HUD Rental Assistance and Healthy Aging in the Current Long-Term Care Landscape

By

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Abstract

HUD Rental Assistance and Healthy Aging in the Current Long-Term Care Landscape

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Population aging is coinciding with a growing affordable housing and long-term care crisis. The Department of Housing and Urban Development (HUD) provides rental assistance to roughly 1.8 million older adults, but assistance falls substantially short of demand, and little is known about the health of older HUD renters and if receipt of HUD rental assistance supports healthy aging in the community. In three separate papers, I use data from the National Health Interview Survey merged with HUD administrative data to describe the health of older HUD renters (first paper) and examine if receipt of HUD rental assistance is associated with improved access to health-related services (second paper) and better health/functioning (third paper). For the second and third papers, I use multivariate logistic regression models to compare older current HUD renters to future older HUD renters, who will start receiving rental assistance without two years after their NHIS interview (the average HUD waitlist duration). This "pseudo-waitlist" method mitigates the potential impact of selection into HUD assistance, a common limitation of prior work.

The first descriptive paper demonstrates that older HUD renters face considerable health challenges and that older housing choice voucher (HCV) holders are more likely to experience health problems compared to public housing (PH) or multifamily housing (MFH) residents. The second paper suggests that receipt of HUD rental assistance does not significantly improve access to health-related services; however, differences in access to more comprehensive health

insurance may mediate this association and should be explored in future research. The results from the third paper suggest that receipt of HUD rental assistance is associated with better self-rated health and psychological well-being, and among PH residents and HCV holders, rental assistance was also associated with better physical functioning. Taken together, the results support policies and programs that recognize the important connection between housing and health in later life. The results also serve as a reminder to not conflate the health challenges faced by older HUD renters with the effects of the program itself and call for more research to examine if and why health outcomes might differ by age and the type of HUD rental assistance received.

Chapter 1. Introduction and Dissertation Overview

Introduction

In the United States, population aging is coinciding with a growing affordable housing and long-term care crisis. As older Americans are increasingly spending more of their income on housing (Joint Center for Housing Studies, 2019), approximately 70% will need long-term care services (U.S. Department of Health and Human Services, 2019) and many struggle to find and maintain affordable housing that can adapt to their changing needs (Bipartisan Policy Center, 2016). The Department of Housing and Urban Development (HUD) provides rental assistance to roughly 1.8 million older adults, but assistance falls substantially short of demand with only 36% of income eligible older households receiving assistance (HUD, 2021). Older adults waiting for housing assistance experience homelessness, housing instability, food insecurity, poor health, and high hospital use (Carder, Kohon, Limburg, & Becker, 2018).

Households participating in HUD rental assistance programs typically pay 30% of their household income toward rent and a HUD subsidy covers the remaining costs. There are three main types of HUD rental assistance programs: housing choice vouchers, public housing, and multifamily housing. Housing choice vouchers are a tenant-based form of rental assistance meaning that recipients use the voucher in the private rental market and are not limited to units located in subsidized housing projects. Public housing and multifamily housing are considered project-based rental assistance programs since the rental subsidy is tied to a specific unit. Multifamily housing projects are privately owned, whereas public housing is publicly owned and managed by local housing agencies. Table 1 summarizes key attributes of each program in more detail.

A growing number of older HUD renters are aging within HUD housing with 27% of older adults remaining in HUD assisted housing until they are at least 85 years old (Locke et al., 2011). Households receiving HUD rental assistance are increasingly headed by an older adult and the share of HUD households with children has decreased significantly. Across HUD programs, this trend is especially dramatic in the housing choice voucher program, which has aged rapidly over the past two decades (Reina & Aiken, 2022).

