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The Impact of Housing Assistance on the Mental Health of Children in the United States

Andrew Fenelon¹, Natalie Slopen¹, Michel Boudreaux¹, Sandra J. Newman²

¹University of Maryland, College Park, College Park, MD, USA

²Johns Hopkins University, Baltimore, MD, USA

Abstract

Housing assistance policies may lead to improved mental health for children and adolescents by improving housing quality, stability, and affordability. We use a unique data linkage of the National Health Interview Survey and U.S. Department of Housing and Urban Development administrative data to examine the impact of housing assistance on parent-reported mental health outcomes for children ages 2 to 17 (N = 1,967). We account for selection into housing assistance using a *pseudo-waitlist* method that compares children receiving assistance to those who will enter housing assistance within two years of their interview. Compared to those in the pseudo-waitlist group, we find that children living in public housing have better mental health outcomes. We do not find similar benefits for children receiving vouchers. Our results suggest that housing assistance policies can have a positive impact on mental health among disadvantaged children.

Keywords

housing; housing assistance; mental health; public housing; United States

There are large socioeconomic differences in mental health among children in the United States, driven in large part by disparities in access to advantageous social environments and by differential exposure to social stressors (McLeod and Shanahan 1996; Reiss 2013). One pathway linking socioeconomic status to mental health inequality in the United States is housing, particularly the ability of families to afford high-quality housing in a high-opportunity location (Newman and Holupka 2015). In 2015, 84% of renters in the bottom income quintile spent more than 30% of their income on housing, and 70% spent at least half (Joint Center for Housing Studies of Harvard University 2017). Growing more severe since the financial crisis and the Great Recession (Houle 2014), this trend may have significant implications for mental health among children in disadvantaged families. Policies

Corresponding Author: Andrew Fenelon, University of Maryland, College Park, 3310B School of Public Health Bldg., 4200 Valley Dr., College Park, MD 20742, USA. afenelon@umd.edu.

SUPPLEMENTAL MATERIAL

Additional supporting information may be found with the online version of the article.

AUTHORS' NOTE

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that improve housing may have a beneficial impact on the mental health of disadvantaged children and adolescents.

Federal housing assistance programs aim to provide affordable, stable, and high-quality housing to low-income families (U.S. Department of Housing and Urban Development [HUD] 2017). As of 2017, HUD provided housing assistance to approximately 5 million families, including nearly 3 million children (Center on Budget and Policy Priorities 2017). Assisted households are expected to pay 30% of their incomes to rent with the difference subsidized by HUD.¹ HUD benefits allow assisted households to purchase higher-quality housing and more stable housing than they would otherwise be able to afford while freeing up household income that can be invested in other health-promoting goods (Fertig and Reingold 2007).

Experimental and quasiexperimental evidence suggests that housing assistance during childhood imparts long-term economic benefits that extend into adulthood (Andersson et al. 2016). Given strong evidence that mental health conditions in childhood impact adult outcomes (Currie and Stabile 2006), the impact of housing assistance on child mental health is a particularly relevant question. Although recent studies indicate that housing assistance is associated with improvements in physical and mental health, chronic disease management, and healthcare access and use for adults (Fenelon et al. 2017; Keene, Guo, and Murillo 2018; Pfeiffer 2018; Simon et al. 2017), there are relatively few studies examining whether housing assistance improves child outcomes (Slopen et al. 2018). While the Moving to Opportunity study provided important experimental evidence of the effect of housing assistance type on short- and long-run outcomes, it did not consider the impact of any assistance versus none.

This study improves upon shortcomings of previous research to examine whether HUD housing assistance programs are associated with improved child mental health. We leverage a unique data set that merges longitudinal administrative data with a nationally representative household health survey. We use a quasiexperimental approach that controls for unobserved selection into HUD assistance, and we consider differences by housing assistance program type and child's age.

BACKGROUND

Housing and Children's Mental Health

Children who experience persistent poverty or economic instability are likely to have more socioemotional problems than their advantaged counterparts, a pattern that has been found with respect to a number of mental health and behavioral measures (Lee and Jackson 2017; Reiss 2013). HUD housing assistance may ameliorate some of the negative effects of poverty on low-income children by providing superior physical quality and neighborhood context, afford-ability, and better parental mental health, which may impact child mental health (Kull and Coley 2014).

¹Initial voucher recipients spend 30% of income on rent but after one year have the option to increase their spending in order to extend the voucher to new neighborhoods.

Improvement in housing quality and reductions in overcrowding are likely to increase cognitive stimulation and psychosocial well-being for children (Thomson et al. 2009). In addition to physical quality, growing up in a neighborhood with high rates of poverty or violence may be detrimental to mental health in childhood and adolescence, and can reduce social and economic mobility in adulthood (Chetty, Hendren, and Katz 2016; DeLuca and Rosenblatt 2010). Reductions in neighborhood disadvantage or improvements in neighborhood social capital can have mental health benefits during adolescence (Dupéré, Leventhal, and Vitaro 2012). Improvements in housing affordability could help families free up resources to spend on health-care, transportation, education, and leisure activities (Newman and Holupka 2015). High rent burden and unstable housing can have direct impacts on parents' mental health, which can affect the well-being of children by increasing child maltreatment (Warren and Font 2015). Decreases in rent burden could also reduce the stress that is known to accompany poverty (Burgard, Seefeldt, and Zelner 2012; Gladstone, Boydell, and McKeever 2006) and can limit the frequency of evictions or unexpected moves (Desmond and Kimbro 2015).

HUD Housing Assistance Programs

In 2016, the HUD provided housing assistance to approximately 5 million families, including nearly 3 million children under 18 (HUD 2016). Housing assistance is primarily provided through three major programs that are administered by local public housing agencies (PHAs): *public housing* (1.1 million current households), *housing choice vouchers* (2.2 million households), and *multifamily housing* (1.5 million households). The public housing program refers to entire developments of subsidized housing owned and operated by PHAs. Although past public housing developments were often high-density towers, newer-construction projects tend to be less dense and are more likely to be directly integrated within mixed-income neighborhoods than their predecessors (Lloyd and Helms 2016). The concentration of assisted families in public housing may permit relatively efficient delivery of services, such as healthcare or food assistance (Digenis-Bury et al. 2008; Meyers et al. 1993). High density of public housing has also been a source of criticism in academic and policy circles, given the expectation that a concentration of poverty was responsible for reducing life chances for disadvantaged children (Popkin and Edin 2016).

The housing choice vouchers program was developed to alleviate concerns associated with the concentration of residents in public housing (Fischer 2015). Vouchers allow recipients to enter the private housing market by providing a housing subsidy that is paid on the renter's behalf directly to landlords that rent properties that meet HUD quality standards (Center on Budget and Policy Priorities 2017). Voucher values are set to cover the difference between 30% of beneficiaries' incomes and the fair market rent, set by HUD at the 40th percentile of rents in the metropolitan area. Vouchers are highly portable, allowing renters to take their voucher to any qualified property in the United States.

Multifamily housing programs involve privately owned housing developments that reserve a certain number of housing units for rent at below-market rates, with the difference in price subsidized by HUD. Although multifamily housing involves a number of different individual HUD programs and roughly one quarter of all subsidized units in the United States, there are

few existing studies on its impact on child outcomes and no studies focusing on child mental health (Kucheva 2018; Newman and Harkness 2002).

Unlike other federal safety-net programs, like the Supplemental Nutrition Assistance Program or Medicaid, HUD's housing assistance programs are not entitlements. The demand for housing assistance exceeds the supply of assisted housing units. In 2015, only one in four renters with incomes below HUD's income eligibility threshold for housing assistance received housing assistance, and there were nearly twice as many low-income renters that paid over 50% of their incomes in rent or lived in substandard housing as there were people receiving housing assistance (HUD 2017).² To manage the excess demand for benefits, PHAs may establish waitlists. The mean wait time for housing assistance is currently 26 months, although it can be more than five years in many U.S. cities (HUD 2016).

