ARTICLE

Childhood Residential Mobility and Multiple Health Risks During Adolescence and Adulthood

The Hidden Role of Adverse Childhood Experiences

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Background: Throughout US history, US society has been characterized by its high degree of residential mobility. Previous data suggest a relationship between mobility and increased health risk, but this relationship might be confounded by unmeasured adverse childhood experiences (ACEs).

Objectives: To examine the relationship of childhood residential mobility to health problems during adolescence and adulthood and to determine how much these apparent relationships may result from underlying ACEs.

Design, Setting, and Participants: Retrospective cohort study of 8116 adults who completed a survey that included childhood residential mobility, ACEs (childhood abuse, childhood neglect, and household dysfunction), and multiple health problems.

Main Outcome Measures: Number of childhood residential moves and number of ACEs (ACE score) were assessed for relationships to depressed affect, attempted suicide, alcoholism, smoking, early sexual initiation, and teenaged pregnancy.

Results: After adjustment for demographic variables, the risk of high residential mobility during childhood (≥8 moves) was 1.7- to 3.1-fold for each ACE, and increased with the number of ACEs. Compared with respondents who never moved, the odds of health risk for respondents with high mobility during childhood ranged from 1.3 (for smoking) to 2.5 (for suicide). However, when the number of ACEs was entered into multivariate models, the relationship between mobility and health problems was greatly reduced.

Conclusions: Adverse childhood experiences are strongly associated with frequent residential mobility. Moreover, the apparent relationship between childhood mobility and various health risks is largely explained by ACEs. Thus, previous studies showing a relationship between residential mobility and negative outcomes were likely confounded by unmeasured ACEs.

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HISTORIANS HAVE REferred to US history as the legacy of a restless migratory people.[1] In fact, during the 1990s, more than 16% of heads of households moved every year.[2] For example, from March 1999 to March 2000, an estimated 43 million Americans changed residences.[2]

During the past decade, however, concern has emerged regarding the potential negative effects of such transitions on children. Emerging research indicates that frequent changes of residence during childhood are associated with increased risk of numerous developmental and behavioral problems among children, including poor academic achievement,[3-6] emotional and behavioral problems,[3,7,8] substance abuse and sexual promiscuity,[9,10] and juvenile delinquency.[11,12]

Although previous studies have inferred that these negative effects are primarily due to changes in residence, per se, some researchers have acknowledged that residential mobility is associated with family disadvantages, such as single parenthood and poverty, that could negatively affect children's well-being[12-15] and that frequent moving may be a marker for various family problems.[4] Frequent changes in residence could also intensify preexisting family problems, especially if the move is not welcomed.[3] Thus, residential instability may be a proxy for unobserved variables, such as family instability,[12] that act as underlying causes harmful to children's welfare and healthy development.

Despite the existence of multiple previous studies on the relationship of residential mobility to negative health and social outcomes, limited information exists about the role of many unobserved childhood exposures that may occur with higher frequency among mobile families. These exposures likely include emotional and physi-

cal abuse, domestic violence, mental health problems, substance abuse among parents and household members, and parental marital discord, all of which could affect family mobility and the appropriate social and neurodevelopment[16] of the children involved. Thus, the extent to which the apparent effects of residential mobility on children's short- and long-term well-being may actually be caused from underlying abuse, violence, and related traumatic stressors is unclear.

We examined data from the Adverse Childhood Experiences (ACEs) Study[17] to assess the relationship of childhood residential mobility to various health risks. We then used multivariate models to determine whether the apparent risks of residential mobility can be explained by previously unmeasured exposure to a wide range of ACEs, including abuse and neglect, domestic violence, and related forms of serious household dysfunction (ie, confounding).[18]

METHODS

The ACEs Study is a collaboration between Kaiser Permanente's Health Appraisal Clinic in San Diego, Calif, and the Centers for Disease Control and Prevention, Atlanta, Ga. The study was approved by the institutional review boards of Kaiser Permanente and the Office for Protection from Research Risks at the National Institutes of Health, Bethesda, Md.

