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Association of Residential Mobility with Child Health: An Analysis of the 2007 National Survey of Children's Health

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Abstract To describe the association of residential mobility with child health. We conducted descriptive, bivariate, and multivariable analyses of data from 63,131 children, 6–17 years, from the 2007 National Survey of Children's Health. Logistic regression was used to explore the association of residential mobility with child health and measures of well-being. Analyses were carried out using SAS-callable SUDAAN to appropriately weight estimates and adjust for the complex sampling design. After adjusting for age, race/ethnicity, presence of a special health care need, family structure, parental education, poverty level, and health insurance status, children who moved ≥3 times were more likely to have poorer reported overall physical (AOR 1.21 [95 %CI: 1.01–1.46]) and oral health status (AOR 1.31 [95 % CI: 1.15–1.49]), and ≥1 moderate/severe chronic conditions (AOR 1.40 [95 % CI: 1.19–1.65]) than children who had no lifetime moves. When compared to children who had never moved, children who moved ≥3 times were more likely to be uninsured/have periods of no coverage (AOR 1.35; 95 % CI: 0.98–1.87) and lack a medical home (AOR 1.16, 95 % CI: 1.04–1.31). None of the outcomes were statistically significant for children who moved fewer than 3 times. Clinicians need to be aware that children who move frequently may lack stable medical homes and consistent coverage increasing their risk of poor health outcomes and aggravation of mild or underlying chronic conditions. Public health systems could provide the necessary link between parents and clinicians to ensure that continuous, coordinated care is established for children who move frequently.

Keywords National Survey of Children's Health · Residential mobility · Child health

Abbreviations

MCHB	Maternal and Health Child Bureau
NSCH	2007 National Survey of Children's Health

Introduction

Residential mobility, defined as the frequent change of residence, either within the same city, or between cities, states or communities, is common among American households. Between 2008 and 2009, more than 10 % of households with children between 6 and 17 years of age changed location of their primary residence [1]. Further, residential mobility is more prevalent among low income households [2]. Frequent residential mobility in childhood has been associated with numerous adverse and long-term educational [3–5], behavioral [3, 6–10], emotional and mental health issues [5, 9–15], and physical health outcomes [12, 15–17]. Adverse physical health outcomes ranged from increased incidence and severity of unintentional burns [18] to increased risk of attempted suicide [14]

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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and poor self-assessment of overall health [12] to increased mortality [16, 19]. Children and youth who frequently move also have been found to have poorly coordinated, non-continuous healthcare [15, 17, 20–22].

While there is some research [12, 15–17] to support an association between frequent residential mobility and markers of child health and well-being, these studies have been conducted with small, specialized study populations which are not necessarily generalizable to children aged 6–17 years across the US. In addition, many of these studies [12, 15–17] did not control for child, family, household, and/or environmental factors that could influence purported associations. Further, the characteristics of US children who frequently move and their markers of health and well-being have not been examined or well described in large, nationally representative samples of children. In these analyses, we describe the characteristics of children who frequently move residences and explore the association between the degree of residential mobility and markers of health and well-being.

Methods

We conducted an analysis of cross-sectional data from the 2007 National Survey of Children's Health (2007 NSCH) using a subpopulation of children, aged 6–17 years, among whom information on residential mobility was collected (N = 63,131). Children <6 years of age were excluded from analysis because some 2007 NSCH variables are not collected among this subpopulation. We conducted descriptive, bivariate and multivariable analyses on this subset of data to describe the association of key markers of health and well-being with residential mobility while adjusting for potential confounding variables.

Outcome Variables

The primary outcome variables are described below and were included in the analysis based on prior research and the availability of child health and well-being variables in the 2007 NSCH.

Child's overall health was measured based on the question: "In general, how would you describe [child's name]'s health?" Responses were grouped into three categories: excellent/very good, good, and fair/poor for bivariate analyses and collapsed into two categories (excellent/very good and good/fair/poor) for multivariate analyses.

Preventive medical care was measured based on the question: "During the past 12 months, how many times did child see a doctor, nurse, or other health care provider for preventive medical care such as a physical exam or well-child checkup?" Responses were categorized into one or more preventive visits and no preventive visits.

Severity of current chronic conditions was measured by a variable comprised of responses to 3 questions about 16 different chronic health conditions. Parents were asked to rate the severity of the child's chronic conditions as mild, moderate, or severe. Responses were grouped into three categories: no chronic condition, mild current chronic conditions, and one or more moderate/severe current chronic conditions for bivariate analyses and collapsed into two categories (moderate/severe chronic conditions and none or only mild conditions) for multivariate analyses.

Child's overall oral health was based on the question: "In general, how would you describe the child's teeth?" Responses were grouped into three categories: excellent/very good, good, and fair/poor for bivariate analyses and collapsed into two categories (excellent/very good and good/fair/poor) for multivariate analyses.