Given the scope and importance of HUD rental assistance programs in the United States, it is surprising how little we know about the health and long-term care needs of older HUD renters, especially among the growing population of older housing choice voucher holders (Dawkins & Miller, 2017; Reina & Aiken, 2022). Recent studies have found that HUD rental assistance is associated with improved self-rated health, psychological well-being (Fenelon et al., 2017), and healthcare access (Simon et al., 2017), but these studies either do not include or do not specifically examine these effects among older adults.

Shaped by the current policy context (e.g., access to Medicare and Social Security), research also suggests key differences among HUD renters based on age. Compared to HUD-assisted adults ages 18-61, older HUD renters are more likely to have significant health challenges, but are also more likely to be insured, receive preventive care, and be able to afford needed care (Brucker et al., 2018). Given that older adults have worse health, but also better access to healthcare compared to younger adults, it is not known if older adults experience similar health benefits after receiving HUD rental assistance as seen in previous NHIS-HUD research with the general adult population (Fenelon et al., 2017) or among adults without disabilities 18-64 years old (Simon et al., 2017).

Dissertation Overview

To address current gaps in the literature, this dissertation will examine if receiving HUD rental assistance promotes healthy aging among older adults. Data on low-income renters ages 62 and older from 13 years (2006-2018) of pooled cross-sectional data from the National Health Interview Survey (NHIS) merged with HUD administrative records (NHIS-HUD) will be used to describe the health/functioning, healthcare access/use, and adverse health events experienced by older adults receiving HUD assistance across the three main HUD rental assistance programs: housing choice vouchers, public housing, and multifamily housing. Multivariate regression models will also be used to examine healthy aging outcomes among older renters currently receiving HUD rental assistance, compared to unassisted low-income older renters, and older renters who will receive HUD assistance within two years, the average HUD waitlist duration. This “pseudo-waitlist” control group method (comparing current to future HUD recipients) mitigates the potential impact of selection into HUD assistance, a common limitation of prior work. Overall, this dissertation provides the first nationally representative picture of health among older HUD renters and improves our understanding of the connection between affordable housing and health in later life. The results can help inform programs and policies to better meet the needs of the growing population of low-income older renters and support aging in the community. This dissertation has three distinct aims that are organized into three separate papers. A high-level overview of each aim is described below.

Aim 1: To describe the health, functioning, access to health-related services, and adverse health events experienced by older adults receiving HUD rental assistance.

This is the first known study to use merged NHIS-HUD data to describe the health and long-term care needs of older HUD renters. Comparisons to unassisted low-income older renters

from the NHIS will be used to provide additional context. Differences by HUD program type (housing choice voucher, multifamily housing, and public housing) will also be examined to better understand potential variation in health among older adults receiving HUD rental assistance.

Aim 2: To examine if receipt of HUD rental assistance is associated with improved access to health-related services among low-income older adults.

Previous research suggests that among adults 18-64 years old without a disability, receipt of HUD rental assistance improves access to health-related services (Simon et al., 2017). However, it is not known if receipt of HUD rental assistance reduces barriers to long-term homecare services and improves access to other health-related services among older adults. I draw from the Behavioral Model for Vulnerable Populations (Gelberg et al., 2000) to examine if current HUD renters, compared to future HUD renters, are less likely to have unmet care needs and more likely to use long-term homecare services compared to future older HUD renters, who will start receiving rental assistance within two years after their NHIS interview (the average HUD waitlist duration). This pseudo-waitlist method mitigates the potential impact of selection into HUD assistance, a common limitation of prior work. I also use a stepwise approach to explore potential mediators that help explain the association between receipt of HUD rental assistance and access to health-related services. I hypothesize that current HUD renters will be *less* likely to have unmet care needs and *more* likely to receive long-term homecare services than future HUD renters.

Aim 3: To examine if receipt of HUD rental assistance is associated with better health and functioning.

