

US Housing Insecurity and the Health of Very Young Children

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In the United States, as in other countries, housing is considered a strong social determinant of health.¹ Poor housing conditions have been linked to multiple negative health outcomes in both children and adults. The Department of Health and Human Services has defined housing insecurity as high housing costs in proportion to income, poor housing quality, unstable neighborhoods, overcrowding, or homelessness.² Crowding in the home and multiple moves from home to home have clear negative associations for children. Crowding is negatively associated with mental health status,³ ability to cope with stress,⁴ child and parent interaction,⁵ social relationships,³ and sleep.³ It also increases the risk for childhood injuries,⁶ elevated blood pressure,⁵ respiratory conditions,⁷ and exposure to infectious disease.⁷ Adults⁸ and children⁹ living in crowded households are less likely to access health care services than are those in noncrowded households, and families with multiple moves are less likely to establish a medical home and seek out preventive health services for their children than are securely housed families.¹⁰

In older children and adolescents, a history of multiple moves has been associated with mental health concerns,¹¹ substance abuse,¹² increased behavior problems,¹³ poor school performance,^{13,14} and increased risk of teen pregnancy.¹⁵ Multiple moves in childhood can have lifelong impact, as evidenced by higher rates of adverse childhood events,¹⁶ lower global health ratings in adulthood,¹⁷ and increased mental health and behavior concerns lasting through adolescence and into adulthood.¹⁶ Grade-school children with more than 2 school moves are 2.5 times more likely to repeat a grade,¹⁸ and adolescents who experience school moves are 50% more likely not to graduate from high school.¹⁹

Access to affordable housing is likely to reduce the chances that a family will live in crowded conditions or make multiple moves within a short period of time. Since the Housing Act of 1937 was passed,²⁰ 30% of monthly

Objectives. We investigated the association between housing insecurity and the health of very young children.

Methods. Between 1998 and 2007, we interviewed 22 069 low-income caregivers with children younger than 3 years who were seen in 7 US urban medical centers. We assessed food insecurity, child health status, developmental risk, weight, and housing insecurity for each child's household. Our indicators for housing insecurity were crowding (>2 people/bedroom or >1 family/residence) and multiple moves (≥ 2 moves within the previous year).

Results. After adjusting for covariates, crowding was associated with household food insecurity compared with the securely housed (adjusted odds ratio [AOR]=1.30; 95% confidence interval [CI]=1.18, 1.43), as were multiple moves (AOR=1.91; 95% CI=1.59, 2.28). Crowding was also associated with child food insecurity (AOR=1.47; 95% CI=1.34, 1.63), and so were multiple moves (AOR=2.56; 95% CI=2.13, 3.08). Multiple moves were associated with fair or poor child health (AOR=1.48; 95% CI=1.25, 1.76), developmental risk (AOR 1.71; 95% CI=1.33, 2.21), and lower weight-for-age z scores (-0.082 vs -0.013 ; $P=.02$).

Conclusions. Housing insecurity is associated with poor health, lower weight, and developmental risk among young children. Policies that decrease housing insecurity can promote the health of young children and should be a priority. (*Am J Public Health.* 2011;101:1508–1514. doi:10.2105/AJPH.2011.300139)

adjusted income has been used as the threshold for affordable housing costs. But affordability by this definition is becoming increasingly less common. In 2008, half of renter households paid more than 30% of their income in rent, and nearly a quarter paid more than 50%.²¹ Increases in unemployment and the poverty rate since 2008 have likely increased the number of families living in housing that they are hard pressed to afford. Although poverty is higher among young children than among any other age group,²² little is known about the effects of housing insecurity on very young children who are considered housed, albeit precariously. We examined the health, developmental, and anthropometric correlates of housing insecurity among children younger than 3 years, using crowding and multiple moves as indicators.

METHODS

Between June 1998 and December 2007, researchers with the ongoing Children's

HealthWatch study approached 36 618 adult caregivers of children younger than 3 years at Children's HealthWatch sites in 7 central-city medical centers serving diverse, low-income populations in Baltimore, MD; Boston, MA; Little Rock, AR; Los Angeles, CA; Minneapolis, MN; Philadelphia, PA; and Washington, DC. Institutional review board approval was obtained at each site prior to data collection and has been renewed annually since then.