Preventive dental care was measured based on the question: "During the past 12 months, how many times did child see a dentist for preventive dental care such as check-ups and dental cleanings?" Responses were categorized into one or more preventive visits and no preventive visits.

Consistency of health insurance coverage was measured using responses to the question: "During the past 12 months was there any time when he/she was not covered by any health insurance?" Responses were grouped into currently uninsured or periods of no coverage during the past year and consistently insured during the past year.

We measured whether the child had a *medical home* using an indicator variable, which takes into account the six component American Academy of Pediatrics' (AAP) Medical Home definition (accessible, continuous, comprehensive, family-centered, coordinated, and compassionate) [23]. In order to have a medical home the child must have a usual source of care and a healthcare provider who is considered a personal doctor or nurse. Additionally, if the child had needed health services in the past 12 months, they must have (1) received family-centered, compassionate, culturally effective care from all of the child's doctors and other healthcare providers, (2) reported no problems getting referrals, if needed, and, (3) if needed, effective care coordination [24]. Responses were categorized into care meets medical home criteria and care does not meet medical home criteria. Elements of a medical home were also explored by indicator variables that measured the presence or absence of a personal doctor or nurse, a usual source of sick and well care, family-centered care, referrals, and effective care coordination.

Explanatory Variables

The primary independent variable of interest was residential mobility. Residential mobility was measured by the question "How many times has the child ever moved to a

new address?" [25, 26] The continuous variable was re-classified into a categorical variable: no lifetime moves, 1–2 lifetime moves, and 3 or more lifetime moves.

Other explanatory variables, described below, were included in the analysis based on prior research and the availability of variables plausibly-associated with the outcome variables. Age was re-classified into four levels: 6–8 years, 9–11 years, 12–14 years, and 15–17 years for bivariate analyses, and left as a continuous variable for logistic regression. Race and ethnicity were re-classified into a single variable: Hispanic; black, non-Hispanic; white, non-Hispanic; and, multi-racial/other, non-Hispanic. Family household structure was classified into four levels: two-parent households (two biological or adoptive parents); two-parent households with one step parent; one-parent households (mother only, no father figure); and, all other family household compositions. Household education (highest level of parental education) was classified into three levels: no parent has greater than high school education; at least one parent has more than high school education; and both parents have more than a high school education. Family poverty level was based on the imputed variable for family incomes: 0–99 % of the federal poverty level (FPL); 100–199 % of the FPL; 200–399 % of the FPL; and ≥400 % of the FPL [25].

Statistical Analyses

We created and recoded variables using SAS version 9.2. Analyses were carried out using SAS-callable SUDAAN version 10 to appropriately weight estimates and adjust for the survey's complex sampling design [25].

We estimated the prevalence and 95 % confidence intervals (CI) of children whose parents reported 0, 1–2, and 3 or more lifetime moves. In bivariate analyses, crude odds ratios (ORs) and 95 % CI were estimated to examine associations between residential mobility and potentially confounding independent variables, e.g., household structure, education, and FPL. Logistic regression models [27] were constructed to examine associations between markers of child health and well-being and residential mobility, while controlling for individual, family, and household characteristics. Children who had never moved served as the referent group. The following explanatory variables were retained in all final adjusted models: age, race/ethnicity, family structure, parental education, and poverty level, health insurance status (except in the insurance model) and presence of special healthcare need (except in the severe conditions model).

Results

There were 63,131 children in the study population with data on the number of lifetime moves. More than 35 % had moved ≥3 times during their lifetimes, 40.9 % had moved 1–2 times, and 23.7 % had no reported lifetime moves.

Table 1 shows the characteristics of children aged 6–17 years and their families by degree of residential mobility. As expected, ≥3 lifetime moves was more common among older children with 42.7 % of 15–17 year olds having ≥3 lifetime moves compared to 26.6 % of children 6–8 years. White, non-Hispanic children were more likely to have zero lifetime moves than children of other racial/ethnic backgrounds. Children living within 'non-traditional' family structures (i.e., two-parent step families, households headed by single mothers, and other family compositions) were more likely to have ≥3 lifetime moves than children living within 'traditional' two-parent biological/adoptive families. For example, ≥3 lifetime moves were more frequently reported among children of two-parent step families (62.5 %), single mother households (47.6 %), and other family compositions (44.5 %) than for children of two parent biological/adoptive families (26.2 %). Low levels of parental education were also associated with ≥3 lifetime moves. Lastly, children living in families at 0–99 % of the FPL were more likely to move frequently (47.6 %) than children living at 200–399 % or at or above 400 % of the FPL (32.3 and 26.4 % respectively).