Prior Research on Housing Assistance and Children's Health

There are a number of challenges to studying the relationship between housing assistance and child outcomes that relate largely to the lack of high-quality nationally representative data on both housing assistance participation and health outcomes (Slopen et al. 2018). Much of the previous work on housing assistance focuses on local or convenience samples (Jacob, Ludwig, and Miller 2013; Shiono et al. 1997) or has limitations associated with survey self-reports of housing assistance participation (Shroder and Martin 1996). There are also difficulties in establishing causality in the relationship between housing assistance and child outcomes. HUD-assisted families have average incomes of 24% of the area median (HUD 2016), and many have experienced periods of homelessness (Helms, Sperling, and Steffen 2017). Few studies have used rigorous methods to control for selection bias in the relationship between housing assistance and health, and thus many past conclusions may be biased.

Only two published studies since 1990 have examined the impact of housing assistance on children's psychological well-being, mental health, or behavior. Using parent-reported information on housing assistance, Coley et al. (2013) showed little evidence for an effect of self-reported housing assistance participation on child behavior issues but suggested that access to assisted housing may lead to less growth in internalizing problems over time. However, this effect may also trade off with greater stress as a result of neighborhood quality and housing market affordability. Similarly, using administrative HUD data linked to the Panel Study of Income Dynamics, Newman and Holupka (2017) found no general relationship between housing assistance and child behavior problems but showed conditional effects. Children with the fewest behavior problems show a benefit from housing assistance, while high-risk children show negative impacts.

Some other studies have used quasiexperimental approaches to study other child outcomes, though not directly mental health, with the balance of evidence suggesting no significant

²The income eligibility threshold for housing choice vouchers and multifamily housing is 50% of area median income (adjusted for household size) and for public housing is 80%. However, 75% of new voucher recipients and 40% of new multifamily or public housing recipients must have incomes below 30%.

impact of housing assistance on child outcomes (Fertig and Reingold 2007; Jacob et al. 2013). Currie and Yelowitz (2000) used an instrumental-variables approach to study the impact of public housing on children's educational outcomes. They found that although children in public housing experience poor outcomes compared to children in private housing, this effect disappears when they adjust for selection into public housing, although they rely on self-reported public housing residence. Another study used propensity score matching techniques and found that access to HUD housing assistance was associated with reduced blood lead levels in children (Ahrens et al. 2016), which can be a risk factor for behavior problems. Finally, one experimental study indicates that vouchers have only modest effects on child mortality in Chicago (Jacob et al. 2013). A critical assessment of the existing literature indicates that relatively little is known about the general impact of receiving federal housing assistance on children's outcomes, and we are left without answers to many questions surrounding the potential for housing assistance to function as an upstream investment in children's health and well-being.

HUD Program Type and Health Outcomes

Differences in the contextual and policy characteristics of HUD's major housing programs have been of great interest to researchers in terms of their expected benefits for health and socioeconomic outcomes (Jacob, Kapustin, and Ludwig 2015). The neighborhood dynamics involved in public housing construction in the post-World War II period have been especially controversial, and much of the current stigma surrounding public housing reflects its association with economic and racial segregation (Popkin et al. 2000). Public housing is a unique institution, in that it concentrates a population of housing-assisted households in a small geographic area. Historically, public housing projects were very-high-density developments, and population density in public housing today remains high relative to the average in U.S. cities (HUD 2016).³ A number of recent studies have suggested that the density of subsidized households in public housing developments may actually promote some benefits for residents, particularly surrounding the development of social networks and sources of social support (Clampet-Lundquist 2010; Keene and Ruel 2013). Residents of public housing are more likely than those receiving vouchers to report informal support and assistance among residents (Keene and Geronimus 2011), and a recent analysis of Moving to Opportunity indicated that social connectedness was an important mediator of housing mobility effects on boys' psychological distress (Schmidt, Glymour, and Osypuk 2017).

The social network benefits of living in public housing may be tempered if public housing exposes children to more disadvantaged neighborhoods than before they entered. The overhaul of HUD's approach to housing assistance policy— from a focus on public housing to a focus on housing vouchers—was directly related to concerns about the characteristics of neighborhoods formed by dense public housing projects (Popkin et al. 2000). Housing mobility programs seek to enable low-income families to access higher-opportunity neighborhoods than they would otherwise be able to afford (Keels et al. 2005). Vouchers may be expected to have positive effects on children's mental health if they provide access

³Although most severely distressed housing projects have been demolished, many of these subsidized units have been lost entirely or converted to vouchers or multifamily housing (Goetz 2012).

to greater neighborhood opportunity or reduce exposure to neighborhood disorder and violence (Carlson et al. 2012). Receipt of vouchers has been linked to reduced mental distress in low-income mothers in Hawaii (Garg et al. 2013) and improved socio-emotional status in some subsets of adolescents in the Moving to Opportunity study (Nguyen et al. 2016).

In contrast, literature on social ties in mixed-class and mixed-race neighborhoods suggests that there may be short-term downsides to moving to high-opportunity neighborhoods. Voucher recipients, particularly those of color, may experience a greater burden of discrimination and may be more likely to be excluded from social and economic benefits once arriving in the high-opportunity location (de Souza Briggs 1998). Moving to new neighborhoods can increase exposure to social stressors, including new neighborhood social norms, changes to social networks, and experiences of racism (DeLuca, Garboden, and Rosenblatt 2013; Turney, Kissane, and Edin 2013), which might attenuate positive effects of vouchers on children's mental health.

Families receiving housing choice vouchers may also experience greater residential instability relative to families in public housing. Among families relocated with vouchers after public housing demolition in the early 2000s, 40% had moved again within two years of the initial relocation (Burton, Levy, and Gallagher 2007). In contrast, only 9% of families who moved to another public housing development following relocation ended up moving within two years. Given qualitative evidence that public housing provides greater residential stability (Goetz 2013; Manzo 2014), we may expect positive impacts of public housing on children's mental health (Suglia, Duarte, and Sandel 2011).

This study draws on a nationally representative data linkage that combines data from a national household survey with administrative records on episodes of housing assistance participation in order to examine the impact of receiving housing assistance on children's mental health. We apply a quasiexperimental waitlist design to account for unobserved factors that select families into housing assistance and isolate the causal effects on children's outcomes, focusing on differences between housing programs and by children's age.

DATA AND METHODS

We used data from the National Health Interview Survey (NHIS) linked with HUD administrative housing assistance records (Lloyd, Helms, and Simon 2017). Public-use NHIS data were obtained from Integrated Public Use Microdata Series NHIS at the University of Minnesota (Blewett et al. 2016). NHIS is a nationally representative household survey that collects demographic and health information of all members of sampled households. The NHIS Sample Child file contains detailed physical and mental health information about one randomly selected child per household. Our measures of child mental health came from a mental health screening questionnaire in the Sample Child file and included 2001 and 2004 through 2012. The HUD administrative records covered 1999 through 2014 and were linked to NHIS based on deterministic matching (Lloyd and Helms 2016). Individuals were linked using Social Security numbers, birth dates, and sex. Survey respondents could be linked to the HUD record regardless of their housing status at

interview; linked respondents may have entered assisted housing subsequent to their interview or may have exited assisted housing prior to their interview. The linkage provided a longitudinal record of program-specific HUD entry and exit dates, which could be used to generate housing histories for each NHIS respondent. NHIS did not obtain Social Security numbers from children in the 2002 and 2003 surveys. As a result, no respondents under the age of 18 were eligible for linkage to the HUD record in these years. Respondents who did not provide enough information to be linked tended to be younger and were more likely to be Hispanic compared to the general population (Boudreaux, Fenelon, and Slopen forthcoming). NCHS created adjusted weights that accounted for nonrandom linkage eligibility so that estimates from the linkage-eligible sample were representative of the entire civilian noninstitutionalized U.S. population (Lloyd and Helms 2016).

