Residential mobility and socioemotional and behavioural difficulties in a preschool population cohort of New Zealand children

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ABSTRACT

Background Findings regarding early residential mobility and increased risk for socioemotional and behavioural (SEB) difficulties in preschool children are mixed, with some studies finding no evidence of an association once known covariates are controlled for. Our aim was to investigate residential mobility and SEB difficulties in a population cohort of New Zealand (NZ) children.

Methods Data from the Integrated Data Infrastructure were examined for 313 164 children born in NZ since 2004 who had completed the Before School Check at 4 years of age. Residential mobility was determined from address data. SEB difficulty scores were obtained from the Strengths and Difficulties Questionnaire administered as part of the Before School Check.

Results The prevalence of residential mobility was 69%; 12% of children had moved ≥4 times. A linear association between residential mobility and increased SEB difficulties was found (B=0.58), which remained robust when controlling for several known covariates. Moves >10 km and moving to areas of higher socioeconomic deprivation were associated with increased SEB difficulties (B=0.08 and B=0.09, respectively), while residential mobility before 2 years of age was not. Children exposed to greater residential mobility were 8% more likely to obtain SEB difficulties scores of clinical concern than children exposed to fewer moves (adjusted OR 1.08).

Conclusion This study found a linear association between residential mobility and increased SEB difficulties in young children. This result highlights the need to consider residential mobility as a risk factor for SEB difficulties in the preschool years.

INTRODUCTION

Moving home is a major life event which reduces the predictability of children's environments and necessitates adjustment.[1] Repeated exposure to stressful life events is associated with decreased well-being and socioemotional and behavioural (SEB) difficulties in children and adolescents.[2 3] Despite the large literature on residential mobility, few studies have specifically addressed SEB well-being outcomes in early childhood.[4 5] The transition to formal schooling is an important milestone[6 7] and socioemotional well-being at this time predicts future achievement.[8] New Zealand (NZ) has one of the highest reported rates of residential mobility among developed countries.[9 10] Parents with young children are a particularly mobile population group, with around two-thirds of children moving at least once in their first 5 years of life.[11] Taking a developmental perspective, this study investigated associations between early residential mobility and socioemotional well-being in a population-based cohort of NZ children prior to starting school.

Generally speaking, families in rental housing are more likely to move than families in owner-occupied housing,[9 12 13] while low household income, low maternal education and ethnicity are all known to be associated with both residential mobility and SEB difficulties.[14–17] Although evidence on the association between residential mobility and SEB difficulties in young children is inconclusive, there appears to be a small but robust association between greater residential mobility and increased SEB difficulties.[9 12 18 19] However, the strength of this association often decreases when known covariates are controlled for, becoming non-significant,[4 5 20] or holding only for subgroups, such as children from low-income families.[8 19 21 22] Furthermore, questions remain regarding the role of move characteristics such as the distance moved, the age at which moves occur and the socioeconomic direction of moves (ie, move quality) in SEB outcomes.[5 18 21 23–25] Many studies are concerned mainly with the effects of 'high' residential mobility, variously defined. Thresholds of three or more moves have been used as an indicator of high residential mobility in several studies[4 19 26]; however, further evidence on the utility of such thresholds is required.

The research questions in this study concerned the association between residential mobility and SEB difficulties in young children. Using data from a large national population cohort, the aims were to (1) replicate previous findings on the prevalence and predictors of residential mobility and extend these to a population cohort of NZ children, (2) investigate the association between residential mobility and SEB difficulties and assess whether this association was linear or non-linear, (3) investigate the association between residential mobility and SEB difficulties when controlling for a range of covariates, and (4) explore move quality, distance and timing characteristics controlling for residential mobility and known covariates.

