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Rent Assistance and Health: Findings from Detroit

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Abstract

This study assesses the relationship between rent assistance and health in a longitudinal, population-representative sample collected in the Detroit metro area. Previous research has found that rent assistance recipients are less healthy than otherwise similar non-recipients in the cross-section, but the evidence about the effects of rent assistance on health in the long run is ambiguous. Our study uses panel survey data to compare the health of recipients and eligible non-recipients at the study's onset and four years later at follow-up with respect to an extensive set of physical, mental, and behavioral health outcomes. Our results demonstrate that rent assistance recipients are in worse overall health than non-recipients, but also provide suggestive evidence that the program may buffer health declines in the medium term. However, the positive buffering effects may be erased in the long run, as we simultaneously observed an increase in smoking among rent assistance recipients. Our study shows that the current shortage of rent assistance may have implications for population health.

Keywords

health; housing; vouchers; rent; health disparities

Social and health policies are key determinants of population health (Schoeni, House, Kaplan, & Pollack, 2008). Housing policy is especially important because it influences multiple aspects of our lives: from where we live, to how safe we are in our dwellings and how spend on a mortgage or rent, all of which have implications for health (Schwartz, 2010). Housing policy can promote housing stability and housing affordability, and it is likely to have large implications especially for low-income renters, who are most vulnerable to the housing market. Concern for the welfare of low-income families led the U.S. Congress to pass the National Housing Act of 1937, declaring the intent to provide 'decent, safe, and sanitary dwellings for families of low income and for the reduction of unemployment and the stimulation of business activity.'¹ This study evaluates whether and to what extent rent assistance to low-income individuals influences their health over time in a longitudinal, population-representative sample of Southeast Michigan residents.

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¹United States Housing Act of 1937, P.L. 93–383; 88 Stat. 653; 42 U.S.C. 1437 et seq.

The U.S. federal government operates three main programs for renters in the spirit of the first housing act: Housing Choice Vouchers (HCV), Project-based Rental Assistance (PBRA), and Public Housing. In combination, these three programs assist approximately 4.8 million households whose incomes do not exceed 50 percent of the local county median (Congressional Budget Office, 2015). The extent of U.S. federal government rent assistance provided is far from adequate. The Congressional Budget Office (CBO) estimates that there are 14 million additional households that meet the eligibility criteria for rent assistance but do not receive it due to lack of funding (Congressional Budget Office, 2015). It is likely that the absence of adequate rent assistance for low-income Americans also negatively impacts their health, but the research on the relationship between the two has been limited and the resulting evidence mixed.

Study Contributions

Our study provides a comprehensive assessment of the relationship between rent assistance and health in a population-representative sample collected in the Detroit metropolitan area, encompassing Macomb, Oakland, and Wayne counties, and expands the limited literature on health effects of rent assistance in several important ways. We focus our analyses on HCV and PBRA renters, the larger but less frequently studied population of rent assistance recipients. Because our dataset is longitudinal, we evaluate the health of recipients and non-recipients at the study's onset and four years later at follow-up, considering the implications of selection into rent assistance as well as the possible treatment effect of rent assistance on health.

First, we can contrast the health outcomes of rent assistance recipients to those who met the income threshold requirements but who received no aid. Second, rather than focusing on a single dimension of individual health, we examine a broad set of health outcomes; we attain a comprehensive picture of recipients' and non-recipients' health by measuring the presence and number of chronic conditions, limiting chronic conditions, depressive symptomology, harmful or hazardous alcohol use, smoking, and body mass index (BMI).

The results demonstrate that HCV and PBRA recipients are in worse overall health than non-recipients in the cross-section, but also provide suggestive evidence of the program's potential to buffer health declines in the medium term. However, the positive buffering effects may be lessened in the long-run by the simultaneously observed increase in smoking among the recipients that contrasts with the declining trend observed among non-recipients.

Overview of Federal Rental Assistance

The federal government operates three main housing programs for renters that aim to prevent cost-induced financial hardship: Section 8 Housing Choice Vouchers (HCV), Section 8 Project-based Rental Assistance (PBRA), and Public Housing, all of which require recipients to contribute at least 30 percent of their income toward rent. According to the Congressional Budget Office (Congressional Budget Office, 2015), in 2013, the three programs together assisted approximately 4.8 million households whose income did not exceed 50 percent of the local median. The largest of the three programs, HCV, served 2.2

million low-income households. Vouchers provide eligible families the flexibility to select housing in the private market anywhere throughout the country.² Existing research finds, however, that households rarely use vouchers to relocate to higher socio-economic status neighborhoods (Darrah & DeLuca, 2014). Congress has not issued any new, ‘incremental’ housing vouchers since 2002 (McCarty, 2014b).

The second largest program, PBRA, served 1.5 million households in 2013 (Congressional Budget Office, 2015). Under the PBRA, the Department of Housing and Urban Development (HUD) enters into contracts with private property owners to rent housing units to low-income tenants. Most owners of PBRA buildings are for-profit entities that have entered into tenancy agreements with HUD. In contrast to the ‘tenant-based’ HCV program, PBRA assistance is tied to specific housing units. When a low-income household moves out of their assisted unit, they do not carry the subsidy with them; instead, the income-eligible household that moves into the unit after them will inherit the assistance (McCarty, Perl, & Jones, 2014).

The third program, Public Housing, consists of high-rise buildings, low-rise buildings, scattered sites, and mixed-income housing developments operated by local housing authorities. The smallest of the three major forms of assistance, public housing currently shelters 1.1 million households (Congressional Budget Office, 2015). The construction and acquisition of net-new public housing properties effectively ended two decades ago, leading to a decline in public housing units from a peak of 1.4 million units in the mid-1990s (McCarty, 2014a). Since then, public housing buildings have been demolished in several major American cities in an effort to reduce concentrated poverty (Crump, 2002). Households displaced from public housing and project-based units are eligible for a replacement HCV.

Unlike the Earned Income Tax Credit and the Supplemental Nutrition Assistance Program (SNAP) (i.e., food stamps), rent assistance is not an entitlement program—that is, not all eligible families receive assistance. While the availability of rent assistance has stagnated for decades, the number of households eligible for rent assistance has risen. Between 2003 and 2013, the number of households potentially qualifying for aid increased from 15.7 to 18.5 million (Joint Center for Housing Studies, 2013). As a result of the considerable demand for rent assistance and for HCV, in particular, local waiting lists for vouchers range from several months to years, with an overall average wait time of 23 months in 2013 (Congressional Budget Office, 2015).

Overall, three-quarters of income-eligible households receive no rent assistance. Among eligible but unassisted households, 7.7 million are considered to have ‘worst-case housing needs,’ meaning that they earn less than 50 percent of the area median income while spending over half of household income on rent. The number of unassisted households with worst-case needs is 50 percent higher than it was a decade earlier, pointing to an increased

²Vouchers may also go to families displaced from other HUD programs, for example, because of the demolition of public housing. Public housing agencies also have discretion to project-base vouchers by attaching them to specific housing units, or to allow first-time homebuyers to apply vouchers to monthly mortgage payments.

need for rent assistance among very low-income households (Congressional Budget Office, 2015).

Characteristics of Rent Assistance Recipients

Combined, HCV, PBRA, and Public Housing currently aid 9.8 million individuals nationwide (Congressional Budget Office, 2015). Because of the restrictive income eligibility rules, the recipients have substantially lower incomes than the general population. In 2012, for instance, the gross household income of participants across these three programs averaged just 25 percent of the area median income, with average annual incomes ranging from \$12,000 for PBRA to \$13,800 for public housing residents. Across the programs, nearly one-third of households had an elderly head or spouse, 39 percent of households had children, and 23 percent had a non-elderly head or spouse who was disabled. However, there are differences in household type among the three programs. For example, half of households receiving PBRA have an elderly head or spouse. In comparison, only one-fifth of HCV households have an elderly head or spouse and nearly half of these households have children (Congressional Budget Office, 2015).

Rent Assistance in Detroit Context

The three-county Detroit area, where our sample resides, has been experiencing deindustrialization and long-term population loss since the 1970s (Urban Institute, 2017). Homeownership has declined over time and is estimated at about 51 percent of the population, contrasting with the 64 percent in the United States overall (U.S. Census Bureau, 2015). Though the median gross rent of \$871 in the Detroit area is below the national average of \$951 (U.S. Census Bureau, 2016), rents remain unaffordable for the economically struggling local population; 70 percent of renters in Detroit spend more than 30 percent of their income on rent (Urban Institute, 2017).

The majority of the sample live in Wayne County. As of 2015, there were 43,103 subsidized housing units available in Wayne County, including 18,654 vouchers, 14,464 project-based assistance units, and 6,803 public housing units (U.S. Department of Housing and Urban Development, 2016). Compared to rest of the country, Wayne County had more project-based rentals and fewer public housing units on average. Wayne County recipients had lower average household income than recipients nationally. For example, housing voucher recipients had an average income of \$11,548 compared to a national average of \$13,821. The population of rent assistance recipients in Wayne County was far more racially homogenous than the rest of the state and country. Eighty-six percent of voucher recipients in Wayne were African American compared to 62 percent statewide and 47 percent nationwide (U.S. Department of Housing and Urban Development, 2016).

Pathways from Rental Assistance to Health

There are several plausible mechanisms through which the current scarcity of rent assistance could influence individual and population health. The first pathway reflects the overall goal of the rent assistance program: lowering housing costs frees up financial resources and

enables rent assistance recipients to purchase healthcare, health insurance, nutritious food, and other goods and services that can enhance or protect well-being (Desmond, 2016). In the absence of rent assistance, low-income Americans will be less able to purchase such goods and services and can be forced to make tradeoffs between meeting their health needs and meeting their housing needs (Meltzer & Schwartz, 2016). If their housing needs are judged to be more pressing, their health may suffer as a result.

However, an increase in financial resources that eliminates this tradeoff may not necessarily lead to improved health. For some, more money could also mean spending on things that can lead to worsened health such as junk food, cigarettes, large quantities of alcohol, and harmful substances. If this were the case, a greater availability of rent assistance could translate to worsened behavioral and, eventually, health outcomes. However, there is little evidence that rent assistance contributes to greater participation in harmful health behaviors (Fertig & Reingold, 2007). This may be due to the fact that alcohol abuse and related disorderly conduct as well as drug-related criminal activity can both lead to the loss of rent assistance (U.S. Department of Housing and Urban Development, 2013).

