength of any associations. Residential mobility trajectories were associated with the number of completed Wellchild check-ups across the study waves. This association persisted when sociodemographic and housing tenure variables were included. For the full model, children were less likely to have Wellchild check-ups complete if they were in trajectories of *stability with increasing residential mobility* (-0.08+), *consistently low residential mobility* (-0.14\*\*), *a transition to high residential mobility* (-0.14\*), or *a transition to very high residential mobility* (-0.18\*). Other sociodemographic and housing tenure variables were associated with the number of completed Wellchild check-ups, including a weak positive association with household income (0.04\*\*) and stronger negative associations with: having no maternal secondary school qualifications (-0.16\*); living rurally (-0.15\*\*); living in Counties Manukau DHB (0.15\*\*\*); living in Waikato DHB (-0.13\*\*\*); and having a mother identifying as Māori (-0.10\*). Full results are presented in Table A3 in the appendix.

#### *Completed B4 School checks at 54-months*

Next, a logistic regression model with B4 School check complete (or booked) as the outcome variable was created. The Odds Ratio of having a complete B4 School check are presented and represent the 'relative risk' for particular factors. Residential mobility trajectories predicted the likelihood of a completed B4 School check at the 54 months study wave. This association persisted when sociodemographic and housing tenure variables were included. For the full model, children in all trajectories were less likely than the reference stable trajectory (T1) to have completed a B4 School check at 54-months. This decreased likelihood was particularly strong for children experiencing a *transition to very high residential mobility* (0.36\*\*\*) but were also noted for children experiencing a *transition to high residential mobility* (0.70\*), *consistently low residential mobility* (0.64\*\*\*), trajectories of *stability with increasing residential mobility* (0.76\*\*), and *one school-aged move* (0.81+). These results suggest that experiencing residential stability (i.e. no moves at each wave) confers a significant advantage when it comes to accessing routine health care - in this case B4 school checks. Other statistically significant sociodemographic and housing tenure variables predicting complete B4 School checks were: having a mother identifying as Māori (compared to NZ European/Pākehā, 0.77\*\*) or Asian (compared to NZ European/Pākehā, 1.28+); maternal age (0.98\*\*); having siblings (0.91\*); living rurally (0.75\*); living in Counties Manukau DHB region (compared to Auckland/Waitemātā, 3.81\*\*\*) or n Waikato DHB (Auckland/Waitemātā, 2.43\*\*\*); living in private rental accommodation (compared to homeownership, 1.24\*). Full results are presented in Table A4 in the appendix.

#### *Research Question 4: Are patterns of residential mobility associated with children's health at 8 years, and does unmet need influence this association?*

To understand whether residential mobility, and specific residential mobility trajectories were associated with poorer child health outcomes we first examined these outcomes in a bivariate table (see Table 2), before undertaking OLS and logit regression modelling. Overall, there appear to be rather few differences in the health outcomes of children at 8 years between different residential mobility trajectories. While children experiencing *transitions to high/very high residential mobility* (T5 & T6) had slightly lower parent-reported health, there was very little difference in the health outcomes of children in other trajectories.

Table 2. Child health outcomes at 8 years by residential mobility trajectory

Child health outcomes at 8 years	Total n	Stability (T1)		Stability with increasing RM (T2)	One school-age move (T3)	Consistently Low RM (T4)	Transition to High RM (T5)	Transition to Very High RM (T6)
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Parent-rated health at 8 years*								
	4,612	4.3 (0.8)	4.3 (0.8)	4.3 (0.8)	4.3 (0.8)	4.3 (0.8)	4.2 (0.9)	4.1 (0.9)
Number of different types of acute illness incidence at 8 years								
	4,561	0.4 (0.6)	0.4 (0.6)	0.4 (0.7)	0.4 (0.7)	0.4 (0.6)	0.4 (0.6)	0.4 (0.6)

\* Note this variable is scored on a scale from 1 ('poor') to 5 ('excellent') with higher scores indicating 'better' parent-rated child health

Next, we conducted OLS regression models examining whether children's residential mobility trajectories were statistically significantly associated with child health outcomes at 8 years as indicated by parent-rated health, and the number of different types of acute illness experienced. The findings from this analysis are presented in Tables A5 and A6. Similarly to the unmet healthcare need analysis, the models were run four times for each outcome; (1) without controls; (2) with the inclusion of sociodemographic factors; (3) with the additional inclusion of housing tenure; and (4) with the additional inclusion of the number of complete (or booked) Wellchild check-ups as a measure of healthcare access that may influence child health outcomes independently from residential mobility, sociodemographic, and housing tenure variables. Overall, associations between residential mobility trajectories and the two health outcomes examined were not particularly strong. Any associations were either attenuated once socioeconomic characteristics were controlled for, or if the association remained it was weaker than the association between socioeconomic characteristics and child health.

#### *Parent-rated health*

A negative association was identified between parent-rated health and trajectories 5 and 6 (-0.12\*\*, -0.17\*\*), suggesting that children experiencing *transitions to high and very high levels of residential mobility* were more likely to have lower levels of parent-rated health at the 8-year study wave.

However, these associations did not persist when sociodemographic and housing tenure variables were

included in Models 2, 3, and 4. This indicates that poorer parent-rated health among children experiencing *transitions to high and very high levels of residential mobility* are explained by underlying differences in the sociodemographic and characteristics of these children and their families. Our regression modelling identified sociodemographic and housing tenure variables associated with parent-rated health of children at the 8 year study wave. These included: having a mother who identified as Māori (-0.11\*\*\*), Pacific (-0.23\*\*\*), or Asian (-0.25\*\*\*); maternal experiences of racism (-0.08\*\*); area-level socioeconomic deprivation at antenatal (-0.01\*)<sup>8</sup>; household income at antenatal (0.05\*\*\*); and female gender (0.08\*\*\*). The R<sup>2</sup> results indicate that Model 1 (trajectories only) explained approximately 0.4% of the variance in children's parent-rated health, Model 2 - which included socioeconomic characteristics - explained 6.7%, while Model 3 and Model 4 both explained 6.8% of the variance in parent-rated child health.

#### *Number of different types of acute illnesses experienced at 8 years*

The only association between residential mobility trajectories and the number of different types of acute illnesses at 8 years was with T2 – *stability with increasing residential mobility*. This relationship persisted (but with decreased statistical significance) when sociodemographic and housing tenure variables were included in the model. Children experiencing *stability with increasing residential mobility* were slightly more likely to have experienced more different types of acute illnesses (0.05+). Sociodemographic factors associated with acute illness at the 8 year study wave included: having a mother who identified as Asian (-0.15\*\*\*); having a mother who moved to NZ as an adult (-0.09\*\*); maternal experiences of racism (0.07\*\*); and child age deviation from the study wave (-0.00\*). The R<sup>2</sup> results indicate that overall, Model 1 (trajectories only) explained approximately 0.1% of the variance in acute illness, Model 2 - which included socioeconomic characteristics - explained 2%, while Model 3 and Model 4 both explained 2.2% of the variance in the number of types of acute illness children experienced at 8 years.

#### *Maternal experiences of racism, residential mobility, unmet child health needs and child health outcomes*

While not tied to a specific research question, it is important to examine the influence of maternal experiences of racism on unmet child health needs and child health outcomes. As noted in the

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<sup>8</sup> Note that this association with *area-level* socioeconomic deprivation is net of individual socioeconomic characteristics also included in the regression models, such as maternal education, employment status, household income, and housing tenure - which are incorporated in the calculation of area-level deprivation in NZDep.

introduction section, there is a strong and growing body of international evidence linking experiences of racism with poorer health outcomes, including in children and young people (43). In Aotearoa vicarious racism via caregiver experience has been associated with unmet need for children's healthcare and dissatisfaction with the child's medical provider (31). In addition, racial discrimination within the housing system is one of the reasons for low rates of home ownership among Māori and Pacific people (26, 27). In this study, we first examined factors predicting the different residential mobility trajectories, finding that maternal experiences of interpersonal racism were statistically significantly associated with one residential mobility trajectory – *a transition to high residential mobility*. Mothers of children in this trajectory were 27% more likely to have experienced racial discrimination than the mothers of children in the stable *no moves* trajectory. In addition, maternal experiences of racism attenuated the relationship between maternal ethnicity and residential mobility trajectory, indicating that some of the differences in residential mobility trajectories between ethnic groups are likely to be partly due to experiences of racial discrimination. Next, we examined associations between residential mobility trajectories and the unmet healthcare needs of children such as the number of completed Wellchild check-ups or whether a B4 School check had been completed at 54-months. However, maternal experiences of racism at the antenatal wave were not statistically significantly associated with either Wellchild check-ups or B4 School checks. However, maternal experiences of interpersonal racism were found to be statistically significantly associated with one child health outcome – parent rated health, albeit with small effect sizes – but not with the number of different acute illnesses at the eight-year study wave.

## Discussion

Both internationally and in Aotearoa, high levels of residential mobility have been associated with poorer child health and development outcomes. Research also indicates that high levels of residential mobility are associated with reduced child healthcare access. Previous research using the GUiNZ longitudinal dataset and recent studies using the Integrated Data Infrastructure have shown that residential mobility is very common in Aotearoa, particularly among children, and that higher levels of residential mobility are associated with Māori and Pacific ethnicity and less secure housing tenure. Gaps remain in both the international and Aotearoa research literature around the specific timing and patterns of early childhood residential mobility, and how these patterns are associated with childhood access to healthcare and child health outcomes.

