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Housing and child development: Trajectories of child wellbeing by tenure type in Aotearoa New Zealand

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Document information

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Disclaimer

The views and interpretations in this report are those of the researchers.

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Executive summary

Housing provides a central foundation for family life, particularly during the crucial early years of a child's development.

While the effects of housing on children's physical health are becoming well-understood, comparatively little attention has been given to its role in children's psychological wellbeing.

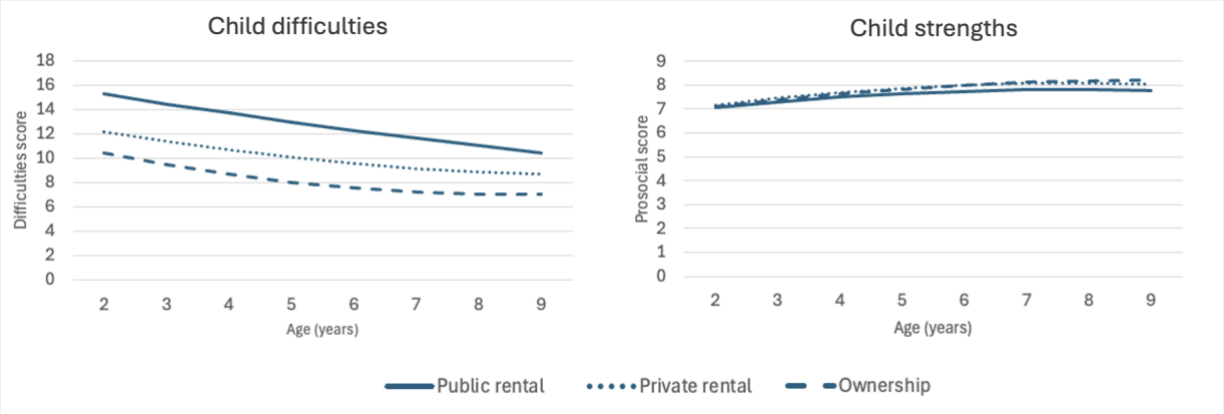
This study investigates how public housing support during a child's early years affects children's socio-emotional development and wellbeing in Aotearoa New Zealand, using longitudinal data from nearly 6,000 children in the *Growing Up in New Zealand (GUiNZ)* study. The research focuses on children who lived in public housing during the critical early years period from pregnancy to 9 months and tracks their wellbeing outcomes through to age 12.

The study uses growth curve modelling of Strengths and Difficulties Questionnaire (SDQ) data collected from 2-9 years of age, alongside a child-reported quality of life measure at age 12. The key finding is that children who began life in public housing were the group facing the most disadvantage and they exhibited higher levels of behavioural difficulties in early childhood than those in other housing tenures. However, their difficulties scores declined more steeply over time, getting closer to their peers by age 9. The difficulties score covers conduct, hyperactivity, emotional and peer relationship problems. Prosocial behaviour scores, in contrast, were similar across all tenure types across childhood. When statistical models were run with only the tamariki Māori sample, results were similar to the whole sample across all outcomes.

Importantly, the study highlights the role of extended family living arrangements. A quarter of children lived with relatives, in addition to their parents, during infancy and this rose to nearly half of children in public housing. Children in the group living in wider-family households initially presented with higher behavioural problem scores than those in single-parent households, but their scores declined more rapidly over time. This suggests that families are likely to be sharing housing to save money during a period where earning potential is limited (when a baby is born). While there are well-documented problems associated with household crowding, the emotional and practical support of extended family members may also provide some long term benefit. These findings reinforce the importance of culturally and contextually appropriate housing support that considers living situations beyond a typical nuclear family.

At age 12, children who started life in public housing report quality of life (QoL) that is similar to, or better than, those from private rentals. Factors such as strong relationships with important adults like parents and teachers and reduced exposure to bullying were found to be more strongly associated with quality of life at this age than housing tenure or residential mobility.

Average trajectories of child behavioural strengths and difficulites over time by initial housing tenure



The study also found that residential mobility had a smaller impact on wellbeing than expected. Frequent moves were only weakly associated with lower QoL after more than four residential moves over childhood. School changes had a more noticeable impact, although this may reflect other confounding factors. Notably, children in public housing experienced only slightly fewer moves as those in private rentals.

The findings highlight the importance of early housing support, especially during a child's formative years. They also suggest that public housing may provide a protective effect over time, helping to reduce initial disadvantage. Nevertheless, targeted early support remains essential to prevent early behavioural difficulties from affecting long-term educational outcomes.

This research provides a unique contribution to the research on child wellbeing and housing by including strengths-based wellbeing measures, incorporating child perspectives, and focusing on the early housing experiences of children in New Zealand.

JEL codes: I14 , I31.

Keywords: Public housing, Child wellbeing, Longitudinal data, Growth curve analysis, Socio-emotional development.

Summary haiku:

Tamariki grow
Wellbeing gaps slowly close
Housing, flourishing

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1. Introduction

New Zealand households spend more of their disposable income on housing costs than nearly any other country in the OECD,[1] despite having relatively poor-quality housing stock. In New Zealand's unaffordable housing market, low-income families face the biggest constraints in terms of housing choice, often accepting housing that is insecure, cold, damp or in unsuitable neighbourhoods (Howden-Chapman et al., 2024).

The New Zealand Government provides housing subsidies to around 7% of the population; public housing comprises about 4% of the country's housing stock (Ministry of Housing and Urban Development, 2024) which is below the OECD average of approximately 7% (OECD, 2024). Tenants in public housing receive subsidised rent and have greater security of tenure than those in the private rental market. Moving into public housing in New Zealand is associated with an improvement in housing quality and an increase in housing satisfaction (Anastasiadis et al., 2018; Grimes et al., 2024).

New Zealand children are overrepresented in poverty statistics and inadequate housing is central to their poor wellbeing outcomes (Howden-Chapman et al., 2021). New Zealand has high rates of diseases linked to poor housing such as asthma, bronchitis and rheumatic fever (Riggs et al., 2021) and tenure, household crowding and housing affordability are all associated with psychological distress among New Zealand adults (Pierse et al., 2016). Despite this, New Zealand children are under-represented in government administrative housing data and relatively little is known about their experiences in the housing sector (Pehi et al., 2025).

Given the importance of childhood experiences for long term wellbeing outcomes, it is crucial to understand the experience of children in public housing. What are their trajectories of wellbeing and socio-emotional development? How do these differ from children who start life in other tenure types? How might residential mobility affect their experiences? Do early housing experiences affect children's wellbeing differently at later stages of development?

To fill this gap, this study maps wellbeing for New Zealand children in the Growing Up in New Zealand study from two years through to twelve years of age. We compare wellbeing outcomes for children provided with public housing support during the crucial earliest years (pregnancy-9 months) with those in other tenure types. From two to nine years of age we examine trajectories of socio-

[1] With 26% of adjusted disposable income, compared to an average of 20% in the rest of the OECD. https://www.oecdbetterlifeindex.org/topics/housing/. New Zealand has 31.6% of households with housing costs at over 30% of household income while 18.2% of households spend more than 40% (Stats NZ household income and housing cost statistics for the year ended June 2023).

emotional development using multi-level growth curve models from mother-reported data. At twelve years of age, we utilise data from children themselves to provide a unique child-centred perspective on housing and wellbeing.

This study has been conducted as part of the Public Housing and Urban Regeneration project[2] and has been guided by the Whakawhanaungatanga model of wellbeing (Penny et al., 2024), which emphasises relationships as central to wellbeing in the context of housing.

[2] https://www.sustainablecities.org.nz/our-research/current-research/public-housing-urban-regeneration-programme

2. Background

The influence of stable, quality housing on healthy child development is well established in theory and increasingly in practice (Fowler & Farrell, 2017; Leventhal & Newman, 2010). That said, children's wellbeing is inseparable from their family and social contexts (Fu et al., 2015) and for children in public housing, frequently that social context involves poverty and its related consequences; hence untangling causal pathways of the effect of housing on child development is difficult.

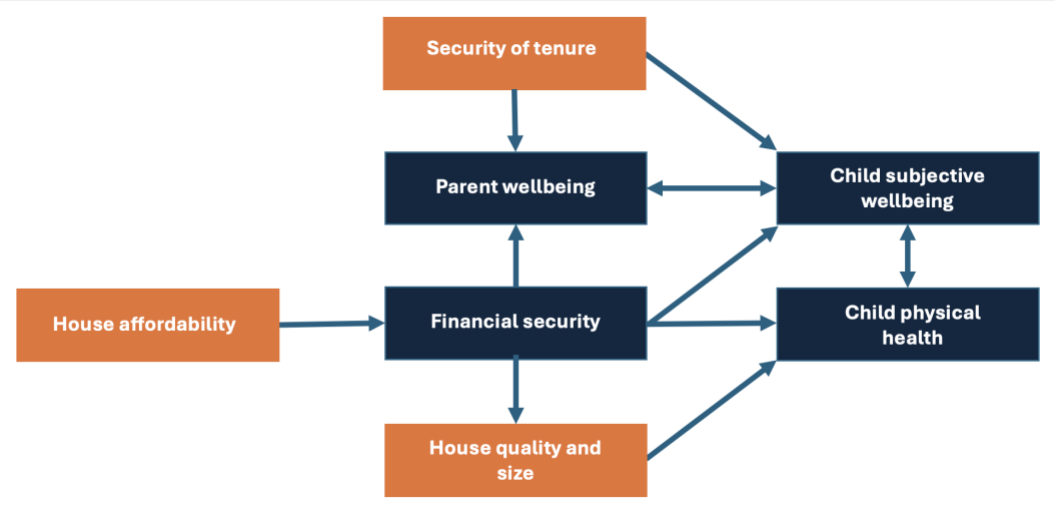
Much of the research on housing and child development takes an ecological approach, which sees a child's home as a central environment that shapes the child development process in ways that evolve over different stages of the child's development (Bronfenbrenner, 1979; Marçal et al., 2024). During a child's earliest years, a majority of their time is spent at home and during this period secure relationships and quality interactions with a child's caregivers are most important for healthy development (Phillips & Shonkoff, 2000; Shonkoff et al., 2016).

As children move into later childhood and adolescence their developmental needs orient more outside of the home environment where school and community networks become increasingly salient.

Child wellbeing is strongly associated with parent wellbeing, with the wellbeing of parents affecting parenting practices (Newland, 2015) and many of the ways housing affects children occur indirectly through parents' wellbeing and associated parenting practices (Clair, 2012).