Rent assistance can also be a first step toward connecting low-income Americans to other programs that will help strengthen their health and well-being. Researchers have hypothesized that enrollment may serve as a ‘gateway’ to other services that can bring additional resources to a household (Fertig & Reingold, 2007). Applying for and accessing rent assistance may help gain familiarity with not only rent assistance, but also programs, such as SNAP, that may be available to them. In addition, some rent assistance programs actively promote additional services that assisted households can use (Shlay, 1993), such as vocational or household finance management training. Rent assistance can therefore tie the recipient into the broader safety net system and consequently improve their economic well-being beyond cutting the cost of housing. Ultimately, such a ‘gateway’ mechanism could translate to a positive health effect.

In addition to freeing up resources and connecting low-income recipients to additional support services, rent assistance may positively influence health by increasing housing stability. Past research has found that high cost of housing relative to income leads to doubling up or overcrowding, when multiple households or family units must sometimes pool resources to afford small dwellings. This form of instability translates to an vulnerability to infectious disease and added psychological strain (Lubell, Morley, Ashe, Merola, & Levi, 2011). Additionally, the inability to pay rising rent costs can lead to frequent moves, which is associated with worse health, even after taking into account sociodemographic characteristics that could explain the relationship (Burgard, Seefeldt, & Zelner, 2012; Evans, Wells, & Moch, 2003). As low-income Americans are at an increased risk of multiple forms of housing instability (Phinney, Danziger, Pollack, & Seefeldt, 2007), rent assistance could provide a safety net helping them stay in their homes, while weathering financial fluctuations. And in fact, low-income households benefiting from rent assistance have been found less likely to experience instability than similarly financially situated households (Kim, Burgard, & Seefeldt, 2017; Phinney, 2013; Wood, Turnham, & Mills, 2008), and it has been documented that they move less often than non-recipients (U.S. Department of Housing and Urban Development, 2015).

Finally, households eligible for rent assistance tend to be clustered in the same buildings and neighborhoods (Churchill, Holin, Khadduri, & Turnham, 2001; Varady, 2010; Wang & Varady, 2005; Wang, Varady, & Wang, 2008), which could have both positive and negative implications for health. The close proximity to other assistance recipients can lead to the formation of social ties with more experienced assistance recipients (Fertig & Reingold, 2007), which may bring both instrumental and informal resources to the household in times of need. For example, a household may learn from their neighbors about medical providers who accept Medicaid patients or about nearby food banks and pantries. They may ask for advice or practical assistance with program applications or with the income verification procedure. In addition, living among a substantial group of rent assistance recipients in a neighborhood may also protect individual recipients from experiencing stigmatization, which too has been linked to multiple adverse health outcomes (Link & Phelan, 2001).

There are, however, a number of documented negative health-related consequences of living in areas with a high density of rent assistance recipients, as well. The neighborhoods to which rent assistance beneficiaries have access are less well-resourced on average (Digenis-Bury, Brooks, Chen, Ostrem, & Horsburgh, 2008; Krieger & Higgins, 2002). Areas with a high concentration of low-income residents suffer greater crime rates and have fewer safe outdoor spaces. This increases the probability of crime victimization, heightens stress, and limits options for outdoor exercise. Low-income neighborhoods also often lack access to supermarkets and grocery stores that sell nutritious food and fruit and vegetables at affordable prices, which can promote malnourishment and obesity (Ellen, Mijanovich, & Dillman, 2001).

Prior Research on Rent Assistance and Health

Whereas there is a substantial literature on the relationship between housing and health, we know far less about the relationship between rent assistance and health (Fenelon et al., 2017; Fertig & Reingold, 2007). One consistent finding is that prior to adjusting for socioeconomic characteristics, rent assistance recipients are in substantially worse physical health compared to the general population. Straightforward comparisons reveal that relative to the general population, rent assistance recipients across geographic areas are more likely to report fair or poor health and to suffer from conditions such as hypertension, asthma, diabetes, obesity, disability, and depression (Chambers & Rosenbaum, 2014; Digenis-Bury et al., 2008; Manjarrez, Popkin, & Guernsey, 2007; Ruel, Oakley, Wilson, & Maddox, 2010). While evidence suggests that rent assistance recipients are about as likely as the general population to have health insurance and access to preventative health screenings, and they are actually less likely to binge drink or use marijuana (Chambers & Rosenbaum, 2014; Digenis-Bury et al., 2008), they have higher rates of smoking and physical inactivity in comparison to the general public (Digenis-Bury et al., 2008), which could contribute to health disparities. National health surveys also indicate little difference in self-rated health and psychological distress across the public housing, HCV, and PBRA programs, suggesting that the beneficiaries of these programs are similarly disadvantaged relative to the general population (Fenelon et al., 2017).

The challenge for researchers is to determine if poor physical and mental health among rent assistance recipients is explained by selection—that is, whether unhealthier people are more likely to receive rent assistance in the first place, or whether rent assistance adversely affects health. Furthermore, scholars are also interested in understanding if health effects vary across the types of rent assistance. Thus far, empirical studies on rent assistance and health have yielded mixed results. In addition to studying different health outcomes, forms of rent assistance, and populations, studies also vary in how they account for selection into housing assistance. In this section we discuss the strengths and limitations of results from previous experimental and observational studies.

Moving to Opportunity Mobility Experiment

The Moving to Opportunity (MTO) mobility experiment dealt with selection by randomly assigning public housing residents in five U.S. cities to one of three groups: an experimental group that received a housing voucher that could only be used in low-poverty neighborhoods, a comparison group that received a housing voucher with no geographic restrictions, and a control group that did not receive a voucher (but remained eligible for public housing). The results of this experiment suggest that HCVs may have a positive impact on health. Relative to public housing residents, adult MTO voucher recipients experienced improvements across several mental and physical health outcomes and significant gains in subjective well-being (Ludwig et al., 2013). Children, too, experienced some health gains. For instance, the results showed that boys (8 to 13 years) in the families that moved to low-poverty neighborhoods in New York City were less likely to report symptoms of anxiety and depression, and had fewer substance dependency issues (Leventhal & Brooks-Gunn, 2003). Because all participants in the MTO received some type of rent assistance, we cannot use the study's results to evaluate the health effects of receiving rent assistance versus not receiving any assistance—the more relevant comparison, given that funding for rent assistance falls short of affordable housing needs.

Observational Studies

Because it would be unethical to assign experiment participants to a control group receiving no assistance, researchers must rely on observational studies to examine the health effects of rent assistance relative to a comparison group of non-recipients. Two studies that were limited to public housing residents failed to find a strong connection—negative or positive—between rent assistance and most health-related outcomes. Fertig and Reingold (2007) used instrumental variable estimation to account for selection in a national study of mothers who had recently given birth. Among mothers who moved into public housing between the birth of their child and a one-year follow-up interview, public housing was associated with a worsening of mothers' self-reported health relative to mothers who financially qualified for public housing but did not receive it. At a three-year follow-up interview, there were no differences in self-rated health across groups, but public housing was associated with a lower probability that mothers were depressed but a greater probability that they were overweight. Results pertaining to mothers' health behaviors (e.g., alcohol use, drug use, and smoking) were generally insignificant across model specifications with the exception that mothers were more likely to use drugs during pregnancy. There was also evidence from the one- and three-year follow-up interviews that public housing residents had a lower probability of

reporting a chronic condition, but these results were not consistent across models. One important limitation of the study is that the results pertain to women and children at and around the time of childbirth—which is itself a major life event with both health and financial implications.

In another study, Ruel and colleagues (2010) examined the presence of chronic conditions among the general population of public housing residents in Atlanta.³ They found that poor health was a major reason why respondents moved into public housing, and that a majority of respondents who had chronic conditions developed these conditions prior to moving into public housing. For those residents who were healthy upon entering public housing, the researchers found no relationship between public housing tenure and the onset of any of the chronic conditions, leading them to conclude that public housing was not related to the worsening of health over time.

A major limitation of both the Fertig and Reingold (2007) and Ruel et al. (2010) studies is that they examined only public housing residents—a limited subset of all rent assistance recipients compared to the HCV program, for example, which serves twice as many households as public housing. Furthermore, the MTO experiment suggests that HCVs may provide health benefits relative to public housing. Fenelon and colleagues (2017) addressed these limitations by combining national survey data with administrative records that enabled them to distinguish between types of rent assistance. They attempted to address selection by comparing current rent assistance recipients with individuals who would eventually enter rent assistance within two years. In contrast to earlier findings, the study found that, after controlling for socioeconomic characteristics, public housing and PBRA residents were less likely than a comparison group of future public housing residents to report fair or poor self-rated health. Public housing was also associated with a lower probability of serious psychological distress. However, contrary to what the MTO findings may have led us to expect, the study found no difference in self-rated or mental health between current and future HCV recipients.

While public housing has been correlated with various health outcomes, observational studies have been unable to find consensus on whether HCVs impact health outcomes. In contrast to Fenelon and colleagues' (2017) study, Garg et al. (2013) found that mothers in Hawaii who received an HCV were considerably less likely to report poor mental health relative to a comparison group of mothers who said they wanted or needed rent assistance but who did not have access to a voucher. However, the study was limited by a small sample size and only applied to mothers in Hawaii who had just given birth. In two other studies, Chambers and colleagues (2015; 2014) looked into the effects of rental assistance on cardiovascular symptoms and depression among a small sample of Latinos living in New York City. A major limitation of these studies is that the authors made no attempt to account for selection beyond controlling for health behaviors and socioeconomic characteristics, which could explain why public housing residents were found to have higher odds of reporting symptoms of cardiovascular disease than a similar group of unassisted renters.

³Chronic conditions included diabetes, asthma, hypertension, stroke, and arthritis.

Nevertheless, the authors found no differences in cardiovascular or depressive symptomology between HCV recipients and the comparison group.