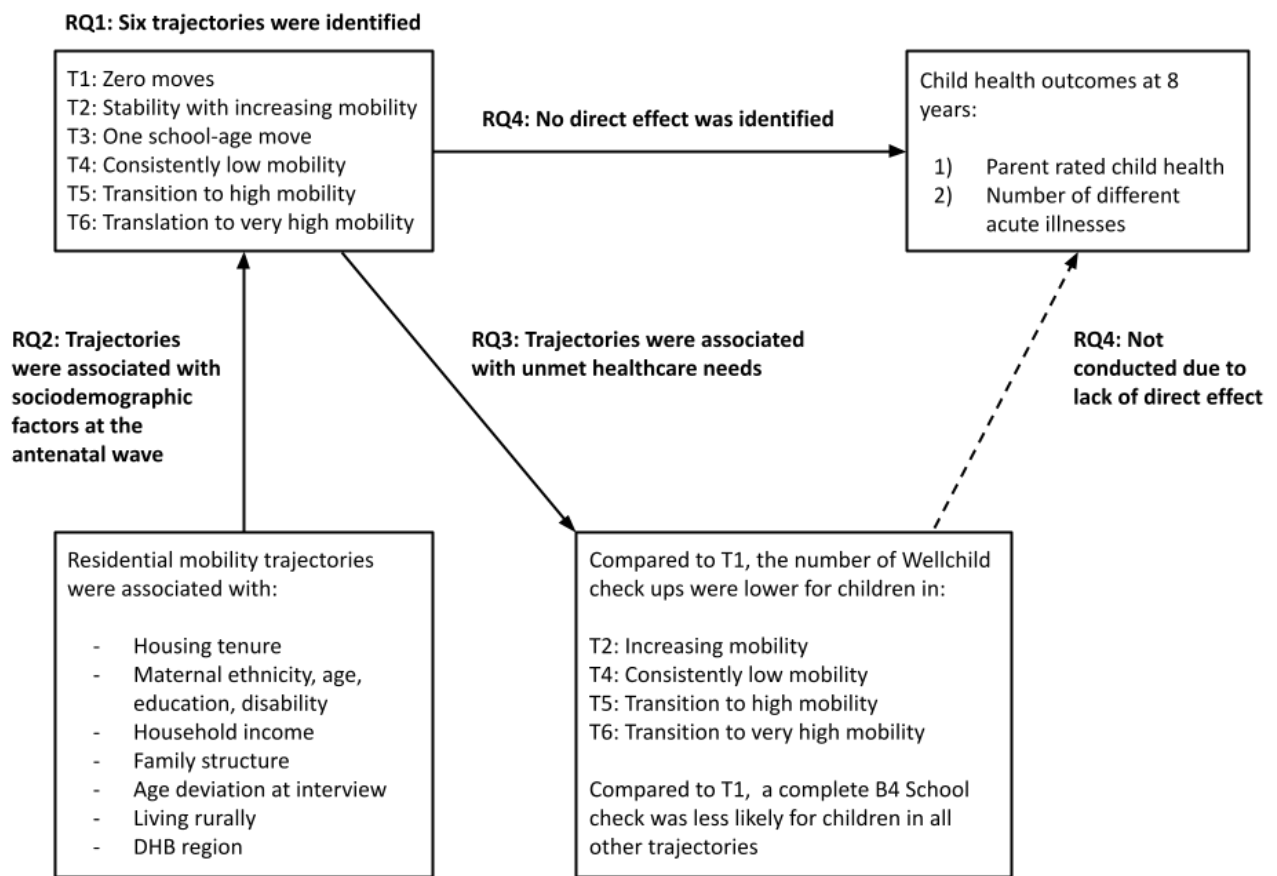
The purpose of this study was therefore to identify early childhood residential mobility trajectories, and understand who is likely to experience these trajectories. Once this was established, the next stage was to explore the impacts of these residential mobility patterns on unmet healthcare needs and health outcomes for children. Several important findings emerged, including the identification of six unique early childhood residential mobility trajectories, and the sociodemographic factors that predicted these trajectories. Our research has also identified an association between residential mobility trajectories and incomplete Wellchild check-ups in children. No direct association was identified between residential mobility trajectories and child health at the eight-year study wave. Figure 9 below outlines our key findings in relation to our research questions, and these are outlined in further detail in the remainder of this discussion section.

Six residential mobility trajectories were identified

Social sequence analysis identified six early childhood residential mobility trajectories:

- T1: No moves (*n*= 1,781; 36%)
- T2: Increasing residential mobility (*n*=1,002, 20%)
- T3: One school-age move (*n*=728, 15%)
- T4: Consistently low residential mobility (*n*=892, 18%)
- T5: Transition to high residential mobility (*n*=414; 8%)
- T6: Transition to very high residential mobility (*n*=189; 4%)

Figure 9. Overall findings in relation to research questions



### Predictors of residential mobility trajectories

More 'stable' residential mobility trajectories were associated with markers of socioeconomic advantage such as homeownership, maternal education, maternal age, two-parent households, and household income. On the other hand, compared to the most stable 'reference' trajectory, children who experienced a transition to very high residential mobility were likely to: have younger mothers; have a mother with a disability; experience changes in family structure; and were 2.6 times more likely to have mothers without secondary school qualifications; and 5.4 times more likely to live in private rental accommodation, and twice as likely to live in public rented accommodation (90% CI). Although not statistically significant, children in this highly mobile trajectory were more likely to have mothers who identified as Māori.



### *Residential mobility trajectories and unmet healthcare needs at 54-months*

Compared to the most stable reference trajectory, children with less stable residential mobility experiences tended to have completed a lower number of Wellchild check-ups by the 54-month wave. This negative association was strongest for children experiencing a *transition to very high residential mobility* but was also present for children in trajectories where a *transition to high residential mobility* occurred, and trajectories of *consistently low residential mobility*. A negative association (at the 90% CI level) was also identified for children in the trajectory experiencing *stability with increasing residential mobility*. A similar pattern was identified when the B4 School check was examined. Children who experienced all trajectories other than the stable reference trajectory were less likely to have completed or scheduled the B4 School check at the 54-month wave. This was strongest for children experiencing a *transition to very high residential mobility*, who were 64% less likely to have completed or scheduled the B4 School check.

### *Residential mobility trajectories and child health at 8 years*

Overall, associations between residential mobility trajectories and parent-rated child health or acute illness were not strong. Any associations were either attenuated once socioeconomic characteristics were controlled for, or if the association remained it was weaker than the association between socioeconomic characteristics and child health. Negative associations between parent-rated health and experiences of both a *transition to very high residential mobility* and a *transition to high residential mobility* were identified, however these associations did not persist when sociodemographic and housing tenure variables were included in the models. The number of different types of acute illness experienced was associated with a trajectory of *stability with increasing residential mobility*. This association persisted (but decreased in statistical significance) when sociodemographic and housing tenure variables were included in the regression model. While there was no direct association between residential mobility trajectories and the child health outcomes examined, the previously outlined findings of associations between residential mobility trajectories and both Wellchild visits and B4 School checks are still important for child health and wellbeing. This is because these scheduled visits are opportunities for children and their families to interact with medical professionals and potentially identify any issues with children's health, growth and development, hearing, vision, teeth, learning and behaviour. Picking up any potential issues early means that they are more likely to be addressed, thereby potentially preventing their exacerbation in the long term.

*Interpersonal racism, structural racism, residential mobility and child healthcare and health outcomes*

We also examined the impact of maternal experiences of interpersonal racism – both on the likelihood of children experiencing particular residential mobility trajectories, and as a factor that influences children’s unmet healthcare needs and child health. Maternal experiences of interpersonal racism were statistically significantly associated with one residential mobility trajectory – *a transition to high residential mobility* – and attenuated the relationship between maternal ethnicity and residential mobility trajectory. Overall, maternal experiences of racism at the antenatal wave were not statistically significantly associated with unmet healthcare needs such as the number of completed Wellchild check-ups or whether a B4 School check had been completed at 54-months. However, maternal experiences of interpersonal racism were associated with parent-rated health, but not the number of different acute illnesses at the eight-year study wave. Racism is an important factor in the observed ethnic differences in childhood residential mobility, unmet healthcare needs, and child health outcomes – particularly for Māori. While several of the associations with interpersonal racism may not be statistically significant, it is essential to recognise that structural racism is a key factor driving societal inequities in Aotearoa which mean that Māori mothers are much more likely to experience socioeconomic disadvantage, and worse access to the social determinants of health. On the other hand, New Zealand European / Pākehā mothers are more likely to experience socioeconomic advantage which is strongly tied to access to stable and secure housing, which is a prerequisite for residential stability.

*Implications / Policy opportunities*

Overall, this research confirms previous findings that many young children in Aotearoa are not residentially stable. Our finding that experiences of higher residential mobility were associated with unmet healthcare need also indicates that the health system needs to better account for residential mobility when providing healthcare services. These findings offer several important implications for policy. It indicates that stable housing has benefits for children’s access to healthcare and, to a lesser extent, child health. Policies should ensure that all children have access to stable housing. Public health interventions and healthcare delivery should also recognise that residential mobility may disrupt children’s access to healthcare. Models based on an assumption of residential stability will not work for everyone, and risk increasing healthcare access inequities and health inequity. Residential stability, and patterns of relatively stable housing, are associated with markers of socioeconomic advantage. Policies should therefore address socioeconomic inequities facing children and their families. There has been a small but noticeable shift towards ‘other’ forms of accommodation tenure, which appears to be

associated with an increase in residential mobility between the 54-month and 8-year study waves. Further research is needed, but the increase in 'other' forms of accommodation tenure may be associated with housing unaffordability, and a lack of available public and private rental housing. Although beyond the scope of this research, the current health system reforms – including the establishment of Te Whatu Ora and Te Aka Whai Ora, and disestablishment of District Health Boards – provide a potential opportunity to address the findings of our report more systematically. This could include through developing strategies to address the disruption that high residential mobility can have on childhood access to health services.

#### *Limitations and future directions*

We know that residential mobility is associated with child health outcomes and access to healthcare, and therefore the aim of this study was to shed light on how experiences of residential mobility are patterned across early childhood and distributed across the population. It also explored further how patterns of residential mobility are associated with child health and healthcare access. Describing these patterns is an important first step to identifying the nature and scope of this policy 'issue'. The patterns that we identified, however, are correlational and not necessarily causal, with other unmeasured or unobserved factors potentially explaining some of these associations. Future research can leverage the longitudinal features of GUiNZ and, with appropriate statistical methods, examine the extent the associations uncovered in this study are likely to be causal.