There are three broad pathways by which housing can positively affect child wellbeing: through security of tenure, house quality (including size) and a lower housing cost burden, which frees family income for other spending (Leventhal & Newman, 2010). Some education models also include a fourth school/education pathway (Holme, 2022). Public housing in New Zealand supports children through all three of these main pathways

Figure 1: Pathways which housing is theorised to affect child wellbeing



How public housing affects child wellbeing has been well theorised but there are few studies that address the relationship directly. Much of the broader housing research is focused on either adult outcomes or adult concerns about children such as educational attainment (Clair, 2019). Given the various factors that influence child development alongside housing tenure, the differential impact of housing on children at different developmental stages, and the variation in public housing policies across countries, it is essential to have longitudinal studies on children's experiences of public housing in diverse international contexts.

A central focus of housing and children's wellbeing research has included behavioural development, with the Strengths and Difficulties Questionnaire (SDQ) frequently employed as an outcome measure with studies examining either an overall difficulties problem score, or smaller components of the SDQ. Results vary considerably across studies based on country context, child age, and the aspect of housing examined.

Fenelon et al. (2018) used US administrative data with a pseudo-waitlist approach, finding evidence that children in public housing have better mental health outcomes, but they did not find the same for children who received housing vouchers. Using a similar approach, with a smaller sample, Newman and Holupka (2017) found no mean effects of being in public housing during childhood on adolescent behaviour outcomes. Interestingly, they found differing results based on initial behaviour problems, with public housing providing benefits to those with the lowest initial behaviour scores, but the opposite effect for those with the highest scores.

Several studies have utilised longitudinal studies to examine trajectories of behavioural problems and incorporated measures of tenure in their models. Coley et al. (2013) used a sample of US children and adolescents from low-income families in the Three-City Study and found housing type not associated with externalising problems, but children in public housing had a lower growth in internalising problems than children in private rental housing.

Flouri et al. (2015) used data from three- to seven-year-old children in the United Kingdom's Millenium Cohort Study to examine the relationship between behavioural outcomes and the number of social houses in the neighbourhood alongside whether a child was living in social housing. They found that both social housing in the neighbourhood and living in social housing had significant associations with conduct, hyperactivity and emotional symptoms, but that at the average age, being in social housing was more important than the neighbourhood effects.

Finally, using data from children from 4-15 years over two cohorts of the Longitudinal Study of Australian Children, O'Donnell and Kingsley (2020) examined trajectories of behavioural difficulties across several housing characteristics. They found overall difficulties scores highest for those in social housing, but a convergence with those in private rentals by age 16. Additionally, they find higher difficulties scores between children in public housing and those in privately owned homes but that housing characteristics such as stability, quality and neighbourhood explained much of this difference.

2.1 Residential mobility

Families can move for a wide variety of positive and negative reasons with moves in childhood often undertaken to improve housing as family needs change (Gambaro et al., 2017). Residential stability is considered beneficial for wellbeing (Acolin, 2022), with forced mobility particularly detrimental to adult and child mental wellbeing (Ong ViforJ et al., 2023; Ramphal et al., 2023).

Evidence on the effects of mobility on children is mixed. Mobility is multi-dimensional and is often inconsistently operationalised across different dimensions, meaning results from studies can vary (Garboden et al., 2017). Several studies have found associations between more mobility and externalising problems (Coley et al., 2013; Fowler et al., 2014; Zilanawala et al., 2019; Ziol-Guest & McKenna, 2014), however the findings on internalising are more varied. Ziol-Guest and McKenna (2014) found a negative association for children in the Fragile Families Study, while Zilanawala et al. (2019) found no association in a broader sample of Millenium Cohort Study children and Coley et al. (2013) found that children from low-income families who experienced more residential stability showed more internalising problems, but within child effects showed residential moves in a prior year predicted a significant decrease in children's internalising problems.

In New Zealand, Nathan et al. (2019) found a linear relationship between residential mobility and socioemotional behavioural difficulties (the combined internalising and externalising score) in four year old children using administrative data.

Overall, studies that have examined mobility within a broader family context such as Gambaro et al. (2017) and Beck et al. (2016) have concluded that the circumstances around moving appear more consequential for children's wellbeing than the moving itself.

2.2 House quality

The quality of housing affects children's health directly (Howden-Chapman et al., 2023). Dampness, cold and mould affect children's health with conditions such as respiratory infections and rheumatic fever linked to poor quality housing (Groot et al., 2023) (Holden et al., 2023; Wimalasena et al., 2021). Quality, accessible housing is particularly important for children and parents with disabilities (Lindsay et al., 2024).

A warm, dry home also has wellbeing benefits (Fyfe et al., 2022; Liddell & Guiney, 2015) which are likely to extend to both parents and children. When examining different housing factors for low income children, Coley et al. (2013) found that poor housing quality was the factor most consistently associated with children and adolescents' behavioural and cognitive development.

Finally, living in a house of an adequate size to prevent household crowding prevents the transmission of infectious diseases (Baker et al., 2013; Colosia et al., 2012), however isolating the causal effect of crowding on broader child development outcomes is difficult as it frequently co-occurs with many other social and environmental vulnerabilities (Lorentzen et al., 2022).

2.3 Financial security

Affordable housing has flow-on financial effects – the less a household spends on housing, the more is available for other types of consumption. There are two broad pathways by which this is hypothesised to affect children. First is the investment approach (Becker, 1993) which takes an economic perspective and highlights that when families have more disposable income it can be invested in resources that benefit children such as nutritious food, quality childcare and schooling. Second is the family stress model (Conger & Conger, 2002; Masarik & Conger, 2017) which highlights how inadequate income affects parent's mental wellbeing which subsequently affects children through changes in parenting. Both these pathways have evidence supporting their relevance in the context of housing (Kull & Coley, 2014; Marçal et al., 2024; Marçal, 2022; Monk, 2022; Newman et al., 2024).

When we look at the previous research on children and housing overall, it is likely that housing affects children to a greater extent in the early years (Coley et al., 2013; Marçal et al., 2024) and the negative outcomes related to housing are most likely to be experienced by those on the lowest income (Gambaro & Joshi, 2016; Ziol-Guest & McKenna, 2014).

3. Data and methods

3.1 Sample

GUiNZ is a contemporary longitudinal child development study following New Zealand children from birth to young adulthood. Parents were recruited from all expected births in the Auckland, Counties-Manukau and Waikato District Health Board regions of New Zealand between 25 April 2009 and 25 March 2010. The initial GUiNZ cohort is broadly generalisable to the New Zealand population in terms of ethnicity and family socioeconomic status (Morton et al., 2015).

For the growth curve analysis, outcome data are mother-reported and have been included from the 2-year, 4.5-year and 8-year waves of GUiNZ (DCW2-DCW8). Independent variables and covariates are also mother-reported and have been sourced from the antenatal and 9-month waves (DCW0 and DCW1). The original sample was mothers pregnant with 6,916 children. Children were not included in the final growth curve sample if their mothers did not continue from pregnancy into the 9-month data collection (n=449) or if they did not provide complete data for other variables in the full analysis (n=583). This left a final sample of 5,887 of which 5,713 children had some outcome data so could be included in the difficulties analysis. The final sample for the externalising scores is 5,772, internalising scores is 5,728 and strengths scores is 5,728.

For the Ordinary Least Squares (OLS) regression analysis estimating quality of life at 12- years-old, children were included in the analysis sample if their mother provided data for both the antenatal wave and the perinatal (6 week) wave (n=6,852).

3.2 Wellbeing measures

For the growth curve models, the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997) is used to assess children's socio-emotional development at the 2-year, 4.5-year and 8-year waves. At two years of age the preschool version of the SDQ is used in which three items have slightly modified wording to be more developmentally appropriate. Satisfactory psychometric properties have been found for this measure in GUiNZ (D'Souza et al., 2017).

The SDQ comprises five subscales, four of which measure problem areas: conduct problems, hyperactivity, emotional problems and peer relationship problems. The final 'strengths' subscale measures prosocial behaviour. Each scale item is measured on a three-point scale with response options of "not true", "somewhat true" and "certainly true". Responses are coded from 0-2 and summed to get scores from 0-40 for the overall difficulties domain, 0-10 for the strengths' subscale, and 0-20 for the externalising and internalising subscales. The full list of questions is provided in Appendix 1. A higher difficulties score indicates greater behaviour problems and a higher strengths score indicates more positive behaviour.

Figure 2: Strengths and difficulties scales and subscales

Two-factor model	Three-factor model	Five-factor model
Strengths	Strengths	Prosocial behaviour
Difficulties	Internalising problems	Emotional problems
		Peer relationship problems
	Externalising problems	Hyperactivity/inattention
		Conduct problems

Cronbach's alpha for the difficulties subscale across each age ranged from 0.76-0.82. The strengths subscale varied from 0.62-0.73. Externalising was 0.73-0.79 and internalising was a little lower, ranging from 0.62-0.74.

At twelve years of age there was no mother-reported SDQ data. Instead we utilise the child-reported data at twelve years to understand wellbeing from the child's perspective using KIDSCREEN-10 which is a wellbeing and health-related quality of life measure (Ravens-Sieberer et al., 2010). It is self-reported and covers 10 items reflecting different aspects of child wellbeing. It includes questions such as "Have you felt full of energy?" and "Have you felt lonely?". Chronbach's alpha is 0.775. Full questions for the measure are included in Appendix 1.

3.3 Housing variables

Initial housing tenure: Across all of the models, housing tenure is grouped into four categories based on a mother's response to legal ownership of her home: (1) private ownership (outright, or with a mortgage); (2) public rental; (3) private rental; (4) other. Children were included in the public housing group if their mothers had reported their home was publicly owned in either the antenatal or 9-month data collection waves. Otherwise, tenure status was captured from the 9-month wave. Children of mothers who reported their home was owned by a family trust were included in the ownership group. A small number of mothers reported living in free rentals, these children were included in the 'other' group.

Residential mobility: For the twelve-year analysis the number of residential moves over the course of the study was also examined, both independently and concurrently with initial tenure. This measure was chosen to capture the cumulative effect of mobility over the early life course. An analysis was also run with the number of schools attended to isolate the effect of school moves compared to residential moves.

3.4 Other variables and covariates

Child's age: For the growth curve models the age of children is centred at two-years of age to interpret the intercept at the initial behaviour scores. A quadratic slope for age had better model fit. In addition, other studies have shown increasing difficulties scores in late childhood/early adolescence (e.g. Turkmani et al., 2023) which fits better with a quadratic rather than a linear specification. As each child was interviewed at slightly different ages at each wave, each child's trajectory has been plotted using the exact age at

the interview, in months. This was important as at the 8-year wave there was a particularly large spread of interview ages (mean = 8.6 years).