METHODS
Data source
All data were sourced from the Integrated Data Infrastructure (IDI), an administrative data set
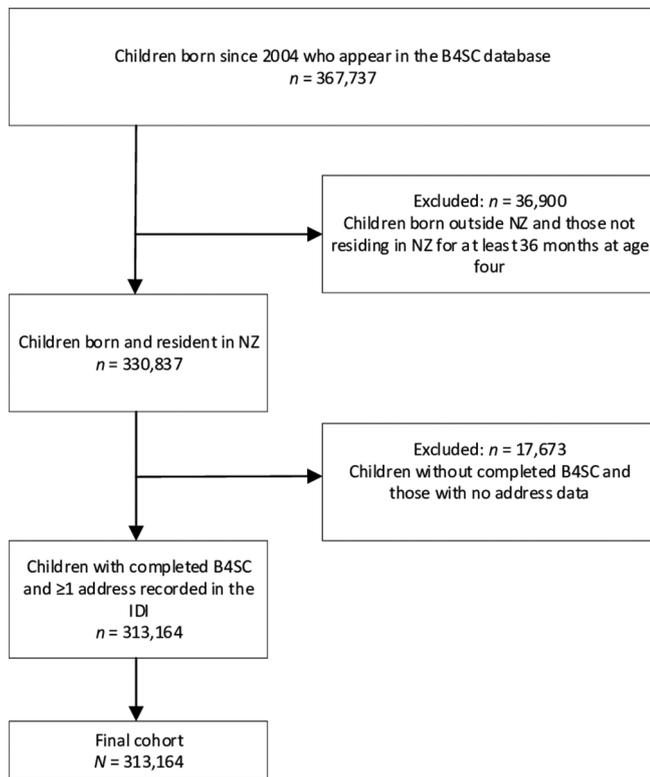
Figure 1 Study cohort diagram.

maintained by Statistics NZ containing de-identified microdata from government agencies, Statistics NZ surveys and community-based providers.[27] The IDI provides the most comprehensive national cohort for health and social research in NZ.[28 29] The Before School Check (B4SC) is a universal health and development check for 4-year-olds, administered by nurses in community settings. Its aims are to promote health and well-being through identifying and addressing behavioural, developmental and health concerns.[30] Socioemotional well-being (SEB difficulties) and residential mobility variables were sourced from B4SC and address data, respectively.

Study design and cohort

We conducted a population-based cohort study using data from the IDI. As shown in figure 1, an initial population cohort of individuals born since 2004 who appeared in the B4SC database (n=367 737) was created. This cohort was then refined to include only individuals born in NZ, who had resided in NZ for at least three of their first 4 years of life (n=330 837), had completed a B4SC and for whom address data were available. The final cohort of 313 164 children represented 94.7% of the cohort of NZ-born, resident children.

Socioemotional and behavioural difficulties

The version of the well-validated Strengths and Difficulties Questionnaire (SDQ) for children 2–4 years old is administered as part of the B4SC.[31] Parent-completed SDQ scores were available for 95.8% of the cohort (n=300 099) providing the outcome variable. The SDQ includes four difficulty subscales—*emotional symptoms*, *peer relationship problems*, *conduct problems* and *hyperactivity/inattention*. Consistent with standard procedure, the subscale scores were summed to create a *total difficulties* score with a maximum of 40 (M=6.64, SD 4.87; table 1).[31] For the age group 2–4 years, *total difficulties* scores of 13–15 are

Table 1 Sociodemographic, SDQ and covariate descriptive statistics for the cohort