The study design was cross-sectional. At each study site, trained interviewers surveyed caregivers accompanying children younger than 3 years who were seeking care at acute or primary care clinics or hospital emergency departments during peak patient flow times. Interviewers did not approach caregivers of critically ill or injured children. Potential respondents were excluded if they did not speak English or Spanish (or, in Minneapolis only, Somali), were not knowledgeable about the child's household, had been interviewed previously, lived out of state, or did not consent to

participate. The caregivers were approached in private settings.

Of the 36 618 caregivers who were approached, 3419 (9.3%) were ineligible, and 3343 (10.9%) refused to participate or were not able to complete the interview (Figure 1). To ensure that sample participants had relatively similar economic backgrounds, participants with private insurance were excluded (n=3358). Because our study interest concerned housing insecurity distinct from homelessness, we also excluded families who were homeless or living in shelters, residential treatment centers, or military facilities (n=780) (Figure 1). Also eliminated were 3649 (14.2%) interviews that had missing data. This process yielded a final analysis sample of 22 069 caregiver/child dyads. Those with complete data were similar to those with incomplete data in terms of child's gender, birth weight, household employment, and number of children in the household. Caregivers with incomplete data were more likely to be Hispanic, foreign born, interviewed in Minneapolis, married, older, have less education, have breastfed their child, and not report depressive symptoms.

Survey, Anthropometric, and Housing Insecurity Measures

From study inception, the survey covered multiple domains, including demographics, housing, reports of child health, and the United States Food Security Scale.²³⁻²⁶ Participants self-identified their race/ethnicity using definitions based on US Census Bureau definitions.²⁷ We asked race/ethnicity questions to characterize the sample and to demonstrate the diversity of this population. Respondents characterized their child's health as excellent, good, fair, or poor using a question from the 1988-1994 National Health and Nutrition Examination Survey,²⁸⁻³⁰ which has been validated against medical chart review. Poor child health was defined as caregivers ranking children as being in either fair or poor health.³¹

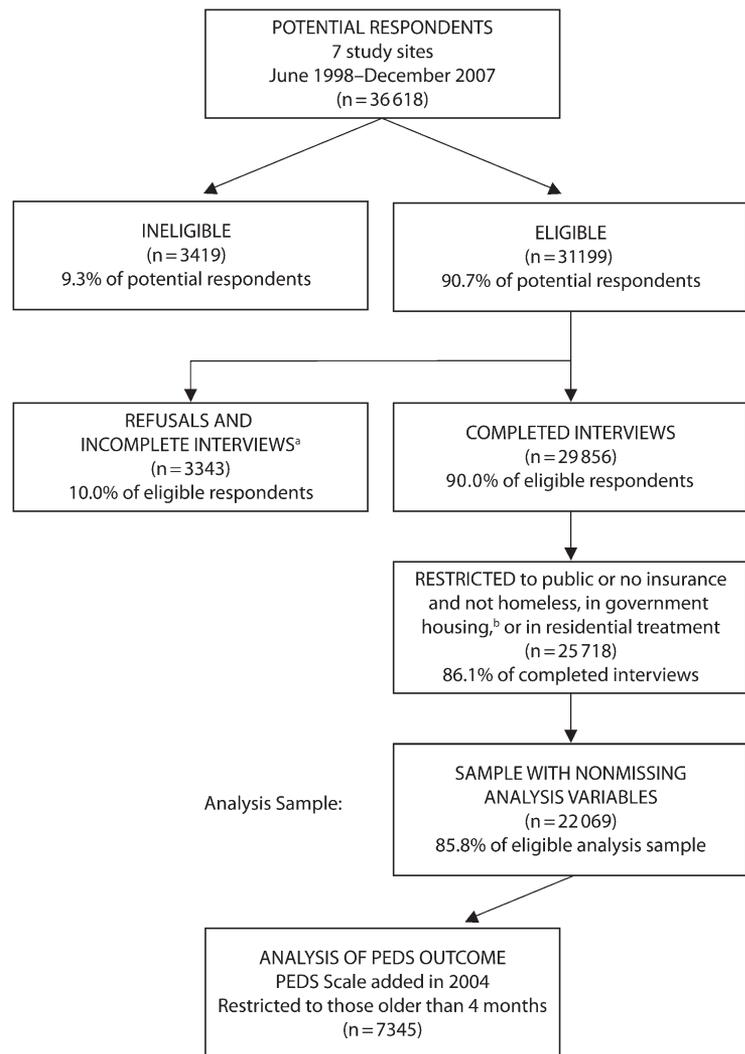
Household food insecurity and child food insecurity were derived from the Food Security Scale in accordance with established procedures.^{23,25} Households were classified as food insecure if they scored at a level indicating they could not afford enough nutritious food for active, healthy lives, and if this condition resulted from constrained resources.²³⁻²⁵ Children

were classified as food insecure if their caregivers reported that they met the criteria for either child hunger (skipping or reducing the size of child meals) or poor diet quality (relying on only a few foods or being unable to provide a balanced diet for children).²⁴