Furthermore, it is important to note that there are several limitations and caveats to this work. Overall, the models developed did not explain a large amount of the variance in the independent variables being investigated. For instance, 'Model 2' explained the largest amount of variance in residential mobility at just 8%, indicating that 92% of variance is unexplained by the model and could therefore be due to other variables that were not assessed. Models of acute illness were particularly weak, with just 0.1% - 2.2% of variance in acute illness explained, indicating that these results do need to be interpreted with caution. As noted in the introduction section, although the GUiNZ sample is nationally representative, participants were initially only drawn from the Auckland and Waikato regions, and therefore caution should be exercised when generalising research findings to a wider national context. While the drivers of residential mobility, unmet health care need, and child health are likely to be similar at a national level, there may be important regional differences in these patterns, and where possible further research should be carried out. Furthermore, there were substantial differences between the analytic sample,

and the missing sample as outlined in appendix Table A7. The ‘missing sample’ of mothers – who were excluded from the analysis due to one or more missing maternal surveys across the study period – were substantially more likely to have lower household incomes, less likely to be homeowners, had lower levels of educational attainment, were more likely to have moved to Aotearoa as an adult or child, and were more likely to identify as Māori, Asian, and in particular Pacific. For instance, in the analytic sample 9.6% of mothers identified as Pacific but triple this proportion (28.9%) identified as Pacific in the ‘missing sample’. The ‘missing sample’ was also more likely to include single-parent households, include households with other adult members, and to live in the Counties Manukau DHB region. In short, the ‘missing sample’ were more likely to show characteristics of socioeconomic disadvantage, and therefore the results presented in this report are likely to be an underestimate of the prevalence of these characteristics. Excluding these participants from the analysis, while necessitated by the methodological approach, may also have influenced the research findings. In addition, the use of antenatal housing measures in our statistical models means that any changes in these experiences over time are not reflected in the results.

It is also important to recognise that residential mobility occurs for reasons beyond those acknowledged in this report and reflected in the data collected by GUiNZ. On that note, the availability and structure of data within the GUiNZ dataset itself results in additional limitations. For instance, the way that some variables were collected (i.e., the specific questions that were asked or the way that responses have been coded) changes between collection waves, presenting a barrier to maintaining consistent variables over time. In addition, data collection waves were not set at equal time-periods (antenatal, 9-months, 24-months, 54-months, 8-years). This means that while some trends appear to accelerate with time this may just be an artefact of the increased lengths of time between the later data collection waves. Furthermore, information that is now highly topical, such as ‘emergency housing’ utilisation was not necessarily of urgent relevance at the time that the original surveys were designed. Therefore, some of the key questions of relevance for ‘policy partners’ were not able to be directly answered using the GUiNZ dataset. It would have been particularly useful to have information about the different types of ‘other’ forms of accommodation tenure, and in particular what proportion of this group consisted of ‘emergency housing’, but this level of detail was unavailable in the dataset. While there is substantial potential to incorporate geographic analysis, using Geographic Information Systems (GIS) approaches to examine the effects of changing environments on children over time, this is currently limited by the structure of the available data. Furthermore, it is of course essential to ensure that if any geospatial

information about children's residential locations is made available to researchers strict processes are followed to maintain the confidentiality, privacy, and anonymity of participants and their associated data. One example of the benefits of incorporating geospatial data into longitudinal analyses would be including information about the distances that children moved into the available datasets. This would be useful for determining whether children's environmental contexts had changed, as a proxy measure for whether whānau were likely to be using different health services, or whether they were likely to be experiencing increased transportation related barriers. Furthermore, there is the potential to incorporate 'background' geospatial data to provide additional contextual information. For example, information on the availability of health services (such as General Practitioner clinics, or Whānau Ora providers) which could be used to control for potential differences in the availability of health services in children's neighbourhoods, which may in turn influence measures of unmet health care need.

An additional potential limitation is that the health effects of early childhood residential mobility patterns may not be observed until late childhood, adolescence or even adulthood. The disruption that patterns of high residential mobility have on access to healthcare, which is observed in this study, may accumulate over the life-course resulting in poorer health outcomes later in life. For instance, fewer childhood health checks may result in missed opportunities for preventative healthcare or earlier detection of treatable health issues. Likewise, missed childhood vaccinations may result in an increased risk of disease with long term impacts. This cumulative impact of residential mobility patterns on healthcare access and then health outcomes is unlikely to have been effectively captured in the current study due to the relatively short study period of eight years. Future research using the GUiNZ longitudinal dataset could examine longer-term impacts of early childhood residential mobility. In addition, it may also be true that the measures of child health used in this study, and available within the GUiNZ dataset, may not be sensitive enough to determine differences in health outcomes related to childhood residential mobility trajectories.

Finally, arguments for early investment for longer-term fiscal return rely on research that regularly tracks children well into the future, requiring high-quality longitudinal data that is frequently collected. Aotearoa New Zealand has a legacy of producing these long-term studies (e.g., The Dunedin Study, the Christchurch Study), however, as the population diversifies, contexts changes, and ecological shocks happen (e.g., pandemics, recessions, natural disasters, climate change), new data are needed if they are to be fit for identifying policy problems and assessing impact. Indeed, the COVID-19 pandemic is a prime

example of how generations move through periods under different sets of opportunities and constraints. New Zealand lacks a comprehensive, mandated longitudinal panel data collection strategy, with the last Statistics New Zealand longitudinal survey (the Survey of Family, Income and Employment) ending in 2010. New Zealand needs a longitudinal data collection strategy that invests in the existing flagship longitudinal studies, while also preparing for the next birth cohort study on a consistent basis. Doing so is imperative for evidence-backed policy responses aimed at supporting the wellbeing of future generations and making sure there is a fair chance for all.

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## Appendix

Table A1. Sample characteristics by trajectory

Variable	Total sample		No moves (T1)	Increasing RM (T2)	One school-age move (T3)	Consistently Low RM (T4)	Transition to High RM (T5)	Transition to Very High RM (T6)
	n	% / Mean (SD)	% / Mean (SD)	% / Mean (SD)	% / Mean (SD)	% / Mean (SD)	% / Mean (SD)	% / Mean (SD)
Maternal educational attainment								
No secondary school qualification	232	4.6%	3.0%	4.2%	4.4%	5.1%	6.6%	17.0%
NCEA	1,033	20.7%	20.2%	19.1%	17.9%	23.1%	24.0%	25.0%
Diploma/Trade certificate	1,489	29.8%	30.0%	29.3%	26.7%	30.6%	31.1%	36.2%
University degree or higher	2,242	44.9%	46.7%	47.4%	51.0%	41.2%	38.3%	21.8%
Maternal age	5,006	30.8 (5.5)	32.5 (4.8)	30.6 (5.4)	31.2 (5.2)	29.4 (5.6)	28.4 (6.0)	26.8 (6.2)
Maternal nativity								
Born in NZ	3,428	68.5%	66.5%	69.4%	67.6%	68.8%	70.7%	80.9%
Moved to NZ as a child	482	9.6%	10.5%	9.9%	9.1%	8.7%	10.2%	5.3%
Moved to NZ as an adult	1,092	21.8%	23.0%	20.7%	23.4%	22.4%	19.1%	13.8%
Mother's ethnicity (prioritised)								
NZ European	2,708	56.6%	59.7%	63.2%	58.7%	56.4%	50.8%	48.9%
Māori	772	16.1%	12.5%	14.8%	13.6%	17.3%	21.3%	31.9%

Variable	n	Total sample	No moves (T1)	Increasing RM (T2)	One school-age move (T3)	Consistently Low RM (T4)	Transition to High RM (T5)	Transition to Very High RM (T6)
		% / Mean (SD)	% / Mean (SD)	% / Mean (SD)	% / Mean (SD)	% / Mean (SD)	% / Mean (SD)	% / Mean (SD)
Asian	672	14.1%	14.6%	11.3%	15.9%	13.0%	12.8%	7.4%
Other ethnicity	148	3.1%	2.8%	2.9%	2.7%	3.4%	3.4%	2.7%
Maternal experiences of (pre-birth) racism								
Racism from a health professional	138	2.8%	2.4%	3.2%	3.1%	2.4%	4.3%	3.8%
Any form of racism	1,521	30.4%	28.4%	30.4%	29.0%	30.7%	36.7%	39.2%
Housing tenure at antenatal								
Homeowner	2,690	58.8%	78.4%	52.7%	61.6%	38.4%	41.3%	31.5%
Private rental	1,649	36.1%	16.4%	43.8%	33.6%	56.0%	53.0%	58.3%
Public rental	208	4.6%	5.1%	3.4%	4.2%	4.3%	3.6%	10.1%
Other form of housing tenure	24	0.5%	0.1%	0.1%	0.6%	1.2%	2.2%	0.0%
Change in housing tenure between waves								
	4,571	0.4 (0.6)	0 (0)	0.4 (0.5)	0.3 (0.5)	0.8 (0.8)	0.7 (0.8)	1.0 (0.9)
Residential mobility at 9 months								
No moves	3,738	75.7	100.0%	64.7%	100.0%	30.8%	63.0%	43.4%
1 move	1,013	20.5	0.0%	30.7%	0.0%	64.8%	21.4%	33.5%
2 moves	142	2.9	0.0%	3.0%	0.0%	3.1%	14.6%	15.4%

3 or more moves	46	0.9	0.0%	1.6%	0.0%	1.4%	1.0%	7.7%
Variable	Total sample		No moves (T1)	Increasing RM (T2)	One school-age move (T3)	Consistently Low RM (T4)	Transition to High RM (T5)	Transition to Very High RM (T6)
Change in residential mobility categories between waves								
	4,478	0.8 (0.8)	0 (0)	1.4 (0.5)	1.0 (0)	1.1 (0.6)	1.8 (0.4)	1.9 (0.3)
Household income at antenatal								
<\$20k	99	2.5%	1.7%	2.4%	2.4%	3.5%	2.9%	5.6%
\$20k-30k	158	3.9%	3.5%	2.4%	2.7%	6.4%	5.2%	7.9%
\$30k-50k	468	11.6%	11.1%	9.7%	9.6%	12.6%	17.6%	19.8%
\$50k-70k	621	15.4%	14.7%	15.7%	15.0%	15.1%	17.6%	20.6%
\$70k-100k	986	24.5%	25.2%	24.5%	24.5%	24.3%	23.2%	20.6%
\$100k-150k	1,013	25.2%	25.1%	26.7%	27.7%	24.6%	21.6%	16.7%
>\$150k	678	16.9%	18.7%	18.7%	18.2%	13.6%	11.8%	8.7%
Area-level deprivation at antenatal								
Mean (SD) NZDep	5,004	5.6 (2.9)	5.4 (2.9)	5.4 (2.8)	5.6 (2.8)	5.8 (2.8)	5.9 (2.9)	6.5 (2.7)
NZDep Q1	973	19.4%	20.9%	20.1%	18.2%	16.0%	15.7%	11.6%
NZDep Q2	1,055	21.1%	22.7%	20.7%	20.1%	20.7%	20.0%	15.3%
NZDep Q3	930	18.6%	17.6%	20.4%	20.2%	18.4%	19.3%	18.5%
NZDep Q4	997	19.9%	17.7%	21.8%	21.7%	23.0%	19.1%	24.3%
NZDep Q5	1,049	21.0%	21.0%	17.2%	19.8%	21.9%	25.8%	30.2%