Sample

The final data set included 20,642 linkage-eligible Sample Child respondents (ages 2 to 17) interviewed by NHIS (2001, 2004 to 2012), of whom 1,990 were receiving housing assistance at the time of the interview or within two years. Of these children, 3 were missing on the mental health outcomes, 1 was missing on sociodemographic characteristics, and 19 did not have an available census tract identifier. The resulting sample included 1,967 children. Of these, 1,536 children were current housing assistance recipients: 305 in public housing, 970 in housing choice vouchers, and 261 in multifamily housing. Additionally, 431 respondents would enter housing assistance within two years of their interview, the mean waiting period to enter HUD housing (HUD 2016).

Mental Health Measures

We examined three outcomes of child mental health: the abridged Strengths and Difficulties Questionnaire (SDQ) symptom score, a dichotomous indicator of whether the child had a likely socioemotional problem (a clinical threshold on the SDQ scale), and a report of whether the child experienced emotional difficulties. The SDQ is a five-item parent-report screening tool for child socioemotional problems over the past six months (He et al. 2013). Individual items consisted of Likert-scale questions in which a knowledgeable adult reported on a child's level of worry, unhappiness, behavior, attention, and social interactions, with scores on individual items ranging from 0 to 2 ("not true" to "certainly true"). For each child, we calculated total SDQ symptom scores, which ranged from 0 to 10, with increasing values indicating poorer mental health. The scale is highly predictive of clinician-diagnosed mental illness and mental health service use and has been validated across diverse populations (Goodman 2001, Palmieri and Smith 2007). We also modeled SDQ scores as a binary indicator of likely socio-emotional problems—defined as a score of 6 or above (Classi et al. 2012). The SDQ was administered in the NHIS 2001 to 2007 and 2010 to 2012, so our sample for the analysis examining this outcome is limited to data from 2001 to 2007 and 2010 to 2012. Finally, we used a single-item adult-reported indicator denoting whether the child experienced emotional difficulties. The parent-reported child emotional difficulty indicator was available from 2001 to 2012. The parent responded to the question, "Overall, do you think that [child] has difficulties in any of the following areas: emotions, concentration, behavior, or being able to get along with other people?" Responses to this question are strongly related to subsequent use of mental health services (Goodman 2001).

Housing Assistance Status

The primary independent variable of interest was whether the child lived in a household receiving HUD housing assistance on the date of the interview. We first examined housing assistance using a *naïve indicator* of assistance, comparing children receiving housing assistance to those not receiving housing assistance at the time of interview. In order to address the potential of selection bias, we exploited the timing of assistance, comparing children currently receiving housing assistance with children in a *pseudo-waitlist comparison group*—those who will enter assisted housing within two years. The mean length of waitlists for HUD housing was 26 months in 2016. During our analysis period, the length ranged from 18 to 26 months (HUD 2016). As a result, pseudo-waitlist individuals were likely to resemble those on HUD waitlists. This approach accounted for unobserved time-invariant differences between individuals who obtain housing assistance and those who do not, since all pseudo-waitlist individuals eventually enter housing assistance. This approach has been applied in previous work on HUD housing assistance and adult health (Fenelon et al. 2017; Simon et al. 2017). It is possible that there were unobserved factors that influenced which housing program respondents would ultimately enter. This may reflect self-selection or differences across PHAs in the number of housing units in each housing program. For program-specific models, pseudo-waitlist children were coded based on the HUD program they would eventually enter (e.g., pseudo-waitlist for public housing).

Individual and Family Characteristics

Our covariates from the NHIS included individual characteristics, including age (coded as 2 to 5, 6 to 12, and 13 to 17 years), sex, and race-ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other); and family characteristics, including family structure (one parent, two parents partnered/married), highest level of education in the household (less than high school, high school, more than high school), family income-to-poverty ratio (<50%, 50% to 99%, 100% to 199%, 200%+), household employment status (any worker in household, no workers in household), and census region of residence.

Neighborhood Characteristics

We merged individual records with year-specific socioeconomic and demographic characteristics of census tracts. Characteristics came from the 2000 Census Summary File 3 and the 2010-to-2014 American Community Survey and were linearly interpolated for missing years. We used principal components analysis to generate three neighborhood indexes commonly used in studies of housing programs (Oakley and Burchfield 2009). The first component (“disadvantage”) was loaded with the family poverty rate, the percentage receiving public assistance, and percentage female-headed households. The second component (“instability”) was associated with percentage living in a different house five years prior and percentage renter-occupied housing, and inversely with percentage single-family housing. The third component (“vacancy”) was loaded with percentage vacant housing and percentage living in a different house (see online Appendix A for full component analysis and variable loadings). Indexes were normalized to have a mean of 0 and a standard deviation of 1. We also included a measure of neighborhood racial composition, categorizing tracts as either mostly white (>80%), mostly black (>80%),

mostly Hispanic/Latino (>50%), or mixed race (all other compositions), consistent with several prior studies (e.g., Fenelon et al. 2017; Wagmiller 2008).

Statistical Analysis

First, we examined the relationship between housing assistance and each mental health outcome using a naive indicator of housing assistance (current assistance vs. no assistance). In this set of models, the comparison group was children not receiving housing assistance at the time of the interview. We then compared these models to the pseudo-waitlist models that restricted the comparison group to future housing assistance recipients. We reported models unadjusted for covariates and models adjusting for individual and family characteristics. We modeled the continuous outcome using linear regression (reporting linear coefficients) and dichotomous outcomes using logistic regression (reporting odds ratios).

To examine differences by type of housing program, we tested for multiplicative interactions between *housing assistance status* (current vs. pseudo-waitlist) and *program type* (public housing, vouchers, multifamily housing). We reported the result of this interaction test in addition to the effects of housing assistance stratified by program type. To examine differences in the effects of housing assistance by child's age, we tested interactions between housing assistance status and age groups (2 to 5, 6 to 12, 13 to 17) and report results stratified by age group. Finally, we examined the role that neighborhood context plays in the link between housing assistance and mental health, including neighborhood variables as covariates in the adjusted model. All analyses accounted for the complex survey design of the NHIS and incorporated adjusted weights.

Sensitivity Analysis

To examine the robustness of our pseudo-waitlist approach, we used an event-study framework that considered whether there were trends in mental health for pseudo-waitlist children in the months prior to entering housing assistance.⁴ The model predicted continuous SDQ symptom scores as a function of the timing of the interview relative to entry into housing assistance. If there were steady improvements in mental health for children prior to entering housing assistance, our pseudo-waitlist approach may have been biased. The lack of significant trends leading up to housing assistance would suggest that our design is robust to time-varying factors that could be correlated with entrance into HUD.

RESULTS

Our total sample includes all individuals ages 2 to 17 who were eligible for linkage to the HUD record. Descriptive characteristics of the sample are shown in Table 1, stratified by housing assistance status (current assistance, pseudo-waitlist, and no assistance). The current-assistance group is highly disadvantaged relative to the no-assistance group. Seventy-six percent of current recipients are racial-ethnic minorities, compared to 39% of the no-assistance group. Seventy-four percent have family income below the federal poverty

⁴Event-study models assess the impact of a specific event (such as entering housing) by examining the outcome in a window prior to the event's occurrence (such as the two years leading up to entering housing) and the period after the event's occurrence (such as the time spent in housing assistance).

line, and 47% have no worker in the family, compared to 18% and 12%, respectively, in the no-assistance group. However, among children with no current assistance, the pseudo-waitlist group has a very similar profile to the current-assistance group. Current-housing-assistance recipients tend to be slightly older than pseudo-waitlist children (31% ages 13 to 17 compared with 27%) and are more likely to live in a single-parent family than pseudo-waitlist children (82% vs. 76%, $p = .029$). There are no other statistically significant differences between current and pseudo-waitlist children, and both groups have a distinct sociodemographic profile from no-assistance children as a whole. The similarity of the two groups provides support for our pseudo-waitlist approach and suggests the comparison includes similar individuals before and after entry into housing assistance. Descriptive statistics by HUD housing program type are shown in Appendix Table B1, in the online supplement. Program-specific samples are smaller than the combined sample but are similar to or larger than samples of all housing assistance recipients in existing studies (e.g., Coley et al. 2013; Newman and Holupka 2017).