From August 1, 1995, to March 31, 1996, and from June 1, 1997, to October 31, 1997, the ACEs Study implemented 2 survey waves among Kaiser Permanente members who underwent a standardized medical examination at the Health Appraisal Clinic. Wave 2 collected additional information that was not part of the wave 1 survey, such as childhood neglect, the number of times residents moved during childhood, and parental education. Consequently, for this article, only the wave 2 data were analyzed. The wave 2 survey data included 8667 members, with a response rate of 65.0%. Of the respondents, 6.4% (n=551) were excluded because of missing information about race, self or parental educational attainment, and number of residential moves during childhood. This brings the final number for this study to 8116, including 53.8% women (n = 4363) and 46.2% men (n = 3753).

ADVERSE CHILDHOOD EXPERIENCES

Questions about ACEs included on the mailed questionnaire asked specifically about the respondent's first 18 years of life (**Table 1**). These experiences included emotional, physical, and sexual abuse; emotional and physical neglect; and growing up with domestic violence, parental marital discord, substance abuse, mental illness, and incarceration of a household member (definitions are listed in Table 1). Questions from the Conflict Tactics Scale[19] were used to define emotional and physical abuse and domestic violence. Questions on neglect were adapted from the Childhood Trauma Questionnaire,[20] and 4 questions on childhood sexual abuse were adapted from Wyatt.[21]

For each respondent, the number of ACEs was summed to create an ACE score, which ranged from 0 (unexposed) to 10 (exposed to all categories). The ACE score was an ordinal variable used as a summary measure for the cumulative effect of multiple ACEs.

The assessment of reliability of the responses to the ACE questions among 644 persons, who serendipitously visited the clinic during wave 1 and 2 operations questions and were inadvertently included in the ACEs Study twice, showed moderate to high agreement.[22] The specific question about childhood residential mobility that was included in the questionnaire was as follows: "During your childhood, how many times did you move residences, even in the same town?"

HEALTH OUTCOMES

Previous publications[22-27] from the ACEs Study have shown that ACEs have a strong dose-response relationship to a wide range of health risk factors that contribute to the leading causes of morbidity and mortality in the United States. This study focused on 6 outcome variables that represent mental health (depressed affect and suicide attempts), addictive behaviors (alcoholism and smoking), and sexual behaviors (early sexual initiation [age, ≤14 years] and teenaged pregnancy [age, ≤18 years]).

Ever smoking was defined by having ever smoked 100 or more cigarettes. Depressed affect was determined by affirmative responses to the question, "Have you had or do you now have depression or feel down in the dumps?" Attempted suicide and alcoholism were identified by a positive response to the respective questions, "Have you ever attempted to commit suicide?" and "Have you ever considered yourself to be an alcoholic?"

STATISTICAL ANALYSIS

All statistical analyses were performed using SAS statistical software.[28] Adjusted prevalences and means were obtained from general linear models. Multivariate logistic regression was used to estimate the strength of associations between residential mobility and ACE score and each of the 10 categories of ACEs and the 6 health outcomes. Demographic covariates in all models included the following: age at survey, sex, race (nonwhite vs white), and educational attainment of self, mother, and father (high school diploma, some college, or college graduate vs less than high school diploma). Because some studies[29-33] reported that socioeconomic status, such as poverty and lower educational level of parents, was associated with mobility, we controlled for parental educational level. By using SAS statistical software diagnostics, no evidence of collinearity between the ACE score and demographic factors was detected. A set of 6 dummy variables for ACE scores (0, 1, 2, 3, 4-5, and ≥6) and a set of 4 dummy variables for number of residential moves (0, 1-3, 4-7, and ≥8) were used. Consistent with Wood et al,[3] the 90th percentile (ie, ≥8 residential moves) was designated as a high degree of childhood residential mobility.