In 2000 we expanded our survey to assess caregivers' depressive symptoms, measured by a 3-item screen with a sensitivity of 100%, specificity of 88%, and positive predictive value of 66%, compared with the 8-item Rand screening instrument for depressive symptoms.³²

We gave the Parents' Evaluation of Developmental Status (PEDS) survey to a subset of

7345 caregivers with children older than 4 months from 2004 through 2007. Caregivers reported concerns about the child's development in 8 areas: expressive language, receptive language, fine motor skills, gross motor skills, behavior, social-emotional skills, self-help, and school. In addition, we asked caregivers 2 open-ended questions about concerns in the global/cognitive area and additional concerns. Other investigators have shown that children whose caregivers express 1 or more concerns on the PEDS are considered to be at developmental risk³³⁻³⁵ and experience from 8 to 20 times the risk of developmental and behavioral



Note. PEDS = Parents' Evaluation of Developmental Status survey.

FIGURE 1—Description of analytic sample selection: 7 US cities, 1998–2007.

problems compared with children whose parents do not express concerns on the PEDS.³⁶

Project staff or clinical staff used standard techniques to collect children’s weight and length/height. When clinical staff collected these data, project staff obtained the data later via medical record reviews conducted on the same day as the interview. Anthropometric status was derived from the Centers for Disease Control and Prevention/National Center for Health Statistics 2000 age-gender standardized growth

charts.³⁷ We also calculated weight-for-age z scores.³⁸

We divided the sample into 3 mutually exclusive groups according to their housing insecurity status. Families with no more than 1 move in the previous year and no indication of crowding were the referent securely housed group. We defined the 2 insecurely housed groups on the basis of crowding and multiple moves in the previous year. Using the US Department of Housing and Urban Development definition as a guideline,³⁹ we defined

crowding as having more than 2 people per bedroom or as temporarily living with other people because of economic difficulties (doubling up). Families that had moved 2 or more times in the previous year, with or without crowding, were classified as households with multiple moves.

Outcome variables included household food insecurity, child food insecurity, caregiver report of child’s health status, developmental risk, and weight-for-age z scores. Weight-for-age z scores were expressed as a continuous variable. All other outcome variables were expressed as 2-level categorical variables.

Analysis

We developed separate multivariate logistic regression models for each of the dichotomous outcome variables, including a secondary analysis to examine whether adding maternal depressive symptoms might alter associations with housing insecurity (we assessed “maternal” depression for any female primary caregiver). We used general linear models for multivariate analysis of variance for continuous outcomes. Covariates included in each model were selected on theoretical grounds and on the basis of whether there was evidence of bivariate association with both the outcome of interest and with housing insecurity. To minimize the potential for collinearity, we calculated the correlation between pairs of independent variables, and we verified that no pair of variables included in the same regression model was highly correlated (i.e., $r > 0.40$). To determine how housing insecurity was related to child health variables, we used SAS 9.1 (SAS Institute, Cary, NC) to conduct multivariate analyses, using securely housed families as the referent category. All models were adjusted for city, maternal race/ethnicity, maternal place of birth (United States vs other), marital status, maternal education, mean number of children in the home, whether adults in the household were employed, mean child’s age, whether the child was breastfed, and child’s birth weight less than 2500 g.

RESULTS

Housing insecurity affected 46% of the study sample, with 41% of households experiencing crowding, and 5% of households

TABLE 1—Sample Characteristics, by Housing Group: Children Younger Than 3 Years, 7 US Cities, 1998–2007