	Count	%	Mean	Median	SD
Sex	–	–	–	–	–
Female	161 049	51.4	–	–	–
Male	152 115	48.6	–	–	–
Ethnicity*	–	–	–	–	–
European	222 897	71.2	–	–	–
Māori	86 565	27.6	–	–	–
Pacific	43 668	13.9	–	–	–
Asian	36 549	11.7	–	–	–
Other	9141	2.9	–	–	–
SDQ	–	–	–	–	–
Total difficulties score	–	–	6.64	6	4.87
Some concern/concerning score	35 613	11.9	–	–	–
No of moves	–	–	1.53	*1	1.58
0	97 716	31.2	–	–	–
1	57 600	18.4	–	–	–
2	89 214	28.5	–	–	–
3	32 496	10.4	–	–	–
4	17 820	5.7	–	–	–
5	9246	3.0	–	–	–
6	4665	1.5	–	–	–
≥7	4404	1.4	–	–	–
1 or more moves	215 445	68.8	–	–	–
No of siblings	–	–	1.69	1	1.36
Contact with child services†	–	–	–	–	–
Yes	32 892	10.5	–	–	–
No	280 275	89.5	–	–	–
Maternal age (years)	–	–	29	30	6
Average parental income 5 years (US$1000s)‡	–	–	–	59	47
Maternal benefit receipt (months)	–	–	13	0	21
NZDep-last	–	–	–	6	2.97
Maternal education§	–	–	–	–	–
No qualifications	34 644	11.1	–	–	–
High school qualifications	104 064	33.2	–	–	–
Post-school qualifications	41 346	13.2	–	–	–
Tertiary qualifications	82 131	26.2	–	–	–
Unknown qualifications	50 979	16.3	–	–	–
Housing tenure¶	–	–	–	–	–
Owner-occupied	202 686	64.7	–	–	–
Private rental	81 402	26.0	–	–	–
Public rental (social housing)	29 076	9.3	–	–	–
Moves over 10 km	–	–	0.53	0	0.96
No moves	213 000	68.1	–	–	–
One or more moves	100 161	32.0	–	–	–
Early moves (before age 2)**	–	–	0.86	1	1.08
No moves	147 114	47.9	–	–	–
One or more moves	159 792	52.1	–	–	–
Cohort N=313 164					

*Ethnicity data sum to greater than 100% as multiple categories may be self-selected.
†Substantiated finding of abuse or neglect, or an out-of-home placement.
‡Average annual income combined for both parents over the 5-year period from the year prior to the birth of the child through to the year in which the child turned 4.
§High school—National Certificate of Educational Achievement Levels 1–3 or overseas high school qualifications; post-school qualifications—certificate or diploma; tertiary—undergraduate degree or above.
¶Owner-occupied status was inferred if the address was not included in private or public rental data.
**Early moves included only children with an address recorded before age 2.
SDQ, Strengths and Difficulties Questionnaire.

considered of *some concern* and scores of ≥16 as *concerning*.[32 33] Hence, we used a cut-off score of ≥13 to create a combined *some concern*/*concerning* variable.

Residential mobility

Residential mobility—defined as the number of residential moves between birth and the SDQ administration date—was derived from the addresses recorded in the '*address_notification_full*' IDI table as the number of addresses minus one. This table collates geocoded address change notifications from government agencies.[27] Changes of address were assumed to represent residential moves, and only unique addresses were used for each child (https://vhin.co.nz/guides/geographic-information-in-idi/).[34] The IDI is updated quarterly and the July 2018 'refresh' was used in the current study.[27 34] To meet confidentiality requirements, we limited the number of moves to a maximum of 7, reflecting the 99th percentile (M=1.53, SD 1.58). We created two dichotomous variables for *moves over 10 km* (move distance) and *early moves* (prior to 2 years of age), respectively. It was thought that moves ≥10 km would be likely to involve changes to neighbourhoods and social networks.

The New Zealand Deprivation Index (NZDep) is an area-based measure of socioeconomic deprivation. It uses information from the NZ Census in which small geographical areas (meshblocks) are allocated socioeconomic deprivation scores from 1 (least deprived) to 10 (most deprived), with a uniform (decile) distribution.[35] Addresses were linked to their corresponding meshblock in the IDI to obtain an NZDep value for each address.

Covariates

Child demographic covariates included sex, ethnicity and age. Family and maternal covariates included number of siblings, maternal age, maternal education and housing tenure (for the most recent address). Birth records ('Parent 1' and 'Parent 2') were used to identify children's parents; 'Parent 1' was assumed to be the child's mother as 99.99% of people categorised as 'Parent 1' were women.