Overall, the results of observational studies provide evidence that HCV recipients have similar physical health outcomes relative to similarly disadvantaged persons, but that new mothers with HCVs may realize some mental health benefits. A strength of observational studies is that they attempt to draw comparisons between rent assistance and the condition of no assistance. Nevertheless, there are several limitations associated with the few existing studies examining the health effects of HCVs. For example, Fenelon et al. (2017) used a large national sample, but they only studied self-reported health and psychological distress, and did not observe the same individuals over time. Consequently, a substantial gap exists in our understanding of the relationship between HCV and changes in health outcomes, and particularly health behavior outcomes. There are no recent observational studies of HCVs that consider changes in health behavior outcomes such as smoking, drinking, or obesity, over time. Finally, because there is substantial variation in housing markets and the administration of housing programs—and therefore selection into assistance—across the United States, one must adjudicate between the relative merits of evaluating the associations between rent assistance and health at the national level versus a local level. One potential problem with national or multi-city studies is that combined results may obscure differences in outcomes across geographies resulting from variation in program administration across public housing authorities and differences in housing and labor market.

Current Study

Our study contributes to the literature by evaluating the health of rent assistance recipients on a wide range of indicators that include markers of physical, psychological, and behavioral health, and by contrasting their health to that of otherwise similar non-recipients, and the health of the ineligible population. We use the Michigan Recession and Recovery Study (MRRS), a panel dataset collected between 2009 and 2013 in Southeast Michigan that enables us to measure health differences between recipients and non-recipients at a single point in time, as well as measure health changes over time. We ask two research questions: First, does the physical, mental, and behavioral health of rent assistance recipients differ from the health of eligible non-recipients and ineligible non-recipients at the onset of the study? And second, after accounting for health at the onset of the observational period, does the physical, mental, and behavioral health of rent assistance recipients, eligible non-recipients, and ineligible non-recipients differ at the end of the observational period, four years later? We discuss our results in the context of earlier findings in the literature and in relation to the current shortage of rent assistance.

METHODS

Data

Michigan Recession and Recovery Study (MRRS) data were collected from a stratified random sample panel of English-speaking adults aged 19 to 64 living in the Detroit area in Southeast Michigan (Macomb, Oakland, and Wayne counties). The baseline wave was fielded from October 2009 to April 2010; the second wave of interviews was conducted

from April to August of 2011; and a third wave of interviews were collected from June to October 2013. (Most wave 1 and 2 interviews were conducted in person with only a small number of phone interviews, while most wave 3 interviews were conducted by phone.) MRRS was designed with an oversample of African Americans and included mainly African American and non-Hispanic white respondents, reflecting the local residential composition. Of the 914 individuals interviewed at wave 1 (83 percent response rate), 847 remained at wave 2 (94 percent response rate), and 751 remained at wave 3 (90 percent response rate). Survey weights calculated for each wave address nonresponse and attrition at waves 2 and 3, making the MRRS representative of working-age adults living in the three-county area in Southeast Michigan.

We constructed two analytic samples for the purposes of this study. The first, cross-sectional analytic sample included all non-homeowners who participated in the first wave of data collection ($N = 462$). Listwise deleting cases with missing data reduced the analytic sample to 400 observations. The second, longitudinal analytic sample included only those non-homeowners who participated in all three waves and whose rent assistance or eligibility status did not vary over time (e.g., they were recipients and eligible in every wave). Because the eligibility status of many respondents fluctuated, our longitudinal sample size was substantially reduced. There were 162 respondents whose eligibility and receipt status remained consistent across all three waves, and 150 of them contained all of the data needed for the construction of the dependent or independent variables used in multivariable models. For the cross-sectional sample, we measured all characteristics at baseline. For the longitudinal sample, we measured demographic characteristics associated with selection into housing at baseline and socioeconomic characteristics potentially associated with changes in health at follow-up.

Measures

Rent Assistance Receipt—All renters were asked if they received assistance with rent in their current residence with the question: ‘Do you get any help on the monthly rent for this apartment or house from any federal, state or city government housing programs, including any Federal Section 8 certificate or voucher?’ Sixty-two members of the baseline analytic sample reported receiving rent assistance at wave 1, and 31 members of the longitudinal sample received assistance at all 3 waves. We cross-referenced respondent addresses with public housing listings and determined that no respondents in the analytic sample resided in public housing at the time of interview and thus most likely received HCV or PBRA.

Rent Assistance Eligibility—We used the U.S. Department of Housing and Urban Development (HUD) guidelines for eligibility at the county level to determine if non-homeowners in our sample were most likely to be eligible for rent assistance based on reported household income and household size. HUD considers households to be eligible for assistance if annual household income does not exceed 50 percent of the local area median. For example, 50 percent of median household income for a family of three was \$31,950 in 2009 for Wayne County. Our main predictor was constructed combining information about respondent eligibility and reported receipt. This variable indicates whether a respondent was an eligible recipient, eligible non-recipient, or ineligible non-recipient. In the first analytic

sample, we identified 200 respondents who were likely eligible for assistance, but who were not receiving assistance at wave 1. In the second analytic sample, we identified 76 respondents who were income eligible at all three points of data collection, but who were not receiving assistance.

Respondents who did not report assistance and whose income exceeded the designated threshold at all waves were designated as ineligible non-recipients. There were 138 such respondents in the first analytic sample and 43 in the second analytic sample. Our analysis excluded three respondents who reported a subsidy, but who were not eligible based on the HUD income guidelines.

Health—We evaluated respondents' health with respect to physical health, mental health, and health behaviors.

Physical health.: Respondents answered questions about specific chronic conditions they may have, including coronary heart disease and any heart attacks, hypertension, asthma, chronic lung disease, diabetes, arthritis, or cancer. When a respondent confirmed that 'a doctor or other health professional ever told [them] they have' any of the conditions listed, they were asked a series of follow-up questions about the age at which they were diagnosed and the extent to which the condition limits their normal activities ('a lot', 'somewhat', 'a little', or 'not at all'). We constructed four physical health measures from these data. The first measure—*any chronic condition*—is a binary indicator that distinguishes respondents who reported at least one chronic condition from those who reported having no chronic conditions. The second measure—*number of chronic conditions*—counted the number of chronic conditions reported by individual respondents. The third measure—*any limiting chronic condition*—is a binary indicator that distinguishes respondents who had at least one chronic condition that limited their daily activities from those who either had no chronic conditions or had a condition (or conditions) that did not limit their daily activities at all. The fourth measure—*number of limiting chronic conditions*—summed the number of limiting chronic conditions that a respondent reported.

Mental health.: Depression was measured using the Patient Health Questionnaire (PHQ), a validated 9-item scale based on the diagnostic criteria for major depressive disorder in the *Diagnostic and Statistical Manual Fourth Edition* (DSM-IV). The PHQ-9 has two components that: (1) assess symptoms and functional impairment over the past two weeks to make a tentative diagnosis, and (2) can be used to derive a depression severity score (designed to help clinicians select and monitor treatment). Respondents were classified as meeting the symptomatic criteria for major or minor depression according to guidelines provided by creators of the scale. Meeting criteria for major or minor depression was considered positive (1) on this outcome, and not meeting the criteria was considered negative (0) (Martin, Rief, Klaiberg, & Braehler, 2006).

Health behaviors.: Harmful and hazardous alcohol consumption was assessed according to the guidelines described by the Alcohol Use Disorder Identification Test (AUDIT), a validated 10-item scale (Allen, Litten, Fertig, & Babor, 1997). We determined whether a respondent was a smoker by asking: 'Do you smoke cigarettes regularly, just occasionally,

for example, when you are at parties or in social situations, or never?’ Respondents who said they smoked regularly or occasionally were classified as smokers. Finally, we calculated respondents’ body mass index (BMI) by dividing the square of their self-reported height in centimeters by their self-reported weight in kilograms.

Housing Unit and Neighborhood Quality Measures—Respondents were asked whether they experienced ‘any of the following problems with your [their] home?’: leaky roof or ceiling; toilet, hot water heater, or other plumbing that does not work right; rats, mice, roaches or other insects; broken windows; heating system that does not work properly; exposed wires or other electrical problems; a stove or refrigerator that does not work properly; peeling paint; or any other problems. They could select as many issues as were applicable to their dwelling. We standardized responses into a scale, mean-centered at zero, with a standard deviation of one, where a higher score indicated worse living conditions. The Cronbach’s alpha of the housing unit quality scale was 0.71 at baseline and 0.72 at follow-up.

Survey interviewers also inquired ‘how much of a problem’ crime and violence, abandoned or run-down buildings, not enough police protection, and lack of interest were in respondents’ neighborhoods. For each, they could select that it was ‘not a problem’, ‘somewhat of a problem’, or ‘a big problem’. Analogously to the housing unit measure, we combined their responses into a standardized scale, mean-centered at zero and with a standard deviation of one, where a higher score indicated worse neighborhood conditions. The Cronbach’s alpha of the neighborhood quality scale was 0.92 at baseline and 0.90 at follow-up.

Other Measures—In multivariable analyses, we controlled for respondents’ other characteristics that could predict rent assistance receipt as well as health. We included indicators for being a woman, being African American, having a low educational attainment (defined as a high school education or less), whether a respondent was in a married or cohabiting relationship, the presence of children in the household, age in years, and natural log transformed household income. We also controlled for whether a respondent reported having health insurance.

Analytic Strategy

We first examined descriptive differences in the characteristics of the first, cross-sectional analytic sample stratified by rent assistance receipt status and eligibility. Then, we estimated multivariable regression models predicting each health outcome with controls for respondents’ other characteristics. We used logistic regression models to predict the presence of any chronic conditions, any limiting chronic conditions, major or minor depression, harmful or hazardous alcohol use, and smoking. We used negative binomial regression models to predict the count of chronic and limiting chronic conditions. A linear model estimated using ordinary least squares was employed to predict BMI.

In the second part of our analysis, we leverage the longitudinal structure of the MRRS data to examine changes in health status between the first and third survey waves. We retained all predictors but then controlled for baseline health status in several models. Alternative

strategies for estimating longitudinal changes associated with rent assistance receipt would have been, for example, fixed effects and first-difference estimators. However, while these estimators have desirable properties, they cannot be implemented when there is little within-person variation across variables of interest.

In addition to controlling health at baseline, we restricted the analytic sample to respondents who were continually eligible and receiving assistance, continually eligible and not receiving assistance, or continually ineligible and not receiving assistance. Groupings based on continuous eligibility and receipt are more appropriate for modeling changes in health across time that may accumulate gradually. We report regression results in average marginal effects. All analyses were performed using Stata/MP 15.0 and applied survey weights by using Stata's -svy- command suite (StataCorp, 2015).