To determine whether the effect of residential mobility on negative health outcomes was a result of hidden effects of ACEs (confounding), we used logistic models with and without controlling for ACE score while controlling for demographic covariates. Respondents with incomplete information about an ACE were considered as not having that experience. This exclusion would most likely result in conservative estimates of the relationships between ACE and outcomes because respondents who had potentially been exposed to an experience would always be misclassified as unexposed. To assess the potential effect of this assumption, the analyses were repeated after excluding respondents with missing information on any of the ACEs; no differences were found in the results.

RESULTS

The mean (SD) age of respondents was 56 (15.1) years. Of the respondents, 75% were white, 37% were college graduates, and only 8% had not graduated from high school. Also, 84% of the respondents had moved at least once during childhood. The crude mean number of moves was 3.7. A

Table 1. Data for High Degree of Mobility (Moved ≥8 Times) for Each Category of ACE*

Category (Definition)	No. of Subjects	No. of Moves, Mean ± SE	Prevalence of High Mobility, %	Odds Ratio (95% Confidence Interval)
Abuse				
Emotional (Did a parent or other adult in the household ever, sometimes, often, or very often [1] swear at you, insult you, or put you down? [2] act in a way that made you afraid that you might be physically hurt?)				
No	7301	3.5 ± 0.05	9.4	1.0
Yes	815	4.5 ± 0.15	15.2	1.7 (1.4-2.1)
Physical (Did a parent or other adult in the household often or very often [1] push, grab, slap, or throw something at you? [2] hit you so hard that you had marks or were injured?)				
No	5999	3.4 ± 0.05	24.9	1.0
Yes	2117	4.4 ± 0.10	37.1	1.8 (1.6-2.1)
Sexual (Did an adult or person ≥5 y ever [1] touch or fondle you or [2] have you touch their body in a sexual way? [3] attempt or [4] actually have oral, anal, or vaginal intercourse with you?)				
No	7221	3.4 ± 0.05	19.8	1.0
Yes	895	4.3 ± 0.10	31.1	1.8 (1.6-2.2)
Neglect (responses: never, rarely, often, and very often true)†				
Emotional ([1] There was someone in my family who helped me feel important or special. [2] I felt loved. [3] People in my family looked out for each other. [4] People in my family felt close to each other. [5] My family was a source of strength and support.)				
No	6936	3.5 ± 0.05	13.6	1.0
Yes	1180	4.4 ± 0.12	21.0	1.7 (1.4-2.0)
Physical ([1] I didn't have enough to eat. [2] I knew there was someone there to take care of and protect me. [3] My parents were too drunk or high to take care of me. [4] I had to wear dirty clothes. [5] There was someone to take me to the physician if I needed it.)				
No	7330	3.5 ± 0.05	8.3	1.0
Yes	786	4.9 ± 0.15	16.9	2.3 (1.9-2.8)
Household dysfunction				
Parental marital discord (ie, parents ever separated or divorced?)				
No	6230	3.1 ± 0.05	20.7	1.0
Yes	1886	5.3 ± 0.10	43.9	3.1 (2.7-3.6)
Domestic violence (responses: never, once or twice, sometimes, often, or very often): (Was your mother [or stepmother] [1] pushed, grabbed or slapped, or did she have something thrown at her? [2] kicked, bitten, hit with a fist, or hit with something hard? [3] repeatedly hit over at least a few minutes? [4] threatened with or hurt by a knife or gun?)				
No	7066	3.4 ± 0.05	11.5	1.0
Yes	1050	5.0 ± 0.14	22.8	2.4 (2.0-2.9)
Mental illness (Lived with a household member who [1] was depressed or mentally ill? [2] attempted suicide?)				
No	6472	3.5 ± 0.05	19.5	1.0
Yes	1644	4.4 ± 0.11	29.5	1.8 (1.5-2.1)
Substance abuse (Lived with anyone who [1] was a problem drinker or alcoholic? [2] used street drugs?)				
No	5822	3.3 ± 0.06	27.2	1.0
Yes	2294	4.4 ± 0.09	40.3	1.9 (1.6-2.2)
Criminal household member (Did a household member go to prison?)				
No	7642	3.6 ± 0.05	5.5	1.0
Yes	474	4.7 ± 0.20	9.6	2.1 (1.6-2.7)
No. of ACEs				
0	2667	2.8 ± 0.08	6.2	1.0
1	2101	3.3 ± 0.09	8.2	1.4 (1.1-1.8)
2	1259	3.9 ± 0.12	11.6	2.1 (1.6-2.6)
3	785	4.5 ± 0.15	15.4	2.9 (2.3-3.8)
4-5	832	4.9 ± 0.15	20.2	4.1 (3.3-5.2)
≥6	472	6.2 ± 0.20	26.3	5.8 (4.3-7.7)