Table 2 presents the markers of health and well-being of the children in the study population by degree of residential mobility. Children who had ≥3 residential lifetime moves had the poorest overall physical health, oral health, and ≥1 current moderate/severe chronic conditions (51.6, 46.6, and 47.1 %, respectively) compared with children who moved less frequently. Children who had ≥3 residential moves were also more likely to be uninsured or experience gaps in coverage (44.3 %). Children who had ≥1 residential lifetime move were more likely to experience fragmented services (lack of a personal doctor or nurse, usual source for sick or well care, family-centered care, needed referrals, and effective care coordination).

Table 3 presents the crude and adjusted odds ratios for residential mobility and markers of child health and well-being. The odds ratios are adjusted for individual, family and household characteristics. Compared to children who had no lifetime moves, children who moved ≥3 times were more likely to have good/fair/poor reported general health status (AOR 1.21 [95 % CI: 1.01–1.46]) and good/fair/poor condition of teeth (AOR 1.31 [95 % CI: 1.15–1.49]). Residential mobility was associated with dental preventive care visits, but not medical preventive care visits. Children who moved ≥3 times were more likely to lack dental preventive care visits (AOR 1.35 [95 % CI: 1.09–1.67]) than children who had no lifetime moves. Compared to children who had no lifetime moves, children who had ≥3 lifetime moves were more likely to have ≥1 current chronic conditions that were rated moderate or severe (AOR 1.40 [95 % CI: 1.19–1.65]).

Table 1 Characteristics of children aged 6–17 years and their families and households by degree of residential mobility

Characteristics	0 lifetime moves (unweighted n = 17,464)			1–2 lifetime moves (unweighted n = 25,755)			3 or more lifetime moves (unweighted n = 19,912)		
	n	Weighted %	95 % CI	*n*	Weighted %	95 % CI	*n*	Weighted %	95 % CI
Child									
Age (years)									
6–8	4,403	29.0	27.2, 30.7	5,811	44.4	42.4, 46.5	3,183	26.6	24.7, 28.6
9–11	3,923	24.5	22.9, 26.1	5,849	41.9	39.9, 43.9	4,228	33.6	31.7, 35.6
12–14	4,279	21.3	19.9, 22.8	6,541	40.4	38.5, 42.3	5,468	38.3	36.4, 40.2
15–17	4,859	20.2	18.9, 21.7	7,554	37.1	35.4, 39.0	7,033	42.7	40.7, 44.6
Sex									
Male	9,069	24.2	23.1, 25.3	13,457	41.1	39.7, 42.5	10,295	34.8	33.4, 36.1
Female	8,366	23.1	22.1, 24.2	12,262	40.8	39.4, 42.2	9,593	36.1	34.7, 37.5
Race/ethnicity									
Hispanic	1,477	17.0	14.9, 19.4	2,866	38.4	35.4, 41.4	2,938	44.6	41.5, 47.7
White, non-Hispanic	12,985	27.7	26.8, 28.7	18,074	41.8	40.7, 42.9	12,605	30.5	29.5, 31.6
African American, non-Hispanic	1,480	18.4	16.7, 20.1	2,585	39.3	36.9, 41.7	2,326	42.4	39.9, 44.8
Multi-/other, non-Hispanic	1,400	21.3	18.5, 24.3	2,045	42.8	38.9, 46.8	1,908	35.9	32.6, 39.4
Child with special health care needs									
No	13,595	24.1	23.2, 25.0	19,934	41.4	40.3, 42.5	14,470	34.5	33.4, 35.7
Yes	3,869	22.2	20.7, 23.8	5,821	39.3	37.4, 41.3	5,172	38.5	36.5, 40.6
Family and household									
Family structure									
2-parent biological/adoptive	13,819	28.8	27.8, 29.9	18,284	45.0	43.8, 46.3	9,684	26.2	25.0, 27.4
2-parent step	464	6.5	5.3, 7.9	1,849	31.1	28.2, 34.1	3,674	62.5	59.4, 65.5
1-parent biological mother	2,175	16.3	15.0, 17.7	4,042	36.2	34.1, 38.3	4,569	47.6	45.4, 49.8
Other family type	988	23.6	20.3, 27.2	1,551	32.0	28.7, 35.4	1,963	44.5	40.7, 48.4
Parental education									
Single parent with or both parents have high school or less	3,377	19.3	18.0, 20.7	5,111	38.5	36.5, 40.4	5,135	42.2	40.2, 44.2
Single parent with or at least 1 parent has more than high school	4,871	22.7	21.2, 24.3	7,478	38.7	37.0, 40.5	6,481	38.6	36.7, 40.4
Both parents have more than high school	8,652	27.7	26.5, 29.0	12,455	45.3	43.8, 46.8	7,314	27.0	25.7, 28.4
Federal poverty level of family (derived)									
0–99 FPL	1,354	15.8	14.2, 17.5	2,418	36.6	34.1, 39.2	3,065	47.6	45.0, 50.2
100–199 FPL	2,520	20.0	18.4, 21.7	3,783	36.5	34.2, 38.7	4,157	43.5	41.2, 45.9
200–399 FPL	6,319	25.9	24.5, 27.4	8,673	41.8	40.1, 43.6	6,602	32.3	30.6, 34.0
≥400 FPL	7,271	28.2	26.8, 29.6	10,881	45.4	43.8, 47.1	6,088	26.4	24.9, 27.9