RESULTS

Table 1 presents summary statistics of the demographic, socioeconomic, and health characteristics measured at baseline for the total analytic sample and three subgroups consisting of rent assistance recipients, eligible non-recipients, and ineligible respondents. We report p-values from the Pearson's χ^2 test for independence for categorical variables and from adjusted Wald tests for continuous variables. Relative to both groups of respondents who did not receive rent assistance at baseline, rent assistance recipients were more likely to be women, African American, and single parents. In comparison to respondents who met the income eligibility guidelines but who did not receive assistance, rent assistance recipients had lower income (\$9,936 versus \$16,224) and lived in lower-quality neighborhoods on average. Rent assistance recipients also had worse physical health at baseline relative to both groups of non-recipients, as they were more likely to have a chronic condition or a limiting chronic condition and reported a higher number of both types of conditions on average. Compared to non-recipients, a higher proportion of rent assistance recipients were depressed, although they were no more likely (and sometimes less likely) to engage in hazardous or harmful alcohol use or to smoke. There was little difference between groups in regard to BMI in that the average for all three groups was just below the 30-point threshold for obesity.

Table 2 reports average marginal effects from logistic and negative binomial regression models examining the relationship between rent assistance receipt and measures of physical health, where all predictors and outcomes are measured at baseline. Marginal effects for respondents who received rent assistance at baseline and for respondents who were ineligible for assistance at baseline are relative to the reference group of eligible non-recipients. We estimated logistic regression models predicting the presence of any chronic condition (Model 1) and any limiting chronic condition (Model 3) and negative binomial regression models predicting the number of chronic conditions (Model 2) and number of limiting chronic conditions (Model 4). All models control for sex, race, education, marital status, presence of children under age 18 in the household, age, natural log of income, housing and neighborhood quality, and health insurance. Given our small sample size, all future references to statistical significance indicate that the p-value for the marginal effect was less than 0.10.

Model 1 shows that relative to the reference group of eligible non-recipients, the probability of having a chronic condition was 10 percentage points higher for rent assistance recipients and 9 percentage points higher for ineligible respondents, but their difference from the reference group was not statistically significant. The marginal effects for rent assistance receipt and all controls except for race, education, and age were not statistically significant. Being African American and having a high school education or less were each associated with a 12-percentage-point greater probability of having a chronic condition relative to the respective reference groups (whites and respondents with at least some college education). The marginal effect of age (0.011) indicates that the probability of having a chronic condition increased by 1 percentage point with each additional year of age.⁴

Model 2 indicates that rent assistance recipients reported having statistically significantly 0.17 more chronic conditions than eligible non-recipients. The directions of the remaining marginal effects follow a similar pattern as in Model 1. In addition to race, only the marginal effect of age was significant. Relative to white respondents, African American respondents reported 0.31 additional chronic conditions, while a one-year increase in age was associated with an additional 0.03 chronic conditions.

In Model 3, the outcome is the presence of any limiting chronic condition. The results are substantively similar to Model 1, in that rent assistance recipients were 7 percentage points more likely to report a limiting chronic condition than eligible non-recipients; although, the marginal effects for the two categories of rent assistance receipt were not significant. A one-year increase in age was associated with nearly a 1.0 percentage point increase in the probability of reporting a limiting chronic condition, while a one-unit improvement in housing quality was associated with a 7-percentage-point decrease in the probability of having a limiting chronic condition. The marginal effects for the remaining demographic and socioeconomic characteristics were not statistically significant.

The results from Model 4 indicate that rent assistance receipt was associated with an additional 0.16 limiting chronic conditions relative to the reference group of eligible non-recipients. Demographic controls for being African American and age were also associated with a greater number of limiting chronic conditions, whereas improvements in housing quality and neighborhood quality were both associated with having fewer limiting chronic conditions.

Table 3 reports the average marginal effects from regression models predicting mental health and health behaviors with all controls and health outcomes measured in the cross-section. We estimated logistic regression models predicting if respondents experienced major or minor depression (Model 5), engaged in harmful or hazardous alcohol use (Model 6), and smoked (Model 7), along with a linear regression model predicting BMI (Model 8).⁵

⁴Marginal effects for continuous variables, such as age, measure instantaneous rate of change. The instantaneous rate of change is not always the same as the change associated with a one-unit change in the independent variable. Using the Stata `spost13` package, we compared the instantaneous change reported in the tables with the one-unit change (Long & Freese, 2014). For simplicity, we will refer to a one-unit change in the text, while noting when there is a substantial difference between the instantaneous and one-unit rate of change.

⁵The average marginal effects from linear regression models are identical to the estimated coefficients.

Overall, we did not find statistically significant differences with respect to mental health and health behaviors between eligible recipients and eligible non-recipients. Model 5 indicates no difference between the categories of rent assistance receipt in the probability of having experienced depression. Both being a woman and higher age were associated with an increase in the probability of depression, while higher neighborhood quality was associated with a decrease in the probability of depression. In Model 6, we observe that rent assistance recipients and ineligible respondents were more likely to engage in hazardous and harmful alcohol use, although only the latter was statistically significant. African American respondents, those with at least some college education, and those with children had a lower probability of problematic alcohol use relative to whites, less educated respondents, and respondents without young children. None of the other marginal effects were statistically significant. Model 7 shows that the association between rent assistance receipt and the probability of smoking was not significant. However, having a high school education or less and being married or cohabitating was positively associated with smoking, while having children was associated with a lower probability of smoking. In Model 8, we observed no difference between rent assistance recipients and eligible non-recipients in regard to their BMI, although the index was a statistically significant 2.04 points higher for ineligible respondents relative to the reference group of eligible non-recipients. Respondents who were African American or had a high school education or less also had a higher predicted BMI relative to their respective reference groups, and higher age was also associated with a higher BMI.

In the second part of our analysis, we turn to the results for our longitudinal analytic sample of the 150 MRRS respondents who had consistent rent assistance receipt and eligibility across the three waves (2009–2010, 2011, and 2013). As in the first part of the analysis, all analyses include an indicator for rent assistance to facilitate a comparison between rent assistance recipients, eligible non-recipients, and ineligible respondents. Demographic characteristics associated with selection into rent assistance (gender, race, education, marital status, children in the household, and age) were measured at baseline, and socioeconomic conditions that could potentially induce a change in health outcomes (household income, housing unit and neighborhood quality, and health insurance) were measured at follow-up. Models in Tables 5 and 6 predict physical health, mental health, and behavioral health outcomes at follow-up both with and without a control for the baseline measure of each health outcome.

Table 4 reports summary statistics for the longitudinal analytic sample. Demographic and socioeconomic characteristics of the longitudinal and cross-sectional analytic samples were substantively similar. Overall, the physical health of rent assistance recipients and eligible non-recipients declined between baseline and follow-up but changed comparatively little for ineligible respondents. Eligible non-recipients experienced the largest increase in the percentage of participants reporting any chronic condition, while rent assistance recipients and eligible non-recipients both reported substantial increases in the mean number of chronic conditions. A similar pattern prevailed for limiting chronic conditions. The percentage of rent assistance recipients reporting depression and negative health-related behaviors increased from baseline to follow-up, while the mean BMI for the group remained relatively unchanged. Eligible non-recipients followed a similar trajectory, except that the

percentage of smokers declined for this group from baseline to follow-up. While there was no change in the percentage of ineligible respondents reporting depression, the percentage reporting smoking and hazardous or harmful alcohol use declined between interviews.

Figure 1 plots unadjusted trajectories for the eight health-related outcomes over three waves of the MRRS (2009–2010, 2011, and 2013) for a subset of respondents who maintained consistent rent assistance eligibility and receipt across all three waves. The figure provides a visual summary of the health outcomes presented in the previous descriptive table, but also incorporates data collected between initial study enrollment and final follow-up. In relation to chronic conditions and limiting chronic conditions, the gap between rent assistance recipients and eligible non-recipients generally narrowed over the study period as eligible non-recipients experienced worsening health. In contrast, ineligible respondents experienced little change in health. Additionally, the figure shows that there was little difference between three categories of rent assistance eligibility and receipt and harmful or hazardous alcohol use. Interestingly, rent assistance recipients were less likely than eligible non-recipients to smoke. Overall, the descriptive figure provides some support for the theory that housing subsidies may protect beneficiaries from developing chronic conditions, as the health of the eligible non-recipients appeared to deteriorate over the study period. The remaining part of the analysis will determine if a similar pattern prevailed after controlling for baseline health and socio-demographic factors.

Table 5 reports average marginal effects from regression models predicting physical health at follow-up.⁶ Overall, the results suggest that there was little difference between rent assistance recipients and the reference group of eligible non-recipients in the number of chronic conditions or in the probability have having any limiting chronic condition at follow-up (Models 9–12). However, Model 14, in predicting the count of limiting chronic conditions, shows that rent assistance recipients reported 0.44 fewer limiting chronic conditions than eligible non-recipients, after controlling for the baseline measure of the dependent variable.⁷ Baseline measures of the health outcomes were significant in the full model for each health outcome. Additionally, across all models, age and housing quality were statistically significant. Age was consistently associated with worse physical health, while higher-quality housing was associated with better physical health outcomes. The marginal effect of health insurance was also significant and positively related to negative health outcomes in models predicting the number of chronic conditions (Models 9 and 10) and number of limiting chronic conditions (Models 13 and 14), likely reflecting both selection into health insurance, where more ill people are more likely to have it, and diagnoses bias, where people with access to medical care are more likely to have been formally diagnosed with a health condition. After controlling for baseline health, the marginal effects for race and having children were not significant predictors of any health outcomes, whereas having a high school education or less was only significant in Models 10

⁶In contrast to earlier tables, we do not include a measure for ‘any chronic condition’ in Table 5, because having a chronic condition at baseline perfectly predicts having a chronic condition at follow.

⁷We estimated all models in Table 5 with rent assistance recipients as the reference group to compare rent assistance recipients with ineligible respondents. The difference in marginal effects for these groups was statistically significant ($p < 0.05$) for Models 9, 11, 13, and 14.

and 14, which predict the number of chronic conditions and number of limiting chronic conditions, respectively.