Abbreviation: ACE, adverse childhood experience.

*Data were adjusted for respondent's age at interview, sex, race, and education and mother's and father's education.

†Questions on emotional and physical neglect were scored on a Likert scale (range, 1-5) with some items being reverse scored. Respondents with a score of 15 or more were defined as having experienced emotional neglect, and respondents with a score of 10 or more were defined as having experienced physical neglect.

high degree of childhood residential mobility (moved ≥8 times) was reported significantly (all groups $P<.001$) more often by respondents aged 19 to 34 years (10.2%) than by respondents who were older (8%). After adjusting for demographic covariates, the prevalence of a high degree of mobility for black, white, Hispanic (ie, anyone who gave a positive response to the question: "Are you of Mexican, Latino, or Hispanic origin?" was treated as a Hispanic), and American Indian respondents was 4.8%, 12.4%, 7.5%, and 16.5%, respectively. Asian respondents had the lowest rate (2.1%) of high mobility. No difference was observed for respondent's sex or educational attainment. Although a slight decrease was found in the number of moves in relation to further maternal education and a slight increase was found in the number of moves in relation to further paternal education, these differences had no statistical significance.

After controlling for demographic covariates, the mean number of childhood moves among respondents with exposure to any type of ACE was 4.3 or greater for each case and was significantly lower among respondents without such type of exposure (≤3.6 for each case) (Table 1). The adjusted prevalence of moving 8 times or more was considerably greater among respondents growing up with childhood abuse, neglect, and multiple serious household dysfunctions than among respondents without these experiences. For respondents with experiences of being physically neglected, observing parental marital discord, witnessing domestic violence, and living with a criminal household member, the odds of a high degree of residential mobility were double or triple those of their counterparts who had no such experiences (Table 1). Moreover, we observed a robust and graded relationship between the number of ACEs and the number of moves during childhood. The adjusted prevalence of moving 8 times or more was 6.2% for respondents with 0 ACEs, but 26.3% for respondents with 6 or more ACEs, a 6-fold increase in odds (Table 1).

Similarly, as the frequency of change of residences increased, the likelihood for each of the ACEs also increased (**Figure**). The adjusted mean number of ACEs for respondents who never moved and for those who moved 1 to 3, 4 to 7, or 8 or more times was 1.3, 1.5, 2.1, and 2.7, respectively ($P<.001$). In the final logistic models, we assessed the relationship of residential mobility to the odds of reporting each of 6 health outcomes, including depressed affect, attempted suicide, smoking, alcoholism, early sexual initiation, and teenaged pregnancy.