Socioeconomic covariates included combined parental income and maternal (Parent 1) benefit receipt. NZDep scores for the most recent address prior to the B4SC (NZDep-last) and for the first known address (NZDep-first) were used in the analyses. NZDep-last was included as a covariate, while NZDep-last and NZDep-first were both entered in Model 3.

Reflecting the influences of environmental factors throughout the early years, combined parental income (Parent 1 and Parent 2 from the birth records) and maternal benefit receipt were calculated over a 5-year period, from the year prior to the child's birth through to the year the child completed the B4SC. For parental income, we calculated the average annual income for both parents over the 5-year period, bottom-coding very low (and negative) values to the first percentile and top-coding very high values to the 99th percentile, respectively (98% winsorisation).

Maternal benefit receipt (social assistance) was calculated as the total number of months Parent 1 received a benefit over the same 5-year period. Finally, determinations regarding substantiated findings of abuse or neglect, or out-of-home care placements were made through record linkage with NZ's child care and protection agency. All cohort children were included in all analyses.

Missing data

Address data were missing for 5.3% (n=17 397) of the cohort born and resident in NZ, with a completed B4SC. Only children with address data were included in the final cohort. The total number of moves was calculated from the number of unique addresses prior to the SDQ parent completion date. Where this date was not available (3.5%, n=10 836), it was imputed using children's mean age at SDQ administration. No imputations were carried out for missing data on other variables. *Total difficulties* scores (the outcome variable) were available for 95.8% of the cohort. All *n*'s reported have been randomly rounded to base three in accordance with Statistics NZ confidentiality requirements.

Statistical analyses

We carried out multiple regression analyses using R, V.3.4.1.[36] In Model 1a, *total difficulties* was regressed on the *number of moves* as a continuous variable. To test the assumption of linearity, this bivariate analysis was repeated with number of moves as a factor, 0 to 7 moves (Model 1b). The full model, Model 2, included number of moves as a linear variable and controlled for all the covariates. Model 3 included the move characteristics—early moves, moves over 10 km and NZDep-last while controlling for NZDep-first, with the associated regression coefficient for NZDep-last reflecting differences between the socioeconomic deprivation level of the area associated with children's first address and that of the area associated with children's last address.[37] We also examined the association between residential mobility (number of moves) and total difficulties scores in the combined '*some concern*' and '*concerning*' range in a separate logistic regression. Data were collapsed where necessary to meet Statistics NZ confidentiality requirements.

RESULTS

Descriptive data for the final cohort of 313 164 children are shown in table 1.

Main analyses

As expected, the distribution of *total difficulties* scores was positively skewed with most children obtaining scores at the lower end of the 40-point scale (M=6.64, SD 4.87). Almost 12% of children (n=35 613) had total difficulties scores in either the *some concern* (score=13–15) or *concerning* range (score≥16).

Mean *total difficulties* scores were higher for children exposed to residential mobility than for children not exposed to residential mobility (table 2, Model 1a; B=0.58, CI 0.57 to 0.59). Furthermore, the relationship between *number of moves* and *total difficulties* was linear, as shown in figure 2, and this was further tested in Model 1b (table 2).

As shown in table 2, we explored the linearity of this relationship by building two models: Model 1a, with *number of moves* as a linear variable; and Model 1b, with *number of moves* as a factor variable. Estimates from each model for the corresponding number of moves are shown in the shaded columns. The similarity of these patterns confirmed the linear nature of the association with *total difficulties* and, therefore, *number of moves* was retained as a continuous variable in all subsequent analyses.

In Model 2 (the full model, table 3), we regressed *total difficulties* on *number of moves* and included all 11 covariates. The regression coefficient for *number of moves* decreased but remained significant (B=0.16, CI 0.15 to 0.18).