Table 6 is analogous to the previous table but examines mental health and health behaviors at follow-up. Except for smoking, there were no statistically significant differences between rent assistance recipients and the reference group of eligible non-recipients. Controls for race, high school education or less, and age were all statistically significant in Model 16, predicting major or minor depression after controlling for baseline depression. Relative to whites, African American respondents were less likely than whites to be depressed, while having a high school education or less and higher age were associated with an increased probability of depression. In Model 18, housing quality was negatively associated with the probability of hazardous or harmful alcohol use, whereas the association between health insurance and hazardous or harmful alcohol use was positive. Model 20 shows that the probability of being a smoker at follow-up was 12 percentage points higher for rent assistance recipients than eligible non-recipients after controlling for smoking at baseline. Other statistically significant variables include income and neighborhood quality. Higher income was associated with an increase in the probability of smoking, while an improvement neighborhood quality was associated with a decrease in the probability of smoking. In Model 22 predicting BMI, marginal effects for being a woman, household income, and housing quality were all statistically significant and associated with having a higher BMI. An increase in age was associated with lower BMI.

Sensitivity Analysis

We examined how sensitive our results are to changes in model specification and measurement in several ways. (Complete sensitivity analyses results are available from the authors upon request.) Although HUD guidelines set the income eligibility limit at 50 percent of local median income, they require that 75 percent of total assistance be given to households whose incomes are 30 percent or less of the local median. In current conditions of rent assistance shortage, this means that almost all the program recipients have household incomes below this more stringent threshold. We constructed an alternative indicator of eligibility and ineligibility where we considered only those households that met the lower threshold as eligible and found that the regression coefficients remained the same or nearly the same in magnitude.

Finally, to address remaining concerns about selection into the treatment and control groups, we re-estimated all models as regression-adjusted treatment effects models, and we tested a supplementary coarsened matching design that only compared recipients and non-recipients who were very similar on all observable characteristics at baseline. Upon inspection of the results from both strategies, we found that the estimated coefficients were largely consistent with the results reported from the main regression models. Because neither of these methods can be seamlessly integrated with complex population survey weights, and because our sample size was substantially reduced after the coarsened matching procedure, we opted to present results from the more standard regression models.

DISCUSSION

Rent assistance influences recipients' lives across multiple domains, including housing stability, employment, and children's school performance (Carlson et al., 2009; Currie & Yelowitz, 2000; Fertig & Reingold, 2007). Theoretical frameworks on socioeconomic resources and health lead us to anticipate that rent assistance would usually contribute to better health of eligible recipients in comparison to eligible non-recipients (Adler & Newman, 2002). Yet, the extant research in this area has thus far been inconclusive and has shown inconsistent associations across experimental and observational study designs, different populations, and outcomes. While some scholars have demonstrated that rent assistance recipients are less healthy prior to assistance receipt and continue to be less healthy while receiving assistance (Ruel et al., 2010), others have highlighted a positive effect of rent assistance on health (Ludwig et al., 2013) and, in other instances, found little or no relationship between the two (Meyers et al., 2005). Most recent work in a national sample found that public housing PBRA residents had reduced odds of poor or fair health, but HCV recipients did not (Fenelon et al., 2017). The incomplete understanding of the links between rent assistance and health prevents us from designing and administering rent assistance programs in a way that would be most beneficial to the recipients' health and enhance their chances of moving out of poverty. Moreover, it complicates the assessment of the potential benefits that would follow from expanding the program to households that are income-eligible but currently excluded due to a lack of federal funds.

Our study builds on prior research and examines the associations between a variety of health indicators and rent assistance in a population-representative longitudinal dataset collected in the Detroit area. The results point to a complex set of associations between rent assistance and health. Similar to past work, we find that rent assistance recipients had worse physical health than eligible non-recipients when measured at the onset of the study. Their baseline health disadvantage, however, did not extend to mental and behavioral health; rent assistance recipients had no greater probability of depression, harmful alcohol use, or smoking than eligible non-recipients, and their BMI, too, was comparable. The cross-sectional results provide further evidence in support of the selection hypothesis that less physically healthy people may be more likely to either seek out or receive rent assistance in the first place.

When we evaluated the health of rent assistance recipients and non-recipients who maintained their receipt and non-receipt statuses consistently for the duration of the study, we found that recipients and eligible non-recipients reported similar numbers of chronic conditions after four years, both when adjusted for the prior health disadvantage of assistance recipients and without the adjustment. As rent assistance recipients had worse physical health at baseline, the absence of a statistically significant difference between the groups at the end of the study is substantively significant. Though the physical health of people in all groups deteriorated over the course of the study, the rent assistance recipients' physical health deteriorated less markedly than that of eligible non-recipients: they developed fewer new limiting chronic conditions on average. This finding suggests that rent assistance may yield protective physical health benefits over time.

The results of the models where we evaluated the change in mental and behavioral health presented a less favorable picture. While there were no statistically significant differences between the probabilities of harmful and hazardous alcohol use and average BMI across groups, and between the probabilities of depression of eligible recipients and non-recipients, we observed an increased probability of smoking for assistance recipients in comparison to other groups. Over the study period, the prevalence of smoking decreased among eligible non-recipients and ineligible non-recipients, contrasting with an increase in smoking prevalence among rent assistance recipients, who were least likely to smoke at the baseline of the study. In line with the hypothesized substitution mechanism, low-income households that had rent assistance may be more likely to afford buying cigarettes. While rent assistance may have positive implications for physical well-being in the three-county Detroit area, the associated increase in smoking among recipients could offset some of the potential physical health benefits in the long run.

Limitations

Although our study presents an important step in advancing the scholarly understanding of the relationship between rent assistance and health, it has several limitations that need to be addressed by future research. The main strength of our survey is that it collected a rich set of health outcomes measured at three points over a four-year period. A trade-off of such a detailed data collection is smaller sample size. It is possible that we were unable to detect associations between physical and behavioral health outcomes and rent assistance that would have been apparent in a larger sample. The relatively small sample size also prevented us from considering the possible interactive relationships between rent assistance and demographic characteristics, such as gender or race. It could be that while rent assistance is associated with better health outcomes for one group, it has no positive associations for another. However, because rent assistance recipients in our sample are overwhelmingly African American and women, the possible interaction would only apply to a small subset of individuals.

Additionally, the sample consists of working-age adults, with a mean baseline age of 35. The associations between health and rent assistance may have been more apparent in an older sample that is at a greater risk of chronic disease limitations. Furthermore, our observational period is too short to capture some of the health changes related to rent assistance receipt. We encourage future studies to consider the long-term effects we were unable to capture here.

The well-defined regional scope of the sample presents an advantage over nationally representative studies because our respondents generally faced the same housing and economic conditions over the study period. The local sampling frame however also implies that our results may not be generalizable to other geographic areas or time periods. For example, Southeast Michigan was disproportionately affected by unemployment and job loss relative to other areas throughout the country during the Great Recession. It is possible that the relationship between rent assistance and health outcomes operates differently during periods of less severe economic distress and in less-troubled housing markets. As there is a large degree of regional variation in both rent assistance availability and housing markets,

we recommend that future studies of rent assistance and health pay careful attention to local conditions rather than aspire to broad-scale generalizations.

Our study would have been strengthened by collecting data on participants' history of rent assistance receipt. While some of our respondents may be new to the program, others could be long-time recipients. The associations between rent assistance and health could vary in magnitude over receipt tenure or be non-linear. For example, new recipients may experience a rapid improvement in health shortly after enrolling in the program, or, in contrast, the health effects of rent assistance may not materialize until after several years of receipt.

In addition, the survey item we used for measuring rent assistance in our study does not allow us to delineate between the specific types of programs our respondents could be participating in. We used respondents' addresses along with data from housing commissions in Southeast Michigan to determine whether they lived in a standard public housing complex or received another type of assistance. We determined that none of our respondents were public housing recipients and thus most likely participated in HCV or PBRA. Similarly, we assessed respondents' eligibility for rent assistance using their self-reported income. These self-reported data may not be accurate in all instances, and some respondents may have been misclassified. A systematic misclassification of respondents would introduce bias into the results of the study.

Conclusion

Real housing costs borne by the poor have risen sharply in the past 30 years due to the growth in rents and utilities, and the stagnation and decrease of incomes in the bottom rungs of the income distribution (Desmond, 2016). Federal rent assistance, a program aiming to provide safe, decent, and affordable housing to low-income Americans, has failed to rise to the challenge and does not shelter most eligible Americans (Congressional Budget Office, 2015). In 2013, for example, only 28 units were available for every 100 eligible renter households with incomes at or below 30 percent of the area median income (Leopold, Getsinger, Blumenthal, Abazajian, & Jordan, 2015).

Our study contributes to the growing literature that examines the consequences of rent assistance receipt (and non-receipt) across multiple domains of low-income Americans' lives. We draw on theoretical frameworks that anticipate predominantly positive associations between rent assistance and health, and on past experimental and observational evidence that reports mixed associations between rent assistance and health. The relationships we uncover are complex and countervailing. Detroit area rent assistance recipients are less physically healthy at baseline, but their health appears to deteriorate less steeply in the medium-term than that of similar non-recipients. This finding implies that rent assistance might have a protective effect on the physical health of this vulnerable subpopulation. At the same time, our results show an increase in smoking over time in the recipient group, which contrasts with the decrease we observed in both the eligible and ineligible subpopulations. Because the increased probability in smoking among rent assistance recipients could have health-harming effects in the long run, we recommend strengthened tobacco control policy efforts, such as assiduous controls of minimum pack sizes and tobacco advertising regulations, in neighborhoods with a large share of rent assistance recipient residents. Additional gains may

be achieved by implementing the recently approved HUD smoke-free housing policy not only in public housing, but in all assisted units.⁸