The models in Table 2 predict each mental health outcome using both a naive ordinary least squares/logit model and our pseudo-waitlist approach (both unadjusted and adjusted for covariates). The naive model, which compares those children receiving housing assistance to those not receiving assistance, indicates that children currently receiving assistance have poorer mental health than those not receiving assistance. For instance, current assistance recipients have SDQ symptom score .59 units higher than those not receiving assistance (.32 standard deviations). Adjusting for covariates reduces this coefficient, although it remains positive though not statistically significant. In contrast to the naive models, pseudowaitlist models compare children receiving assistance to those who will enter within two years. These models indicate that current assistance recipients have better mental health outcomes than those not receiving assistance but entering within two years, although only the SDQ-symptom score ($-.361$ units difference) is statistically significant. Children receiving current assistance have no statistically significant difference in the likelihood of experiencing a socioemotional problem or emotional difficulties. Overall, the differences in the coefficients between the naive models and the pseudo-waitlist models suggest that the observed disadvantages for housing assistance recipients in the naive models reflect unobserved selection into housing assistance. Furthermore, the coefficients in the pseudo-waitlist models do not change after adjustment for covariates, indicating the robustness of the pseudo-waitlist design (see online Appendix C for full model results).

Differences in mental health effects by HUD housing program (public housing, housing choice vouchers, multifamily housing) are shown in Table 3. The stratified results were motivated by a model that included an interaction between the pseudo-waitlist indicator and program type. The interaction term was significant ($p < .01$), suggesting that the effect of assistance on outcomes varied by program type. The mental health benefits of housing assistance are concentrated in children living in public housing, a finding that is consistent across the three outcomes. Children in public housing experience significantly lower SDQ score (coefficient = -1.38 , $p < 0.01$), risk of a socioemotional problem (odds ratio [OR] = .20, $p < .01$), and emotional difficulties (OR = .28, $p < .01$). Children receiving vouchers have a similar SDQ score, risk of a socioemotional problem, and risk of emotional

difficulties compared to pseudo-waitlist children. There are also no statistically significant differences for children living in multifamily housing.

Table 4 examines differences in the effects of housing assistance by the age of the child. The models are stratified by age group (2 to 5, 6 to 12, 13 to 17). The protective effects of housing assistance on mental health, as indicated by the SDQ symptom score, seem to be limited to children in middle childhood and adolescence (ages 6 and above), although sample sizes limit statistical power.

Finally, the models in Table 5 adjust for neighborhood characteristics, including disadvantage, instability, vacancy, and racial composition, and indicate that neighborhoods do not account for the effects of housing assistance on mental health. Although neighborhood racial concentration is strongly associated with neighborhood disadvantage, its inclusion in the models does not impact coefficients for neighborhood disadvantage.

Sensitivity Analysis

The results of an event-study model are shown in Figure 1, examining model coefficients with respect to time before entering housing and time since entered housing. The graph shows coefficients for the SDQ symptom score in six-month intervals relative to entry into housing assistance. Overall, there appears to be no significant trend in mental health prior to entering housing assistance for pseudo-waitlist children, as well as no evidence of a trend in mental health with greater duration spent in housing assistance (results are similar for the other two out-comes). These findings provide assurance of the robustness of our pseudo-waitlist design.

DISCUSSION

In this paper we present evidence that housing assistance can improve the mental health of disadvantaged children and adolescents. However, we find mental health benefits only for children who live in public housing. We do not find similar effects for children receiving housing choice vouchers or living in multifamily housing. Furthermore, we find little evidence that neighborhood context explains the relationship between housing assistance and child mental health. These results extend the accumulating evidence for housing assistance as a platform for improved mental and physical health among adults (Fenelon et al. 2017; Keene et al. 2018; Simon et al. 2017) to children and highlight the fundamental role of housing conditions in the production of health.

Our study builds on prior research showing that for disadvantaged families, lack of access to stable and affordable housing has negative implications for the mental health and behavior of their children (Cutts et al. 2011; Newman and Holupka 2015). Although federal housing policy has long implicitly recognized that providing affordable housing presents a platform to improve other outcomes, we provide conclusive evidence that housing assistance programs can positively intervene in the relationship between housing insecurity and children's mental health outcomes. Our analysis demonstrates that children in families who receive housing assistance in the form of public housing experience fewer mental health symptoms, are less likely to be above the threshold for a socioemotional problem, and are

less likely to experience emotional difficulties, compared to children who are within two years of entering public housing. As a result, housing assistance programs that facilitate access to affordable housing have the potential to reduce socioeconomic disparities in health and well-being across the life course.

Our study provides the first nationally representative analysis of children's mental health that compares the effects of HUD's major assistance programs. Past studies have often focused on individual housing programs (vouchers or public housing) but have generalized their results as reflecting the effects of housing assistance programs as a whole (Currie and Yelowitz 2000; Jacob et al. 2013). Our results suggest that types of housing assistance differ in terms of impacting mental health outcomes for children, and it is important to consider the trade-offs between various aspects of housing programs. We find that public housing in particular has positive effects on children's mental health, while we show no significant effects of housing choice vouchers or multifamily housing programs. This does not indicate that vouchers have no benefits for children, but these benefits do not seem to translate into better mental health. This is also consistent with existing research on adults showing reduced psychological distress for those living in public housing (Fenelon et al. 2017), which may reflect the role of parental mental health in impacting children's mental health.

Our findings demonstrating mental health benefits of living in public housing run in sharp contrast to popular expectations about the effects of growing up in project-based housing. Much of the social science research on the potential impacts of public housing on the outcomes of its residents focuses on the negative effects of concentrated disadvantage (Fauth, Leventhal, and Brooks-Gunn 2008). Although children in public housing tend to live in substantially more disadvantaged neighborhoods than the U.S. average (Carlson et al. 2012), we do not find evidence that neighborhood disadvantage attenuates the effects of housing assistance on mental health. We speculate that public housing may provide greater access to social ties or the opportunity to develop social networks for economically isolated families, which could provide a source of social stability for their children (Newman 2008).

Evidence from the effects of public housing demolition on the social networks of displaced families may suggest the mechanism through which public housing leads to mental health benefits for children. In public housing, local-area social capital represents an important resource for dealing with violence and economic uncertainty. Housing projects may provide some stability that allows residents to develop persistent social ties, which can improve social capital in high-poverty neighborhoods (Clampet-Lundquist 2010). In the wake of HUD's HOPE VI program and the demolition of distressed public housing projects, many public housing residents experienced difficulty navigating the process of relocation. These processes may help to explain our findings with respect to public housing (Kennedy-Hendricks et al. 2015), particularly if disadvantaged families and children perceive greater social integration in public housing projects than in voucher-assisted housing. In addition to social network effects, public housing may provide greater residential stability (Keene and Ruel 2013), and families living in public housing developments may perceive that their unit is more "their home" than do individuals in voucher rentals. Future research should focus on the potential role of residential stability in contributing to health benefits of public housing.

Although we do not find that housing choice vouchers improve mental health for children, we cannot necessarily exclude the possibility that the benefits of vouchers require more time to become evident than similar effects of public housing. To the extent that there are mental health benefits of improved neighborhood socioeconomic status, they may take many years to materialize, as chronic exposure to social stressors in a disadvantaged neighborhood begin to dissipate (Turney et al. 2013). Indeed, evidence from Moving to Opportunity indicates modest effects of relocation to low-poverty neighborhoods in the first 10 to 15 years were limited to particular subgroups (Nguyen et al. 2016), though longer-term positive effects on economic attainment were stronger and more pronounced (Chetty et al. 2016). Additionally, children forced to move from demolished Chicago public housing developments using vouchers showed improved economic outcomes in adulthood (Chyn forthcoming). Thus it is possible that vouchers may buffer individuals from health declines over time (Kalousova and Evangelist 2018). Overall, our program-specific findings echo results among adults (Fenelon et al. 2017) but highlight the need for high-quality prospective studies of the impacts of housing assistance on mental health that include comparisons of different housing programs.