Additional analyses

Next, in Model 3, we added two dichotomous move characteristic variables for *moves over 10 km* (move distance) and *early moves* (move timing). To ascertain whether moving to an area

Table 2 Model 1—bivariate regressions for *number of moves* as continuous variable (1a) and as factor (1b)

Number of moves	1a: Total difficulties regressed on residential mobility as continuous variable				1b: Total difficulties regressed on residential mobility as factor (ref=0 moves)			
	B_{1a}	CI 2.5%	CI 97.5%	P value	B_{1a} number of moves	B_{1b}	CI 2.5%	CI 97.5%
1	0.58	0.57	0.59	<0.0001	0.58	0.51	0.47	0.56
2					1.16	1.06	1.01	1.11
3					1.74	1.68	1.62	1.74
4					2.32	2.32	2.25	2.40
5					2.90	2.92	2.82	3.02
6					3.47	3.23	3.09	3.37
≥7					4.05	4.31	4.16	4.46
Multiple R^2	0.04							
N	300 096							

of higher or lower socioeconomic deprivation was associated with SEB, we also entered NZDep-last while controlling for NZDep-first (as previously noted), providing an indicator of change in area socioeconomic deprivation (ie, move quality).

Controlling for the number of moves (and covariates), *moves over 10 km* (B=0.08, CI 0.05 to 0.10) and moving to an area of higher socioeconomic deprivation (relative to the socioeconomic deprivation level of the area at the first address) (B=0.09, CI 0.08 to 0.09) were both significant in the model, although *early moves* was not (B=0.02, CI −0.01 to 0.05). Thus, longer distance moves and moving to an area of (relatively) greater socioeconomic deprivation were both associated with increased SEB difficulties over and above the number of moves made.

Finally, we fitted a logistic regression model with a dichotomous outcome variable for *total difficulties* scores in the combined *some concern/concerning* range (12% of the cohort, n=35 613) first without, and then with, all the covariates entered. Children exposed to greater residential mobility were 8% more likely to obtain *total difficulties* scores in the *some concern/concerning* range than children exposed to less residential mobility (adjusted OR 1.08, CI 1.07 to 1.09).
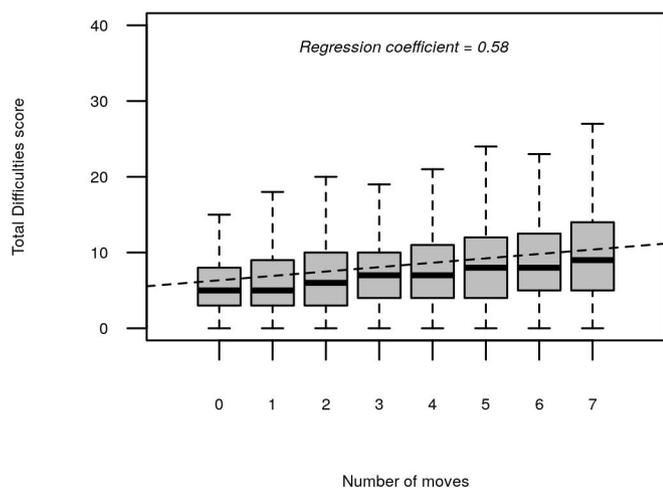

Figure 2 Strengths and Difficulties Questionnaire total difficulties score by number of moves. Outliers are not shown for confidentiality reasons.

DISCUSSION

In relation to the study objectives, three main findings emerged. First, high prevalence rates of residential mobility were found in a population cohort of more than 300 000 NZ children, consistent with previous studies.[17] Next, a linear association

Table 3 Model 2—full model with *total difficulties* regressed on *number of moves* and covariates included