Variable	Total sample	No moves (T1)	Increasing RM (T2)	One school-age move (T3)	Consistently Low RM (T4)	Transition to High RM (T5)	Transition to Very High RM (T6)	
Child sex								
Male	2,560	51.1%	51.9%	51.2%	50.8%	49.2%	50.5%	55.0%
Female	2,446	48.9%	48.1%	48.8%	49.2%	50.8%	49.5%	45.0%
Family structure at antenatal								
Single-parent household	347	7.1%	4.1%	6.5%	5.2%	10.7%	13.1%	15.3%
Two-parent household	4,545	92.9%	95.9%	93.5%	94.8%	89.3%	86.9%	84.7%
Adult household members at antenatal								
No other adult household members	3,740	74.8%	80.3%	75.1%	79.9%	67.9%	62.7%	59.0%
Other adult household members	1,262	25.2%	19.7%	24.9%	20.1%	32.1%	37.3%	41.0%
Urbanicity at antenatal								
Urban	4,595	91.8%	89.9%	93.3%	92.4%	92.8%	93.7%	89.9%
Rural	411	8.2%	10.1%	6.7%	7.6%	7.2%	6.3%	10.1%
District Health Board region								
Auckland/Waitemata	1,865	37.3%	35.5%	39.4%	41.3%	37.7%	35.3%	28.6%
Counties Manukau	1,621	32.4%	35.8%	29.1%	31.9%	29.8%	30.9%	34.9%
Waikato	1,520	30.4%	28.7%	31.4%	26.8%	32.5%	33.8%	36.5%

Table A2. Multinomial regression predicting residential mobility trajectory (ref: stable trajectory (T1))

Variables	Model 1 - Socioeconomic characteristics					Model 2 - Socioeconomic characteristics and housing tenure					Model 3 - Socioeconomic characteristics, housing tenure, and experiences of racism				
	Increasing RM (T2)	One school-age move (T3)	Consistently Low RM (T4)	Transition to High RM (T5)	Transition to Very High RM (T6)	Increasing RM (T2)	One school-age move (T3)	Consistently Low RM (T4)	Transition to High RM (T5)	Transition to Very High RM (T6)	Increasing RM (T2)	One school-age move (T3)	Consistently Low RM (T4)	Transition to High RM (T5)	Transition to Very High RM (T6)
	RRR	RRR	RRR	RRR	RRR	RRR	RRR	RRR	RRR	RRR	RRR	RRR	RRR	RRR	RRR
Mother's prioritised ethnic identification (ref: NZ European/Pākehā)															
Māori	1.01 (0.13)	1.03 (0.15)	1.00 (0.14)	1.24 (0.21)	1.37 (0.30)	0.84 (0.11)	0.91 (0.14)	0.77+ (0.11)	1.00 (0.18)	1.08 (0.24)	0.82 (0.11)	0.91 (0.14)	0.76+ (0.11)	0.94 (0.17)	1.02 (0.23)
Pacific	0.60** (0.11)	0.82 (0.16)	0.59** (0.10)	0.70 (0.16)	0.40** (0.14)	0.52** (0.09)	0.73 (0.14)	0.49** (0.09)	0.61* (0.14)	0.34** (0.12)	0.51** (0.09)	0.73 (0.14)	0.49*** (0.09)	0.59* (0.14)	0.33** (0.11)
Asian	0.55** (0.09)	0.96 (0.16)	0.56*** (0.09)	0.67+ (0.15)	0.39* (0.15)	0.54** (0.09)	0.94 (0.16)	0.56** (0.10)	0.67+ (0.15)	0.39* (0.15)	0.53** (0.09)	0.94 (0.16)	0.55*** (0.10)	0.64+ (0.15)	0.38* (0.15)
MELAA and Other	1.02 (0.25)	1.01 (0.28)	1.17 (0.29)	1.54 (0.50)	1.39 (0.67)	0.94 (0.23)	0.94 (0.26)	1.03 (0.27)	1.37 (0.45)	1.27 (0.62)	0.93 (0.23)	0.94 (0.26)	1.03 (0.27)	1.34 (0.44)	1.25 (0.61)
Maternal age (years)															
	0.92** (0.01)	0.94** (0.01)	0.90*** (0.01)	0.88** (0.01)	0.86** (0.02)	0.94** (0.01)	0.95** (0.01)	0.92** (0.01)	0.90** (0.01)	0.88** (0.02)	0.94** (0.01)	0.95** (0.01)	0.92*** (0.01)	0.90** (0.01)	0.88** (0.02)



Variables	(T2)	(T3)	(T4)	(T5)	(T6)	(T2)	(T3)	(T4)	(T5)	(T6)	(T2)	(T3)	(T4)	(T5)	(T6)
Maternal education (ref: University degree or higher)															
None	1.11	1.08	1.01	1.02	3.11** *	0.98	1.00	0.89	0.95	2.60**	0.99	1.00	0.90	0.97	2.66**
	(0.26)	(0.27)	(0.24)	(0.30)	(1.06)	(0.24)	(0.26)	(0.22)	(0.28)	(0.90)	(0.24)	(0.26)	(0.22)	(0.29)	(0.92)
NCEA	0.85	0.74*	0.94	0.85	1.25	0.83	0.73*	0.92	0.84	1.20	0.83	0.73*	0.92	0.85	1.22
	(0.10)	(0.10)	(0.11)	(0.14)	(0.32)	(0.10)	(0.10)	(0.12)	(0.14)	(0.31)	(0.10)	(0.10)	(0.12)	(0.14)	(0.31)
Diplom a	0.91	0.77*	0.91	0.84	1.41	0.87	0.76*	0.85	0.81	1.28	0.87	0.76*	0.85	0.81	1.29
	(0.09)	(0.09)	(0.10)	(0.12)	(0.32)	(0.09)	(0.09)	(0.10)	(0.12)	(0.30)	(0.09)	(0.09)	(0.10)	(0.12)	(0.30)
Maternal migrant status (ref: born in NZ)															
Moved to NZ <18	1.02	0.82	0.85	0.91	0.56	1.06	0.83	0.87	0.93	0.57	1.05	0.84	0.87	0.91	0.56
	(0.15)	(0.13)	(0.13)	(0.18)	(0.20)	(0.16)	(0.14)	(0.14)	(0.19)	(0.21)	(0.16)	(0.14)	(0.14)	(0.19)	(0.21)
Moved to NZ >=1 8	1.18	1.00	1.28+	1.08	1.04	0.99	0.90	1.01	0.87	0.84	1.00	0.90	1.01	0.87	0.85
	(0.15)	(0.14)	(0.17)	(0.20)	(0.31)	(0.13)	(0.12)	(0.14)	(0.16)	(0.25)	(0.13)	(0.12)	(0.14)	(0.17)	(0.25)
Mother has a disability (ref: no disability)															
	1.11	1.02	1.03	0.92	1.92**	1.05	0.99	0.95	0.87	1.75*	1.04	0.99	0.95	0.85	1.70*
	(0.17)	(0.17)	(0.17)	(0.21)	(0.48)	(0.17)	(0.17)	(0.16)	(0.20)	(0.45)	(0.16)	(0.17)	(0.16)	(0.20)	(0.44)
Maternal employment (ref: Not in labour force)															
Full- time	0.87	0.88	0.93	0.83	0.89	0.82+	0.85	0.85	0.77	0.84	0.82+	0.85	0.85	0.77	0.84
	(0.10)	(0.11)	(0.11)	(0.14)	(0.20)	(0.10)	(0.11)	(0.11)	(0.13)	(0.19)	(0.10)	(0.11)	(0.11)	(0.13)	(0.19)

Variables	(T2)	(T3)	(T4)	(T5)	(T6)	(T2)	(T3)	(T4)	(T5)	(T6)	(T2)	(T3)	(T4)	(T5)	(T6)
Part-time	0.85 (0.11)	0.88 (0.12)	0.75* (0.10)	0.95 (0.17)	0.65 (0.18)	0.86 (0.11)	0.88 (0.12)	0.76+ (0.11)	0.94 (0.17)	0.66 (0.18)	0.86 (0.11)	0.88 (0.12)	0.76+ (0.11)	0.94 (0.17)	0.66 (0.18)
Unemployed	1.09 (0.22)	1.01 (0.23)	1.08 (0.21)	1.14 (0.28)	0.78 (0.26)	1.08 (0.22)	1.01 (0.23)	1.07 (0.22)	1.13 (0.28)	0.78 (0.27)	1.08 (0.22)	1.01 (0.23)	1.07 (0.22)	1.11 (0.28)	0.77 (0.26)
Household income at antenatal															
	1.05 (0.04)	1.03 (0.04)	0.97 (0.04)	0.97 (0.05)	0.92 (0.07)	1.17** *	1.11* (0.05)	1.14** (0.05)	1.11+ (0.06)	1.06 (0.08)	1.17** *	1.11* (0.05)	1.14** (0.05)	1.11+ (0.06)	1.06 (0.08)
Two-parent family at antenatal (ref: single parent family)															
	0.86 (0.17)	0.86 (0.19)	0.71+ (0.14)	0.72 (0.16)	1.29 (0.37)	0.74 (0.15)	0.79 (0.18)	0.58** (0.12)	0.58* (0.14)	1.09 (0.32)	0.75 (0.15)	0.79 (0.18)	0.58** (0.12)	0.58* (0.14)	1.09 (0.32)
Number of family structure changes over study period															
	1.24* (0.11)	1.20+ (0.12)	1.37*** (0.13)	1.56** *	2.09** *	1.20+ (0.11)	1.17 (0.12)	1.32** (0.13)	1.51** *	2.04** *	1.20+ (0.11)	1.17 (0.12)	1.32** (0.13)	1.51** *	2.03** *
Other household members at antenatal (ref: no other members)															
	1.17 (0.30)	0.73 (0.20)	0.93 (0.24)	1.13 (0.37)	1.20 (0.55)	1.31 (0.34)	0.77 (0.22)	1.07 (0.28)	1.28 (0.43)	1.43 (0.66)	1.30 (0.34)	0.77 (0.22)	1.06 (0.28)	1.28 (0.43)	1.42 (0.66)
Proportion of waves spent living in households with other adult members															