References

- Adler NE, & Newman K (2002). Socioeconomic disparities in health: Pathways and policies. *Health Affairs*, 21(2), 60–76. [PubMed: 11900187]
- Allen JP, Litten RZ, Fertig JB, & Babor T (1997). A review of research on the Alcohol Use Disorders Identification Test (AUDIT). *Alcoholism: clinical and experimental research*, 21(4), 613–619.
- Burgard SA, Seefeldt KS, & Zelner S (2012). Housing instability and health: Findings from the Michigan Recession and Recovery Study. *Social Science & Medicine*, 75(12), 2215–2224. doi: 10.1016/j.socscimed.2012.08.020 [PubMed: 22981839]
- Carlson D, Haveman R, Kaplan T, Wolfe B, Heinrich C, Kling J, ... Painter G (2009). Long-term effects of public low-income housing vouchers on labor market outcomes. Discussion Paper. Institute for Research on Poverty University of Wisconsin-Madison.
- Chambers EC, Fuster D, Suglia SF, & Rosenbaum E (2015). Depressive symptomology and hostile affect among Latinos using housing rental assistance: The AHOME study. *Journal of Urban Health*, 92(4), 611–621. [PubMed: 26014382]
- Chambers EC, & Rosenbaum E (2014). Cardiovascular health outcomes of Latinos in the Affordable Housing as an Obesity Mediating Environment (AHOME) study: A study of rental assistance use. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 91(3), 489–498. doi: 10.1007/s11524-013-9840-9 [PubMed: 24190105]
- Churchill S, Holin MJ, Khadduri J, & Turnham J (2001). Strategies that enhance community relations in tenant-based Section 8 programs. Retrieved from Washington, DC: Abt Associates Inc:
- Congressional Budget Office. (2015). Federal housing assistance for low-income households. Retrieved from Washington, DC.:
- Crump J (2002). Deconcentration by Demolition: Public Housing, Poverty, and Urban Policy. *Environment and Planning D: Society and Space*, 20(5), 581–596. doi:10.1068/d306
- Currie J, & Yelowitz A (2000). Are public housing projects good for kids? *Journal of Public Economics*, 75(1), 99–124. doi:10.1016/s0047-2727(99)00065-1
- Darrah J, & DeLuca S (2014). “Living Here has Changed My Whole Perspective”: How Escaping Inner-City Poverty Shapes Neighborhood and Housing Choice. *Journal of Policy Analysis and Management*, 33(2), 350–384. doi:10.1002/pam.21758
- Desmond M (2016). *Evicted: poverty and profit in the American city*. New York: Crown.
- Digenis-Bury EC, Brooks DR, Chen L, Ostrem M, & Horsburgh CR (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]
- Ellen IG, Mijanovich T, & Dillman KN (2001). Neighborhood effects on health: exploring the links and assessing the evidence. *Journal of Urban Affairs*, 23(3–4), 391–408.
- Evans GW, Wells NM, & Moch A (2003). Housing and mental health: A review of the evidence and a methodological and conceptual critique. *Journal of Social Issues*, 59(3), 475–500.
- Fenelon A, Mayne P, Simon AE, Rossen LM, Helms V, Lloyd P, ... Steffen BL (2017). Housing Assistance Programs and Adult Health in the United States. *Am J Public Health*, 107(4), 571–578. doi:10.2105/AJPH.2016.303649 [PubMed: 28207335]
- Fertig AR, & Reingold DA (2007). Public housing, health, and health behaviors: Is there a connection? *Journal of Policy Analysis and Management*, 26(4), 831–860. doi:10.1002/pam.20288 [PubMed: 17894032]
- Garg A, Burrell L, Tripodis Y, Goodman E, Brooks-Gunn J, & Duggan AK (2013). Maternal Mental Health during Children’s First Year of Life: Association with Receipt of Section 8 Rental Assistance. *Housing Policy Debate*, 23(2), 281–297. doi:10.1080/10511482.2012.762033

⁸See Instituting Smoke-Free Public Housing, 24 C.F.R. §§ 965–966 (2016).

- Joint Center for Housing Studies. (2013). The state of the nation's housing. Retrieved from Cambridge, MA: Harvard University: http://www.jchs.harvard.edu/research/state_nations_housing
- Kim H, Burgard SA, & Seefeldt KS (2017). Housing Assistance and Housing Insecurity: A Study of Renters in Southeastern Michigan in the Wake of the Great Recession. *Social Service Review*, 91(1), 41–70.
- Krieger J, & Higgins DL (2002). Housing and Health: Time Again for Public Health Action. *American Journal of Public Health*, 92(5), 758–768. doi:10.2105/AJPH.92.5.758 [PubMed: 11988443]
- Leopold J, Getsinger L, Blumenthal P, Abazajian K, & Jordan R (2015). The housing affordability gap for extremely low-income renters in 2013. Retrieved from Washington, DC: Urban Institute:
- Leventhal T, & Brooks-Gunn J (2003). Moving to Opportunity: an Experimental Study of Neighborhood Effects on Mental Health. *American Journal of Public Health*, 93(9), 1576–1582. doi:10.2105/AJPH.93.9.1576 [PubMed: 12948983]
- Link BG, & Phelan JC (2001). Conceptualizing Stigma. *Annual Review of Sociology*, 27(1), 363–385. doi:10.1146/annurev.soc.27.1.363
- Long JS, & Freese J (2014). Regression models for categorical dependent variables using Stata. College Station, Texas: A Stata Press Publication, Statacorp LP.
- Lubell J, Morley R, Ashe M, Merola L, & Levi J (2011). Housing and health: New opportunities for dialogue and action. Washington, DC: National Center for Healthy Housing.
- Ludwig J, Duncan GJ, Gennetian LA, Katz LF, Kessler RC, Kling JR, & Sanbonmatsu L (2013). Long-term neighborhood effects on low-income families: Evidence from Moving to Opportunity. *American Economic Review*, 103(3), 226–231. doi:10.1257/aer.103.3.226
- Manjarrez CA, Popkin SJ, & Guernsey E (2007). Poor health: Adding insult to injury for HOPE VI families. Retrieved from Washington, DC: Urban Institute:
- Martin A, Rief W, Klaiberg A, & Braehler E (2006). Validity of the brief patient health questionnaire mood scale (PHQ-9) in the general population. *General hospital psychiatry*, 28(1), 71–77. [PubMed: 16377369]
- McCarty M (2014a). Introduction to Public Housing (R41654). Retrieved from Washington, D.C.: <http://congressional.proquest.com/congressional/docview/t21.d22.crs-2014-dsp-0117?accountid=14667>
- McCarty M (2014b). Section 8 Housing Choice Voucher Program: Issues and Reform Proposals (RL34002). Retrieved from Washington, D.C.: <http://congressional.proquest.com/congressional/docview/t21.d22.crs-2014-dsp-0099?accountid=14667>
- McCarty M, Perl L, & Jones K (2014). Overview of Federal Housing Assistance Programs and Policy (RL34591). Retrieved from Washington, D.C.: <http://congressional.proquest.com/congressional/docview/t21.d22.crs-2014-dsp-0206?accountid=14667>
- Meltzer R, & Schwartz A (2016). Housing Affordability and Health: Evidence From New York City. *Housing Policy Debate*, 26(1), 80–104. doi:10.1080/10511482.2015.1020321
- Meyers A, Cutts D, Frank DA, Levenson S, Skalicky A, Heeren T, ... Zaldivar N (2005). Subsidized Housing and Children's Nutritional Status: Data From a Multisite Surveillance Study. *Archives of pediatrics & adolescent medicine*, 159(6), 551. doi:10.1001/archpedi.159.6.551 [PubMed: 15939854]
- Phinney R (2013). Exploring residential mobility among low-income families. *Social Service Review*, 87(4), 780–815. doi:10.1086/673963
- Phinney R, Danziger S, Pollack HA, & Seefeldt K (2007). Housing instability among current and former welfare recipients. *American Journal of Public Health*, 97(5), 832–837. doi:10.2105/AJPH.2005.082677 [PubMed: 17267717]
- Ruel E, Oakley D, Wilson GE, & Maddox R (2010). Is Public Housing the Cause of Poor Health or a Safety Net for the Unhealthy Poor? *Journal of Urban Health*, 87(5), 827–838. doi:10.1007/s11524-010-9484-y [PubMed: 20585883]
- Schoeni RF, House JS, Kaplan GA, & Pollack H (2008). Making Americans healthier: social and economic policy as health policy. New York, NY: Russell Sage Foundation.
- Schwartz AF (2010). Housing policy in the United States. New York: Routledge.
- Shlay AB (1993). Family Self-Sufficiency and Housing. *Housing Policy Debate*, 4(3), 457–495.

- StataCorp. (2015). Stata statistical software: Release 14 (Version 14.1). College Station, TX: StataCorp LP.
- U.S. Census Bureau. (2015). American Community Survey 2010–2014: 5 year estimates.
- U.S. Census Bureau. (2016). American Community Survey 1-Year Estimates.
- U.S. Department of Housing and Urban Development. (2013). HUD Handbook 4350.3: Occupancy Requirements of Subsidized Multifamily Housing Programs. Retrieved from <https://www.hud.gov/sites/documents/43503HSGH.PDF>.
- U.S. Department of Housing and Urban Development. (2015). Family options study: Short-term impacts of housing and services Interventions for homeless families. Retrieved from Washington, DC:
- U.S. Department of Housing and Urban Development. (2016). County Housing Assistance Data. Retrieved from: https://www.huduser.gov/portal/datasets/pictures/files/COUNTY_2015.xlsx
- Urban Institute. (2017). The Detroit Housing Market: Challenges and Innovations for a Path Forward. Retrieved from https://www.urban.org/sites/default/files/publication/88656/detroit_path_forward_finalized.pdf
- Varady DP (2010). What should housing vouchers do? A review of the recent literature. *Journal of Housing and the Built Environment*, 25(4), 391–407. doi:10.1007/s10901-010-9199-0
- Wang X, & Varady DP (2005). Using hot-spot analysis to study the clustering of Section 8 housing voucher families. *Housing Studies*, 20(1), 29–48.
- Wang X, Varady DP, & Wang Y (2008). Measuring the deconcentration of housing choice voucher program recipients in eight U.S. metropolitan areas using hot spot analysis. *Cityscape*, 10(1), 65–90.
- Wood M, Turnham J, & Mills G (2008). Housing affordability and family well-being: Results from the housing voucher evaluation. *Housing Policy Debate*, 19(2), 367–412.

Figure 1. Health conditions by rent assistance eligibility and receipt for three waves of the MRRS (n=148)

Note: Figure 1 includes respondents with consistent rent assistance eligibility and receipt across all three waves. The figure corresponds to the analytic sample for Tables 4 to 6 except that it excludes two individuals who were missing data on the outcomes at Wave 2. The figure was constructed using Wave 3 weights.

Table 1.

Population-weighted characteristics of MRRS non-homeowner respondents measured at baseline (2009–2010), stratified by rent assistance receipt and eligibility at baseline.