Unweighted N = 64,076; unweighted N = 63,131 with moving data

Children who moved ≥3 times were also more likely to be uninsured/have gaps in coverage during the previous year (AOR 1.35 [95 % CI: 0.98–1.87]) compared to children who had no lifetime moves. Lastly, children who moved ≥3 times were more likely to lack a medical home than children who had no lifetime moves (AOR 1.16 [95 % CI: 1.04–1.31]). These associations were only significant for children ≥3 lifetime moves. No associations were found for children with 1–2 moves.

Discussion

We found that even after adjusting for potential confounders, residential mobility was significantly associated with reported poor health, lack of a sufficient medical home, and consistent health care coverage. With the exception of medical preventive care visits (which was not significantly associated with residential mobility) the odds ratios of residential mobility were strikingly similar among

Table 2 Markers of health and well-being of children aged 6–17 years by degree of residential mobility

Characteristics	0 lifetime moves (unweighted n = 17,464)			1–2 lifetime moves (unweighted n = 25,755)			3 or more lifetime moves (unweighted n = 19,912)		
	n	Weighted %	95 % CI	*n*	Weighted %	95 % CI	*n*	Weighted %	95 % CI
Child's health status									
Very good/excellent	15,608	24.7	23.8, 25.5	22,728	41.9	40.8, 42.9	16,692	33.5	32.4, 34.5
Good	1,499	19.0	17.0, 21.3	2,457	37.7	34.8, 40.8	2,519	43.3	40.1, 46.4
Fair/poor	355	17.4	13.3, 22.4	562	31.0	25.7, 36.9	695	51.6	45.2, 58.0
Preventive medical care during the past year									
No medical preventive visits	2,736	22.3	20.5, 24.3	3,830	39.5	36.9, 42.1	3,191	38.2	35.5, 40.9
Received 1 or more medical preventive visits	14,629	24.0	23.1, 24.9	21,753	41.2	40.1, 42.2	16,574	34.9	33.8, 35.9
Severity of chronic health condition									
No chronic condition	13,012	24.6	23.7, 25.5	19,211	42.5	41.3, 43.7	13,610	32.9	31.8, 34.1
Mild condition	2,522	22.9	21.0, 24.9	3,637	40.3	38.0, 42.7	3,028	36.8	34.4, 39.2
1 or more moderate/severe condition	1,912	19.7	17.8, 21.7	2,876	33.3	30.8, 35.9	3,255	47.1	44.3, 49.9
Condition of child's teeth									
Very good/excellent	13,475	25.5	24.6, 26.5	19,564	42.7	41.5, 43.8	13,668	31.8	30.7, 33.0
Good	3,152	20.8	19.4, 22.4	4,733	37.7	35.7, 39.8	4,523	41.5	39.4, 43.6
Fair/Poor	830	17.3	14.8, 20.1	1,444	36.1	32.3, 40.1	1,709	46.6	42.6, 50.7
Preventive dental care during the past year									
No dental preventive visits	1,170	18.1	15.3, 20.7	1,919	34.8	31.7, 38.1	2,289	47.2	43.7, 50.6
Received 1 or more dental preventive visits	16,235	24.4	23.6, 25.2	23,754	41.7	40.7, 42.8	17,537	33.9	32.9, 34.9
Consistency of coverage during the past year									
Consistently insured	15,793	24.7	23.8, 25.5	22,866	41.5	40.5, 42.6	16,753	33.8	32.8, 34.9
Currently uninsured or periods of no coverage	1,629	18.2	16.1, 20.4	2,830	37.6	34.9, 40.4	3,090	44.3	41.4, 47.1
Care meets medical home criteria									
No	6,023	20.5	19.3, 21.8	9,662	39.8	38.2, 41.4	8,918	39.7	38.1, 41.3
Yes	10,710	26.3	25.3, 27.3	15,073	41.9	40.6, 43.1	10,135	31.9	30.6, 33.1
Child has a personal doctor or nurse									
No	876	17.3	14.7, 20.2	1,650	37.8	34.2, 41.6	1,965	44.9	41.2, 48.7
Yes, one or more	16,550	24.3	23.5, 25.1	24,031	41.1	40.1, 42.1	17,879	34.6	33.6, 35.7
Child has a usual source of sick and well care									
No	657	13.8	11.8, 16.2	1,240	41.8	37.4, 46.4	1,348	44.3	40.0, 48.7
Yes	16,774	24.4	23.6, 25.2	24,460	40.9	39.9, 41.9	18,509	34.8	33.8, 35.8
Child receives family-centered care									
Received	12,205	25.7	24.7, 26.6	17,520	42.4	41.2, 43.5	12,089	32.0	30.9, 33.2
Not received	4,385	20.5	19.1, 22.0	6,958	39.5	37.6, 41.5	6,593	40.0	38.1, 41.9
Child gets needed referrals for care									
No referrals needed	14,697	24.1	23.2, 24.9	21,666	41.3	40.2, 42.4	16,058	34.6	33.6, 35.7
Gets needed referrals	2,276	22.0	19.9, 24.3	3,364	39.6	36.8, 42.4	3,004	38.4	35.6, 41.2
Has problems getting needed referrals	445	21.1	17.6, 25.2	654	36.8	31.4, 42.5	780	42.1	36.6, 47.8
Child has effective care coordination									
No coordination needed (or <2 services)	9,711	24.3	23.3, 25.4	14,057	41.4	40.0, 42.7	10,288	34.3	33.0, 35.7
Met all needed elements of coordination	5,526	24.0	22.7, 25.4	8,190	41.4	39.7, 43.2	6,136	34.6	32.8, 36.3