Limitations

Our study has limitations that should be noted. First, although the HUD housing data represent a longitudinal record, given that the NHIS is collected in repeated cross-sections, we are unable to examine changes in individual mental health over time. The ideal approach would be to examine changes in mental health symptoms for the same individuals before and after entry into housing assistance, but the data preclude such an analysis. Second, although our approach mimics a natural experiment, it is not random assignment, and it is possible there are concurrent changes that occur alongside housing assistance (e.g., policy changes related to the supply of housing) that are correlated with children's mental health and behavior. We address this possibility in two ways. First, we include models in the online Appendix D that control for state of residence to adjust for possible geographic differences in the length of the actual waitlist. These results are unchanged from those of our main analysis. Second, the results of the event-study analysis (Figure 1) do not indicate significant changes in mental health prior to entering housing assistance, although relatively small samples limit statistical power. Previous studies have demonstrated that a particularly disadvantaged period directly prior to entering HUD housing, the so-called Ashenfelter's dip, does not explain improvements in healthcare access for adults entering housing (Simon et al. 2017). Third, our results demonstrate the effects of housing assistance on children who actually receive it rather than children in eligible families (Shroder 2002). Since families that are able to obtain assistance may themselves be relatively select, the impacts on children who do not receive housing assistance are uncertain. Finally, our measures of child mental health do not include clinical assessments, although the SDQ has been validated as highly indicative of eventual clinical diagnoses (Goodman 2001).

CONCLUSION

Although the number of subsidized housing units supported by HUD has grown since the 1990s, it has not kept pace with the scope of the housing afford-ability problem in the United States, with severe implications for the stability and economic circumstances of low-

income families (Desmond 2016). Our results suggest that this trend is also likely to have significant impacts on the mental health and well-being of children in these families who might benefit from access to affordable housing. Future work should consider in more detail the specific mechanisms that link housing assistance to improvements in children's outcomes. Specifically, research should devote particular attention to differences across major housing assistance programs. Our findings imply that increased investments in affordable housing through federal housing assistance can be a means to improve population health by leveraging the social determinants of health, and may function as a means to reduce socioeconomic and racial-ethnic disparities in health and well-being among children. Furthermore, investment in federal affordable housing programs for children may have important impacts on later-life outcomes as well. To the extent that improvements in health among children lead to better outcomes throughout the life course, housing assistance may be a vital lever for addressing later-life differences in health, health behaviors, and long-term quality of life.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Biography

Andrew Fenelon is an assistant professor in the Department of Health Services Administration in the School of Public Health at the University of Maryland, College Park, and a faculty associate at the Maryland Population Research Center. He studies demography and the social determinants of health. His current research focuses on the impact of housing assistance programs on health, well-being, and neighborhood attainment of U.S. children and adults.

Natalie Slopen is an assistant professor in the Department of Epidemiology and Biostatistics in the School of Public Health at the University of Maryland, College Park. Her research interests focus on social determinants of health across the life course, with attention to determinants of racial-ethnic and socioeconomic disparities. Her current research explores the biological mechanisms through which early-life experiences are embedded to increase risk for later chronic diseases.

Michel Boudreaux is an assistant professor in the Department of Health Services Administration in the School of Public Health at the University of Maryland, College Park. He studies publicly financed health programs for low-income populations and how they affect the evolution of health, human capital, and socioeconomic position across the life course.

Sandra J. Newman is a professor of policy studies at Johns Hopkins University and the director of the Center on Housing, Neighborhoods, and Communities. Her interdisciplinary research focuses on the effects of housing and neighborhoods on children and families, and on the dynamics of neighborhood change. Her current work includes studies of the effects of key housing attributes, such as affordability, tenure (owning vs. renting), and receipt of housing subsidies, on the life outcomes of children and adults.

REFERENCES

- Ahrens Katherine A., Haley Barbara A., Rossen Lauren M., Lloyd Patricia C., and Aoki Yutaka. 2016 "Housing Assistance and Blood Lead Levels: Children in the United States, 2005–2012." *American Journal of Public Health* 106(11):2049–56. [PubMed: 27631737]
- Andersson Fredrik, Haltiwanger John C., Kutzbach Mark J., Palloni Giordano E., Pollakowski Henry O., and Weinberg Daniel H.. 2016 "Childhood Housing and Adult Earnings: A Between-siblings Analysis of Housing Vouchers and Public Housing." Working Paper No. 22721, National Bureau of Economic Research, Cambridge, MA.
- Blewett Lynn A., Rivera Drew Julia A., Griffin Risa, King Miram L., and Williams Kari C. W.. 2016 "National Health Interview Survey, Version 6.2." Minneapolis: University of Minnesota Retrieved June 16, 2017 (<http://www.nhis.ipums.org>).
- Boudreaux Michel H., Fenelon Andrew, and Slopen Natalie. Forthcoming. "Misclassification of Rental Assistance in the National Health Interview Survey: Evidence and Implications." *Epidemiology*.
- Burgard Sarah A., Seefeldt Kristin S., and Zelner Sarah. 2012 "Housing Instability and Health: Findings from the Michigan Recession and Recovery Study." *Social Science & Medicine* 75(12): 2215–24. [PubMed: 22981839]
- Buron Larry F., Levy Diane K., and Gallagher Maggie. 2007 *Housing Choice Vouchers: How Hope VI Families Fared in the Private Market*. Issue Brief No. 3. Washington, DC: Urban Institute.
- Carlson Deven, Haveman Robert, Kaplan Thomas, and Wolfe Barbara. 2012 "Long-term Effects of Public Low-income Housing Vouchers on Neighborhood Quality and Household Composition." *Journal of Housing Economics* 21(2):101–20.
- Center on Budget and Policy Priorities. 2017 "Fact Sheet: Federal Rental Assistance." Retrieved January 12, 2018 (<http://www.cbpp.org/sites/default/files/atoms/files/4-13-11hous-US.pdf>).
- Chetty Raj, Hendren Nathaniel, and Katz Lawrence F.. 2016 "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment." *American Economic Review* 106(4):855–902. [PubMed: 29546974]
- Chyn Eric. Forthcoming. "Moved to Opportunity: The Long-run Effect of Public Housing Demolition on Labor Market Outcomes of Children." *American Economic Review*.
- Clampet-Lundquist Susan. 2010 "'Everyone Had Your Back': Social Ties, Perceived Safety, and Public Housing Relocation." *City & Community* 9(1):87–108.
- Classi Peter, Milton Denai, Ward Sarah, Sarsour Khaled, and Johnston Joseph. 2012 "Social and Emotional Difficulties in Children with ADHD and the Impact on School Attendance and Healthcare Utilization." *Child and Adolescent Psychiatry and Mental Health* 6(1):33–40. [PubMed: 23035861]
- Coley Rebekah Levine, Leventhal Tama, Lynch Alicia Doyle, and Kull Melissa. 2013 "Relations between Housing Characteristics and the Well-being of Low-income Children and Adolescents." *Developmental Psychology* 49(9):1775–89. [PubMed: 23244408]