Growth curve covariates: The growth curve analysis includes the child's sex at birth to account for differing socio-emotional development trajectories between girls and boys. It also includes several demographic controls taken from the antenatal and 9-month waves including household structure, maternal age, maternal education, maternal self-prioritised ethnicity, household material deprivation and neighbourhood deprivation as measured by the New Zealand Deprivation Index score (Salmond et al., 2007). Material deprivation is measured using a 6-item scale of common material deprivations such as feeling cold and receiving food grants. This measure was chosen instead of income as material deprivation typically has a stronger association with child wellbeing than income (Bradshaw, 2007) and had a much higher response level. See Table 4 for descriptive statistics.

Twelve-year OLS analysis covariates: Child covariates in the twelve-year analysis included child-reported ethnicity, represented by a series of binary variables to account for children identifying with multiple ethnicities. Two-year difficulties scores were also included to control for initial behaviour. Mother-focused covariates include mother's Big-5 personality (measured at the 2-year wave), education, age, and employment (at 12-years). Household covariates include neighbourhood deprivation (NZ Deprivation Index) and material deprivation (Dep-17 index) all measured at twelve-years. Finally, a group of child-reported variables measured at twelve-years including; parent-child closeness measured using the Parent-Child Relationship tool (Ridenour et al., 2006), the frequency of bullying in the last school term, the teacher-child relationship measured using the Class Maps Survey's 'My teacher' subscale (Doll et al., 2010) and the frequency of time reported outside. See Appendix 2 for full descriptive statistics.

Partner/father covariates were not included in either analysis as only 65% of fathers completed the antenatal wave (decreasing to 56% at two-years). Including only children with father data would mean excluding single mothers from the sample. The children with father-reported data also have notably lower behaviour scores (a mean of 10.74 vs 12.86 at two-years of age) so dropping children with no father data would drop many of the children we are most interested in.

3.5 Statistical analysis

Growth curve models

Growth curve models measure trajectories over time and how these vary between and within children. In this case, children's trajectories of socio-emotional development scores, measured using the SDQ were the outcomes of interest. Growth curve models are a type of multilevel model that is flexible and efficient for unbalanced, unevenly spaced longitudinal data.

Growth curve models comprise two parts and can be expressed as:

$$y_{it} = \gamma_{00} + \gamma_{10}x_{it} + u_{0i} + u_{1i}x_{it} + \varepsilon_{it}$$

where $\gamma_{00} + \gamma_{10}x_{it}$ is a fixed effects component that captures the estimated mean intercept γ_{00}, and mean growth rate γ_{10} , and $u_{0i} + u_{1i}x_{it} + \varepsilon_{it}$ is a random effects component which captures the

deviations of the individual growth trajectories from the mean trajectory. The slope for individual *i* in relation to x_{it} can be expressed as $\gamma_{10} + u_{1i}$. An unstructured covariance matrix is specified for the random effects. AIC and BIC were used to assess model fit.

An initial interclass correlation analysis is undertaken to examine variation in scores within and between children. It shows that 44.3% of the variation in difficulties scores is due to differences between children, versus 55.7% of the variation coming from within children (as they change over time). This result is significant with a chi-squared test of p<0.01.

Four models are constructed to examine the trajectories of child behaviour (Table 1). Model 1 which includes a quadratic term for age, examines growth curves for the whole sample across four outcomes - total difficulties, strengths and the difficulties' subscales of externalising and internalising. Model 2 adds the variable for early life tenure to Model 1 alongside interaction terms between tenure with age and age^2.

Models 3 and 4 are used to examine the difficulties subscale in greater detail. The wider literature has shown that boys and girls have differing patterns of socio-emotional development. To account for these differences, interaction terms between sex at birth and child's age and age^2 have been included in Model 3, alongside a household structure variable also interacted with age and age^2.

Model 4 expands Model 3 to control for many of the key selection effects into public housing, including maternal education, maternal age, maternal ethnicity, household material deprivation and neighbourhood deprivation.

To understand the experience of tamariki Māori, the four models are then run with the tamariki Māori sample which has been constructed by including all children who self-identify as Māori when interviewed at 8 years of age. Note that this sample is much smaller (17.2% of the original sample).

Table 1: Summary of growth curve models

Model 1	Age +age^2
Model 2	Model 1 + tenure + tenure (age + age^2)
Model 3	Model 2 + sex + sex (age + age^2) + household structure + household structure (age + age^2)
Model 4	Model 3 + maternal education + maternal age + maternal ethnicity + household material deprivation + neighbourhood deprivation

Sensitivity analysis

To better understand the effect of public housing compared to children in the private rental market (the likely alternative option available for low-income families), we run a placebo analysis. A placebo group of children is constructed from the children in the private rental group who are matched with the public housing group on family material deprivation and on initial child difficulties scores (at 2-years of age). Models 3 and 4 are then run with the placebo group as a comparison.

OLS results

For the analysis of twelve-year wellbeing we utilise an OLS regression:

$$y_i = \beta_0 + \beta_1 x_1 + \beta_2 X_2 + \varepsilon_i \qquad (2)$$

Where y_i is our quality-of-life outcome, β_0 is an intercept, β_1 estimates the effect of early years

tenure, X_2 is our matrix of covariates, and ε_i is an idiosyncratic error term.

The OLS analysis utilises six models to analyse how housing affects children's wellbeing at twelve-years of age.Model 1 focuses on early life tenure. Model 2 examines residential mobility across the study period, then Model 3 combines the two. Model 4 provides a comparison between the effect of the number of schools attended with the number of residential moves. Model 5 expands upon Model 3 by incorporating additional control variables. Finally, Model 6 builds on Model 5 by including the more endogenous child-reported variables.

Table 2: Summary of covariates in OLS models estimating twelve-year wellbeing

Model 1	Early life tenure
Model 2	Residential mobility
Model 3	Early life tenure + residential mobility
Model 4	No. schools attended
Model 5	Model 3 + 2-year difficulties + sex at birth + child ethnicity + siblings + maternal personality + maternal education + maternal age + maternal employment + material deprivation + neighbourhood deprivation
Model 6	Model 5 + parent-child closeness + bullying + teacher-child relationship + freq. time outdoors

Missing data

Using a growth curve model means most data can be utilised, even if there is attrition at later waves. The biggest problem with missing data for the growth curve models is for those without data on initial tenure (7.7% of the sample). When compared with the sample as a whole, this group has slightly higher difficulties scores in the two year and 4.5-year waves compared to the sample as a whole. They are also slightly less likely to be European and slightly more likely to be living in a high deprivation neighborhood. Multiple imputation (MI) was evaluated for the growth curve analysis to address this issue. However, modelling the curves using exact months as distinct waves resulted in MI models being infeasible due to insufficient data for numerous equations, causing the models to fail to converge. It was considered that accurately reporting months was more important to the study conclusions than imputation of the missing data, so complete case analysis is adopted in preference to using MI.

MI by chained equations (MICE) was chosen for the twelve-year QoL analysis with the creation of 50 datasets. For reference, Appendix 3 presents the results of Models 1, 2 and 5 using complete case analysis. Estimates for key variables did not change substantially, but standard errors decreased with MI. MI results also show a more logical patterns of results for variables such as household deprivation.

4. Results

4.1 Social and emotional development trajectories

Mean externalising and internalising scores decrease as children get older (see descriptive statistics in Table 4). However, externalising scores decrease by more and drive much of the decrease across the difficulties scores. Mean strengths scores increase slightly as children get older.

The sample is diverse and is spread across different neighborhood deprivation areas, reflecting the wider makeup of New Zealand families. For family structure, 65% of children are living with two parents (and no other adults). Only 3.5% of the sample are living in a household with just a single parent. Interestingly, more than 30% of children are living with other adults in the home (with either one or both parents), generally with other family members. Nearly half of children in public housing are living with other family members in addition to a parent. Most children have low levels of household material deprivation with the highest levels found for those children in public housing. Just over half of the sample mothers identify as European (self-prioritised), with others distributed evenly between Māori, Pacific and Asian groups.

Correlations between the subscales and over time show that correlations are stronger at closer time points (Table 3).

Table 3: Correlation between internalising problems, externalising problems and strengths

		Externalising			Internalising			Strengths	
		2 year	4.5 year	8 year	2 year	4.5 year	8 year	2 year	4.5 year
Externalising	4.5 year	0.491							
	8 year	0.335	0.522						
Internalising	2 year	0.396	0.234	0.163					
	4.5 year	0.291	0.358	0.216	0.493				
	8 year	0.292	0.252	0.429	0.276	0.446			
Strengths	2 year	-0.327	-0.176	-0.150	-0.180	-0.099	-0.100		
	4.5 year	-0.180	-0.318	-0.237	-0.108	-0.145	-0.160	0.361	
	8 year	-0.136	-0.241	-0.447	-0.141	-0.191	-0.283	0.258	0.415

Source: GUiNZ DCW2, DCW5, DCW8

Table 4: Descriptive statistics for variables in the growth curve models

	Initial tenure					Total
	Ownership	Public rental	Private rental	Other	Missing	
	Mean(SD)/%	Mean(SD)/%	Mean(SD)/%	Mean(SD)/%	Mean(SD)/%	Mean(SD)/%
Child variables:						
Difficulties scores:						
Wave 1 (2 yr)	10.37 (4.66)	15.13 (5.56)	12.12 (5.23)	11.29 (4.81)	12.14 (5.21)	11.27 (5.15)
Wave 2 (4.5 yr)	8.26 (4.52)	13.04 (5.64)	10.29 (5.08)	9.04 (4.46)	9.74 (5.18)	9.23 (4.95)
Wave 3 (8 yr)	6.86 (4.92)	10.32 (5.89)	8.41 (5.56)	7.56 (4.82)	7.47 (4.96)	7.55 (5.25)
Externalising scores:						
Wave 1 (2 yr)	6.91 (3.31)	9.21 (3.41)	7.78 (3.16)	7.63 (3.35)	7.85 (3.45)	7.46 (3.46)
Wave 2 (4.5 yr)	5.31 (3.12)	7.29 (3.41)	6.30 (3.32)	5.69 (3.06)	6.12 (3.29)	5.84 (3.27)
Wave 3 (8 yr)	4.10 (3.19)	5.73 (3.62)	4.79 (3.44)	4.16 (3.14)	4.47 (3.11)	4.40 (3.30)
Internalising scores:						
Wave 1 (2 yr)	3.45 (2.43)	5.85 (3.15)	4.35 (2.69)	3.67 (2.42)	4.35 (2.78)	4.01 (2.69)
Wave 2 (4.5 yr)	2.96 (2.49)	5.77 (3.32)	4.00 (2.86)	3.39 (2.43)	3.68 (2.94)	3.58 (2.82)
Wave 3 (8 yr)	2.76 (2.70)	4.59 (3.17)	3.62 (3.08)	3.40 (2.83)	3.01 (2.73)	3.14 (2.89)
Strengths scores:						
Wave 1 (2 yr)	7.11 (1.83)	7.14 (1.87)	7.20 (1.81)	7.10 (1.99)	7.10 (1.76)	7.14 (1.83)
Wave 2 (4.5 yr)	7.73 (1.82)	7.65 (1.94)	7.78 (1.78)	7.84 (1.76)	7.89 (1.74)	7.76 (1.80)
Wave 3 (8 yr)	8.19 (1.80)	7.85 (2.05)	8.09 (1.84)	8.08 (1.88)	8.12 (1.74)	8.14 (1.82)
Sex at birth						
Boy	52.0	53.7	50.6	46.9	53.2	51.5
Girl	48.0	46.3	49.4	53.1	46.8	48.5
Mother variables:						
Maternal uni. educ. (preg)						
No	48.8	94.4	69.7	58.0	65.6	61.7
Yes	51.2	5.6	30.3	42.0	34.4	38.3
Mother's age (preg)	31.77 (5.26)	27.50 (6.74)	28.59 (5.85)	28.94 (5.77)	30.41 (6.33)	30.06 (5.97)