Table 2 continued

Characteristics	0 lifetime moves (unweighted n = 17,464)			1–2 lifetime moves (unweighted n = 25,755)			3 or more lifetime moves (unweighted n = 19,912)		
	n	Weighted %	95 % CI	*n*	Weighted %	95 % CI	*n*	Weighted %	95 % CI
Did not meet ≥1 elements of coordination	2,050	20.7	18.6, 23.0	3,263	37.4	34.8, 40.0	3,288	41.9	39.2, 44.7

Unweighted N = 64,076; unweighted N = 63,131 with moving data

Table 3 Crude and adjusted odds ratios of children's health outcomes and residential mobility

	Crude		Adjusted		*p* value
	Odds ratio	95 % CI	Odds ratio	95 % CI	
General health—good/fair/poor					
Residential mobility 3+	1.79	1.53–2.09	1.21	1.01–1.46	**0.0148**
Residential mobility 1–2	1.14	0.98–1.33	0.97	0.81–1.16	
Residential mobility 0	Ref		Ref		
Model adjusted for: CSHCN, child's age in years, race/ethnicity, family structure, parental education level, poverty level, and health insurance status*					
Child did not have medical preventive care visit					
Residential mobility 3+	1.18	1.02–1.36	1.04	0.88–1.21	0.8928
Residential mobility 1–2	1.03	0.90–1.18	1.00	0.87–1.16	
Residential mobility 0	Ref		Ref		
Model adjusted for: CSHCN, child's age in years, race/ethnicity, family structure, parental education level, poverty level, and health insurance status*					
Moderate or severe conditions					
Residential mobility 3+	1.74	1.50–2.01	1.40	1.19–1.65	**0.0000**
Residential mobility 1–2	0.98	0.84–1.13	0.94	0.80–1.10	
Residential mobility 0	Ref		Ref		
Model adjusted for: child's age in years, race/ethnicity, family structure, parental education level*, poverty level, and health insurance status**					
Condition of teeth—Good/fair/poor					
Residential mobility 3+	1.75	1.56–1.95	1.31	1.15–1.49	**0.0000**
Residential mobility 1–2	1.13	1.01–1.26	1.02	0.90–1.15	
Residential mobility 0	Ref		Ref		
Model adjusted for: CSHCN, child's age in years, race/ethnicity, family structure, parental education level, poverty level, and health insurance status*					
Child did not have dental preventive care visit					
Residential Mobility 3+	1.88	1.55–2.27	1.35	1.09–1.67	**0.0035**
Residential Mobility 1–2	1.12	0.93–1.36	1.02	0.83–1.26	
Residential Mobility 0	Ref		Ref		
Model adjusted for: CSHCN, child's age in years, race/ethnicity, family structure, parental education level, poverty level, and health insurance status*					
Uninsured/periods of no coverage					
Residential mobility 3+	1.78	1.51–2.10	1.35	0.98–1.87	**0.0119**
Residential mobility 1–2	1.23	1.04–1.45	0.97	0.71–1.32	
Residential mobility 0	Ref		Ref		
Model adjusted for: CSHCN, child's age in years, race/ethnicity, family structure*, parental education level, and poverty level*					
Care that does not meet medical home definition					
Residential mobility 3+	1.59	1.43–1.77	1.16	1.04–1.31	**0.0368**
Residential mobility 1–2	1.22	1.10–1.35	1.09	0.98–1.21	