Sample Characteristics	Housing Groups			P
	Secure Housing	Crowding	Multiple Moves	
Housing group totals	11 904 (54)	9113 (41)	1052 (5)	
Study site, no. (%)				<.001
Baltimore, MD	1896 (16)	992 (11)	90 (8)	
Boston, MA	3556 (30)	1982 (22)	246 (24)	
Little Rock, AR	2695 (23)	1120 (12)	282 (27)	
Los Angeles, CA	540 (4)	931 (10)	55 (5)	
Minneapolis, MN	2034 (17)	2982 (33)	266 (25)	
Philadelphia, PA	1047 (9)	643 (7)	101 (10)	
Washington, DC	136 (1)	463 (5)	12 (1)	
Child characteristics				
Girl, no. (%)	5597 (47)	4263 (47)	463 (44)	.17
Age, mo, mean (SD)	12.8 (9.9)	10.6 (9.4)	16.3 (8.9)	<.001
Breastfed, no. (%)	5848 (49)	5323 (58)	540 (51)	<.001
Birth weight <2500 g, no. (%)	1622 (14)	1189 (13)	163 (15)	.03
Caregiver race/ethnicity, no. (%)				<.001
Asian	139 (1)	158 (2)	8 (1)	
Black	7281 (61)	4093 (45)	482 (46)	
Hispanic	2461 (21)	3871 (42)	310 (29)	
Native American	93 (1)	95 (1)	20 (2)	
White	1930 (16)	896 (10)	232 (22)	
Caregiver US born, no. (%)	8821 (74)	4726 (52)	783 (74)	<.001
Caregiver single marital status, no. (%)	8031 (67)	5452 (60)	747 (71)	<.001
Caregiver education, no. (%)				<.001
Some school	3386 (29)	4110 (45)	422 (40)	
High school diploma/GED	5035 (42)	3346 (37)	389 (37)	
Post-high school	3483 (29)	1657 (18)	241 (23)	
Caregiver age, y, mean (SD)	26.4 (6.7)	25.5 (6.2)	25.5 (6.8)	<.001
No. of children in home, mean (SD)	2 (1.2)	3(1.6)	2 (1.5)	<.001
≥1 household member employed, no. (%)	9280 (78)	7578 (83)	772 (73)	<.001
Maternal depressive symptoms, ^a no. (%)	2140 (22)	1858 (27)	349 (41)	<.001

Note. GED = general equivalency diploma. Caregivers were 93% mothers, 5% fathers, and 2% other.
^aAsked only of female caregivers.

experiencing multiple moves. As indicated in Table 1, housing insecurity was significantly associated with research site and more children in the home. Maternal older age, minority race/ethnicity, foreign place of birth, single marital status, lower education, depressive symptoms, and breastfeeding were also significantly associated with housing insecurity. Older child age was significantly associated with multiple moves.

Household food insecurity (HFI) was found in 9% of families with secure housing, 12% of families with crowding, and 16% of families with multiple moves ($P < .001$). Child food insecurity (CFI) was found in 7% of families with secure housing, 17% of families with crowding, and 19% of families with multiple moves ($P < .001$). Multivariate analysis showed that, compared with the referent of secure housing, crowding was significantly associated with HFI (adjusted odds ratio [AOR]=1.30; 95% confidence interval [CI]=1.18, 1.43; $P < .001$) and with CFI (AOR=1.47; 95% CI=1.34, 1.63; $P < .001$) (Table 2). Multiple moves were also significantly associated with HFI (AOR=1.91; 95% CI=1.59, 2.28; $P < .001$) and CFI (AOR=2.56; 95% CI=2.13, 3.08; $P < .001$), with higher AORs than crowding and non-overlapping confidence intervals. In addition, multiple moves were significantly associated with caregivers reporting their child's health as fair or poor (18% vs 11% of the securely housed, AOR=1.48; 95% CI=1.25, 1.76; $P < .001$) and reporting developmental risk as measured by the PEDS (22% vs 14% of the securely housed, AOR=1.71; 95% CI=1.33, 2.21; $P < .001$). Children in the multiple-moves group had significantly lower weight-for-age z scores than the secure-housing group (-0.082 vs -0.013 ; $P = .02$) (Figure 2).

When we added maternal depressive symptoms to the models as a covariate, the associations of housing insecurity with fair/poor child health and developmental risk were somewhat attenuated but remained significant. The AOR between multiple moves and fair/poor child health diminished only slightly, from 1.48 (95% CI=1.25, 1.76) to 1.40 (95% CI=1.16, 1.70; $P < .001$), whereas the AOR between multiple moves and developmental risk diminished from 1.71 (95% CI=1.33, 2.21) to 1.53 (95% CI=1.18, 1.99; $P = .001$), remaining significant but showing partial attenuation. Maternal depressive symptoms were significantly associated with HFI, CFI, fair/poor child health, and developmental risk ($P < .001$) but not with weight-for-age z score. CFI was also tested as a mediator of the association between housing insecurity and child weight for age, but results did not differ from our primary analysis.