Maternal ethnicity (preg)						
European	68.7	12.7	45.6	74.6	43.6	53.0
Māori	8.0	27.5	17.7	13.6	15.0	13.9
Pacific	6.8	52.2	14.0	6.2	19.9	14.6
Asian	13.4	3.1	18.2	5.1	17.8	14.6
Other	2.8	4.2	4.5	<1	3	3.5
Missing	<1	<1	<1	0	<1	<1
Family variables:						
Household structure (preg.)						
Two parent	74.7	38.0	61.5	76.3	63.1	65.3
Parent alone	1.3	9.4	4.1	<5	6.9	3.5
Living with other family	19.1	49.8	26.7	18.6	27.7	25.7
Living with non-family adults	4.7	2.8	7.7	<5	2.3	5.4
Missing	<1	<1	0	0	0	<1
Material deprivation (9m)						
Low	83.6	35.4	64.0	83.6	67.2	67.7
Medium	14.2	26.8	26.0	13.6	22.3	18.6
High	1.7	27.5	9.7	2.8	9.6	6.7
Missing	0.4	10.2	0.4	0	<1	6.87
NZ Deprivation index (9m)						
Low	34.8	2.2	18.9	37.3	23.8	24.5
Med	38.7	12.6	39.2	39.0	34.6	34.3
High	26.5	75.1	41.9	23.2	41.6	34.7
Missing	0	10.2	<1	<1	0	6.5
Total	**51.3%**	**6.3%**	**32.0%**	**2.8%**	**7.7%**	

Source: GUiNZ DCW0, DCW1, DCW2, DCW5, DCW8

Note: the source wave for each variable is provided in parentheses

For the growth curve models, the age variable is measured in months and has been centred at 2 years of age. As each child was interviewed at slightly different ages, each trajectory has been plotted with the child's exact age at each interview (measured in months). The mean starting point of the difficulties trajectory for all children at two years of age is 11.41 (column (1) of Table 5). The random effects estimators show the variation of the residuals from the estimated mean slope and intercept. The negative correlation between the two shows that, on average, children who have higher initial scores will decrease at a faster rate (i.e. there is a convergence of scores over time).

Model 2 introduces an interaction term for initial housing tenure to examine the trajectories of children's socio-emotional development based on their housing tenure at the start of their lives. Column (2) of Table 5 provides the results for the difficulties outcome, the other outcomes are reported in Appendix 4 and presented graphically in Figure 3. Results show that children in public rentals and private rentals have significantly higher initial difficulties scores than those in privately owned homes (4.87 and 1.76 points higher respectively). Children who start life in public housing, however, have more steadily decreasing scores than children from other tenure types, with their scores converging towards their peers by later childhood. Trajectories of strengths scores are not significantly different across tenure types.

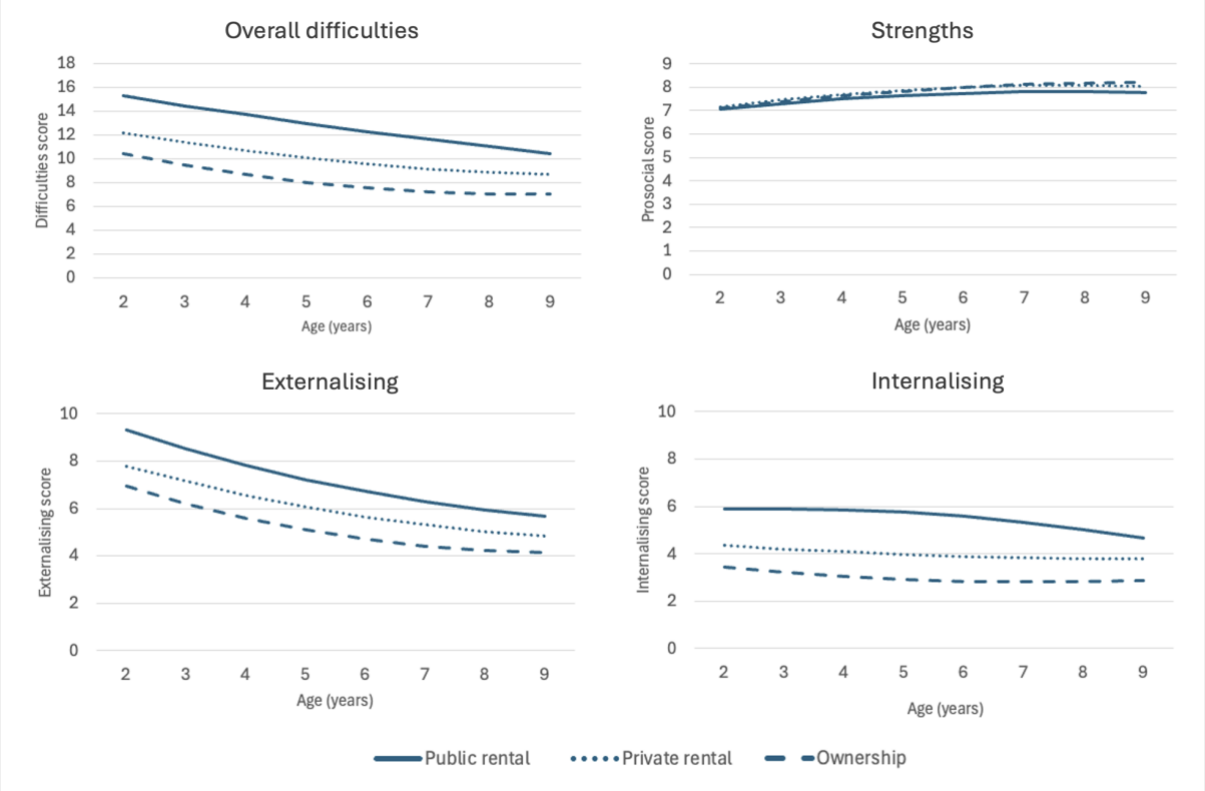
When the externalising and internalising subscale trajectories are examined separately, we see higher scores for children starting life in public housing across both subscales. Externalising trajectories follow a similar pattern to the overall difficulties scores. However, mean internalising trajectories stay higher for children in public housing across the younger years before starting to converge between the ages of 5-9 years.

Model 3 allows us to examine overall difficulties trajectories in greater detail by adding sex at birth and household structure into the model. Results are best understood graphically (Figure 4). For the group of children in public housing, children starting life in two-parent households have the lowest initial difficulties scores, and these remain lower throughout middle childhood.

Overall, girls and children starting life in two-parent households have the lowest initial difficulties scores. Children in households with a single parent have lower scores than those living also with relatives. While children living with relatives initially have higher difficulties scores than those in single-parent households, their scores decrease further over time than those in single-parent households, which may reflect the benefits of emotional and practical support of other relatives in the household.

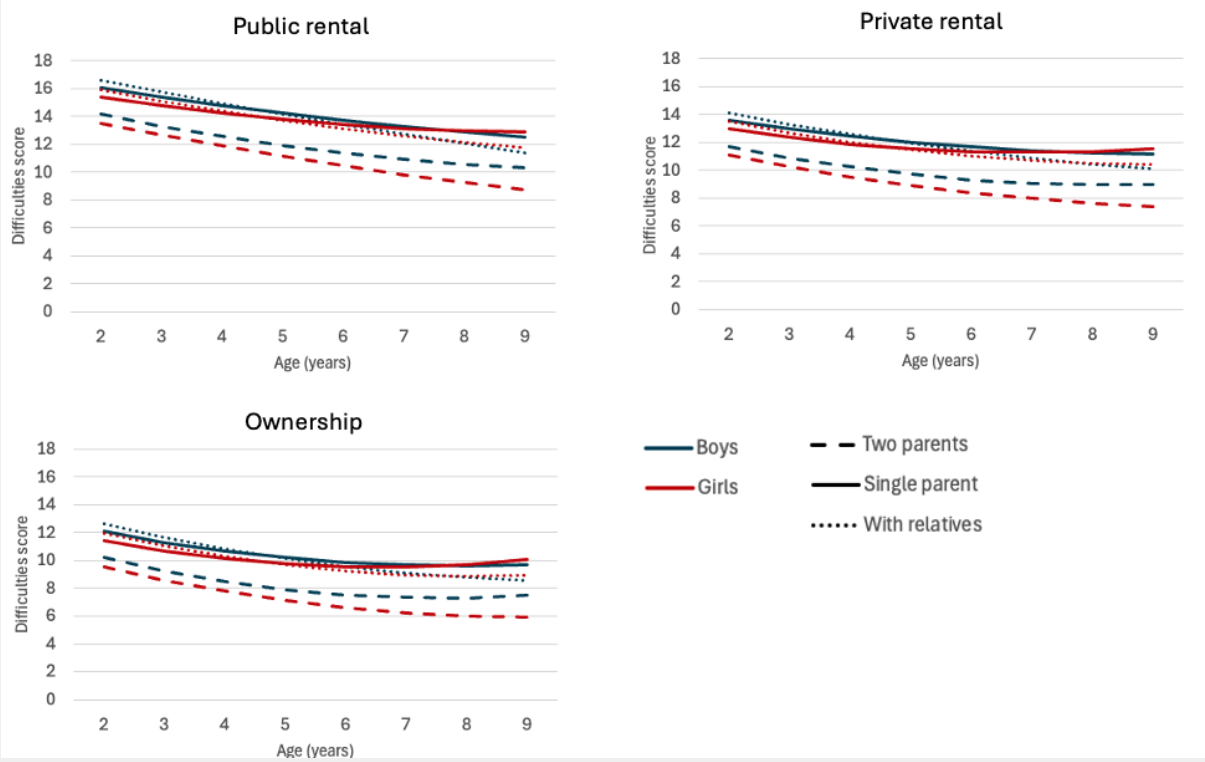
Results in column (4) of Table 5 show that controlling for basic selection factors into public housing (maternal age, education and ethnicity, and material and neighbourhood deprivation) brings down the initial difference in difficulties scores between those in public housing and those in private ownership to 1.42 points while for those in private rentals this falls to 0.4. However, the trajectory of the slopes across the tenure types remains similar. Once demographic variables are controlled for, the initial behaviour scores for children living with relatives is no longer significantly different to other children.