Table 3 continued

	Crude		Adjusted		*p* value
	Odds ratio	95 % CI	Odds ratio	95 % CI	
Residential mobility 0	Ref		Ref		
Model adjusted for: CSHCN, child's age in years, race/ethnicity, family structure, parental education level, poverty level, and health insurance status					
Child does not have a personal doctor or nurse					
Residential mobility 3+	1.83	1.48–2.26	1.21	0.95–1.54	0.2873
Residential mobility 1–2	1.30	1.04–1.61	1.10	0.87–1.39	
Residential mobility 0	Ref		Ref		
Model adjusted for: CSHCN, child's age in years, race/ethnicity, family structure, parental education level, poverty level, and health insurance status*					
Child does not have a usual source of sick and well care					
Residential mobility 3+	2.25	1.82–2.77	1.43	1.12–1.82	**0.0049**
Residential mobility 1–2	1.80	1.44–2.26	1.44	1.12–1.85	
Residential mobility 0	Ref	Ref			
Model adjusted for: CSHCN, child's age in years, race/ethnicity, family structure*, parental education level, poverty level, and health insurance status*					
Child does not receive family-centered care					
Residential mobility 3+	1.57	1.39–1.76	1.16	1.02–1.32	0.0607
Residential mobility 1–2	1.17	1.04–1.31	1.04	0.92–1.17	
Residential mobility 0	Ref		Ref		
Model adjusted for: CSHCN, child's age in years, race/ethnicity, family structure, parental education level, poverty level, and health insurance status*					
Child does not get needed referrals for care					
Residential mobility 3+	1.35	1.03–1.76	1.12	0.82–1.54	0.5857
Residential mobility 1–2	1.01	0.76–1.33	0.96	0.72–1.29	
Residential mobility 0	Ref		Ref		
Model adjusted for: CSHCN, child's age in years, race/ethnicity, family structure, parental education level, poverty level, and health insurance status**					
Child does not have effective care coordination					
Residential mobility 3+	1.42	1.21–1.67	1.16	0.97–1.38	0.0686
Residential mobility 1–2	1.06	0.90–1.24	0.98	0.83–1.16	
Residential mobility 0	Ref		Ref		
Model adjusted for: CSHCN, child's age in years, race/ethnicity, family structure, parental education level*, poverty level*, and health insurance status**					

Bolded *p* values are statistically significant

* Not statistically significant in full models

the markers of child health and well-being. Additionally, we did not observe any statistically significant effect on markers of child health and well-being with 1–2 moves, indicating an apparent threshold effect with regard to the number of lifetime moves at ≥3 moves. This relationship has been previously reported [17].

Several studies have reported associations between residential mobility and emotional/behavioral outcomes [3, 5–15], particularly in the educational outcome research. This study adds to the smaller body of literature reporting associations between physical health and residential mobility. This study also supports and strengthens the previously limited findings related to markers of well-being by examining several health outcomes while adjusting for individual, family, and household characteristics. While research has established that children living in poverty are more likely to have high residential mobility as well as poor health outcomes, few studies have had the large, nationally representative survey data that would allow for results more generalizable to the US populations and ability to simultaneously adjust for characteristics like household structure, parental education, and FPL.

It was not surprising that a child's frequent residential mobility was associated with a lower probability of having

a medical home or consistent health coverage. Residential mobility is likely both a marker for and the result of chaotic or disrupted family life arising out of a number of social determinants of health, including young maternal age, poverty, lack of safe and stable housing [28], poor employment conditions and opportunities, and lack of or decreased availability of employer-based healthcare coverage. This notion of chaotic and disrupted family life has been particularly evident over the past couple of years during the economic recession and housing crisis [29]. These 2007 NSCH data were collected in the year prior to the economic recession and likely reflect the residential mobility of the nation's impoverished and working poor households who had limited employment and income opportunities, unstable housing, and limited means to maintain a medical home and health coverage for their children [29–31]. For these families, urgent care clinics, emergency rooms, and public health clinics may serve as their sole or primary source of care.

The association between high residential mobility and preventive dental care also was not a surprise. Lack of preventive dental care may be a reflection of loss of family employment, coverage, or a reduction in health benefits as well as the loss of available income to pay for preventive visits and better quality foods. In turn, poor prevention manifests in poor tooth conditions and increased likelihood of childhood caries [32, 33]. Changes in dietary conditions also may increase the risk of poor oral health.