	Overall	Rent assistance eligible/ receiving at baseline	Rent assistance income eligible/not receiving at baseline	Rent assistance income ineligible/not receiving at baseline	p for diff.
<i>Demographic and Socioeconomic Characteristics Measured at Baseline</i>					
% Women	54	79	59	46	0.048
% African American	41	92	54	21	<0.001
% HS or less at baseline	50	57	65	32	<0.001
% Married or cohabitating at baseline	35	13	33	40	0.119
% With children in household at baseline	49	65	52	44	0.456
Mean age in years at baseline	35.14	38.90	35.35	34.38	0.585
CI	[32.88,37.40]	[28.42,49.37]	[32.35,38.35]	[32.45,36.32]	---
Mean household income at baseline (\$)	42,571	9,936	16,224	74,318	<0.001
CI	[36,365,48,777]	[7,789,12,083]	[12,865,19,584]	[64,582,84,054]	---
Mean housing unit quality score at baseline (range: -3.1, 0.3; higher=better)	0.03	0.00	-0.02	0.07	0.586
CI	[-0.06,0.11]	[-0.19,0.18]	[-0.19,0.16]	[-0.01,0.16]	---
Mean neighborhood quality score at baseline (range: -1.9, 1.0; higher=better)	0.07	-0.46	-0.14	0.36	<0.001
CI	[-0.07,0.21]	[-0.72,-0.20]	[-0.30,0.01]	[0.21,0.52]	---
% Health insurance at baseline	69	83	59	78	<0.001
<i>Health Outcomes Measured at Baseline</i>					
% Any chronic condition at baseline	46	68	46	43	0.277
Mean number of chronic conditions at baseline (range: 0,7) ^a	0.79	1.49	0.83	0.65	0.066
CI	[0.66,0.92]	[0.78,2.20]	[0.63,1.02]	[0.45,0.84]	---
% Any limiting chronic conditions at baseline	26	55	31	18	0.004
Mean number of limiting chronic conditions at baseline (range: 0,7) ^a	0.47	1.31	0.61	0.21	0.002
CI	[0.34,0.60]	[0.48,2.14]	[0.42,0.80]	[0.11,0.32]	---
% Major or minor depression at baseline	19	29	21	15	0.429
% Hazardous or harmful alcohol use at baseline	17	12	11	23	0.015
% Smoker at baseline	46	43	52	42	0.196

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	Overall	Rent assistance eligible/ receiving at baseline	Rent assistance income eligible/not receiving at baseline	Rent assistance income ineligible/not receiving at baseline	p for diff.
Body mass index at baseline	27.91	29.52	27.53	28.06	0.214
CI	[26.94,28.88]	[27.90,31.15]	[25.90,29.16]	[26.08,30.05]	---
N	400	62	200	138	---

Note:

^aThe potential number of chronic conditions and limiting chronic conditions ranges from 0 to 8.

Table 2.

Average marginal effects and standard errors from regression models predicting physical health-related outcomes by rent assistance receipt for non-homeowners at baseline of the MRRS (2009–2010).

	(1)		(2)		(3)		(4)	
	Any chronic condition at baseline ^b		Number of chronic conditions at baseline ^c		Any limiting chronic condition at baseline ^b		Number of limiting chronic conditions at baseline ^c	
Received assistance at baseline ^a	0.10		0.17	+	0.07		0.16	*
	(0.07)		(0.09)		(0.04)		(0.08)	
Ineligible for assistance at baseline ^a	0.09		0.11		−0.02		−0.19	
	(0.11)		(0.19)		(0.07)		(0.13)	
Women	0.05		0.14		0.09		0.10	
	(0.11)		(0.19)		(0.06)		(0.11)	
African American	0.12	+	0.31	+	0.06		0.18	+
	(0.07)		(0.16)		(0.06)		(0.10)	
High school or less at baseline (y/n)	0.12	*	0.11		0.05		0.05	
	(0.05)		(0.10)		(0.05)		(0.09)	
Married or cohabitating at baseline (y/n)	−0.08		−0.04		−0.06		−0.10	
	(0.08)		(0.18)		(0.04)		(0.09)	
Children in household at baseline (y/n)	0.05		0.11		0.04		0.11	
	(0.08)		(0.15)		(0.08)		(0.13)	
Age at baseline	0.011	***	0.03	***	(0.009)	***	0.027	***
	(0.002)		(0.01)		(0.001)		(0.005)	
LN household income at baseline	−0.01		−0.02		−0.01		−0.02	
	(0.01)		(0.02)		(0.01)		(0.01)	
Housing unit quality at baseline (higher = better)	−0.01		−0.04		−0.07	+	−0.11	+
	(0.05)		(0.08)		(0.04)		(0.05)	
Neighborhood quality at baseline (higher = better)	−0.01		−0.10		−0.05		−0.14	*
	(0.05)		(0.07)		(0.04)		(0.07)	
Health insurance at baseline (y/n)	0.04		0.10		0.08		0.20	
	(0.09)		(0.18)		(0.07)		(0.12)	
F	6.779		12.070		2.801		13.420	
Prob>F	0.001		<0.001		0.044		<0.001	
N	400		400		400		400	

Notes:

^aEligible but no receipt at baseline is the reference group.

^b Marginal effects from logit model for binary outcomes.

^c Marginal effects from negative binomial model for count outcomes.

⁺
p<0.10

^{*}
p<0.05

^{**}
p<0.01

^{***}
p<0.001

Table 3.

Average marginal effects and standard errors from regression models predicting psychological and behavioral health-related outcomes by rent assistance receipt for non-homeowners at baseline of the MRRS (2009–2010).

	(5)	(6)	(7)	(8)
	Major or minor depression at baseline ^b	Harmful and hazardous alcohol use at baseline ^b	Smoker at baseline ^b	Body mass index at baseline ^c
Received assistance at baseline ^a	0.04 (0.08)	0.11 (0.08)	−0.03 (0.07)	0.19 (1.24)
Ineligible for assistance at baseline ^a	0.01 (0.07)	0.11 (0.06)	+ −0.06 (0.07)	2.04 (1.11)
Women	0.14 (0.04)	** −0.04 (0.06)	−0.02 (0.05)	0.43 (0.75)
African American	−0.05 (0.06)	−0.12 (0.06)	* −0.09 (0.07)	3.42 (0.81)
High school or less at baseline (y/n)	0.10 (0.07)	0.13 (0.07)	+ 0.21 (0.07)	** 2.29 (0.94)
Married or cohabitating at baseline (y/n)	0.08 (0.07)	−0.01 (0.05)	0.12 (0.06)	* 0.40 (1.04)
Children in household at baseline (y/n)	−0.01 (0.05)	−0.10 (0.05)	* −0.18 (0.06)	** 1.67 (1.04)
Age at baseline	0.007 (0.003)	* −0.004 (0.002)	+ −0.0001 (0.0022)	0.18 (0.02)
LN household income at baseline	−0.004 (0.008)	−0.01 (0.01)	0.01 (0.01)	0.16 (0.13)
Housing unit quality at baseline (higher=better)	−0.03 (0.03)	0.004 (0.061)	−0.08 (0.06)	−1.12 (1.10)
Neighborhood quality at baseline (higher=better)	−0.05 (0.02)	+ 0.01 (0.03)	−0.10 (0.04)	* 0.78 (0.46)
Health insurance at baseline (y/n)	0.01 (0.04)	0.005 (0.045)	0.06 (0.09)	0.47 (0.95)
F	4.383	2.237	7.403	7.496
Prob>F	0.008	0.089	0.001	0.001
N	400	400	400	400

Notes:

^{a)} Eligible but no receipt at baseline is the reference group.

^{b)} Marginal effects from logit model for binary outcomes.

^c Marginal effects from linear model for continuous outcomes.

⁺
p<0.10

^{*}
p<0.05

^{**}
p<0.01

^{***}
p<0.001

Table 4.

Population-weighted characteristics of MRRS non-homeowner respondents measured at baseline (2009–2010) and at follow-up (2013), stratified by continuous rent assistance receipt and eligibility.

	Overall	Rent assistance eligible/ receiving at all waves	Rent assistance income eligible/not receiving at all waves	Rent assistance income ineligible/not receiving at all waves	p for diff.
<i>Demographic and Socioeconomic Characteristics Measured at Baseline</i>					
% Women	58	82	65	46	0.067
% African American	53	91	72	22	<0.001
% HS or less at baseline	52	63	77	22	<0.001
% Married or cohabitating at baseline	31	5	31	37	0.074
% With children in household at baseline	47	65	54	35	0.085
Mean age in years at baseline	35.93	41.97	35.69	34.86	0.445
CI	[33.45,38.41]	[31.53,52.41]	[32.38,39.00]	[30.41,39.31]	---
<i>Socioeconomic Characteristics Measured at Follow-up</i>					
Mean household income at follow-up (\$)	44,429	9,043	12,990	87,957	<0.001
CI	[36,058,52,801]	[7,196,10,890]	[9,921,16,059]	[76,162,99,751]	---
Mean housing unit quality score at follow-up (range: -3.1, 0.3; higher = better)	-0.10	-0.01	-0.33	0.13	<0.001
CI	[-0.19,-0.02]	[-0.13,0.11]	[-0.48,-0.17]	[0.08,0.18]	---
Mean neighborhood quality score at follow-up (range: -2.0, 0.7; higher = better)	0.02	-0.40	-0.36	0.55	<0.001
CI	[-0.13,0.18]	[-0.98,0.18]	[-0.52,-0.20]	[0.49,0.62]	---
% Health insurance at follow-up	65	88	47	80	<0.001
<i>Health Outcomes Measured at Baseline and Follow-up</i>					
% Any chronic condition at baseline	49	70	43	50	0.078
% Any chronic condition at follow-up	62	79	68	51	0.023
Mean number of chronic conditions at baseline (range: 0.7) ^a	0.93	1.68	0.90	0.79	0.174
CI	[0.68,1.17]	[0.79,2.56]	[0.52,1.27]	[0.52,1.06]	---
Mean number of chronic conditions at follow-up (range: 0.8) ^a	1.32	2.17	1.51	0.91	0.006
CI	[1.03,1.60]	[1.34,3.00]	[1.10,1.92]	[0.62,1.20]	---
% Any limiting chronic conditions at baseline	29	57	32	19	0.019
% Any limiting chronic conditions at follow-up	40	58	56	17	0.002