Figure 3: Child behaviour trajectories by tenure (Model 2)



Source: GUiNZ DCW0, DCW1, DCW2, DCW5, DCW8

Figure 4: Child difficulties trajectories by tenure, gender and household structure (Model 3)



Source: GUiNZ DCW0, DCW1, DCW2, DCW5, DCW8

When the difficulties analysis is run only on the tamariki Māori sample (Appendix 5), the results are similar to the results for the overall sample. The intercept at two years for Model 1 is slightly higher for the Māori sample (11.85 compared to 11.41), however, the intercept for public rentals is lower for tamariki Māori across models 2-4. There is no significant difference between boys and girls at two-years for the tamariki Māori sample, although the intercepts are about 2/3 the size so this may just reflect a smaller sample size.

Finally, attrition over the GUiNZ study has not been even across demographic groups. The mean two-year difficulties score for children that are still in the study at age 8 is 10.95 compared with 13.12 for those that dropped out. In addition, children from the public housing group are more likely to drop out by 8 years (50.2% attrition versus 15.5% attrition for those from private ownership).

To get an indication of the effect of attrition, we run the analysis on a balanced sample, i.e. only including those that have responded to every wave. When the full analysis is run on the balanced sample, the intercept falls for both models 1 and 2, reflecting the fact that more disadvantaged children drop out of the sample (see columns (3) and (4) of Appendix 6). In the balanced sample, the difficulties trajectory for public housing is flatter than for the original sample. This suggests that children from public housing who drop out of the study have difficulties scores that decrease faster than those who remain. Since public housing children are more likely to drop out, if these children had remained in the study, then the trajectory of difficulties scores for the public housing group is more likely to have fully converged with their peers' scores by 9 years.

Table 5: Growth curve analysis results for child difficulties

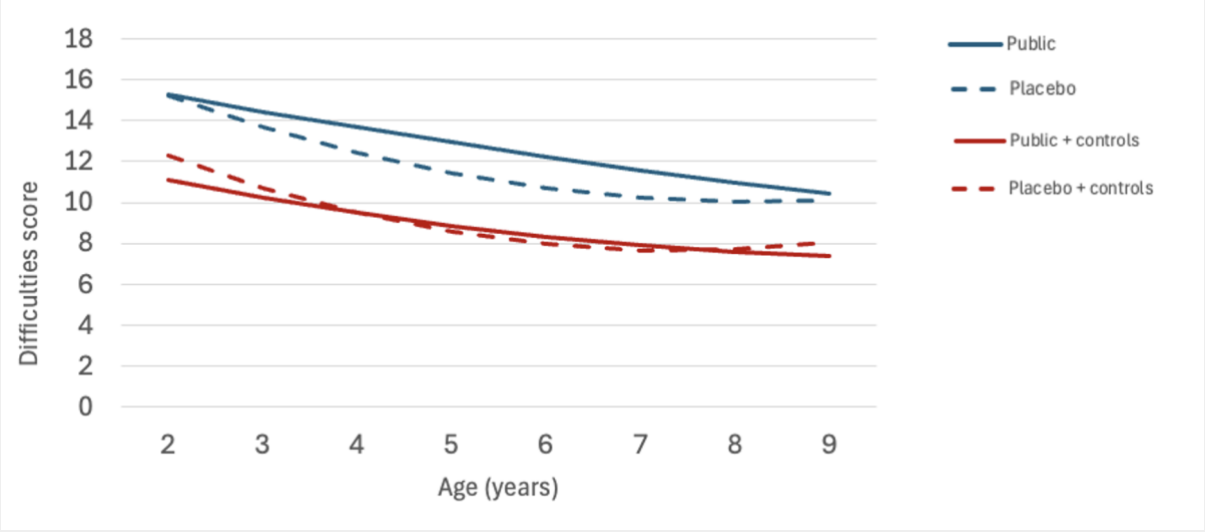
	(1) Model 1	(SE)	(2) Model 2	(SE)	(3) Model 3	(SE)	(4) Model 4	(SE)
Fixed effects								
Intercept	11.408***	(0.072)	10.386***	(0.094)	10.179***	(0.180)	9.499***	(0.147)
Age	-0.079***	(0.003)	-0.085***	(0.004)	-0.087***	(0.006)	-0.087***	(0.006)
Age^2	0.00044***	(0.0003)	0.00054***	(0.00005)	0.0006***	(<0.001)	0.0006***	(<0.001)
Public rental			4.868***	(0.276)	3.965***	(0.278)	1.417***	(0.281)
Public rental x age			0.016	(0.014)	0.013	(0.014)	0.012	(0.014)
Public rental x age^2			-0.0004**	(0.0002)	-0.0003*	(<0.001)	-0.0003*	(<0.001)
Private rental			1.764***	(0.149)	1.510***	(0.148)	0.412***	(0.145)
Private rental x age			0.014***	(0.007)	0.014*	(0.007)	0.013*	(0.007)
Private rental x age^2			-0.00019**	(0.0001)	-0.0002**	(<0.001)	-0.0002*	(<0.001)
Other ownership			0.791*	(0.409)	0.852**	(0.399)	0.457	(0.378)
Other ownership x age			-0.001	(0.019)	-0.001	(0.019)	-0.0006	(0.019)
Other ownership x age^2			-0.00001	(0.0002)	-0.001	(<0.001)	-0.0001	(<0.001)
Girl					-0.628***	(0.135)	-0.606***	(0.128)
Girl x age					0.001	(0.007)	0.001	(0.007)
Girl x age^2					-0.0002**	(<0.001)	-0.0001*	(<0.001)
Parent alone					1.895***	(0.408)	0.791**	(0.390)
Parent alone x age					0.017	(0.020)	0.016	(0.020)
Parent alone x age^2					-0.0002	(<0.001)	-0.001	(<0.001)
Parent(s) with extended family					2.416***	(0.167)	0.869***	(0.169)
Parent(s) with extended family x age					0.004	(0.008)	0.004	(0.008)
Parent(s) with extended family x age^2					-0.0002**	(<0.001)	-0.0002**	(<0.001)
Parent(s) with non-kin					0.821***	(0.300)	0.155	(0.285)
Parent(s) with non-kin x age					-0.003	(0.015)	-0.004	(0.015)
Parent(s) with non-kin x age^2					0.0001	(<0.001)	0.0001	(<0.001)
Maternal age (centred)							-0.119***	(0.010)
University education							-1.017***	(0.112)
Māori							1.509***	(0.166)
Pacific							2.309***	(0.190)
Asian							1.102***	(0.158)
Other ethnicity							0.246	(0.281)
Med. household material deprivation							0.890***	(0.131)
High household material deprivation							1.792***	(0.222)
Med. neighbourhood deprivation							0.073	(0.126)
High neighbourhood deprivation							0.491***	(0.145)
Random effects								
Level 1 (within-person):								
Residual variance	10.264	(0.219)	10.209	(0.217)	10.198	(0.217)	10.190	(0.216)
Level 2 (between-person):								
Intercept variance (2 yr)	16.580	(0.517)	14.519	(0.478)	13.333	(0.457)	10.619	(0.410)
Intercept-slope covariance	-0.070	(0.007)	-0.065	(0.007)	-0.061	(0.007)	-0.048	(0.006)
Slope variance	0.002	(<0.001)	0.002	(<0.001)	0.002	(<0.001)	0.002	(<0.001)
Number of groups	5,713		5,713		5,713		5,713	
AIC	86,862		86,286		85,897		85,147	
BIC	86,916		86,407		86,110		85,435	

Placebo results

To further isolate the role of public housing on child wellbeing trajectories by comparing similar groups of children, we use a placebo analysis where a placebo group is created from the private rental group and matched on initial difficulties scores and family material deprivation. Figure 5 and Appendix 6 present the trajectory of difficulties scores for the placebo group compared with the public housing group. For Model 2 (blue) the placebo group has scores that fall faster over time, but converge with the public housing group by 9 years of age. Once we control for selection effects (red) we can see that the public housing group has lower initial scores at 2 years of age and these consistently decrease over time to a slightly lower point at 9 years than the placebo group.

These results suggest that the public housing and the placebo groups are following slightly different development trajectories and therefore differences in housing experiences may play a role in shaping the trajectories. As the public housing group are likely to be more disadvantaged in ways not picked up in the data (e.g. qualifying for housing support due to a household member with a disability) these results therefore suggest public housing may have a positive influence on behavioural trajectories.

Figure 5: Child behaviour trajectories for public housing and private rental placebo group (Models 2 & 4)



Note: the curves plotted with control variables are given for results where the categorical variables are at their base, and continuous variables are at their mean.

Source: GUiNZ DCW0, DCW1, DCW2, DCW5, DCW8

4.2 Quality of life at twelve years

Prior to analysing the relationship between tenure and QoL at 12 years, we note that there is, as may be expected, a significant association between 8-year difficulties scores and twelve-year QoL (column (1) of Table 6). Model 1 in Table 6 shows that children who start life in private and public rentals have slightly lower wellbeing at twelve years than those who started life in privately owned homes with 0.1 and 0.16 SD lower quality of life (QoL) scores respectively. However, much of this difference appears to be due to residential mobility as once mobility is controlled for, these differences substantially decrease (Model 3) and mostly disappear once other demographic factors are included in Model 5. In that model, children who start life in public rentals have QoL at 12 years that is 0.07 SD higher than children who start life in private rentals and 0.05 SD higher than children who start in owner-occupied housing, although these differences are not statistically significant.

Residential mobility is only significantly associated with lower quality of life for children who have frequently moved (Model 2), but again, even this effect disappears once other covariates are controlled for. School moves show a stronger association with QoL than do residential moves with children who have been to four or more schools having a 0.22 SD lower QoL compared to the reference group who had been to the typical two schools. However, this may reflect reverse causality as children who are less happy at school may be more likely to shift schools, even if they have not shifted house. We therefore do not explore this relationship further.[3]

When the child and demographic controls are included in Model 5, we see that Pacific children have 0.1 SD higher QoL than for other children. Children who consider themselves European have significantly lower QoL than those who do not. Boys have 0.18 SD higher QoL scores than girls. Children of conscientious mothers also have significantly higher QoL. The number of siblings living with a child, maternal education, age and employment were not significantly associated with QoL. Household material deprivation was an important predictor of QoL with children from low deprivation households having about a quarter SD higher QoL scores than other children. However, once relationship variables are controlled for in Model 6, this effect size is halved. Neighbourhood deprivation is not significantly associated with QoL.