Children with high levels of residential mobility were more likely to have a moderate or severe chronic condition and reported poor overall physical and oral health. This association may be due in part to a lack of or access to regular medical and dental care. Stress responses caused by frequent mobility may lead to allostasis. These cumulative responses may result in continuously elevated cortisol levels and a cascade of related adverse physiological responses, which may aggravate certain existing chronic conditions [34]. However, whether mobility serves as a stressor for the child may depend on the circumstances surrounding the nature of the residential move. Children may benefit from moves associated with positive situations (e.g., promotion of a parent or moving to be closer to extended family). However, frequent moves associated with negative events (e.g., foreclosure, eviction, divorce, or death) may have profound, compounding effects. Residential mobility is considered one of several stressful life events [35], disrupting daily routines, impacting the development of and ability to maintain friendships/social networks, and negatively impacting classroom learning.

There are several limitations to this research. These data are from a cross-sectional survey and, because both exposure and outcome data were collected simultaneously, temporality between residential moves and health outcomes cannot be assessed. A longitudinal analysis of children could be more informative as to the impact of residential mobility and its specific role in child health. Additionally, parents were asked to remember the number of times the child had ever moved, introducing the possibility of both recall and detection bias. This bias could be more pronounced among older children and children in foster care. Residual confounding is also a limitation. Moving may coincide with other stressful life events, like eviction or divorce, which are not measured in the 2007 NSCH. Thus, the effects associated with frequent mobility in this study could be associated with the other stressful life events rather than residential mobility. Previous research has found residential mobility to be associated with adverse childhood experiences [9]. In addition, it is difficult to separate the specific contribution of residential mobility to the outcomes due to the complex relationships between social disadvantage, housing conditions, family characteristics, and neighborhood characteristics [17]. The study was also limited by the information available around residential mobility. The NSCH does not assess the reasons for moving, the length of time since last move/duration of current residency, whether the residence is rented or owned, or the distance moved. Lastly, because the health effects are reported by the subject child's parent, misclassification, under/over reporting, and/or recall bias are possible.

In spite of the limitations, this study has several strengths. This study was based on a recent, large nationally representative sample of children to examine the associations between residential mobility and child health and sentinel measures of well-being. To our knowledge, this is the first study that investigates both the association and degree of impact of residential mobility on overall physical and oral health, presence and severity of chronic health conditions, as well as key measures of child well-being such as preventive medical and dental care, consistent health care coverage, and medical home. Using this study as a baseline, it will be interesting to compare these data with NSCH data collected during the present economic recession and housing crisis to determine further impacts of residential mobility and its association with child health and markers of well-being.

Conclusion

This study confirms previous findings regarding the association of residential mobility with the overall physical health of children. The findings suggest that residential mobility—even after controlling for individual child, family and household characteristics—is an important factor in the severity of chronic disease conditions, oral

health, continuity of health insurance coverage, and presence of a medical home. Residential mobility may be a potential social determinant of health that warrants further attention. Longitudinal studies of family mobility may be necessary to fully tease apart the relationships between coincident stressful life events, confounding factors, and residential mobility.

Healthcare providers—clinical, public health, and school-based—need to be aware that children who move frequently may lack stable medical homes and consistent coverage increasing their risk of poor health outcomes and aggravation of mild or underlying chronic conditions. Providers can help all families by endorsing system-level changes that would result in universal coverage, mandatory medical homes, and comprehensive electronic medical records. Providers should encourage families to establish a medical home and work with them to maintain and plan transitions in a medical home. Public health systems could provide the necessary link between parents and clinicians to ensure that continuous, coordinated care is established for children who move frequently and experience coverage gaps.