	1.01	1.07	1.17+	1.12	1.07	1.03	1.08	1.21*	1.14	1.08	1.03	1.08	1.21*	1.15	1.08
	(0.09)	(0.10)	(0.10)	(0.12)	(0.17)	(0.09)	(0.10)	(0.11)	(0.13)	(0.17)	(0.09)	(0.10)	(0.11)	(0.13)	(0.17)
Variables	(T2)	(T3)	(T4)	(T5)	(T6)	(T2)	(T3)	(T4)	(T5)	(T6)	(T2)	(T3)	(T4)	(T5)	(T6)
Child has siblings (ref: no siblings)															
	0.88*	0.91+	0.94	0.91	0.75**	0.88*	0.90+	0.94	0.92	0.75**	0.88*	0.90+	0.94	0.92	0.76**
	(0.05)	(0.05)	(0.05)	(0.06)	(0.08)	(0.05)	(0.05)	(0.05)	(0.07)	(0.08)	(0.05)	(0.05)	(0.05)	(0.07)	(0.08)
Child female (ref: male)															
	1.03	1.05	1.11	1.04	0.82	1.02	1.05	1.09	1.03	0.82	1.02	1.05	1.10	1.02	0.82
	(0.08)	(0.09)	(0.09)	(0.12)	(0.13)	(0.08)	(0.09)	(0.10)	(0.12)	(0.13)	(0.08)	(0.09)	(0.10)	(0.12)	(0.13)
Child age deviation from interview wave															
	1.07+	1.11**	1.05	1.10*	1.24**	1.07*	1.11**	1.06+	1.12**	1.24**	1.07*	1.11**	1.06+	1.12**	1.24**
	(0.03)	(0.04)	(0.04)	(0.05)	(0.06)	(0.04)	(0.04)	(0.04)	(0.05)	(0.06)	(0.04)	(0.04)	(0.04)	(0.05)	(0.06)
Area-level socioeconomic deprivation at antenatal															
	0.98	1.02	0.99	0.98	1.03	0.99	1.02	1.00	0.99	1.04	0.99	1.02	1.00	0.99	1.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)
Lived in a rural area at antenatal (ref: lives in an urban area)															
	0.57**					0.49**		0.55**			0.49**				
	*	0.79	0.65**	0.54**	0.92	*	0.73+	*	0.47**	0.78	*	0.73+	0.54***	0.46**	0.78
	(0.09)	(0.14)	(0.11)	(0.13)	(0.27)	(0.08)	(0.13)	(0.10)	(0.11)	(0.23)	(0.08)	(0.13)	(0.10)	(0.11)	(0.23)

Variables	(T2)	(T3)	(T4)	(T5)	(T6)	(T2)	(T3)	(T4)	(T5)	(T6)	(T2)	(T3)	(T4)	(T5)	(T6)
District Health Board region at antenatal (ref: Auckland/Waitemata)															
Counties															
Manukau	0.67** *	0.73**	0.58***	0.57** *	0.53**	0.78*	0.81+	0.71**	0.67**	0.65*	0.78*	0.81+	0.71**	0.67**	0.64*
	(0.07)	(0.08)	(0.06)	(0.08)	(0.12)	(0.08)	(0.09)	(0.08)	(0.10)	(0.14)	(0.08)	(0.09)	(0.08)	(0.10)	(0.14)
Waikato	0.91	0.76*	0.84	0.87	0.72	1.07	0.85	1.04	1.03	0.88	1.06	0.85	1.03	1.01	0.86
	(0.10)	(0.09)	(0.10)	(0.13)	(0.16)	(0.12)	(0.11)	(0.13)	(0.16)	(0.20)	(0.12)	(0.11)	(0.13)	(0.16)	(0.20)
Housing tenure at antenatal (ref: homeowners)															
Private rental						3.99** *	2.50** *	6.15** *	4.88** *	5.40** *	3.98** *	2.50** *	6.15***	4.86** *	5.36** *
						(0.42)	(0.29)	(0.68)	(0.69)	(1.10)	(0.42)	(0.29)	(0.68)	(0.69)	(1.10)
Public rental						1.41	1.33	1.65*	0.99	2.06+	1.41	1.33	1.65*	0.99	2.06+
						(0.36)	(0.34)	(0.41)	(0.35)	(0.78)	(0.36)	(0.34)	(0.41)	(0.35)	(0.78)
Other form of tenure						2.64	7.55+	18.37* *	21.59* *	0.00	2.68	7.57+	18.55**	22.02* *	0.00
						(3.49)	(7.83)	(18.05)	(21.63)	(0.21)	(3.54)	(7.85)	(18.24)	(22.12)	(0.21)
Maternal experiences of racial discrimination at antenatal (ref: no experience of racism)											1.08	1.00	1.02	1.27+	1.27
											(0.10)	(0.10)	(0.10)	(0.16)	(0.22)
Constant	12.81**	4.38**	27.70** *	25.58**	12.92**	3.34**	1.87	4.19**	5.13**	2.46	3.26**	1.88	4.16**	4.75**	2.28

	(5.20)	(1.98)	(11.36)	(13.39)	(9.30)	(1.44)	(0.88)	(1.84)	(2.83)	(1.86)	(1.41)	(0.88)	(1.83)	(2.63)	(1.73)
Pseudo R <sup>2</sup>	.047	.047	.047	.047	0.047	.075	.075	.075	.075	.075	.075	.075	.075	.075	.075
N	5,006	5,006	5,006	5,006	5,006	5,006	5,006	5,006	5,006	5,006	5,006	5,006	5,006	5,006	5,006

Note: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. Standard errors in parentheses.

Table A3. OLS regression predicting number of Wellchild check-ups completed by 54-months

Variables	Model 1	Model 2	Model 3
	Residential mobility trajectories	Trajectories + sociodemographic	Trajectories + sociodemographic + housing tenure
Residential mobility trajectory (ref: No moves (T1))			
Stability with increasing residential mobility (T2)	-0.07+ (0.04)	-0.06 (0.04)	-0.08+ (0.04)
One school-age move (T3)	-0.01 (0.05)	-0.01 (0.05)	-0.02 (0.05)
Consistently low residential mobility (T4)	-0.15*** (0.04)	-0.12** (0.04)	-0.14** (0.05)
Transition to high residential mobility (T5)	-0.17** (0.06)	-0.13* (0.06)	-0.14* (0.06)
Transition to very high residential mobility (T6)	-0.24** (0.08)	-0.16* (0.08)	-0.18* (0.08)
Mother's prioritised ethnic identification (ref: NZ European/Pākehā)			
Māori		-0.09+ (0.05)	-0.10* (0.05)
Pacific		0.05 (0.06)	0.04 (0.06)
Asian		-0.01 (0.06)	-0.01 (0.06)
MELAA and Other		-0.02 (0.09)	-0.02 (0.09)
Maternal education (ref: University degree or higher)			
No secondary school qualifications		-0.16* (0.08)	-0.16* (0.08)
Secondary school / NCEA		0.00 (0.04)	-0.00 (0.04)

<b>Variables</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
Diploma / Trade certificate		-0.02 (0.04)	-0.02 (0.04)
Maternal migrant status (ref: born in NZ)			
Moved to NZ aged 0-18 years		-0.04 (0.05)	-0.04 (0.05)
Moved to NZ aged 18 years or older		-0.08+ (0.05)	-0.08+ (0.05)
Maternal employment (ref: Not in labour force)			
Employed full-time		0.04 (0.04)	0.04 (0.04)
Employed part-time		0.02 (0.05)	0.02 (0.05)
Unemployed		0.06 (0.07)	0.06 (0.07)
Maternal age (years)		-0.00 (0.00)	-0.00 (0.00)
Mother has a disability (ref: no disability)		0.00 (0.05)	0.00 (0.06)
Maternal experiences of racial discrimination at antenatal (ref: no experience of racism)		-0.05 (0.03)	-0.05 (0.03)
Household income at antenatal		0.04* (0.01)	0.04** (0.01)
Two-parent family at antenatal (ref: single parent family)		0.06 (0.06)	0.05 (0.07)
Number of family structure changes over study period		-0.03 (0.03)	-0.03 (0.03)

Variables	Model 1	Model 2	Model 3
Other household members at antenatal (ref: no other members)		0.05 (0.09)	0.06 (0.09)
Proportion of waves spent living in households with other adult members		-0.03 (0.03)	-0.03 (0.03)
Child has siblings (ref: no siblings)		-0.02 (0.02)	-0.02 (0.02)
Child age deviation from interview wave		0.00 (0.01)	0.00 (0.01)
Child female (ref: male)		-0.04 (0.03)	-0.04 (0.03)
Area-level socioeconomic deprivation at antenatal		0.01 (0.01)	0.01 (0.01)
Lived in a rural area at antenatal (ref: lives in an urban area)		-0.15** (0.06)	-0.15** (0.06)
District Health Board region at antenatal (ref: Auckland/Waitemata) Counties Manukau		0.14*** (0.04)	0.15*** (0.04)
Waikato		-0.14*** (0.04)	-0.13*** (0.04)
Housing tenure at antenatal (ref: homeowners) Private rental			0.06 (0.04)
Public rental			0.05 (0.09)
Other form of accommodation tenure			0.16 (0.22)
Constant	7.95***	7.88***	7.83***



	(0.02)	(0.15)	(0.15)
R <sup>2</sup>	.005	.030	.031
N	5,006	5,006	5,006

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*Note:* \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. Standard errors in parentheses.