Model 6 includes the child-reported variables and finds that parent-child closeness, the teacher-child relationship, frequency of bullying and time in the outdoors are all significantly associated with QoL. Across the model, the strongest predictor of poor QoL is being bullied several times a week (0.59 SD lower than those never bullied). The strongest protective factors are being outdoors several times a day (compared to never) and positive relationships with parents and teachers. A one SD increase in parent-child closeness is associated with a 0.33 SD higher QoL while a one SD increase in teacher-child closeness is associated with a 0.28 SD higher QoL. We note that a number of these child-reported variables may have bi-directional

[3] In addition, including school moves in a model alongside residential mobility causes collinearity problems.

causality with the child's reported QoL (and/or be subject to common reporting biases). Hence these relationships are best interpreted as showing associations only.

Table 6: OLS results estimating standardised Quality of Life at twelve years

	(1)		(2)		(3)		(4)		(6)		(7)		(8)	
Quality of life (12yr) (z)	Difficulties	SE	Model 1	SE	Model 2	SE	Model 3	SE	Model 4	SE	Model 5	SE	Model 6	SE
8-year difficulties (z)	-0.208***	(0.016)												
Tenure (ref: ownership)														
Public rental			-0.158*	(0.064)			-0.099	(0.064)			0.047	(0.072)	0.004	(0.063)
Private rental			-0.103***	(0.031)			-0.069**	(0.034)			-0.022	(0.036)	-0.039	(0.029)
Other tenure			-0.003	(0.089)			0.014	(0.089)			0.061	(0.088)	0.133	(0.072)
Residential mobility (ref: none)														
One move					-0.031	(0.052)	-0.023	(0.051)			-0.033	(0.052)	0.010	(0.042)
Two moves					-0.031	(0.053)	-0.017	(0.054)			-0.015	(0.053)	0.037	(0.043)
Three moves					-0.071	(0.057)	-0.051	(0.058)			-0.046	(0.059)	-0.009	(0.048)
Four moves					-0.131**	(0.063)	-0.106	(0.064)			-0.098	(0.067)	-0.013	(0.052)
Five + moves					-0.151***	(0.049)	-0.115**	(0.052)			-0.075	(0.056)	<0.001	(0.047)
Schools attended 5-12yrs (ref: two)														
One									0.029	(0.040)				
Three									-0.133***	(0.038)				
Four +									-0.218***	(0.055)				
2-year difficulties (Z)											-0.060***	(0.019)	-0.027*	(0.015)
Girl											-0.178***	(0.029)	-0.102***	(0.015)
Child-reported ethnicity (binary)														
European											-0.084*	(0.045)	-0.080**	(0.037)
Māori											-0.053	(0.039)	-0.034	(0.031)
Pacific people											0.096**	(0.049)	0.020	(0.039)
Asian											-0.003	(0.051)	0.055	(0.040)
Siblings at home (ref: two)														
None											-0.108	(0.092)	-0.122	(0.075)
One											-0.021	(0.034)	-0.028	(0.027)
Three+											-0.072	(0.056)	-0.047	(0.045)
Maternal openness											-0.057**	(0.029)	-0.035	(0.023)
Maternal conscientiousness											0.164***	(0.030)	0.104***	(0.024)
Maternal agreeableness											0.024	(0.034)	-0.013	(0.027)
Maternal neuroticism											0.004	(0.024)	0.003	(0.019)
Maternal extroversion											0.035	(0.024)	0.008	(0.020)

Maternal educ. (ref: high school)														
Diploma/ trade cert											-0.060	(0.048)	-0.032	(0.033)
Bachelor's											-0.067	(0.043)	-0.036	(0.035)
Higher degree											-0.042	(0.043)	0.005	(0.038)
Maternal age											-0.006	(0.003)	-0.003	(0.003)
Maternal employment (ref: employed)														
Unemployed											-0.033	(0.078)	-0.040	(0.064)
Out of workforce											-0.072	(0.055)	-0.041	(0.045)
Material deprivation (ref:low)														
Medium											-0.225***	(0.071)	-0.127**	(0.056)
High											-0.243***	(0.080)	-0.126*	(0.070)
NZDep Index score (neighbourhood)														
3-4											-0.027	(0.043)	0.028	(0.036)
5-6											-0.021	(0.046)	0.008	(0.037)
7-8											-0.035	(0.050)	-0.008	(0.039)
9-10											-0.063	(0.058)	0.021	(0.047)
Parent-child closeness (z)													0.331***	(0.014)
Freq. bullying last term (ref: never)														
Once or twice													-0.284***	(0.030)
Every few weeks													-0.306***	(0.064)
Once a week													-0.456***	(0.083)
Several times a week+													-0.590***	(0.085)
Teacher/child relationship (z)													0.275***	(0.014)
Freq. time outdoors (ref: never)														
Once a week													0.037	(0.050)
Several times a week													0.142***	(0.048)
Once a day													0.252***	(0.049)
Several times a day													0.351***	(0.050)
Constant	-0.013	(0.015)	0.020	(0.019)	0.047	(0.038)	0.062	(0.038)	0.014	(0.020)	-0.367	(0.227)	-0.187	(0.191)
Observations	6,852		6,852		6,852		6,852		6,852		6,852		6,852	
R-squared	0.042		0.003		0.004		0.005		0.006		0.044		0.378	

Note: QoL and continuous variables have been standardised.

*** p<0.01, ** p<0.05, * p<0.1

5. Discussion

This study sought to understand wellbeing trajectories through childhood for children in Aotearoa New Zealand who started life in public housing alongside trajectories for children with different initial tenure types. Due to the nature of New Zealand's housing policy, families who are provided with public housing are those with greatest need for support and include children with the highest risk of poor outcomes. These children could be expected to have steadily worse trajectories of wellbeing than their peers, but we found that over time, gaps in wellbeing between children from public housing and their peers instead narrowed.

We found clear differences in how trajectories of positive and negative behaviour were associated with initial housing tenure. Prosocial behaviour increased slowly over time and trajectories did not significantly vary by initial tenure. In contrast, behavioural difficulties (both internalising and externalising problems) decrease over time and were much higher in the early years for children in public housing, before converging to be closer to their peers by nine years of age.

Research on children's psychological wellbeing, particularly as it relates to housing, has typically focused on problematic behaviour at the expense of positive measures of wellbeing. Differences in results suggest that positive wellbeing may be less influenced by structural factors compared to negative domains. Children from disadvantaged backgrounds display similar prosocial skills as their peers from age two, despite other adversities. These prosocial skills could potentially help mitigate poorer long-term outcomes if leveraged by those working with families.

Our results suggest that household structure should be considered in the discussion on housing tenure, particularly in contexts like New Zealand where housing costs are high and families frequently share accommodation. We find that a quarter of the children in our sample start their lives living with relatives (in addition to their parents) in their households and that for children in the public housing group half have relatives living with them. Children starting their lives in nuclear two-parent households have fewer behaviour problems across childhood, although much of this difference disappears after controlling for demographic factors.

Aside from financial savings, there are good reasons for wider families to live together when babies are born – both for cultural reasons and for practical support. Housing support for families in need should actively consider the integration of wider family members, either by providing adequately sized housing, or, if this is not possible, to put strategies in place to mitigate the hazards to young children associated with household crowding.

By twelve years of age, 57% of the children who start life in public housing are living in the top quintile of neighbourhoods for deprivation. However, descriptive results show these children have similar quality relationships with parents,

teachers and peers to children from the other tenure groups. Self-reported wellbeing at twelve years of age for children who start life in public housing is at or above that of their peers in private rentals, despite being in the most disadvantaged group in their early years. That said, twelve years of age is a transitional point in development as children move from childhood to adolescence. These wellbeing similarities between groups may or may not translate into later adolescent and adult wellbeing.

Our results are in line with similar studies which find that children from public housing have higher levels of early behaviour problems. For example, we find similar overall trajectories for behaviour problems to the Australian sample used by O'Donnell and Kingsley (2020). Their public housing group have higher initial difficulties scores than the ownership group, but rather than converging as in our New Zealand sample, the difficulties scores for their public housing group diverge from other children over time.

Most studies on child wellbeing in the context of housing find some kind of neighbourhood effects. We find slightly higher difficulties scores for two-year-olds in high deprivation areas, but no effect at age twelve. This may be due to using neighbourhood as an initial control or because the quality of neighbourhoods is more similar within New Zealand than in countries like the US.

5.1 Residential mobility

One of the touted benefits of public housing in New Zealand is security of tenure. Interestingly, children who started life in public housing moved nearly as much as their peers in the private rental market by twelve years of age (an average of 4.3 moves compared with 4.7 moves).

The impact of mobility was examined directly at twelve years and the effect on child wellbeing was less pronounced in this study than hypothesised. There are several potential reasons for this. The first is that children are reasonably resilient to moving and that quality relationships with family and peers is what is most important for their behavioural development. Therefore, if a child has strong relationships in place then shifting house has little effect on their wellbeing in the long term. The second is that mobility is likely to affect children differently at different developmental stages and at twelve years residential stability may not be as developmentally important as in later adolescence (Fowler et al., 2014). Thirdly, it could be because families move to improve their situations as well as for involuntary reasons. Many families move to take advantage of employment and school opportunities. Others move when family needs change or income growth enables a move.

Differences across the developmental stages

These findings reinforce the importance of a child's early years. During the early years of life, a child's home, and their relationships within it, are the central influence on their wellbeing. We found that the biggest differences in wellbeing between children across the tenure types occurred in the preschool years. Children reported only very small differences in wellbeing between the tenure groups by the time children were twelve years of age.

The trajectories examined in this study cover the period when children are starting school (generally on their 5th birthday in New Zealand). At this point, children from the public housing group are starting school with similar levels of prosocial skills, but significantly higher internalising and externalising problems. These problems are likely to affect their ability to pay attention at school and to form positive peer relationships – all critical skills for engaging in education. These gaps in behaviour narrow by later childhood but educational disadvantages may have already been set in place during this period.

By twelve years of age, positive relationships with family, peers and teachers are most strongly associated with children's wellbeing (Table 6). So, while we find frequent residential moves only has a small association with wellbeing, these results only pick up the average effect of moving and the effect of moving is likely to be child dependent. Those in supportive families who make friends easily and integrate well into new classrooms are more likely to be resilient to frequent moves. Those lacking in these areas may be more negatively affected by moving.