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References

1. United States Census Bureau Current Population Survey. (2009). *Table 9. General mobility of family householders, by type of household, race and Hispanic origin of householder, and presence and age of own children under 18: 2008–2009*. [cited 2011 January 26]; Available from: http://www.census.gov/population/www/socdemo/migrate/cps2009.html.
2. United States Census Bureau Current Population Survey. (2009). *Table 1. General mobility, by race and Hispanic origin, region, sex, age, relationship to householder, educational attainment, marital status, nativity, tenure, and poverty status: 2008 to 2009*. [cited 2011 May 2]; Available from: http://www.census.gov/population/www/socdemo/migrate/cps2009.html.
3. Wood, D., et al. (1993). Impact of family relocation on children's growth, development, school function, and behavior. *JAMA, 270*, 1334–1338.
4. Astone, N. M., & Mclanahan, S. S. (1994). Family structure, residential mobility, and school dropout: A research note. *Demography, 31*, 575–584.
5. Simpson, G. A., & Fowler, M. G. (1994). Geographic mobility and children's emotional/behavioral adjustment and school functioning. *Pediatrics, 93*, 303.
6. Stack, S. (1994). The effect of geographic mobility on premarital sex. *Journal of Marriage and Family, 56*, 204–208.
7. Dewit, D. J. (1998). Frequent childhood geographic relocation: Its impact on drug use initiation and the development of alcohol and other drug-related problems among adolescents and young adults. *Addictive Behaviors, 23*, 623–634.
8. Crowder, K., & Teachman, J. (2004). Do residential conditions explain the relationship between living arrangements and adolescent behavior? *Journal of Marriage and Family, 66*, 721–738.
9. Dong, M., et al. (2005). Childhood residential mobility and multiple health risks during adolescence and adulthood: The hidden role of adverse childhood experiences. *Archives of Pediatrics and Adolescent Medicine, 2005*(159), 1104–1110.
10. Stoneman, Z., et al. (1999). Effects of residential instability on Head Start children and their relationships with older siblings: Influences of child emotionality and conflict between family caregivers. *Child Development, 70*, 1246–1262.
11. Maciejewski, P. K., et al. (2001). Sex differences in event-related risk for major depression. *Psychological Medicine, 31*, 593–604.
12. Bures, R. M. (2003). Childhood residential stability and health at midlife. *American Journal of Public Health, 93*, 1144–1148.
13. Oishi, S., et al. (2007). Residential mobility, self-concept, and positive affect in social interactions. *Journal of Personality and Social Psychology, 93*, 131–141.
14. Qin, P., et al. (2009). Frequent change of residence and risk of attempted and completed suicide among children and adolescents. *Archives of General Psychiatry, 66*, 628–632.
15. Tunstall, H., et al. (2010). Residential mobility in the UK during pregnancy and infancy: Are pregnant women, new mothers and infants 'unhealthy migrants'? *Social Science and Medicine, 71*, 786–798.
16. Oishi, S., & Schimmack, U. (2010). Residential mobility, well-being, and mortality. *Journal of Personality and Social Psychology, 98*, 980–994.
17. Jelleyman, T., & Spencer, N. (2008). Residential mobility in childhood and health outcomes: A systematic review. *Journal of Epidemiology and Community Health, 62*, 584–592.
18. Knudson-Cooper, M. S., & Leutchtag, A. K. (1982). Stress of a family mover as a precipitating factor in children's burn accidents. *Journal of Human Stress, 8*, 32–38.
19. Juon, H.-S., et al. (2003). Childhood adversity and later mortality in an urban African American cohort. *American Journal of Public Health, 93*, 2044–2046.
20. Fowler, M. G., Simpson, G. A., & Schoendorf, K. C. (1993). Families on the move and children's health care. *Pediatrics, 91*, 934–940.
21. Mustard, C. A., et al. (1996). Continuity of pediatric ambulatory care in a universally insured population. *Pediatrics, 98*, 1028–1034.
22. Duchon, L. M., et al. (1999). The relationship of residential instability to medical care utilization among poor mothers in New York City. *Medical Care, 37*, 1282–1293.
23. Medical home initiatives for children with Special Needs Project Advisory Committee. (2002). The Medical Home. *Pediatrics, 110*, 184–186.
24. The Child and Adolescent Health Measurement Initiative. (2009). *Measuring medical home for children and youth: Methods and findings from the National Survey of Children with Special Health Care Needs and the National Survey of Children's Health*. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.
25. Blumberg, S., et al. (2009). Design and operation of the National Survey of Children's Health, 2007. National Center for Health Statistics. *Vital and Health Statistics 1, 9, 26*. [cited 2011 May 2]; Available from: http://www.cdc.gov/nchs/slaits/nsch.htm

26. U.S. Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau. (2009). *The National Survey of Children's Health 2007*. Rockville, MD: U.S. Department of Health and Human Services.
27. Kleinbaum, D. G., & Klein, M. (2005). Logistic regression: A self-study learning text, 2nd ed. Berlin: Springer.
28. March, E., et al. (2011). Behind closed doors: The hidden impacts of being behind on rent. *Children's Health Watch*, January, 1-6.
29. Sell, K., et al. (2010). *The effect of recession on child well-being: A synthesis of the evidence by PolicyLab. The Children's Hospital of Philadelphia.*
30. Rouse, C. E. (2010). *The state of the American Child: The impact of federal policies on children. Subcommittee on Children and Families Committee on Health, Education, Labor and Pensions United States Senate*. Washington, DC: The Council of Economic Advisors.
31. Guttmacher Institute. (2010). *Women of reproductive age hit hard by recession, new census data show*.
32. Holt, R., et al. (2000). Dental damage, sequelae, and prevention. *BMJ, 320*, 1717–1719.
33. Watt, R., & Sheiham, A. (1999). Health policy: Inequalities in oral health: A review of the evidence and recommendations for action. *British Dental Journal, 187*, 6–12.
34. Logan, J. G., & Barksdale, D. J. (2008). Allostasis and allostatic load: Expanding the discourse on stress and cardiovascular disease. *Journal of Clinical Nursing, 17*, 201–208.
35. Stokols, D., & Shumaker, S. A. (1982). The psychological context of residential mobility and well-being. *Journal of Social Issues, 38*, 149–171.