- Currie Janet, and Yelowitz Aaron. 2000 “Are Public Housing Projects Good for Kids?” *Journal of Public Economics* 75(1):99–124.
- Currie Janet, and Stabile Mark. 2006 “Child Mental Health and Human Capital Accumulation: The Case of ADHD.” *Journal of Health Economics* 25(6):1094–118. [PubMed: 16730082]
- Cutts Diana Becker, Meyers Alan F., Black Maureen M., Casey Patrick H., Chilton Mariana, Cook John T., Geppert Joni, de Cuba Stephanie Ettinger, Heeren Timothy, and Coleman Sharon. 2011 “US Housing Insecurity and the Health of Very Young Children.” *American Journal of Public Health* 101(8):1508–14. [PubMed: 21680929]
- DeLuca Stefanie, Garboden Philip M. E., and Rosenblatt Peter. 2013 “Segregating Shelter How Housing Policies Shape the Residential Locations of Low-income Minority Families.” *Annals of the American Academy of Political and Social Science* 647(1):268–99.
- DeLuca Stefanie, and Rosenblatt Peter. 2010 “Does Moving to Better Neighborhoods Lead to Better Schooling Opportunities? Parental School Choice in an Experimental Housing Voucher Program.” *Teachers College Record* 112(5):1443–91.
- Desmond Matthew. 2016 *Evicted: Poverty and Profit in the American City*. New York, NY: Crown.
- Desmond Matthew, and Rachel Tolbert Kimbro. 2015 “Eviction’s Fallout: Housing, Hardship, and Health.” *Social Forces* 94(1):295–324.
- de Souza Briggs Xavier. 1998 “Brown Kids in White Suburbs: Housing Mobility and the Many Faces of Social Capital.” *Housing Policy Debate* 9(1): 177–221.
- Digenis-Bury Eleni C., Brooks Daniel R., Chen Leslie, Ostrem Mary, and Robert Horsburgh C. 2008 “Use of a Population-based Survey to Describe the Health of Boston Public Housing Residents.” *American Journal of Public Health* 98(1):85–91. [PubMed: 18048798]
- Dupéré Véronique, Leventhal Tama, and Vitaro Frank. 2012 “Neighborhood Processes, Self-efficacy, and Adolescent Mental Health.” *Journal of Health and Social Behavior* 53(2):183–98. [PubMed: 22660825]
- Fauth Rebecca C., Leventhal Tama, and Brooks-Gunn Jeanne. 2008 “Seven Years Later: Effects of a Neighborhood Mobility Program on Poor Black and Latino Adults’ Well-being.” *Journal of Health and Social Behavior* 49(2):119–30. [PubMed: 18649497]
- Fenelon Andrew, Mayne Patrick, Simon Alan E., Rossen Lauren M., Helms Veronica, Lloyd Patricia, Sperling Jon, and Steffen Barry L. 2017 “Housing Assistance Programs and Adult Health in the United States.” *American Journal of Public Health* 107(4):571–78. [PubMed: 28207335]
- Fertig Angela R., and Reingold David A.. 2007 “Public Housing, Health, and Health Behaviors: Is There a Connection?” *Journal of Policy Analysis and Management* 26(4):831–60. [PubMed: 17894032]
- Fischer Will. 2015 *Research Shows Housing Vouchers Reduce Hardship and Provide Platform for Long-term Gains among Children*. Washington, DC: Center on Budget and Policy Priorities.
- Garg Arvin, Burrell Lori, Tripodis Yorghos, Goodman Elizabeth, Brooks-Gunn Jeanne and Duggan Anne K.. 2013 “Maternal Mental Health During Children’s First Year of Life: Association with Receipt of Section 8 Rental Assistance.” *Housing Policy Debate* 23(2):281–97.
- Gladstone Brenda McConnell, Boydell Katherine M., and Patricia McKeever. 2006 “Recasting Research into Children’s Experiences of Parental Mental Illness: Beyond Risk and Resilience.” *Social Science & Medicine* 62(10):2540–50. [PubMed: 16316714]
- Goetz Edward G. 2012 “The Transformation of Public Housing Policy, 1985–2011.” *Journal of the American Planning Association* 78(4):452–63.
- Goetz Edward G. 2013 “Too Good to Be True? The Variable and Contingent Benefits of Displacement and Relocation among Low-income Public Housing Residents.” *Housing Studies* 28(2):235–52.
- Goodman Robert. 2001 “Psychometric Properties of the Strengths and Difficulties Questionnaire.” *Journal of the American Academy of Child & Adolescent Psychiatry* 40(11):1337–45. [PubMed: 11699809]
- He Jian-Ping, Burstein Marcy, Schmitz Anja, and Merikangas Kathleen R.. 2013 “The Strengths and Difficulties Questionnaire (SDQ): The Factor Structure and Scale Validation in US Adolescents.” *Journal of Abnormal Child Psychology* 41(4):583–95. [PubMed: 23183936]
- Helms VE, Jon Sperling, and Steffen Barry L.. 2017 *A Health Picture of HUD-assisted Adults, 2006–2012*. Washington, DC: U.S. Department of Housing and Urban Development.

- Houle Jason N. 2014 “Mental Health in the Foreclosure Crisis.” *Social Science & Medicine* 118:1–8. [PubMed: 25084488]
- Jacob Brian A., Kapustin Max, and Ludwig Jens. 2015 “The Impact of Housing Assistance on Child Outcomes: Evidence from a Randomized Housing Lottery.” *Quarterly Journal of Economics* 130(1):465–506.
- Jacob Brian A., Ludwig Jens, and Miller Douglas L.. 2013 “The Effects of Housing and Neighborhood Conditions on Child Mortality.” *Journal of Health Economics* 32(1):195–206. [PubMed: 23202264]
- Joint Center for Housing Studies of Harvard University. The State of the Nation’s Housing 2017 Cambridge, MA: Harvard University.
- Kalousová Lucie, and Evangelist Michael. 2018 “Rent Assistance and Health: Findings from Detroit.” *Housing Studies*. Advance online publication. doi: 10.1080/02673037.2018.1441977
- Keels Micere, Duncan Greg J., Stefanie DeLuca Ruby Mendenhall, and Rosenbaum James. 2005 “Fifteen Years Later: Can Residential Mobility Programs Provide a Long-term Escape from Neighborhood Segregation, Crime, and Poverty.” *Demography* 42(1):51–73. [PubMed: 15782895]
- Keene Danya E., and Geronimus Arline T.. 2011 “Community-based Support among African American Public Housing Residents.” *Journal of Urban Health* 88(1):41–53. [PubMed: 21279452]
- Keene Danya E., Guo Monica, and Murillo Sascha. 2018 “‘That Wasn’t Really a Place to Worry about Diabetes’: Housing Access and Diabetes Self-management among Low-income Adults.” *Social Science & Medicine* 197:71–77. [PubMed: 29222997]
- Keene Danya E., and Ruel Erin. 2013 “‘Everyone Called Me Grandma’: Public Housing Demolition and Relocation among Older Adults in Atlanta.” *Cities* 35:359–64.
- Kennedy-Hendricks Alene, Schwartz Heather L., Beth Ann Griffin Susan Burkhauser, Green Harold D., Kennedy David P., and Craig Evan Pollack. 2015 “Health Implications of Social Networks for Children Living in Public Housing.” *Health & Place* 36:145–51. [PubMed: 26598958]
- Kucheva Yana. 2018 “Subsidized Housing and the Transition to Adulthood.” *Demography* 55(2):617–42. [PubMed: 29542072]
- Kull Melissa A., and Rebekah Levine Coley. 2014 “Housing Costs and Child Functioning: Processes through Investments and Financial Strains.” *Children and Youth Services Review* 39:25–38.
- Lee Dohoon, and Jackson Margot. 2017 “The Simultaneous Effects of Socioeconomic Disadvantage and Child Health on Children’s Cognitive Development.” *Demography* 54(5):1845–71. [PubMed: 28836169]
- Lloyd PC, and Helms VE. 2016 NCHS-HUD Linked Data: Analytic Considerations and Guidelines. Hyattsville, MD: Office of Analysis and Epidemiology, National Center for Health Statistics.
- Lloyd PC, Helms VE, and Alan E Simon. 2017 Linkage of 1999–2012 National Health Interview Survey and National Health and Nutrition Examination Survey Data to U.S. Department of Housing and Urban Development Administrative Records. Vital and Health Statistics Series 1, No. 60. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, and National Center for Health Statistics.
- Manzo Lynne C. 2014 “On Uncertain Ground: Being at Home in the Context of Public Housing Redevelopment.” *International Journal of Housing Policy* 14(4):389–410.
- McLeod Jane D., and Shanahan Michael J.. 1996 “Trajectories of Poverty and Children’s Mental Health.” *Journal of Health and Social Behavior* 37(3):207–20. [PubMed: 8898493]
- Meyers Alan, Rubin Dana, Napoleone Maria, and Nichols Kevin. 1993 “Public Housing Subsidies May Improve Poor Children’s Nutrition.” *American Journal of Public Health* 83(1):115.
- Newman Sandra J. 2008 “Does Housing Matter for Poor Families? A Critical Summary of Research and Issues Still to Be Resolved.” *Journal of Policy Analysis and Management* 27(4):895–925.
- Newman Sandra J., and Harkness Joseph M.. 2002 “The Long-term Effects of Public Housing on Self-sufficiency.” *Journal of Policy Analysis and Management* 21(1):21–43.
- Newman Sandra J., and Scott Holupka C. 2015 “Housing Affordability and Child Well-being.” *Housing Policy Debate* 25(1):116–51.
- Newman Sandra, and Scott Holupka C. 2017 “The Effects of Assisted Housing on Child Well-being.” *American Journal of Community Psychology* 60(1/2):66–78. [PubMed: 27861993]