As shown in the individual models in **Tables 2**, **3**, and **4**, the frequency of mobility and the number of ACEs were strongly associated with all 6 health outcomes. Compared with respondents who never moved, the odds of health risk for respondents who changed residences 8 times or more ranged from 1.3 (for smoking) to 2.5 (for suicide). The ACE score showed a strong graded relationship to all health risks, as seen in prior publications.[17,23,24,34-41] However, the strength of the relationship between childhood residential mobility and the 6 health outcomes was greatly reduced after adjusting for the ACE score in the full models, whereas the odds of health outcomes for each ACE score level remained nearly unchanged. Further evidence that ACEs are important risk factors for all health risks comes from the finding that the receiver operating characteristic curve for the fit of the model that included only mobility was dramatically improved with the addition of the ACE score. Conversely, the addition of mobility to the individual model of the ACE score did not improve the fit of the model (data not shown).

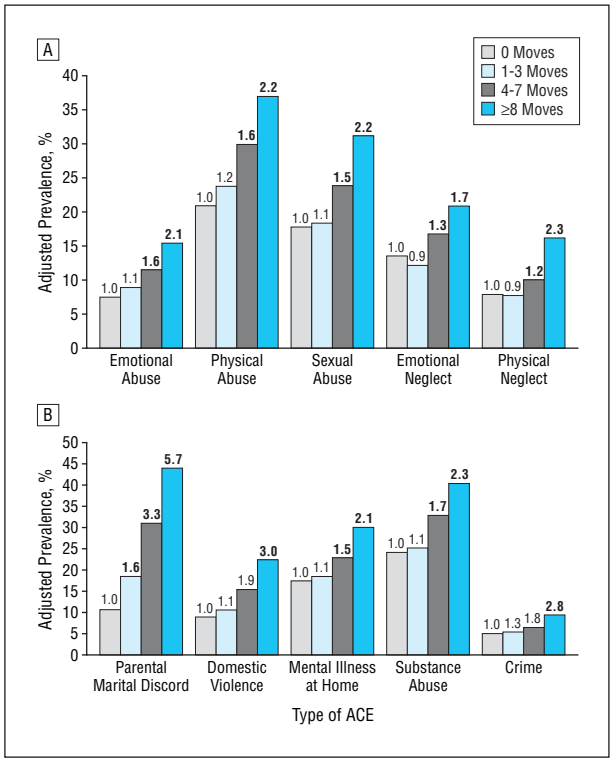

Figure. The adjusted prevalences and odds ratios of each category of adverse childhood experience (ACE) by the number of residential moves during childhood. A, Childhood abuse and neglect ACEs. B, Household dysfunction ACEs. The height of each bar represents the adjusted prevalence of ACEs; number above each bar, the adjusted odds ratios of the ACE comparing each number of residential move categories with the referent (never moved); and bold-faced numbers, data that are statistically different ($P<.001$ for all) from the referent.

COMMENT

Residential mobility during childhood was strongly related to 10 types of ACEs. Moreover, as the number of these experiences (ACE score) increased, residential mobility increased in a graded fashion. Thus, ACEs may often be hidden among families with high residential mobility.

We found a graded relationship between the frequency of childhood residential moves and deleterious health outcomes throughout the lifespan, including early sexual initiation, teenaged pregnancy, depressed affect, attempted suicide, smoking, and alcoholism. Similarly, as the number of ACEs increased, the risk of these outcomes also increased in a strong graded fashion. When we simultaneously entered childhood residential mobility and the number of ACEs into multivariate models, the apparent risk associated with childhood residential mobility was reduced or eliminated, whereas the risk associated with ACEs remained graded and robust. Thus, the apparent relationship between childhood residential mobility and negative health and social outcomes is mostly, if not solely, due to the effects of underlying ACEs that occur with high frequency in extremely mobile families.