DISCUSSION

Homeless children are recognized as being vulnerable to multiple health risks, but there are millions of less visible children whose health, development, and growth may be compromised by living in insecure housing. Nearly half of our sample (46%) had experienced housing insecurity within the past year. We found housing insecurity to be associated with measures of poor health, growth, and development in young children, which is consistent with findings of research on samples of adults and older children. Housing insecurity is also an important marker for food insecurity. Multiple moves had a stronger relation with food insecurity and fair/poor child health than crowding, suggesting that multiple moves are

a more severe form of housing insecurity. Whereas crowding may be used as a coping strategy to avoid outright homelessness, housing transiency as reflected by multiple moves may indicate a lack of social ties⁴⁰ to assist families during household crises.

We found that, compared with the rest of our sample, very young children in households with multiple moves had worse caregiver-reported health status, increased developmental risk, and average weight for age that was lower than expected. Although the magnitude of the weight-for-age z-score differences between the groups was not large, the negative growth differences in this group of very young children are cause for concern. Similar to multiple moves, crowding was associated with HFI and CFI, but to a lesser degree. Children living in households with both housing insecurity and food insecurity experience dual threats because food insecurity has been independently associated with children's risk for hospitalization,⁴¹ poor health,⁴¹ developmental delays,⁴² anemia,^{43,44} and the mother's risk for depressive symptoms.^{45,46}

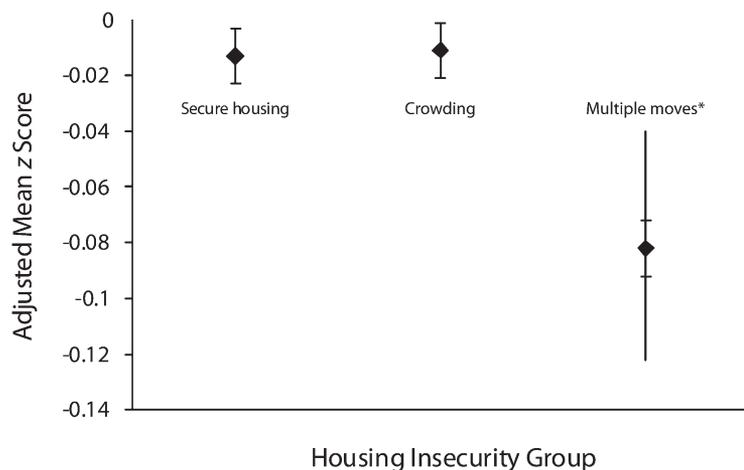
The potential life-course effects of housing insecurity during early childhood are important. Shonkoff et al. made a case that stress or disruption during childhood is a precursor to chronic disease in adulthood.⁴⁷ The relationship between housing insecurity and outcomes of poor child health, diminished weight, increased developmental risk, and greater likelihood of food insecurity suggest that policies promoting stable housing may have latent positive long-term health impacts.

Young children may be particularly vulnerable to the lack of a stable environment or to the stress of their families going through periods of housing insecurity. Social

TABLE 2—Variables Associated With Insecure Housing, by Housing Group: Children Younger Than 3 Years, 7 US Cities, 1998–2007

Variables	Secure Housing (Ref)		Crowding			Multiple Moves		
	Unadjusted No. (%)	AOR (95% CI)	Unadjusted No. (%)	AOR (95% CI)	P	Unadjusted No. (%)	AOR (95% CI)	P
Household food insecurity (n=22 069)	1052 (9)	1.0	1060 (12)	1.30 (1.18, 1.43)	<.001	166 (16)	1.91 (1.59, 2.28)	<.001
Child food insecurity (n=22 069)	872 (7)	1.0	1513 (17)	1.47 (1.34, 1.63)	<.001	204 (19)	2.56 (2.13, 3.08)	<.001
Caregiver report of fair/poor child health (n=22 069)	1313 (11)	1.0	1193 (13)	1.07 (0.98, 1.18)	.14	192 (18)	1.48 (1.25, 1.76)	<.001
Caregiver report of child developmental risk (after 2004, n=7345)	621 (14)	1.0	355 (14)	1.06 (0.91, 1.23)	.49	96 (22)	1.71 (1.33, 2.21)	<.001

Note. AOR=adjusted odds ratio; CI=confidence interval. Analyses are adjusted for site, race/ethnicity, US-born mother, marital status, maternal age, education, mean child's age, mean number of children in the home, household employment, breastfeeding, and low birth weight. Secure housing is the referent group.