- Nguyen Quynh C., Rehkopf David H., Schmidt Nicole M., and Osypuk Theresa L.. 2016 "Heterogeneous Effects of Housing Vouchers on the Mental Health of US Adolescents." *American Journal of Public Health* 106(4):755–62. [PubMed: 26794179]
- Oakley Deirdre, and Burchfield Keri. 2009 "Out of the Projects, Still in the Hood: The Spatial Constraints on Public-housing Residents' Relocation in Chicago." *Journal of Urban Affairs* 31(5): 589–614.
- Palmieri Patrick A., and Smith Gregory C.. 2007 "Examining the Structural Validity of the Strengths and Difficulties Questionnaire (SDQ) in a US Sample of Custodial Grandmothers." *Psychological Assessment* 19(2):189–98. [PubMed: 17563200]
- Pfeiffer Deirdre. 2018 "Rental Housing Assistance and Health: Evidence from the Survey of Income and Program Participation." *Housing Policy Debate* 28(4):515–33.
- Popkin Susan J., Buron Larry F., Levy Diane K., and Cunningham Mary K.. 2000 "The Gautreaux Legacy: What Might Mixed-income and Dispersal Strategies Mean for the Poorest Public Housing Tenants?" *Housing Policy Debate* 11(4):911–2.
- Popkin Susan J., and Edin Kathryn. 2016 *No Simple Solutions: Transforming Public Housing in Chicago*. Lanham, MD: Rowman & Littlefield.
- Reiss Franziska. 2013 "Socioeconomic Inequalities and Mental Health Problems in Children and Adolescents: A Systematic Review." *Social Science & Medicine* 90:24–31. [PubMed: 23746605]
- Schmidt Nicole M., Maria Glymour M, and Osypuk Theresa L.. 2017 "Housing Mobility and Adolescent Mental Health: The Role of Substance Use, Social Networks, and Family Mental Health in the Moving to Opportunity Study." *SSM-Population Health* 3:318–25. [PubMed: 29104907]
- Shiono Patricia H., Rauh Virginia A., Park Mikyung, Lederman Sally A., and Zuskar Deborah. 1997 "Ethnic Differences in Birthweight: The Role of Lifestyle and Other Factors." *American Journal of Public Health* 87(5):787–93. [PubMed: 9184507]
- Shroder Mark. 2002 "Does Housing Assistance Perversely Affect Self-sufficiency? A Review Essay." *Journal of Housing Economics* 11(4):381–417.
- Shroder Mark, and Martin Marge. 1996 *New Results from Administrative Data: Housing the Poor, or, What They Don't Know Might Hurt Somebody*. Washington, DC: U.S. Department of Housing and Urban Development, Office of Policy Development and Research.
- Simon Alan E., Fenelon Andrew, Helms Veronica, Lloyd Patricia C., and Rossen Lauren M.. 2017 "HUD Housing Assistance Associated with Lower Uninsurance Rates and Unmet Medical Need." *Health Affairs* 36(6):1016–23. [PubMed: 28583959]
- Slopen Natalie, Fenelon Andrew, Newman Sandra, and Boudreaux Michel H.. 2018 "Housing Assistance and Child Health in the United States: A Systematic Review." *Pediatrics* 141(6):e20172742.
- Suglia Shakira Franco, Duarte Cristiane S., and Sandel Megan T.. 2011 "Housing Quality, Housing Instability, and Maternal Mental Health." *Journal of Urban Health* 88(6):1105–16. [PubMed: 21647798]
- Thomson Hilary, Thomas Sian, Sellstrom Eva, and Petticrew Mark. 2009 "The Health Impacts of Housing Improvement: A Systematic Review of Intervention Studies from 1887 to 2007." *American Journal of Public Health* 99(S3):S681–92. [PubMed: 19890174]
- Turney Kristin, Kissane Rebecca, and Edin Kathryn. 2013 "After Moving to Opportunity: How Moving to a Low-poverty Neighborhood Improves Mental Health among African American Women." *Society and Mental Health* 3(1):1–21.
- U.S. Department of Housing and Urban Development. 2016 *Picture of Subsidized Households*. Washington, DC: U.S. Department of Housing and Urban Development Retrieved June 16, 2017 (<https://www.huduser.gov/portal/datasets/picture/about.html>).
- U.S. Department of Housing and Urban Development. 2017 *Worst Case Housing Needs: 2017 Report to Congress*. Washington, DC: U.S. Department of Housing and Urban Development Retrieved December 12, 2017 (<https://www.huduser.gov/portal/sites/default/files/pdf/Worst-Case-Housing-Needs.pdf>).
- Wagmiller Robert L. Jr. 2008 "Male Nonemployment in White, Black, Hispanic, and Multiethnic Urban Neighborhoods, 1970–2000." *Urban Affairs Review* 44(1):85–125.

Warren Emily J., and Font Sarah A.. 2015 “Housing Insecurity, Maternal Stress, and Child Maltreatment: An Application of the Family Stress Model.” *Social Service Review* 89(1):9–39.

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Figure 1.

Strengths and Difficulties Questionnaire (SDQ) Symptom Scores as a Function of Time Relative to Entry into Housing Assistance.

Source: Authors' calculations based on National Health Interview Survey 1999 to 2012.

Note: Graph shows coefficients for SDQ symptom score by timing relative to entry into housing assistance. *Before Entry* refers to the number of months from interview to entry into housing assistance. *Months After* refers to the number of months since entering housing assistance, according to the data linkage. Reference category is children zero to six months before entry. Models adjust for individual, family, and neighborhood characteristics and year of interview. Dashed lines are 95% confidence intervals

Descriptive Characteristics of National Health Interview Survey—Housing and Urban Development Sample by Housing Assistance Status 2001 to 2012.

Table 1.

Variable	Current ^a	Pseudo-waitlist ^b	No Assistance ^c
<i>N</i>	1,555	431	19,087
<i>Age group</i>			
2–5	.151	.218	.148
6–11	.536	.513	.489
12–17	.313	.269	.363
<i>Race-ethnicity</i>			
Non-Hispanic white	.238	.248	.615
Non-Hispanic black	.484	.496	.133
Non-Hispanic other	.053	.050	.056
Hispanic	.225	.205	.196
<i>Family structure</i> [*]			
Single parent	.817	.755	.291
Married/partnered parents	.184	.245	.709
<i>Highest level of education</i>			
Less than high school	.259	.230	.105
High school	.330	.323	.213
More than high school	.412	.448	.681
<i>Family poverty status</i>			
Below 50% FPL	.364	.331	.067
50%–99% of FPL	.373	.340	.120
100%–199% of FPL	.215	.245	.248
200%+ of FPL	.048	.084	.565
<i>Family employment</i>			
No worker in family	.467	.420	.119
Any worker in family	.533	.580	.881
<i>Region</i>			
Northeast	.166	.176	.134
Midwest	.245	.196	.261

Variable	Current ^a	Pseudo-waitlist ^b	No Assistance ^c
South	.434	.489	.410
West	.156	.139	.194
<i>Neighborhood index</i>			
Disadvantage index ^d	.850	.897	-.098
Instability index ^d	-.134	-.136	-.276
Vacancy index ^d	-.085	-.015	.005
<i>Racial composition</i>			
>80% white	.211	.236	.459
>80% black	.104	.121	.027
>50% Hispanic	.138	.133	.091
Mixed race	.548	.511	.424

Note: Pseudo-waitlist group is a subsample of those in the no-assistance group. See online Appendix D for program-specific descriptive statistics. FPL = federal poverty line.

^aReceiving housing assistance at interview.