Table A4. Logistic regression predicting complete (or booked) B4 School check at 54-months

Variables	Model 1	Model 2	Model 3
	RM trajectories	Trajectories + sociodemographic	Trajectories + sociodemographic + housing tenure
Residential mobility trajectory (ref: Stable (T1))			
Stability with increasing RM (T2)	0.80* (0.08)	0.80* (0.08)	0.76** (0.08)
One school-age move (T3)	0.83+ (0.09)	0.83 (0.09)	0.81+ (0.09)
Consistently Low RM (T4)	0.70*** (0.07)	0.69*** (0.07)	0.64*** (0.07)
Transition to High RM (T5)	0.77* (0.10)	0.75* (0.10)	0.70* (0.10)
Transition to Very High RM (T6)	0.44*** (0.07)	0.38*** (0.07)	0.36*** (0.07)
Mother's prioritised ethnic identification (ref: NZ European/Pākehā)			
Māori		0.78* (0.09)	0.77* (0.09)
Pacific		0.83 (0.12)	0.84 (0.13)
Asian		1.28+ (0.18)	1.28+ (0.18)
MELAA and Other		1.28 (0.28)	1.27 (0.28)
Maternal education (ref: University degree or higher)			
No secondary school qualifications		1.08 (0.21)	1.07 (0.21)
Secondary school / NCEA		0.97	0.97

		(0.10)	(0.10)
Diploma / Trade certificate		1.04	1.03
		(0.09)	(0.09)
<b>Variables</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
Maternal migrant status (ref: born in NZ)			
Moved to NZ aged 0-18 years		0.98	0.98
		(0.12)	(0.12)
Moved to NZ aged 18 years or older		1.13	1.10
		(0.12)	(0.12)
Maternal employment (ref: Not in labour force)			
Employed full-time		1.19+	1.17
		(0.12)	(0.12)
Employed part-time		1.16	1.15
		(0.13)	(0.13)
Unemployed		1.09	1.08
		(0.18)	(0.18)
Maternal age (years)		0.97***	0.98**
		(0.01)	(0.01)
Mother has a disability (ref: no disability)		1.09	1.08
		(0.14)	(0.14)
Maternal experiences of racial discrimination at antenatal (ref: no experience of racism)		0.89	0.89
		(0.07)	(0.07)
Household income at antenatal		1.00	1.02
		(0.03)	(0.04)
Two-parent family at antenatal (ref: single parent family)		1.16	1.12
		(0.17)	(0.17)
Number of family structure changes over study period		0.89	0.89
		(0.06)	(0.06)
Other household members at antenatal (ref: no other members)		1.20	1.23

		(0.25)	(0.26)
<b>Variables</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
Proportion of waves spent living in households with other adult members		0.90	0.90
		(0.06)	(0.06)
Child has siblings (ref: no siblings)		0.90*	0.91*
		(0.04)	(0.04)
Child age deviation from interview wave		1.04	1.05+
		(0.03)	(0.03)
Child female (ref: male)		0.97	0.97
		(0.07)	(0.07)
Area-level socioeconomic deprivation at antenatal		1.01	1.01
		(0.01)	(0.01)
Lived in a rural area at antenatal (ref: lives in an urban area)		0.76*	0.75*
		(0.10)	(0.10)
District Health Board region at antenatal (ref: Auckland/Waitematā) Counties Manukau		3.75***	3.81***
		(0.36)	(0.37)
Waikato		2.40***	2.43***
		(0.23)	(0.23)
Housing tenure at antenatal (ref: homeowners) Private rental			1.24*
			(0.11)
Public rental			0.87
			(0.17)
Other form of accommodation tenure			1.16
			(0.62)
Constant	4.08***	4.92***	4.24***
	(0.24)	(1.70)	(1.51)
Pseudo R <sup>2</sup>	.006	.060	.062

Observations	4,981	4,981	4,981
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*Note:* \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ , +  $p < 0.1$ . Standard errors in parentheses

Table A5: OLS regression predicting parent-rated child health at 8 years

Variables (measured at antenatal wave unless otherwise stated)	Model 1 Residential mobility trajectories	Model 2 Trajectories + sociodemographic	Model 3 Trajectories + sociodemographic + housing tenure	Model 4 Trajectories + sociodemographic + housing tenure + healthcare access
Residential mobility trajectory (ref: Stable (T1))				
Stability with increasing residential mobility (T2)	0.04 (0.03)	0.04 (0.03)	0.05 (0.03)	0.05 (0.03)
One school-age move (T3)	-0.03 (0.04)	-0.01 (0.04)	-0.00 (0.04)	-0.01 (0.04)
Consistently low residential mobility (T4)	-0.04 (0.03)	0.01 (0.03)	0.01 (0.04)	0.01 (0.04)
Transition to high residential mobility (T5)	-0.12** (0.05)	-0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)
Transition to very high residential mobility (T6)	-0.17** (0.06)	-0.02 (0.07)	-0.02 (0.07)	-0.02 (0.07)
Mother's prioritised ethnic identification (ref: NZ European/Pākehā)				
Māori		-0.11** (0.04)	-0.11** (0.04)	-0.11** (0.04)
Pacific		-0.23*** (0.05)	-0.23*** (0.05)	-0.23*** (0.05)
Asian		-0.25*** (0.05)	-0.25*** (0.05)	-0.25*** (0.05)
MELAA and Other		0.07 (0.07)	0.07 (0.07)	0.07 (0.07)
Maternal education (ref: University degree or higher)				
No secondary school qualifications		-0.03 (0.06)	-0.03 (0.06)	-0.03 (0.06)
Secondary school / NCEA		0.03 (0.03)	0.03 (0.03)	0.03 (0.03)
Diploma / Trade certificate		-0.01 (0.03)	-0.01 (0.03)	-0.01 (0.03)
Maternal migrant status (ref: born in NZ)				
Moved to NZ aged 0-18 years		0.07+ (0.04)	0.07+ (0.04)	0.07+ (0.04)
Moved to NZ aged 18 years or older		0.02 (0.04)	0.02 (0.04)	0.02 (0.04)
Maternal employment (ref: Not in labour force)				
Employed full-time		-0.01 (0.03)	-0.01 (0.03)	-0.01 (0.03)
Employed part-time		0.01 (0.04)	0.01 (0.04)	0.01 (0.04)
Unemployed		0.00 (0.06)	0.00 (0.06)	0.01 (0.06)
Maternal age (years)		0.00+ (0.00)	0.00+ (0.00)	0.00+ (0.00)
Mother has a disability (ref: no disability)		-0.06 (0.04)	-0.06 (0.04)	-0.06 (0.04)

Variable	Model 1	Model 2	Model 3	Model 4
Maternal experiences of racial discrimination (ref: no experience of racism)		-0.08** (0.03)	-0.08** (0.03)	-0.08** (0.03)
Household income		0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
Two-parent family (ref: single parent family)		0.10+ (0.05)	0.10+ (0.05)	0.10+ (0.05)
Number of family structure changes over study period		-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
Other household members (ref: no other members)		-0.03 (0.07)	-0.03 (0.07)	-0.03 (0.07)
Proportion of waves spent living in households with other adult members		-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)
Child has siblings (ref: no siblings)		0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Child age deviation from interview wave		-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
Child female (ref: male)		0.08*** (0.02)	0.08*** (0.02)	0.08*** (0.02)
Area-level socioeconomic deprivation		-0.01* (0.00)	-0.01* (0.00)	-0.01* (0.00)
Lived in a rural area (ref: lives in an urban area)		0.04 (0.04)	0.05 (0.04)	0.04 (0.04)
District Health Board region (ref: Auckland/Waitemata)				
Counties Manukau		-0.06+ (0.03)	-0.06+ (0.03)	-0.06+ (0.03)
Waikato		-0.02 (0.03)	-0.03 (0.03)	-0.03 (0.03)
Housing tenure (ref: homeowners)				
Private rental			-0.02 (0.03)	-0.02 (0.03)
Public rental			-0.03 (0.07)	-0.03 (0.07)
Other form of accommodation tenure			0.12 (0.18)	0.12 (0.18)
Number of completed Wellchild checks at 54-months				-0.01 (0.01)
Constant	4.30*** (0.02)	3.95*** (0.12)	3.96*** (0.12)	4.06*** (0.15)
R <sup>2</sup>	.004	.067	.068	.068
N	4,612	4,612	4,612	4,612

Note: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. Standard errors in parentheses

Table A6. OLS regression predicting number of different types of acute illnesses at 8 years

Variables	Model 1	Model 2	Model 3	Model 4
	Residential mobility trajectories	Trajectories + sociodemographic	Trajectories + sociodemographic + housing tenure	Trajectories + sociodemographic housing tenure + healthcare access
Residential mobility trajectory (ref: Stable (T1))				
Stability with increasing RM (T2)	0.06* (0.03)	0.06* (0.03)	0.05+ (0.03)	0.05+ (0.03)
One school-age move (T3)	0.04 (0.03)	0.05+ (0.03)	0.05 (0.03)	0.05 (0.03)
Consistently Low RM (T4)	0.03 (0.03)	0.04 (0.03)	0.03 (0.03)	0.02 (0.03)
Transition to High RM (T5)	0.03 (0.04)	0.03 (0.04)	0.02 (0.04)	0.02 (0.04)
Transition to Very High RM (T6)	0.02 (0.05)	0.01 (0.05)	-0.00 (0.05)	-0.01 (0.05)
Mother's prioritised ethnic identification (ref: NZ European/Pākehā)				
Māori		0.01 (0.03)	0.01 (0.03)	0.01 (0.03)
Pacific		0.00 (0.04)	0.01 (0.04)	0.01 (0.04)
Asian		-0.14*** (0.04)	-0.14*** (0.04)	-0.14*** (0.04)
MELAA and Other		-0.04 (0.06)	-0.04 (0.06)	-0.04 (0.06)
Maternal education (ref: University degree or higher)				
No secondary school qualifications		0.00 (0.05)	0.00 (0.05)	0.00 (0.05)
Secondary school / NCEA		0.00	0.01	0.01



	(0.03)	(0.03)	(0.03)
Diploma / Trade certificate	0.03	0.03	0.03
	(0.02)	(0.02)	(0.02)
<b>Variables</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
<b>Model 4</b>			
Maternal migrant status (ref: born in NZ)			
Moved to NZ aged 0-18 years	-0.04	-0.04	-0.04
	(0.03)	(0.03)	(0.03)
Moved to NZ aged 18 years or older	-0.08**	-0.09**	-0.09**
	(0.03)	(0.03)	(0.03)
Maternal employment (ref: Not in labour force)			
Employed full-time	0.02	0.02	0.02
	(0.03)	(0.03)	(0.03)
Employed part-time	0.04	0.04	0.04
	(0.03)	(0.03)	(0.03)
Unemployed	0.01	0.01	0.01
	(0.05)	(0.05)	(0.05)
Maternal age (years)	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)
Mother has a disability (ref: no disability)	0.04	0.04	0.04
	(0.03)	(0.03)	(0.03)
Maternal experiences of racial discrimination at antenatal (ref: no experience of racism)	0.05	0.05	0.05
	(0.06)	(0.06)	(0.06)
Household income at antenatal	-0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)
Two-parent family at antenatal (ref: single parent family)	0.02	0.01	0.01
	(0.04)	(0.04)	(0.04)