Table 2. Relationship of the Number of Residential Moves During Childhood to the Prevalence and Risk (Odds Ratio) of Depressed Affect and Attempted Suicide With and Without Control for ACEs

		Depressed Affect			Attempted Suicide		
Variable	Sample Size	No. (%) of Subjects	Individual Models*†	Full Model*‡	No. (%) of Subjects	Individual Models*†	Full Model*‡
No. of moves							
0§	1260	343 (27.2)	1.0	1.0	26 (2.1)	1.0	1.0
1-3	3571	974 (27.3)	1.2 (0.9-1.5)	0.9 (0.8-1.1)	105 (2.9)	1.3 (0.9-1.9)	1.1 (0.8-1.7)
4-7	1959	629 (32.1)	1.4 (1.1-1.9)	1.1 (0.9-1.3)	79 (4.0)	2.0 (1.3-2.9)	1.3 (0.9-1.9)
≥8	894	338 (37.8)	2.1 (1.6-2.9)	1.2 (0.9-1.4)	48 (5.4)	2.5 (1.6-3.9)	1.3 (0.8-2.0)
No. of ACEs							
0§	2667	534 (19.4)	1.0	1.0	21 (0.8)	1.0	1.0
1	2101	553 (26.1)	1.4 (1.3-1.7)	1.4 (1.2-1.6)	39 (1.8)	2.3 (1.4-4.0)	2.3 (1.3-3.9)
2	1259	420 (33.1)	2.0 (1.7-2.3)	1.9 (1.7-2.3)	42 (3.3)	4.0 (2.4-6.9)	3.9 (2.3-6.7)
3	785	286 (37.8)	2.3 (1.9-2.8)	2.2 (1.9-2.7)	30 (4.0)	4.4 (2.5-7.7)	4.2 (2.4-7.5)
4-5	832	400 (47.6)	3.4 (2.8-4.0)	3.2 (2.7-3.8)	59 (7.0)	7.7 (4.6-12.8)	7.3 (4.4-12.3)
≥6	472	199 (53.2)	4.0 (3.1-5.0)	3.8 (3.0-4.8)	80 (21.4)	25.6 (15.4-42.6)	24.1 (14.3-40.4)
Total	**8116**	**2392** (29.5)	NA	NA	**271** (3.3)	NA	NA

Abbreviations: ACE, adverse childhood experience; NA, data not applicable.
*Data are given as odds ratio (95% confidence interval).
†Includes either the number of moves or the ACE score and demographic covariates (respondents' age, race, sex, and education and mother's and father's education).
‡Includes the number of moves, the ACE score, and demographic covariates.
§Referent group.

Table 3. Relationship of the Number of Residential Moves During Childhood to the Prevalence and Risk (Odds Ratio) of Alcoholism and Smoking Behaviors With and Without Control for ACEs

		Alcoholism			Ever Smoked (≥100 Cigarettes)		
Variable	Sample Size	No. (%) of Subjects	Individual Models*†	Full Model*‡	No. (%) of Subjects	Individual Models*†	Full Model*‡
No. of moves							
0§	1260	66 (5.2)	1.0	1.0	579 (46.0)	1.0	1.0
1-3	3571	217 (6.1)	1.2 (0.9-1.5)	1.1 (0.9-1.5)	1682 (47.1)	1.0 (0.9-1.2)	1.0 (0.9-1.2)
4-7	1959	147 (7.5)	1.4 (1.1-1.9)	1.1 (0.8-1.5)	1036 (52.9)	1.3 (1.0-1.4)	1.1 (0.9-1.3)
≥8	894	94 (10.5)	2.1 (1.6-2.9)	1.4 (1.0-2.0)	475 (53.1)	1.3 (1.1-1.4)	1.0 (0.9-1.2)
No. of ACEs							
0§	2667	75 (2.7)	1.0	1.0	1207 (43.8)	1.0	1.0
1	2101	118 (5.6)	2.1 (1.6-2.8)	2.1 (1.5-2.8)	1022 (48.3)	1.3 (1.1-1.4)	1.3 (1.1-1.4)
2	1259	96 (7.6)	2.8 (2.0-3.8)	2.7 (2.0-3.7)	655 (51.6)	1.5 (1.3-1.8)	1.5 (1.3-1.8)
3	785	78 (10.3)	4.2 (3.0-5.8)	4.0 (2.9-5.6)	404 (53.4)	1.8 (1.6-2.2)	1.7 (1.5-2.2)
4-5	832	107 (12.7)	5.5 (4.0-7.5)	5.2 (3.8-7.2)	460 (54.8)	2.1 (1.8-2.4)	2.0 (1.7-2.4)
≥6	472	69 (18.4)	9.0 (6.3-13.0)	8.5 (5.8-12.3)	224 (59.9)	2.9 (2.3-3.6)	2.8 (2.2-3.6)
Total	**8116**	**543** (6.7)	NA	NA	**3972** (48.9)	NA	NA