Note. Least squares mean weight-for-age z scores by levels of housing insecurity were adjusted for site, race/ethnicity, US-born mother versus immigrant mother, maternal age, marital status, caregiver education, mean child's age, mean number of children in the home, household employment, breastfeeding, and low birth weight.

* $P = .02$.

FIGURE 2—Adjusted mean weight-for-age z scores by housing group: children younger than 3 years, 7 US cities, 1998–2007.

disorganization theory suggests that environmental factors such as housing insecurity influence parenting and child behavior.⁴⁸ Housing insecurity impedes the development of role models, informal neighborhood social supports, connections to resources such as child care, family participation in the social environment, and establishment of a medical home for consistent health care. All of these social factors are important to families with young children. Other social models discuss a competition process whereby neighbors compete for scarce community resources and services, impairing parental mental and physical health and influencing parental behaviors in ways that negatively affect the health of their children. Neighborhoods where families know and trust each other and community-level interventions that ensure adequate, safe, and affordable housing can positively affect the physical and mental health of parents and children.⁴⁹

Programs offering housing subsidies or energy assistance have been shown to protect against child health concerns, including hospitalizations⁵⁰ and poor growth,⁵¹ as well as anemia.⁵² Mills et al. found that families receiving housing subsidies moved less frequently and were less crowded than families that did not receive a subsidy.⁵³ Despite the benefits of subsidized housing, only 1 out of 4 eligible

households receives housing assistance.⁵⁴ Meyers et al. found that children younger than 3 years who lived in food-insecure households that were eligible for housing subsidies but did not receive them were more than twice as likely to have growth delays as measured by weight for age compared with those receiving housing subsidies.⁵¹ Frank et al. showed that children in families receiving energy assistance had lower odds of acute hospitalizations and diminished risk of having weight-for-age z scores that were more than 2 standard deviations below the mean.⁵⁰

Recent increases in unemployment, housing foreclosures (including those related to subprime lending), and the continued demand for low-income housing all contribute to an environment of housing insecurity.²¹ Although all socioeconomic groups are affected by housing insecurity, low-income households are particularly at risk because of their already constrained financial resources and lack of reserve funds. Low-income families often pay a larger proportion of their income for housing than do higher-income households, which decreases the resources available for other necessities such as food, transportation, heat, and medical care.²¹

There are several methodological limitations that should be considered when interpreting these data. First, because of the cross-sectional

design of this study, it is not possible to determine cause-and-effect relationships on the basis of our findings. Furthermore, although we controlled for important confounding variables, other unmeasured confounders may exist. We further acknowledge that, despite our use of previously independently validated questions whenever possible, respondents may have over- or underreported negative child outcomes. Because this study assesses families from low-income backgrounds in emergency rooms and hospital-based clinics, their children are already at elevated risk for developmental and health concerns and may not be representative of all low-income children. However, we excluded urgently ill or injured children, so some of the highest-risk children may not have been included in this study.

In addition, families that were excluded from the analyses because of incomplete data represent a high-risk segment of the study population, judged on the basis of demographic variables of caregiver education, maternal race/ethnicity, and maternal country of birth. Therefore, it is possible that excluding these families from the analyses contributes to underestimating the impact of housing insecurity. Finally, our measurement of housing insecurity does not incorporate measures of housing safety or quality of neighborhood conditions; nor does it consider affordability.

Nevertheless, the association between housing insecurity and measures of children's health and development provide evidence of the vulnerability of children who have insecure housing but who are not homeless. Low-income children often bear the burden of multiple risk factors for adverse outcomes, some of which (such as housing insecurity) can be addressed through public policies. Governmental action and community investment in expanding the supply of affordable housing, increasing funding for housing assistance programs, and stabilizing families in uncrowded housing they can afford can alleviate housing insecurity. Protecting families with young children from being economically forced into crowded conditions and frequent moves should be a policy priority. ■

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Human Participant Protection

The institutional review boards of Boston University Medical Center, Hennepin County Medical Center, Drexel University College of Medicine, University of Arkansas for Medical Sciences, and University of Maryland School of Medicine approved the study protocol at the beginning of the study. We obtained renewal of the protocol approval from each institutional review board annually.

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