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	Overall	Rent assistance eligible/ receiving at all waves	Rent assistance income eligible/not receiving at all waves	Rent assistance income ineligible/not receiving at all waves	p for diff.
Mean number of limiting chronic conditions at baseline (range: 0,6) ^a	0.57	1.45	0.70	0.22	0.004
CI	[0.32,0.81]	[0.50,2.40]	[0.37,1.02]	[0.07,0.37]	---
Mean number of limiting chronic conditions at follow-up (range: 0,6) ^a	0.85	1.50	1.29	0.21	<0.001
CI	[0.54,1.16]	[0.72,2.27]	[0.82,1.76]	[0.08,0.34]	---
% Major or minor depression at baseline	14	23	22	3	<0.001
% Major or minor depression at follow-up	17	28	28	3	<0.001
% Hazardous or harmful alcohol use at baseline	12	9	7	19	0.002
% Hazardous or harmful alcohol use at follow-up	11	12	10	12	0.890
% Smoker at baseline	46	31	58	36	0.036
% Smoker at follow-up	37	37	51	21	0.001
Body mass index at baseline	28.03	30.26	27.35	28.31	0.248
CI	[27.15,28.92]	[27.59,32.93]	[25.22,29.47]	[26.24,30.39]	---
Body mass index at follow-up	29.03	30.65	29.04	28.67	0.329
CI	[27.02,31.05]	[28.09,33.21]	[24.11,33.97]	[27.12,30.23]	---
N	150	31	76	43	---

Note:

^aThe potential number of chronic conditions and limiting chronic conditions ranges from 0 to 8.

Table 5.

Average marginal effects and standard errors from regression models predicting physical health-related outcomes at follow-up for non-homeowners with consistent rent assistance eligibility and receipt across three MRRS waves (2009–2010, 2011, and 2013).

	(9)	(10)	(11)	(12)	(13)	(14)
	Number of chronic conditions at follow- up ^b	Number of chronic conditions at follow- up ^b	Any limiting chronic condition at follow- up ^c	Any limiting chronic condition at follow-up ^c	Number of limiting chronic conditions at follow-up ^b	Number of limiting chronic conditions at follow-up ^b
Received assistance at all waves ^a	−0.04 (0.29)	−0.22 (0.26)	−0.08 (0.15)	−0.12 (0.17)	−0.38 (0.24)	−0.44 (0.25)
Ineligible for assistance at all waves ^a	−0.56 ⁺ (0.28)	−0.37 (0.24)	−0.32 ^{**} (0.11)	−0.29 ^{**} (0.08)	−1.08 ^{***} (0.25)	−0.92 ^{***} (0.22)
Women	0.49 [*] (0.19)	0.33 [*] (0.15)	0.08 (0.07)	0.08 (0.06)	0.33 ⁺ (0.17)	0.26 ⁺ (0.13)
African American	0.60 [*] (0.21)	0.22 (0.18)	0.06 (0.10)	0.03 (0.10)	0.28 (0.16)	0.08 (0.15)
High school or less at baseline (y/n)	0.28 (0.17)	0.54 ^{***} (0.09)	0.09 (0.07)	0.04 (0.05)	0.23 (0.16)	0.32 ⁺ (0.16)
Married or cohabitating at baseline (y/n)	0.29 (0.30)	0.34 (0.30)	0.13 (0.12)	0.11 (0.13)	0.22 (0.24)	0.33 (0.28)
Children in household at baseline (y/n)	−0.07 (0.25)	−0.15 (0.23)	0.04 (0.05)	−0.02 (0.05)	0.07 (0.26)	0.06 (0.21)
Age at baseline	0.05 ^{***} (0.01)	0.02 [*] (0.01)	0.015 ^{***} (0.002)	0.013 ^{**} (0.003)	0.06 ^{***} (0.01)	0.04 ^{***} (0.01)
LN household income at follow- up	0.05 (0.07)	0.03 (0.05)	0.005 (0.013)	0.01 (0.01)	0.01 (0.06)	0.01 (0.04)
Housing unit quality at follow-up (higher = better)	−0.26 ^{**} (0.09)	−0.19 [*] (0.08)	−0.11 ^{**} (0.03)	−0.12 ^{***} (0.03)	−0.32 ^{***} (0.07)	−0.19 [*] (0.08)

	(9)	(10)	(11)	(12)	(13)	(14)
	Number of chronic conditions at follow- up ^b	Number of chronic conditions at follow- up ^b	Any limiting chronic condition at follow- up ^c	Any limiting chronic condition at follow-up ^c	Number of limiting chronic conditions at follow-up ^b	Number of limiting chronic conditions at follow-up ^b
Neighborhood quality at follow- up (higher = better)	0.16 (0.14)	0.09 (0.13)	0.04 (0.04)	0.01 (0.04)	0.07 (0.10)	0.02 (0.09)
Health insurance at follow-up (y/n)	0.51 (0.18)	0.66 (0.22)	0.09 (0.07)	0.08 (0.08)	0.41 (0.19)	0.42 (0.22)
Number of chronic conditions at baseline		0.49 (0.05)				
Any limiting chronic condition at baseline (y/n)				0.36 (0.06)		
Number of limiting chronic conditions at baseline						0.23 (0.04)
F	19.450	23.030	17.270	5.879	66.440	121.500
Prob>F	<0.001	0.001	0.001	0.031	<0.001	<0.001
N	150	150	150	150	150	150

Notes:

^aEligible but no receipt at all waves is the reference group.

^bMarginal effects from negative binomial model for count outcomes.

^cMarginal effects from logit model for binary outcomes.

⁺p<0.10

^{*}p<0.05

^{**}p<0.01

^{***}p<0.001

Table 6.

Average marginal effects and standard errors from regression models predicting psychological and behavioral health-related outcomes at follow-up for non-homeowners with consistent rent assistance eligibility and receipt across three MRRS waves (2009–2010, 2011, and 2013).

	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	Major or minor depression at follow-up ^b	Major or minor depression at follow-up ^b	Harmful and hazardous alcohol use at follow-up ^b	Harmful and hazardous alcohol use at follow-up ^b	Smoker at follow-up ^b	Smoker at follow-up ^b	Body mass index at follow-up ^c	Body mass index at follow-up ^c
Received assistance at all waves ^a	−0.03 (0.09)	−0.01 (0.08)	0.04 (0.06)	0.04 (0.08)	0.00002 (0.11)	0.12 (0.04)	−2.94 (3.46)	−2.74 (2.75)
Ineligible for assistance at all waves ^a	−0.21 (0.05)	−0.18 (0.04)	0.04 (0.05)	0.01 (0.05)	−0.22 (0.06)	−0.13 (0.05)	0.43 (3.06)	−2.18 (1.69)
Women	−0.05 (0.05)	−0.05 (0.05)	−0.13 (0.09)	−0.14 (0.08)	0.11 (0.05)	0.06 (0.04)	2.66 (0.73)	1.83 (0.52)
African American	−0.11 (0.05)	−0.09 (0.05)	0.02 (0.05)	0.01 (0.05)	−0.14 (0.07)	−0.12 (0.07)	7.13 (1.86)	2.15 (1.66)
High school or less at baseline (y/n)	0.11 (0.05)	0.10 (0.04)	0.00 (0.06)	0.02 (0.04)	0.07 (0.09)	−0.01 (0.05)	1.31 (2.19)	0.84 (1.38)
Married or cohabitating at baseline (y/n)	−0.001 (0.051)	−0.02 (0.05)	0.11 (0.08)	0.11 (0.10)	0.22 (0.10)	0.06 (0.05)	−2.88 (2.14)	−0.80 (1.55)
Children in household at baseline (y/n)	0.13 (0.05)	0.10 (0.07)	0.03 (0.07)	0.03 (0.06)	−0.21 (0.07)	−0.03 (0.08)	1.50 (1.12)	0.55 (0.82)
Age at baseline	0.009 (0.001)	0.007 (0.002)	0.0001 (0.0020)	0.001 (0.002)	0.005 (0.003)	0.002 (0.002)	−0.03 (0.068)	−0.12 (0.051)
LN household income at follow-up	−0.001 (0.006)	−0.003 (0.006)	−0.004 (0.009)	0.004 (0.005)	0.02 (0.01)	0.01 (0.01)	0.40 (0.21)	0.30 (0.12)
Housing unit quality at follow-up (higher = better)	0.01 (0.006)	0.005 (0.006)	−0.09 (0.009)	−0.04 (0.005)	−0.04 (0.01)	−0.003 (0.01)	−0.55 (0.21)	0.61 (0.12)

	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	Major or minor depression at follow-up ^b	Major or minor depression at follow-up ^b	Harmful and hazardous alcohol use at follow-up ^b	Harmful and hazardous alcohol use at follow-up ^b	Smoker at follow-up ^b	Smoker at follow-up ^b	Body mass index at follow-up ^c	Body mass index at follow-up ^c
Neighborhood quality at follow-up (higher = better)	(0.03) -0.005 (0.031)	(0.028) 0.00 (0.03)	(0.02) -0.02 (0.02)	(0.01) -0.04 (0.03)	(0.03) -0.11 (0.05)	(0.022) -0.07 (0.03)	(0.54) 1.97 (1.71)	(0.33) 0.79 (1.28)
Health insurance at follow-up (y/n)	-0.0002 (0.0650)	-0.02 (0.06)	0.12 (0.05)	0.07 (0.04)	-0.13 (0.06)	-0.09 (0.06)	5.44 (2.28)	3.17 (2.06)
Major or minor depression at baseline (y/n)		0.14 (0.08)						
Excessive alcohol use at baseline (y/n)				0.49 (0.07)				
Smoker at baseline (y/n)						0.63 (0.10)		
Body mass index at baseline								0.91 (0.07)
F	22.770	16.370	15.170	22.250	5.325	35.190	26.290	428.400
Prob>F	<0.001	0.003	0.002	0.001	0.026	<0.001	<0.001	<0.001
N	150	150	150	150	150	150	150	150

Notes:

^aEligible but no receipt at all waves is the reference group.^bMarginal effects from logit model for binary outcomes.^cMarginal effects from linear model for continuous outcomes.⁺p<0.10^{*}p<0.05

100>0.00d

100>0.00d

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