Abbreviations: See Table 2.
*Data are given as odds ratio (95% confidence interval).
†Includes either the number of moves or the ACE score and demographic covariates (respondents' age, race, sex, and education and mother's and father's education).
‡Includes the number of moves, the ACE score, and demographic covariates.
§Referent group.

Decreased social capital,[42] such as ties to important agents of socialization and the attachments that help to define a child's world, was previously thought to explain the negative effect of mobility.[12,42-45] In this theoretical scenario, children who moved may use certain negative behaviors, such as criminal delinquency,[11] alcohol and other drug abuse,[8] and sexual promiscuity,[9] as a means of gaining acceptance and approval in the new environment and achieving a sense of security and protection that the move had compromised. Although social capital is likely diminished for children (and their families) as a result of residential mobility, our findings clearly show that children in these situations are likely coping with multiple traumatic and stressful exposures (ie, ACEs) that have their own direct effects on childhood (neuro)development and that may also exacerbate vulnerabilities that accompany changes in residences, schools, and various social attachments.

Although most of the association between childhood residential mobility and health risks was a result of underly-

Table 4. Relationship of the Number of Residential Moves During Childhood to the Prevalence and Risk (Odds Ratio) of Early Sexual Initiation and Teenaged Pregnancy With and Without Control for ACEs

		Early Sexual Initiation (≤14 y)			Teenaged Pregnancy (≤18 y)		
Variable	Sample Size	No. (%) of Subjects	Individual Models*†	Full Model*‡	No. (%) of Subjects	Individual Models*	Full Model*‡
No. of moves							
0§	1260	64 (5.1)	1.0	1.0	114 (16.4)	1.0	1.0
1-3	3571	184 (5.2)	0.9 (0.8-1.3)	0.9 (0.7-1.2)	425 (21.7)	1.2 (1.0-1.5)	1.2 (0.9-1.4)
4-7	1959	125 (6.4)	1.3 (0.9-1.7)	0.9 (0.7-1.3)	237 (24.0)	1.4 (1.1-1.8)	1.2 (0.9-1.5)
≥8	894	80 (8.9)	2.0 (1.4-2.7)	1.2 (0.9-1.7)	143 (29.2)	1.9 (1.4-2.5)	1.4 (1.1-1.8)
No. of ACEs							
0§	2667	65 (2.4)	1.0	1.0	197 (13.9)	1.0	1.0
1	2101	99 (4.7)	1.9 (1.4-2.7)	2.0 (1.4-2.7)	218 (20.1)	1.6 (1.3-2.0)	1.6 (1.3-2.0)
2	1259	78 (6.1)	2.5 (1.8-3.6)	2.5 (1.8-3.5)	162 (24.8)	2.0 (1.6-2.6)	2.0 (1.6-2.5)
3	785	60 (7.9)	3.5 (2.4-5.0)	3.0 (2.3-4.9)	130 (29.6)	2.7 (2.1-3.5)	2.6 (2.0-3.4)
4-5	832	102 (12.1)	6.0 (4.3-8.3)	5.7 (4.1-8.0)	164 (30.8)	2.7 (2.1-3.5)	2.6 (2.0-3.4)
≥6	472	74 (19.8)	11.3 (7.8-16.4)	10.7 (7.3-15.7)	116 (44.4)	4.9 (3.6-6.7)	4.6 (3.4-6.3)
Total	**8116**	**478** (5.9)	NA	NA	**987** (22.5)	NA	NA