5.2 Limitations

Conclusions from this study should be considered in light of its limitations. First, despite the benefits of longitudinal data, the data are still observational and the results are descriptive and we are therefore unable to isolate the causal effect of public housing on children. Data for the growth curve models comes primarily from a single respondent and so shared error variance is a possibility. This is somewhat mitigated in the twelve-year analysis with use of child data (except when child-reported data is modelled in Model 6 of Table 6).

Second, while the SDQ has been widely used internationally and well validated across multiple contexts, there have been some questions raised over how little is known about the SDQ's developmental invariance, particularly for the preschool years (Kersten, Czuba, et al., 2016). There have also been questions raised about the cultural appropriateness of the SDQ for Māori and Pacific children in New Zealand (Kersten, Dudley, et al., 2016; Kersten et al., 2018) and this needs to be considered, particularly in light of any findings focused on ethnicity.

6. Conclusion

This study adds to previous research on housing and children's wellbeing in several ways: a) we include positive wellbeing measures alongside the typical deficit-focused measures, (b) we look closely at the preschool years at an earlier age than most others, capturing data on children's mental wellbeing from two years of age, c) we incorporate a child's perspective by utilising child-reported data, and d) we provide new evidence from Aotearoa New Zealand, a high-income country with high housing costs.

We find wellbeing differences between New Zealand children who start life in public housing and their peers, which is most pronounced in early childhood. Children starting life in public housing have similar trajectories of prosocial behaviour scores to their peers, but problem behaviour scores are higher in the preschool years before converging over later childhood. By twelve years of age, children who start life in public housing report similar or higher levels of wellbeing to those who were in private rentals or owner-occupation. We find the impact of residential mobility over childhood on wellbeing at twelve years old is multifaceted. Although initially hypothesized to play an important role in wellbeing, results suggest resilience to moving among most children and quality relationships are what is most important for their wellbeing.

We conclude that the provision of public housing in the early years supports children's wellbeing. However, further assistance to families of preschool children is needed to reduce inequalities and to set children up to capitalise on educational opportunities when starting school.

Appendix 1 – Strengths and difficulties questionnaire questions

Early years SDQ (2 years)	Regular SDQ (4.5 and 8 years)
Internalising problems	Internalising problems
Emotional problems	*Emotional problems*
Often complains of headaches, stomach-aches, or sickness.	Often complains of headaches, stomach-aches, or sickness.
Many worries, often seems worried.	Many worries, often seems worried.
Often unhappy, down-hearted or tearful.	Often unhappy, down-hearted or tearful.
Nervous or clingy in new situations, easily loses confidence.	Nervous or clingy in new situations, easily loses confidence.
Many fears, easily scared	Many fears, easily scared
Peer relationship problems	*Peer relationship problems*
Rather solitary, tends to play alone.	Rather solitary, prefers to play alone.
Has at least one good friend.	Has at least one good friend.
Generally liked by other children.	Generally liked by other children.
Picked on or bullied by other children.	Picked on or bullied by other children.
Gets on better with adults than with other children.	Gets on better with adults than with other children.
Externalising problems	Externalising problems
Conduct problems	*Conduct problems*
Often has temper tantrums or hot tempers	Often loses temper
Generally obedient, usually does what adults request	Generally well behaved, usually does what adults request
Often fights with other children or bullies them	Often fights with other children or bullies them
Often argumentative with adults	Often lies or cheats
Can be spiteful to others	Steals from home, (pre)school or elsewhere
Hyperactivity/inattention	*Hyperactivity/inattention*
Restless, overactive, cannot stay still for long	Restless, overactive, cannot stay still for long
Constantly fidgeting or squirming	Constantly fidgeting or squirming
Easily distracted, concentration wanders	Easily distracted, concentration wanders
Can stop and think things out before acting	Can stop and think things out before acting
Sees tasks through to the end, good attention span	Has good attention span, sees chores or work through to the end
Prosocial behaviour/strengths	*Prosocial behaviour/strengths*
Considerate of other people's feelings	Considerate of other people's feelings
Shares readily with other children, for example toys, treats, pencils.	Shares readily with other children, for example toys, treats, pencils.
Helpful if someone is hurt, upset or feeling ill	Helpful if someone is hurt, upset or feeling ill
Kind to younger children	Kind to younger children
Often volunteers to help others (parents, teachers, other children)	Often volunteers to help others (parents, teachers, other children)

Appendix 2 – Summary statistics for twelve-year analysis

	Initial tenure					
	Ownership	Public rental	Private rental	Other	Item missing	**Total**
	Mean/% (SD)	Mean/% (SD)	Mean/% (SD)	Mean/% (SD)	Mean/% (SD)	Mean/% (SD)
Quality of life (12yr)	39.59 (5.03)	38.82 (5.70)	39.05 (5.26)	39.52 (5.21)	39.60 (5.32)	**39.40 (5.18)**
Residential mobility (12yr)						
None	20.2	6.7	3.2	11.6	14.0	**13.3**
One move	18.3	5.6	9.1	13.6	13.8	**14.0**
Two moves	15.6	8.6	11.0	12.9	10.8	**13.1**
Three moves	8.8	3.7	10.7	15.7	8.4	**9.1**
Four moves	6.5	4.1	7.7	4.1	7.0	**6.6**
Five + moves	12.7	19.4	32.0	25.2	18.9	**19.4**
Item missing	17.9	51.9	26.3	17.0	27.2	**24.6**
Residential mobility (12yr)	2.30 (2.41)	4.33 (4.11)	4.72 (3.57)	3.41 (3.12)	3.11 (3.04)	**3.16 (3.12)**
Schools attended 5-12yrs						
One	19.0	18.4	16.7	25.0	17.2	**18.4**
Two	56.8	35.8	49.0	44.9	51.7	**52.7**
Three	18.3	24.9	22.9	19.1	21.0	**20.2**
Four +	5.5	16.4	10.8	11.0	8.8	**8.1**
Item missing	<1	4.5	<1	0	<2	**0.8**
Child-reported ethnicity (binary,12yr)						
European	86.0	38.0	70.8	90.3	72.8	**77.9**
Māori	17.2	36.0	30.7	22.4	18.5	**22.3**
Pacific people	9.6	67.5	21.3	6.7	21.9	**16.6**
Asian	14.2	8.0	17.1	7.5	18.8	**15.1**
Siblings at home						
None	1.7	<5	4.2	<5	3.1	**2.7**
One	51.2	30.9	44.4	41.9	45.1	**47.3**
Two	27.6	18.4	23.8	28.7	22.3	**25.7**
Three+	9.1	35.3	12.5	15.4	14.7	**11.8**
Item missing	10.4	11.0	14.2	12.4	14.6	**12.6**
Maternal openness	3.74 (0.56)	3.57 (0.47)	3.72 (0.56)	3.67 (0.57)	3.68 (0.56)	**3.72 (0.56)**
Maternal conscientiousness	4.08 (0.56)	3.72 (0.56)	3.93 (0.57)	3.97 (0.55)	3.96 (0.57)	**3.99 (0.57)**
Maternal agreeableness	4.00 (0.49)	3.84 (0.52)	3.94 (0.50)	3.94 (0.53)	3.97 (0.51)	**3.97 (0.50)**
Maternal neuroticism	2.58 (0.70)	2.74 (0.60)	2.73 (0.67)	2.72 (0.75)	2.72 (0.65)	**2.66 (0.69)**
Maternal extroversion	3.65 (0.72)	3.41 (0.55)	3.59 (0.67)	3.53 (0.75)	3.54 (0.68)	**3.60 (0.69)**
Maternal employment (12yr)						
Employed	82.1	51.1	74.4	83.7	73.1	**77.3**
Unemployed	1.9	11.6	4.7	2.0	6.5	**3.6**
Out of workforce	8.0	13.8	9.1	8.2	7.1	**8.5**
Item missing	8.1	23.5	11.8	6.1	13.48	**10.6**
Material deprivation (12yr)						

Low	79.4	29.5	64.6	78.9	63.1	**70.3**
Medium	2.2	9.0	5.2	2.0	4.9	**3.8**
High	1.3	10.5	3.8	3.4	3.5	**2.8**
Item missing	17.1	51.1	26.5	15.7	28.6	**23.2**
Neighbourhood deprivation (12 yr)						
1-2	28.9	3.4	14.9	15.7	22.1	**22.1**
3-4	24.0	7.5	17.5	16.3	20.8	**20.4**
5-6	18.3	10.5	18.8	25.2	17.8	**18.1**
7-8	13.8	16.4	17.9	21.8	14.3	**15.4**
9-10	6.7	57.5	24.0	14.3	08.6	**17.7**
Item missing	5.5	4.9	6.9	6.8	6.5	**6.3**
Parent/child closeness (12yr)	35.80 (4.43)	35.63 (4.34)	34.86 (5.34)	34.68 (4.77)	35.19 (4.70)	**35.64 (4.50)**
Freq. bullying last term (12yr)						
Never	71.3	73.1	70.2	63.8	71.7	**70.9**
Once or twice	18.0	17.8	19.0	17.4	19.1	**18.2**
Every few weeks	3.9	<5	3.6	6.5	3.6	**3.9**
Once a week	2.2	<5	1.9	5.0	<5	**2.1**
Several times a week+	2.1	<5	2.7	<5	<5	**2.2**
Item missing	2.4	<5	2.7	<5	<5	**2.7**
Teacher/child relationship (12yr)	18.85 (4.87)	19.07 (5.01)	18.64 (4.88)	18.81 (4.95)	18.64 (5.21)	**18.78 (4.91)**
Freq. time outdoors (12yr)						
Never	7.2	13.0	10.8	8.0	12.5	**9.0**
Once a week	19.9	21.2	20.4	21.7	22.3	**20.4**
Several times a week	30.0	26.4	28.8	24.6	24.1	**28.7**
Once a day	19.9	15.4	18.5	16.7	15.2	**18.9**
Several times a day	21.1	20.7	19.3	26.1	22.3	**20.7**
Item missing	2.0	<5	2.3	<5	3.6	**2.3**
Total	**51.3%**	**6.3%**	**32.0%**	**2.8%**	**7.7%**	