<b>Variables</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
Number of family structure changes over study period	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)
Other household members at antenatal (ref: no other members)	-0.00 (0.06)	0.00 (0.06)	0.00 (0.06)	0.00 (0.06)
Proportion of waves spent living in households with other adult members	-0.00 (0.06)	-0.00 (0.06)	-0.00 (0.06)	-0.00 (0.06)
Child has siblings (ref: no siblings)	-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)
Child age deviation from interview wave	-0.00* (0.00)	-0.00* (0.00)	-0.00* (0.00)	-0.00* (0.00)
Child female (ref: male)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
Area-level socioeconomic deprivation at antenatal	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Lived in a rural area at antenatal (ref: lives in an urban area)	0.04 (0.04)	0.03 (0.04)	0.03 (0.04)	0.03 (0.04)
District Health Board region at antenatal (ref: Auckland/Waitemata)				
Counties Manukau	-0.00 (0.02)	0.00 (0.02)	0.00 (0.02)	0.00 (0.02)
Waikato	-0.02 (0.03)	-0.02 (0.03)	-0.02 (0.03)	-0.02 (0.03)
Housing tenure at antenatal (ref: homeowners)				
Private rental		0.04 (0.02)	0.04 (0.02)	0.04 (0.02)
Public rental		-0.08	-0.08	-0.08

			(0.06)	(0.06)
Other form of accommodation tenure			-0.14	-0.14
			(0.14)	(0.14)
<b>Variables</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
Number of completed Wellchild checks				-0.01
				(0.01)
Constant	0.37***	0.32**	0.30**	0.35**
	(0.02)	(0.10)	(0.10)	(0.12)
R <sup>2</sup>	.001	.020	.022	.022
N	4,561	4,561	4,561	4,561

*Note:* \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. Standard errors in parentheses

Table A7. Antenatal characteristics of analytic sample versus missing sample

Variable	Analytic sample		Missing sample	
	n	% / Mean	n	% / Mean
Neighbourhood deprivation (1-10 scale)	5004	5.6	1840	7.3
Household income				
\$20,000 or less	99	2.5	121	10.0
\$20,001 - \$30,000	158	3.9	133	11.0
\$30,001 - \$50,000	468	11.6	263	21.8
\$50,001 - \$70,000	621	15.4	240	19.9
\$70,001 - \$100,000	986	24.5	227	18.8
\$100,001 - \$150,000	1013	25.2	146	12.1
More than \$150,000	678	16.9	75	6.2
Housing tenure				
Homeownership	2690	58.8	544	33.4
Private rental	1649	36.1	782	48.0
Public rental	208	4.6	275	16.9
Other'	24	0.5	27	1.7
Maternal educational attainment				
No secondary school qualification	232	4.6	254	13.9
Secondary school qualification/NCEA	1033	20.7	591	32.3
Diploma/Trade certificate	1489	29.8	606	33.1
University degree or higher	2242	44.9	380	20.8
Maternal age at antenatal (years)	5006	30.8	1840	28.0
Maternal migrant status				
Born in NZ	3428	68.5	971	52.9
Moved to NZ between 0-18 years old	482	9.6	261	14.2
Moved to NZ after 18 years old	1092	21.8	605	32.9
Maternal disability	289	6.3	96	5.9

Variable	Analytic sample		Missing sample	
	n	% / Mean	n	% / Mean
NZ European / Pākehā	2928	58.5	378	20.6
Māori	772	15.4	488	26.6
Pacific	482	9.6	531	28.9
Asian	672	13.4	368	20.0
MELAA and Other	148	3.0	71	3.9
Two-parent household	4545	92.9	1461	83.4
Other adult household members	1262	25.2	855	46.5
Number of siblings at antenatal	4571	1.1	1628	1.4
Rural residence	411	8.2	62	3.4
District Health Board region	5006		1840	
Auckland/Waitemātā	1865	37.3	573	31.1
Counties Manukau	1621	32.4	891	48.4
Waikato	1520	30.4	367	19.9

Table A8. Antenatal characteristics of analytical sample versus New Zealand Census 2018 figures

Variable	Analytical sample		Census 2018: Auckland, Counties Manukau, Waikato		Census 2018: New Zealand		Notes on data
	n	% / Mean	n	% / Mean	n	% / Mean	
Child ethnicity							
NZ European / Other ethnicity			15,030	57.8	40,704	69.4	Census: Children aged less than 1 years (2018)
Māori			5,952	22.9	16,287	27.8	
Pacific			5,646	21.7	8,550	14.6	
Asian			7,275	28.0	11,151	19.0	
Mother's ethnicity							
NZ European / Other ethnicity	3,076	61.5	155,742	52.2	411,999	64.7	Census: Ethnic identity for all women aged between 20-39 years (2018) GUiNZ: Mother's ethnicity at antenatal
Māori	772	15.4	41,682	14.0	108,954	17.1	
Pacific	482	9.6	39,774	13.3	55,995	8.8	
Asian	672	13.4	97,515	32.7	143,694	22.6	
Child sex							
Female	2,446	48.9	12,648	48.7	28,656	48.8	Census: Children aged less than 1 years (2018)
Male	2,560	51.1	13,341	51.3	30,009	51.2	
District Health Board Region							
Auckland/Waitematā	1,865	37.3	12,705	48.9			Census: Children aged less than 1 years (2018)
Counties Manukau	1,621	32.3	7,854	30.2			

Variable	Analytical sample	Census 2018: Auckland, Counties Manukau, Waikato	Census 2018: New Zealand	Notes on data			
Waikato	1,520	30.4	5,433	20.9			
<b>Maternal/Women educational attainment</b>							
No secondary school qualifications	232	4.6	18,810	6.3	46,206	7.3	Census: Highest qualification among all women aged between 20-39 years (2018)
Secondary school / NCEA	1,033	20.7	94,599	31.7	218,808	34.4	
Diploma / Trade certificate	1,489	29.8	45,150	15.1	101,625	16.0	
University degree or higher	2,242	44.9	120,753	40.5	235,458	37.0	
Median maternal age at antenatal (years)	5,006	31.0			...	30.4	Median age of mother (Annual-June 2018)
<b>Maternal/Women migration status</b>							
Born in NZ	3,428	68.5	151,494	50.8	391,539	61.5	Census: Birthplace among all women aged between 20-39 years (2018)
Not born in NZ	1,574	31.5	146,754	49.2	245,133	38.5	
Child n	5,006		25,992		58,665		

Table A9. Area-level socioeconomic deprivation by residential mobility trajectory over time

	Total sample		No moves (T1)		Increasing RM (T2)		One school-age move (T3)		Consistently low RM (T4)		Transition to high RM (T5)		Transition to very high RM (T6)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Antenatal														
NZDep 1	450	9.0%	182	10.2%	94	9.4%	60	8.3%	77	8.6%	29	7.0%	8	4.2%
NZDep 2	486	9.7%	191	10.7%	107	10.7%	72	9.9%	66	7.4%	36	8.7%	14	7.4%
NZDep 3	513	10.2%	195	10.9%	106	10.6%	67	9.2%	82	9.2%	48	11.6%	15	7.9%
NZDep 4	542	10.8%	210	11.8%	101	10.1%	79	10.9%	102	11.4%	35	8.5%	15	7.9%
NZDep 5	434	8.7%	147	8.3%	100	10.0%	63	8.7%	71	8.0%	37	8.9%	16	8.4%
NZDep 6	509	10.2%	166	9.3%	104	10.4%	84	11.6%	93	10.4%	43	10.4%	19	10.0%
NZDep 7	519	10.4%	155	8.7%	118	11.8%	82	11.3%	110	12.3%	33	8.0%	21	11.1%
NZDep 8	503	10.0%	161	9.0%	100	10.0%	76	10.5%	95	10.7%	46	11.1%	25	13.2%
NZDep 9	553	11.0%	196	11.0%	93	9.3%	79	10.9%	114	12.8%	46	11.1%	25	13.2%
NZDep 10	496	9.9%	178	10.0%	79	7.9%	65	8.9%	81	9.1%	61	14.7%	32	16.8%
9-month wave														
NZDep 1	454	9.1%	180	10.1%	90	9.0%	59	8.1%	85	9.5%	31	7.5%	9	4.8%
NZDep 2	519	10.4%	192	10.8%	117	11.7%	72	9.9%	81	9.1%	37	8.9%	20	10.6%
NZDep 3	517	10.3%	194	10.9%	125	12.5%	67	9.2%	77	8.6%	41	9.9%	13	6.9%
NZDep 4	538	10.8%	210	11.8%	105	10.5%	77	10.6%	99	11.1%	33	8.0%	14	7.4%



NZDep 5	427	8.5%	147	8.3%	95	9.5%	63	8.7%	74	8.3%	32	7.7%	16	8.5%
NZDep 6	503	10.1%	165	9.3%	100	10.0%	81	11.1%	100	11.2%	43	10.4%	14	7.4%
NZDep 7	492	9.8%	155	8.7%	111	11.1%	78	10.7%	94	10.5%	31	7.5%	23	12.2%
NZDep 8	505	10.1%	163	9.2%	90	9.0%	81	11.1%	103	11.6%	50	12.1%	18	9.5%
NZDep 9	536	10.7%	197	11.1%	92	9.2%	83	11.4%	89	10.0%	45	10.9%	30	15.9%
NZDep 10	513	10.3%	178	10.0%	77	7.7%	66	9.1%	89	10.0%	71	17.1%	32	16.9%

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	<b>Total sample</b>		<b>No moves (T1)</b>		<b>Increasing RM (T2)</b>		<b>One school-age move (T3)</b>		<b>Consistently low RM (T4)</b>		<b>Transition to high RM (T5)</b>		<b>Transition to very high RM (T6)</b>	
24-month wave														
NZDep 1	492	10.0%	186	10.4%	116	11.7%	59	8.1%	83	9.6%	39	9.8%	9	5.1%
NZDep 2	552	11.2%	190	10.7%	130	13.1%	75	10.3%	78	9.0%	38	9.6%	11	6.3%
NZDep 3	497	10.1%	196	11.0%	112	11.3%	69	9.5%	79	9.1%	29	7.3%	12	6.9%
NZDep 4	516	10.5%	208	11.7%	96	9.7%	74	10.2%	100	11.6%	28	7.1%	10	5.7%
NZDep 5	447	9.1%	148	8.3%	91	9.2%	70	9.7%	93	10.8%	32	8.1%	13	7.4%
NZDep 6	495	10.0%	165	9.3%	99	10.0%	86	11.9%	84	9.7%	44	11.1%	17	9.7%
NZDep 7	473	9.6%	151	8.5%	101	10.2%	76	10.5%	85	9.8%	39	9.8%	21	12.0%
NZDep 8	481	9.7%	162	9.1%	73	7.4%	77	10.6%	98	11.3%	50	12.6%	21	12.0%
NZDep 9	511	10.4%	197	11.1%	81	8.2%	73	10.1%	88	10.2%	42	10.6%	30	17.1%
NZDep 10	500	10.1%	178	10.0%	94	9.5%	66	9.1%	76	8.8%	55	13.9%	31	17.7%