	Unadjusted coefficient	Adjusted coefficient* B	C I 2.5%	CI 97.5%
Intercept	–	10.05	9.68	10.42
No of moves	0.58	0.16	0.15	0.18
Sex (male)	0.95	0.94	0.90	0.97
Ethnicity:	–	–	–	–
European	−1.48	−0.52	−0.57	−0.47
Māori	1.74	0.23	0.26	0.34
Pacific	1.63	0.35	0.30	0.40
Asian	−0.41	−0.22	−0.28	−0.16
Other	−0.63	−0.55	−0.65	−0.45
No of siblings	0.28	−0.08	−0.09	−0.06
Contact with child services	2.68	0.63	0.57	0.69
Age at SDQ	0.01	−0.04	−0.04	−0.03
Maternal age	−0.18	−0.07	−0.07	−0.06
Maternal education (high school)	–	–	–	–
None	1.56	0.56	0.50	0.62
Post-high school	−0.62	−0.17	0.23	−0.12
Tertiary	−1.75	−0.66	−0.71	−0.61
Unknown	0.97	0.11	0.06	0.17
Parental income	−0.02	−0.00	−0.00	−0.00
Benefit receipt	0.06	0.02	0.02	0.02
Housing tenure (owner-occupied)	–	–	–	–
Private rental	1.22	0.07	0.03	0.11
Public rental	2.86	0.34	0.27	0.41
NZDep-last	0.37	0.11	0.10	0.12
Adjusted R^2	0.13			
N	299 532			

*All coefficients p<0.0001.
SDQ, Strengths and Difficulties Questionnaire.

between residential mobility and SEB difficulties, which held from one through to seven or more residential moves, was found. Finally, when we controlled for a range of covariates associated with both moving and SEB difficulties, residential mobility continued to reliably predict an increase in SEB difficulties. Furthermore, residential mobility was associated with a higher likelihood of obtaining *total difficulties* scores of at least some concern.

Residential mobility was common, with more than two-thirds of children (69%) experiencing at least one move by the time of their B4SC check at 4 years of age and 12% experiencing four or more moves. One of the key questions addressed in this study was whether residential mobility should be considered as a continuous variable or as a factor. Our results were clear; each additional move (from one to seven or more moves) was linearly associated with a corresponding increase in SEB difficulties. For example, one move was associated with a 0.6-point increase in *total difficulties* scores, while seven or more moves was associated with a 4.1-point increase in *total difficulties* scores.

The prevalence rate findings in this study are consistent with those obtained for preschool children in the Growing Up in NZ longitudinal cohort (66%)[17] and in the USA (69%),[4] and are considerably higher than prevalence rates in the UK (40%)[20] and other countries.[9]

Prior studies with young children have frequently used a residential mobility threshold of three moves.[16 19 26] Some have found linear effects as in this study, for example, Taylor and Edwards,[12] and Hoglund and Leadbeater.[38] However, others have found evidence of a threshold effect; for example, Ziol-Guest and McKenna found that moving three or more times was associated with increases in behavioural problems among children from low-income households.[19] In a recent study, Mollborn and colleagues assessed both linear and threshold effects of residential mobility and found that while all residential moves were associated with poorer kindergarten behaviour scores, this was particularly so when frequent (>4) moves were involved.[18]

Consistent with other research, residential mobility was predicted by most of the covariates in this study, for example, lower parental income, lower maternal age, ethnicity, rental tenure and living in higher socioeconomic deprivation areas. Moreover, many of the same covariates were also moderately associated with increased SEB difficulties. These results suggest that residential mobility is one of several factors associated with SEB difficulties, although the potential for residual confounding remains. Nevertheless, when all the covariates were controlled for, the overall association between residential instability and SEB difficulties remained robust and meaningful. This finding is consistent with other studies,[12 18] and provides a reliable population-level estimate for the association between residential mobility and SEB difficulties in preschool NZ children.

We also tested whether certain characteristics of moving predicted SEB difficulties. No differences were found for early moves (before 2 years of age) versus later moves. However, results for longer distance moves (over 10 km) and for an increase in area socioeconomic deprivation over time enhanced model fit, with both these variables associated with increased SEB difficulties. These findings suggest that the number, distance and quality of moves may be more relevant than their timing in the preschool years.