Abbreviations: See Table 2.
*Data are given as odds ratio (95% confidence interval).
†Includes either the number of moves or the ACE score and demographic covariates (respondents' age, race, sex, and education and mother's and father's education).
‡Includes the number of moves, the ACE score, and demographic covariates.
§Referent group.

ing ACEs, the connection between negative health effects and frequent moving cannot be ignored. The risk of alcoholism and teenaged pregnancy remained significant among respondents who moved 8 or more times, even after adjusting for the ACE score. Because childhood residential mobility has a strong and graded relationship to ACEs, in a highly mobile society like America, the childhood residential mobility can be used as an indication for real-time screening to uncover otherwise hidden exposures to childhood traumatic experiences that, because of their tendency to be kept secret, usually remain undetected by child care providers.

This study has several limitations. First, because the question regarding residential mobility is only a single question about the number of moves, we were unable to compare the results we report with those that may have been found using other questions about residential mobility. Second, the information for residential moves, ACEs, and health outcome variables was retrospective and self-reported. In fact, the estimates for the relationships of ACEs and mobility attributed to the health risks are likely to be conservative, because each of the questions about ACEs and the assessment of health outcomes addressed sensitive topics and, thus, were likely to be underreported. Because both exposures (ACEs and residential mobility) and outcome were likely to be underreported, the results we report herein have most likely been biased toward the null,[46] thereby leading to underestimation of the strength of the relationship between childhood residential mobility and ACEs to health outcomes.

Another potential limitation is uncertainty about the temporal sequence of ACEs and residential mobility that we studied. However, this study was not intended to identify any cause-and-effect relationship between ACEs and residential mobility. Rather, our goals were to quantify the relationship of each of these exposures to negative outcomes and to assess the degree to which previously unmeasured ACEs may account for the reported associations between residential mobility and these outcomes.

Because of the nature of this study, evidence regarding the short-term harms to children that resulted from moving, such as developmental problems or poor school performance, was unavailable. Instead, this study concentrated on assessing health risks and social problems from adolescence to adulthood to discover the long-term effect of childhood residential mobility that had not been assessed in previous studies.

Although information on some demographic characteristics that were associated with mobility[3,47-49] was not measured, such as family income and parents' occupations, the educational level of respondents' parents was used as a proxy for socioeconomic status during childhood. The analysis showed that some of the estimated health risk of high mobility was linked to lower education of either the mother or the father, yet the contribution of parental education diminished when we controlled for the number of ACEs in logistic models.

The occurrence of multiple health risks throughout the life of respondents whose families were highly mobile during the respondents' childhoods seems to be largely, if not solely, attributable to the higher frequency of ACEs in these households. These findings have important implications for future studies, public policy, school systems, and physicians or clinical practitioners. Improved understanding and recognition of these hidden short- and long-term effects of ACEs on children living in highly mobile families may prove to be valuable for understanding and ameliorating childhood trauma that influences the health course through adulthood.

Although residential mobility can be a benefit and improvement for children, allowing them in some cases to move into more protective and safer environments, the high degree of residential mobility among families in which abuse,

violence, and related serious household dysfunction occur also represents a serious challenge to providing continuity of care for troubled families and children who are abused, neglected, or exposed to domestic violence. In addition, educators and health care providers need to be made aware of the strong possibility that children who move frequently may have other unobserved family problems. It is also important for schools and other agencies working with children to offer appropriate counseling for those affected families with children who move frequently. This type of counseling may help health and social service professionals identify stressful and abusive environments, prevent health risk behaviors and social problems among youth during the early stages, and, ultimately, lead to improvement in health from adolescence to adulthood.

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