^bNot receiving assistance at interview but will enter assistance within two years.

^cNot receiving housing assistance at interview, including those who are waiting to enter or will never enter.

^dCalculated using principal components analysis. Normalized with mean 0, standard deviation 1. See online Appendix A for full variable loadings.

[†] $p < .10$,

* $p < .05$,

** $p < .01$ (chi-square test of difference between current and pseudo-waitlist).

Table 2.

Naive and Pseudo-waitlist Models Predicting Child Mental Health Measures as a Function of Housing Assistance Status (N = 20,642).

Housing Assistance Status	SDQ Symptom Score ^a (Linear Coefficients)		Likely Socioemotional Problem ^b (Odds Ratios)		Emotional Difficulty ^c (Odds Ratios)	
	Naive ^d	Pseudo-waitlist ^e	Naive	Pseudo-waitlist	Naive	Pseudo-waitlist
Current assistance (unadjusted model)	.58** [.41, .76]	-.36* [-.68, -.04]	1.89** [1.43, 2.50]	.89 [.55, 1.42]	1.80** [1.56, 2.07]	.85 [.64, 1.13]
Current assistance (adjusted model)	.14 [-.05, .33]	-.36* [-.68, -.04]	1.14 [.82, 1.58]	.86 [.53, 1.38]	1.24* [1.04, 1.42]	.86 [.64, 1.14]

Source: Authors' calculations based on National Health Interview Survey 1999 to 2012.

Note: Models predict mental health outcomes among children 2 to 17. All models adjust for the complex survey design of the National Health Interview Survey and are weighted to reflect eligibility for linkage to U.S. Department of Housing and Urban Development (HUD) record. Adjusted model includes individual and family characteristics (full covariate results in online Appendix C). Ninety-five percent confidence intervals are in brackets. SDQ = Strengths and Difficulties Questionnaire.

^aSDQ symptom score is a 0-to-10 index of mental health severity with higher values indicating poorer well-being and greater risk of mental health problems.

^bLikely socioemotional problem indicates an SDQ symptom score of 6 or greater.

^cEmotional difficulty is a dichotomous parent-reported indicator of whether the child experiences emotional difficulties. It is available in 2008 and 2009, while the SDQ module is not collected in these years.

^dThe naive models compare current assistance recipients to all children not receiving assistance at interview.

^eThe pseudo-waitlist model uses as the reference category those children who are not receiving assistance at interview but will enter housing assistance within two years, the mean length of HUD waitlists.

* $p < .10$,

* $p < .05$,

** $p < .01$.

Table 3.

Adjusted Pseudo-waitlist Models Predicting Effects of Housing Assistance (Current vs. Pseudo-waitlist) on Child Mental Health by Housing Assistance Program (N = 1,967).

Program Type (vs. Pseudo-waitlist)	SDQ Symptom Score ^a (Linear Coefficients)	Likely Socioemotional Problem ^b (Odds Ratios)	Emotional Difficulty ^c (Odds Ratios)
Public housing	-1.39 ** [-1.96, -.82]	.20 ** [.06, .65]	.28 ** [.14, .56]
Housing choice vouchers	-.11 [-.50, .28]	1.07 [.55, 2.06]	1.17 [.80, 1.71]
Multifamily housing	-.20 [-.97, .57]	.77 [.35, 1.60]	1.36 [.63, 2.93]

Source: Authors' calculations based on National Health Interview Survey 1999 to 2012.

Note: Models predict mental health outcomes among children 2 to 17. Models are run separately for each housing program. Each coefficient compares current housing assistance recipients to the pseudo-waitlist group. All models adjust for individual and family characteristics. Ninety-five percent confidence intervals are in parentheses. SDQ = Strengths and Difficulties Questionnaire.

^aSDQ symptom score is a 0-to-10 index of mental health severity with higher values indicating poorer well-being and greater risk of mental health problems.

^bLikely socioemotional problem indicates an SDQ symptom score of 6 or greater.

^cEmotional difficulty is a dichotomous parent-reported indicator of whether the child experiences emotional difficulties. It is available in 2008 and 2009, while the SDQ module is not collected in these years.

† $p < .10$,

* $p < .05$,

** $p < .01$.

Adjusted Pseudo-waitlist Models Predicting Effects of Housing Assistance (Current vs. Pseudo-waitlist) on Child Mental Health Separately by Child Age Group (N = 1,967).

Table 4.

Age Group	SDQ Symptom Score ^a (Linear Coefficients)	Likely Socioemotional Problem ^b (Odds Ratios)	Emotional Difficulty ^c (Odds Ratios)
2-5 years (current vs. pseudo-waitlist)	-.23 [-.91, .46]	1.75 [.42, 7.34]	.65 [.32, 1.33]
6-12 years (current vs. pseudo-waitlist)	-.56* [-1.04, -.08]	.62 [.32, 1.19]	1.07 [.73, 1.57]
13-17 years (current vs. pseudo-waitlist)	-.50 [†] [-1.00, .03]	.56 [.19, 1.62]	.60 [†] [.35, 1.03]

Source: Authors' calculations based on National Health Interview Survey 1999 to 2012.

Note: Models run separately by age group. All models adjust for individual and family characteristics and year of interview. Each model compares current assistance recipients to those within two years of entering (pseudo-waitlist). Ninety-five percent confidence intervals are in parentheses. SDQ = Strengths and Difficulties Questionnaire.

^aSDQ symptom score is a 0-to-10 index of mental health severity with higher values indicating poorer well-being and greater risk of mental health problems.

^bLikely socioemotional problem indicates an SDQ symptom score of 6 or greater.

^cEmotional difficulty is a dichotomous parent-reported indicator of whether the child experiences emotional difficulties. It is available in 2008 and 2009, while the SDQ module is not collected in these years.

[†] $p < .10$.

* $p < .05$.

** $p < .01$.

Pseudo-waitlist Models Predicting Child Mental Health Measures as a Function of Housing Assistance Status Adjusting for Neighborhood Characteristics (N = 1,967).

Table 5.

Housing Assistance Status	SDQ Symptom Score ^a (Linear Coefficients)	Likely Socioemotional Problem ^b (Odds Ratios)	Emotional Difficulty ^c (Odds Ratios)
Current assistance (vs. pseudo-waitlist)	-.41* [-.73, -.09]	.81 [.50, 1.31]	.86 [.64, 1.17]
<i>Census tract characteristics</i>			
Disadvantage index ^d	-.08 [-.20, .04]	.95 [.76, 1.18]	.95 [.82, 1.11]
Instability index ^d	.11 [-.05, .27]	1.19 [.93, 1.52]	.99 [.86, 1.14]
Vacancy index ^d	-.01 [-.13, .11]	1.07 [.87, 1.31]	.99 [.87, 1.13]
Racial composition (vs. >80% white)			
>80% black	.27 [-.37, .90]	1.38 [.44, 4.32]	1.42 [.79, 2.54]
>50% Hispanic	.87* [.13, 1.60]	4.21* [1.41, 12.6]	1.38 [.87, 1.98]
Mixed race	.39 [-.09, .87]	1.90 [†] [.91, 3.94]	1.31 [.79, 2.42]

Source: Authors' calculations based on National Health Interview Survey 1999 to 2012.

Note: Models predict mental health outcomes among children 2 to 17. All models adjust for individual and family characteristics and year of interview. Each model compares current assistance recipients to those within two years of entering (pseudo-waitlist). Ninety-five percent confidence intervals are in parentheses. SDQ = Strengths and Difficulties Questionnaire.

^aSDQ symptom score is a 0-to-10 index of mental health severity with higher values indicating poorer well-being and greater risk of mental health problems.

^bLikely socioemotional problem indicates an SDQ symptom score of 6 or greater.

^cEmotional difficulty is a dichotomous parent-reported indicator of whether the child experiences emotional difficulties. It is available in 2008 and 2009, while the SDQ module is not collected in these years.

^dCalculated using principal components analysis. Normalized with mean 0, standard deviation 1. See online Appendix A for full variable loadings.

[†] $p < .10$.

* $p < .05$.

** $p < .01$.