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	<b>Total sample</b>		<b>No moves (T1)</b>		<b>Increasing RM (T2)</b>		<b>One school-age move (T3)</b>		<b>Consistently low RM (T4)</b>		<b>Transition to high RM (T5)</b>		<b>Transition to very high RM (T6)</b>	
54-month wave														
NZDep 1	521	10.8%	180	10.1%	105	10.8%	106	14.9%	91	10.7%	28	7.4%	11	7.0%
NZDep 2	618	12.8%	215	12.1%	123	12.7%	101	14.2%	111	13.1%	53	14.0%	15	9.5%
NZDep 3	509	10.5%	175	9.8%	122	12.6%	82	11.5%	83	9.8%	33	8.7%	14	8.9%
NZDep 4	505	10.4%	204	11.5%	106	10.9%	68	9.6%	86	10.1%	31	8.2%	10	6.3%
NZDep 5	469	9.7%	170	9.6%	113	11.7%	66	9.3%	75	8.8%	28	7.4%	17	10.8%
NZDep 6	455	9.4%	174	9.8%	86	8.9%	69	9.7%	87	10.2%	30	7.9%	9	5.7%
NZDep 7	406	8.4%	155	8.7%	85	8.8%	58	8.2%	65	7.6%	30	7.9%	13	8.2%
NZDep 8	409	8.4%	150	8.4%	64	6.6%	58	8.2%	76	8.9%	47	12.4%	14	8.9%
NZDep 9	439	9.1%	156	8.8%	74	7.6%	49	6.9%	92	10.8%	44	11.6%	24	15.2%
NZDep 10	514	10.6%	201	11.3%	91	9.4%	53	7.5%	84	9.9%	54	14.3%	31	19.6%

Table A10. Housing tenure by residential mobility trajectory over time

Variables	Total sample		No moves (T1)		Increasing RM (T2)		One school-age move (T3)		Consistently low RM (T4)		Transition to high RM (T5)		Transition to very high RM (T6)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
<i>Antenatal</i>														
Own home	2690	58.8%	1275	78.4%	481	52.7%	409	61.6%	321	38.4%	151	41.3%	53	31.5%
Private rental	1649	36.1%	267	16.4%	399	43.8%	223	33.6%	468	56.0%	194	53.0%	98	58.3%
Public rental	208	4.6%	83	5.1%	31	3.4%	28	4.2%	36	4.3%	13	3.6%	17	10.1%
Other	24	0.5%	1	0.1%	1	0.1%	4	0.6%	10	1.2%	8	2.2%	0	0.0%
<i>9-month wave</i>														
Own home	2748	59.0%	1275	71.6%	568	60.3%	409	61.6%	299	34.7%	145	37.7%	52	29.5%
Private rental	1688	36.3%	267	15.0%	335	35.6%	223	33.6%	529	61.4%	221	57.4%	113	64.2%
Public rental	204	4.4%	83	4.7%	37	3.9%	28	4.2%	31	3.6%	14	3.6%	11	6.3%
Other	15	0.3%	1	0.1%	2	0.2%	4	0.6%	3	0.3%	5	1.3%	0	0.0%
<i>24-month wave</i>														
Own home	2841	59.8%	1275	71.6%	626	64.9%	409	61.6%	355	39.8%	127	30.8%	49	25.9%
Private rental	1693	35.6%	267	15.0%	301	31.2%	223	33.6%	504	56.5%	268	64.9%	130	68.8%
Public rental	208	4.4%	83	4.7%	36	3.7%	28	4.2%	33	3.7%	18	4.4%	10	5.3%
Other	7	0.1%	1	0.1%	2	0.2%	4	0.6%	0	0.0%	0	0.0%	0	0.0%
<i>54-month wave</i>														
Own home	2933	60.5%	1275	71.6%	594	59.5%	436	60.0%	418	46.9%	161	38.9%	49	25.9%

Private rental	1635	33.7%	267	15.0%	358	35.9%	235	32.3%	428	48.0%	226	54.6%	121	64.0%
Public rental	226	4.7%	83	4.7%	39	3.9%	34	4.7%	34	3.8%	21	5.1%	15	7.9%
Other	52	1.1%	1	0.1%	7	0.7%	22	3.0%	12	1.3%	6	1.4%	4	2.1%

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Table A11. Sample characteristics by housing tenure

Variable	Total sample		Home ownership	Private rental	Public rental	Other
	n	% / Mean (SD)	% / Mean (SD)	% / Mean (SD)	% / Mean (SD)	% / Mean (SD)
Maternal educational attainment						
No secondary school qualification	198	4.3%	2.1%	6.3%	18.0%	0.0%
NCEA	934	20.5%	18.1%	22.0%	35.6%	45.8%
Diploma/Trade certificate	1,361	29.8%	26.6%	33.9%	40.0%	16.7%
University degree or higher	2,072	45.4%	53.1%	37.7%	6.3%	37.5%
Maternal age	4,571	30.8 (5.5)	32.0 (5.1)	29.2 (5.5)	28.6 (6.5)	25.6 (6.9)
Maternal nativity						
Born in NZ	3,150	68.9%	71.9%	64.5%	66.3%	58.3%
Moved to NZ as a child	431	9.4%	9.9%	8.1%	14.9%	8.3%
Moved to NZ as an adult	990	21.7%	18.3%	27.4%	18.8%	33.3%
Mother's ethnicity (prioritised)						
NZ European	2,695	59.0%	68.5%	50.0%	13.5%	20.8%
Māori	712	15.6%	11.0%	20.6%	33.7%	25.0%
Pacific	426	9.3%	5.6%	10.0%	45.2%	25.0%
Asian	600	12.8%	12.2%	15.8%	4.3%	16.7%
Other ethnicity	138	2.3%	2.6%	3.6%	3.4%	12.5%
Maternal experiences of (pre-birth) racism						
Racism from a health professional	123	2.8%	2.0%	3.6%	5.6%	4.5%
Any form of racism	1,383	30.3%	25.0%	34.1%	35.1%	29.2%
Residential mobility at 9 months						
No moves	3,392	74.3%	84.9%	57.4%	74.0%	54.2%
1 move	987	21.6%	13.1%	35.4%	21.2%	37.5%
2 moves	140	3.1%	1.5%	5.6%	3.4%	4.2%
3 or more moves	46	1.0%	0.5%	1.7%	1.4%	4.2%
Household income at antenatal						
<\$20k	99	2.5%	0.9%	3.9%	14.2%	15.4%
\$20k-30k	158	3.9%	1.8%	6.4%	14.9%	0.0%
\$30k-50k	468	11.6%	6.6%	17.8%	33.1%	38.5%
\$50k-70k	621	15.4%	12.0%	21.6%	12.8%	23.1%
\$70k-100k	986	24.5%	25.2%	24.6%	13.5%	15.4%
\$100k-150k	1,013	25.2%	30.4%	18.1%	8.8%	7.7%
>\$150k	678	16.9%	23.2%	7.6%	2.7%	0.0%

Variable	Total sample	Home ownership	Private rental	Public rental	Other	
Area-level deprivation at antenatal						
Mean (SD) NZDep	4,569	5.6 (2.9)	5.1 (2.8)	5.9 (2.7)	8.8 (1.9)	6.9 (2.8)
NZDep Q1	848	18.6%	22.9%	13.7%	1.9%	8.3%
NZDep Q2	978	21.4%	24.2%	19.0%	4.8%	16.7%
NZDep Q3	862	18.9%	18.0%	22.2%	3.8%	12.5%
NZDep Q4	926	20.3%	19.1%	22.6%	15.9%	25.0%
NZDep Q5	955	20.9%	15.8%	22.4%	73.6%	37.5%
Child sex						
Male	2,325	50.9%	51.4%	49.7%	53.8%	45.8%
Female	2,246	49.1%	48.6%	50.3%	46.2%	54.2%
Family structure at antenatal						
Single-parent household	320	7.0%	4.7%	8.0%	29.5%	8.3%
Two-parent household	4,245	93.0%	95.3%	92.0%	70.5%	91.7%
Adult household members at antenatal						
No other adult household members	3,413	74.7%	76.5%	74.7%	53.8%	41.7%
Other adult household members	1,158	25.3%	23.5%	25.3%	46.2%	58.3%
Urbanicity at antenatal						
Urban	4,178	91.4%	91.5%	90.5%	96.6%	95.8%
Rural	393	8.6%	8.5%	9.5%	3.4%	4.2%
District Health Board region						
Auckland/Waitematā	1,675	36.6%	36.4%	37.5%	33.7%	33.3%
Counties Manukau	1,474	32.2%	32.3%	30.2%	48.1%	33.3%
Waikato	1,422	31.1%	31.3%	32.3%	18.3%	33.3%

Table A12. Social sequence analysis model fit statistics

Class solutions	PBC	HG	HGSD	ASW	ASWW	HC	CHSQ
2	0.690	0.949	0.855	0.516	0.517	0.075	2169
3	0.729	0.981	0.891	0.522	0.522	0.025	1488
4	0.629	0.954	0.842	0.534	0.535	0.021	2013

5	0.634	0.953	0.876	0.601	0.602	0.020	2133
6	0.648	0.976	0.901	0.619	0.620	0.011	1934
7	0.654	0.979	0.920	0.661	0.662	0.010	1929
8	0.661	0.983	0.938	0.687	0.687	0.008	1979
9	0.666	0.984	0.950	0.731	0.732	0.008	2126
10	0.670	0.989	0.958	0.739	0.740	0.006	2024

Note: PBC = Point Biserial Correlation; HG = Hubert's Gamma; HGSD = Hubert's Sommer's D; ASW = Average Silhouette Width; ASWW = Average Silhouette Width (Weighted); HC = Hubert's C; CHSQ = Calinski-Harabasz index. Grey shading indicates final class number selection.