Our findings are consistent with social capital explanations for the implications of residential mobility. Loss of social capital may be marked depending on the contextual factors surrounding moves.[9] This may lead to stress and increases in SEB difficulties in young children. Further research on the role of social capital from the perspective of residentially mobile children could elucidate this potential causal pathway.[39]

Strengths and limitations

The key strength of this study was the use of a large population-based cohort drawn from the IDI to examine the research questions. This greatly reduced the risk of selection bias commonplace in other research designs. Overall, the results of this study were consistent with prior research; however, the generalisability of the detailed findings to other countries is not known.

Although a wide range of variables are included in the IDI, variable selection was limited by the administrative data available and some contextual variables were lacking. For example, children could only be linked to their parents in birth records and not beyond, necessitating an assumption that children were living with their parents at the time of the B4SC. Additionally, changes in parental relationships were not included in the current analyses.

It is possible that residential mobility rates were higher for children without address data compared with children with address data. However, sensitivity analyses in the current study revealed that children without address data had slightly lower SDQ scores (M=6.47) than children with address data (M=6.64).

The SDQ is a well-validated and reliable measure frequently used in this research domain. However, parent report of their children's SEB well-being may be influenced by their own circumstances and state of mind. Future studies should consider other types of measures, including direct behavioural observation. Using IDI address data as a measure of residential mobility also has some limitations. Residential moves may not always be recorded in the IDI, or in some instances, having different addresses recorded in the IDI may not specifically represent residential mobility, such as in shared care arrangements.

What is already known on this subject

► Residential moves are likely to have implications for children's well-being. Current evidence on the association between exposure to residential mobility and socioemotional and behavioural outcomes in young children is inconclusive.

What this study adds

► High rates of residential mobility were found in a large population-based cohort of New Zealand children, with more than two-thirds having moved home at least once by age 4.
► Residential mobility was linearly associated with increased socioemotional and behavioural difficulties at age 4, with each residential move (one to seven or more) associated with an increase in socioemotional and behavioural difficulties.
► These results further our understanding of the implications of residential mobility for children's well-being and indicate the need to consider residential mobility as a risk factor for socioemotional and behavioural difficulties in young children.

CONCLUSIONS

Children's socioemotional well-being during the transition to school has implications for their future success and well-being. The findings from this study indicate the need to consider residential mobility as a possible risk factor for SEB difficulties, for example, as part of preschool health and development checks.

Further investigation of the circumstances surrounding residential moves (including the reasons for moving) are warranted and could help elucidate the mechanisms through which residential mobility is associated with SEB difficulties in children, and factors which may promote resilience.

Residential mobility in the early years was reliably associated with increased SEB difficulties, with each move having an additive effect on SEB difficulty scores. These findings contribute to the growing international public health focus on children's mental health and well-being.[40]

Disclaimer The funders played no role in the study design, collection, analysis and interpretation of the data, writing of the report or in the decision to submit the article for publication. The results in this report are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI), managed by Statistics New Zealand. The opinions, findings, recommendations and conclusions expressed in this article are those of the authors, not Statistics New Zealand. Access to the anonymised data used in this study was provided by Statistics New Zealand under the security and confidentiality provisions of the Statistics Act 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular person, household, business or organisation, and the results in this article have been confidentialised to protect these groups from identification and to keep their data safe. Careful consideration has been given to the privacy, security and confidentiality issues associated with using administrative and survey data in the IDI. Further detail can be found in the privacy impact assessment for the Integrated Data Infrastructure available online (www.stats.govt.nz). The results are based in part on tax data supplied by Inland Revenue to Statistics NZ under the Tax Administration Act 1994. This tax data must be used only for statistical purposes, and no individual information may be published or disclosed in any other form, or provided to Inland Revenue for administrative or regulatory purposes. Any person who has had access to the unit record data has certified that they have been shown, have read and have understood section 81 of the Tax Administration Act 1994, which relates to secrecy. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

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