Source: GUiNZ DCW0, DCW1, DCW2, DCW5, DCW8

Appendix 3 – Growth curve results using complete case analysis

	(1)		(2)		(3)	
Quality of life (12yr) (z)	Model 1	SE	Model 2	SE	Model 6	SE
Tenure (ref: ownership)						
Public rental	-0.147*	(0.079)			-0.013	(0.145)
Private rental	-0.104***	(0.034)			-0.040	(0.041)
Other tenure	-0.002	(0.088)			0.080	(0.092)
Residential mobility (ref: none)						
One move			-0.010	(0.052)	0.091*	(0.042)
Two moves			-0.015	(0.054)	0.118**	(0.043)
Three moves			-0.054	(0.061)	0.014	(0.048)
Four moves			-0.143**	(0.066)	0.072	(0.052)
Five + moves			-0.143***	(0.050)	0.075	(0.047)
2 year behavioural difficulties (Z)					-0.054**	(0.021)
Girl					-0.111***	(0.015)
Child-reported ethnicity (binary)						
European					-0.093	(0.062)
Māori					-0.075*	(0.043)
Pacific people					-0.031	(0.064)
Asian					-0.005	(0.059)
Siblings at home (ref: two)						
None					-0.311**	(0.075)
One					-0.061*	(0.027)
Three+					-0.041	(0.045)
Maternal openness					-0.043	(0.030)
Maternal conscientiousness					0.096***	(0.032)
Maternal agreeableness					-0.021	(0.037)
Maternal neuroticism					0.016	(0.030)
Maternal extroversion					0.015	(0.025)
Maternal education (ref: high school)						
Diploma/ trade cert					-0.018	(0.049)
Bachelor's					-0.035	(0.048)
Higher degree					-0.015	(0.053)
Maternal age (centred)					-0.002	(0.004)
Maternal employment (ref: employed)						
Unemployed					-0.205	(0.127)
Out of workforce					0.011	(0.061)
Material deprivation (ref: Low)						
Medium					-0.325***	(0.056)
High					-0.105	(0.070)
Neighbourhood deprivation (ref: 1-2)						
3-4					0.016	(0.044)
5-6					0.031	(0.047)
7-8					0.001	(0.052)
9-10					-0.023	(0.067)
Parent-child closeness (z)					0.294***	(0.020)
Freq. bullying last term (ref: never)						
Once or twice					-0.324***	(0.045)
Every few weeks					-0.279***	(0.106)
Once a week					-0.581***	(0.134)
Several times a week+					-0.519***	(0.140)
Teacher/child relationship (z)					0.297***	(0.020)
Freq. time outdoors (ref: never)						

Once a week					0.038	(0.050)
Several times a week					0.178**	(0.048)
Once a day					0.201**	(0.049)
Several times a day					0.356***	(0.050)
Constant	0.036*	(0.019)	0.073	(0.038)	-0.121	(0.269)
Observations	4,205		3,752		2,320	
R-squared	0.003		0.003		0.375	

*** p<0.01, ** p<0.05, * p<0.1

Source: GUiNZ DCW0, DCW1, DCW2, DCW5, DCW8

Appendix 4 – Growth curve results for strengths, internalising and externalising

		(1)		(2)	
		Model 1	(SE)	Model 2	(SE)
Externalising	**Fixed effects:**				
	Intercept	11.408***	(0.072)	10.386***	(0.094)
	Age	-0.079***	(0.003)	-0.085***	(0.004)
	Age^2	0.00044***	(0.0003)	0.00054***	(0.00005)
	Public rental			4.868***	(0.276)
	Public rental x age			0.016	(0.014)
	Public rental x age^2			-0.0004**	(0.0002)
	Private rental			1.764***	(0.149)
	Private rental x age			0.014***	(0.007)
	Private rental x age^2			-0.00019**	(0.0001)
	Other ownership			0.791*	(0.409)
	Other ownership x age			-0.001	(0.019)
	Other ownership x age^2			-0.00001	(0.0002)
Internalising	**Fixed effects:**				
	Intercept	3.972***	(0.038)	3.457***	(0.050)
	Age	-0.016***	(0.002)	-0.021***	(0.003)
	Age^2	0.0001***	(<0.001)	0.0002***	(<0.001)
	Public rental			2.431***	(0.145)
	Public rental x age			0.025***	(0.008)
	Public rental x age^2			-0.0004***	(<0.001)
	Private rental			0.904***	(0.079)
	Private rental x age			0.007*	(0.004)
	Private rental x age^2			-0.0008*	(<0.001)
	Other ownership			0.218	(0.215)
	Other ownership x age			0.007	(0.011)
	Other ownership x age^2			-0.00002	(<0.001)
Prosocial/strengths	**Fixed effects:**				
	Intercept	7.112***	(0.025)	7.087***	(0.034)
	Age	0.025***	(0.001)	0.0256***	(0.002)
	Age^2	-0.0002***	(<0.001)	-0.00015***	(<0.001)
	Public rental			-0.036	(0.102)
	Public rental x age			-0.004	(0.006)
	Public rental x age^2			-0.0001	(<0.001)
	Private rental			0.079	0.054)
	Private rental x age			-0.0004	(0.003)
	Private rental x age^2			0.0001	(<0.001)
	Other ownership			-0.002	(0.147)
	Other ownership x age			0.008	(0.008)
	Other ownership x age^2			-0.0001	(<0.001)

Appendix 5 - Growth curve results for tamariki Māori sample

	(1)		(2)		(3)		(4)	
	Model 1	(SE)	Model 2	(SE)	Model 3	(SE)	Model 4	(SE)
Fixed effects								
Intercept	11.849***	(0.168)	10.901***	(0.241)	10.546***	(0.304)	10.632***	(0.400)
Age	-0.080***	(0.008)	-0.088***	(0.004)	-0.093***	(0.014)	-0.092***	(0.015)
Age^2	0.0004***	(<0.001)	0.0005***	(0.0001)	0.0007***	(<0.001)	0.0007***	(<0.001)
Public rental			3.318***	(0.625)	2.724***	(0.623)	0.972	(0.612)
Public rental x age			0.020	(0.030)	0.014	(0.030)	0.014	(0.030)
Public rental x age2			-0.0004	(<0.001)	-0.0003	(<0.001)	-0.0003	(<0.001)
Private rental			1.558***	(0.350)	1.358***	(0.346)	0.435	(0.342)
Private rental x age			0.015	(0.016)	0.011	(0.016)	0.011	(0.016)
Private rental x age2			-0.0001	(<0.001)	-0.0001	(<0.001)	-0.0001	(<0.001)
Other ownership			0.208	(0.972)	0.421	(0.952)	0.020	(0.906)
Other ownership x age			-0.005	(0.044)	-0.007	(0.044)	-0.0006	(0.019)
Other ownership x age^2			0.0003	(<0.001)	0.0003	(<0.001)	0.0003	(<0.001)
Girl					-0.471	(0.322)	-0.565*	(0.128)
Girl x age					0.011	(0.015)	0.010	(0.015)
Girl x age2					-0.0004**	(<0.001)	-0.0004**	(<0.001)
Parent alone					1.562*	(0.884)	0.496	(0.855)
Parent alone x age					0.076*	(0.043)	0.077*	(0.042)
Parent alone x age^2					-0.001*	(<0.001)	-0.0009*	(<0.001)
Parent(s) with extended family					2.049***	(0.369)	0.990***	(0.386)
Parent(s) with extended family x age					-0.005	(0.008)	-0.007	(0.017)
Parent(s) with extended family x age^2					-0.0001	(<0.001)	-0.0001	(<0.001)
Parent(s) with non-kin					0.958	(0.678)	0.448	(0.648)

Parent(s) with non-kin x age					-0.005	(0.032)	-0.005	(0.032)
Parent(s) with non-kin x age^2					0.0001	(<0.001)	0.0001	(<0.001)
Maternal age (centred)							-0.099***	(0.021)
University education							-1.346***	(0.275)
Med. household material deprivation							0.519*	(0.287)
High household material deprivation							1.394***	(0.466)
Medium neighbourhood deprivation							0.218	(0.330)
High neighbourhood deprivation							1.355***	(0.346)
Māori							0.591**	(0.267)
Pacific							1.390***	(0.535)
Asian							-0.418	(0.896)
Other ethnicity							-0.573	(0.855)
Random effects								
Level 1 (within-person):								
Residual variance	10.222	(0.488)	10.197	(0.487)	10.077	(0.480)	10.075	(0.480)
Level 2 (between-person):								
Intercept variance (age 2)	15.690	(1.154)	14.489	(1.100)	13.581	(1.055)	10.990	(0.942)
Intercept-slope covariance	-0.074	(0.015)	-0.073	(0.015)	-0.069	(0.014)	-0.058	(0.014)
Slope variance	0.002	(<0.001)	0.002	(<0.001)	0.002	(<0.001)	0.002	(<0.001)
Number of groups	983		983		983		983	
AIC	16,173		16,118		16,060		15,947	
BIC	16,214		16,212		16,226		16,172	

*** p<0.01, ** p<0.05, * p<0.1

Source: GUiNZ DCW0, DCW1, DCW2, DCW5, DCW

Appendix 6 – Placebo analysis and balanced sample results

	Placebo analysis				Balanced sample			
	(1)		(2)		(3)		(4)	
	Model 2	(SE)	Model 4	(SE)	Model 1	(SE)	Model 2	(SE)
Fixed effects								
Intercept	10.386***	(0.094)	9.507***	(0.146)	10.852***	(0.077)	10.115***	(0.097)
Age	-0.085***	(0.004)	-0.087***	(0.006)	-0.080***	(0.004)	-0.086***	(0.005)
Age^2	0.0005***	(<0.001)	0.0007***	(<0.001)	0.0005***	(<0.001)	0.0006***	(<0.001)
Public rental	4.868***	(0.276)	1.614***	(0.281)			4.332***	(0.369)
Public rental x age	0.016	(0.014)	0.011	(0.014)			0.030*	(0.018)
Public rental x age^2	-0.0004**	(<0.001)	-0.0003*	(<0.001)			-0.0005**	(<0.001)
Placebo group	4.856***	(0.267)	2.793***	(0.262)				
Placebo group x age	-0.053***	(0.013)	-0.057***	(0.013)				
Placebo group x age^2	0.0004**	(<0.001)	0.0005***	(<0.001)				
Private rental	1.764***	(0.149)	-0.144	(0.152)			1.538***	(0.163)
Private rental x age	0.014***	(0.007)	0.032***	(0.008)			0.014***	(0.008)
Private rental x age^2	-0.0002**	(<0.001)	-0.0003***	(<0.001)			-0.0002**	(<0.001)
Other ownership	0.791*	(0.409)	0.470	(0.375)			0.885**	(0.424)
Other ownership x age	-0.001	(0.019)	-0.0006	(0.019)			-0.001	(0.019)
Other ownership x age^2	-0.00001	(<0.001)	-0.0001	(<0.001)			<0.001	(<0.001)
Control variables	No		Yes		No		No	
	5,713		5,713		4,330		4,330	

*** p<0.01, ** p<0.05, * p<0.1

Source: GUiNZ DCW0, DCW1, DCW2, DCW5, DCW8

Appendix 7 – use of AI tools in this study

Elicit was used as an aid to search the literature. Grammarly and Copilot were used to assist with editing a final draft. ChatGPT provided the first draft of the executive summary.

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