Previous research suggests that receipt of HUD rental assistance is associated with improved self-rated health among adult renters entering public housing or multifamily housing programs, but not among those receiving housing choice vouchers (Fenelon et al., 2017). Recent evidence also suggests that older renters spending more than 30% of their income on rent are more likely to develop functional limitations over time (Jenkins Morales & Robert, 2022). This is the first known study using NHIS-HUD data to examine if receipt of HUD rental assistance is associated with improved health and functioning among the older population. Similar to my second aim, I use the pseudo-waitlist method to test my hypothesis that current HUD renters will be less likely to rate their health as poor or fair, experience serious psychological distress, or have a functional limitation compared to future HUD renters. I also examine if older HUD renters experience the same health outcomes regardless of the type of HUD rental assistance received. Based on prior studies (Airgood-Obrycki & Molinsky, 2020; Fenelon et al., 2017), I hypothesize that older HUD renters with project-based assistance (public housing or multifamily housing) will be more likely to experience potential health benefits compared to those with tenant-based assistance (housing choice voucher).

Conceptual Framework

Although the three aims are distinct, the results of each paper build from each other and integrating the findings of the three papers will also provide new insights, which will be discussed in the conclusion. Next, I provide an overview of the Person-Environment (P-E) Fit perspective (Lawton & Nahemow, 1973) that informs how healthy aging is conceptualized across the three papers. I also describe the specific pathways/mechanisms that help explain the connection between affordable housing and health and demonstrate how the findings from the three papers are interconnected.

Person-Environment Fit Perspective. The P-E Fit perspective (Lawton & Nahemow, 1973) is widely used in gerontology as a theoretical framework for understanding adaptation to the environment among older adults. Although research drawing from the P-E Fit perspective has primarily focused on the physical home environment (Wahl et al., 2009), Lawton and Nahemow (1973) broadly conceptualize the environment as encompassing various domains including the physical, social/relational, organizational, and societal/cultural. The P-E fit perspective posits that individuals thrive in environments where their individual capacities are aligned with environmental demands and opportunities (Lawton & Nahemow, 1973). When environmental press (the interaction between individual capacities and environmental demands) is too strong, older adults are more likely to experience negative outcomes.

According to the World Health Organization (WHO) (2015), healthy aging is defined as "the process of developing and maintaining functional ability that enables well-being in older age." The WHO definition of healthy aging draws from the P-E fit perspective (Lawton & Nahemow, 1973). In this way, healthy aging is not meant to describe a disease-free state that differentiates between healthy and unhealthy older adults; rather, it reflects the well-being of older adults by considering their physical and mental capacities, their environmental context, and the interaction between an individual's capacity and their environment. This dissertation describes and examines a variety of outcomes to measure "healthy aging" that incorporates the P-E fit perspective. For example, the first and second papers include unmet care needs as an outcome of interest, by identifying if a participant needs (individual level capacity), but did not receive, various health services due to cost (environmental context) in the past year. Self-rated health is also an outcome of interest in the first and third papers to measure the participant's assessment of their own health and well-being within their current environment. Drawing from

the P-E fit perspective, the first paper also describes adverse health events (e.g., hospitalization) experienced by older HUD renters, which can reflect a poor fit between the needs of the participant and their home environment. Although these individual measures do not perfectly align with the concept of "healthy aging" as defined by the WHO, collectively they help describe the well-being of older HUD renters and facilitate assessment of whether or not receipt of rental assistance promotes adaptation to health challenges in later life.

Pathways Connecting Affordable Housing and Health. Consistent with the P-E fit perspective (Lawton & Nahemow, 1973), some researchers have proposed specific pathways/effects that connect receipt of rental assistance to improved access to health-related services and health (Fertig & Reingold, 2007; Simon et al., 2017). Although I will not directly test these effects, I describe them here and how they relate to the P-E fit persepective to help explain why we would expect improved access to affordable housing to lead to better health outcomes among older adults.

The stability effect suggest that older adults experiencing housing insecurity might neglect their health as they manage competing needs (e.g., securing shelter, food, etc.) (Gelberg et al., 1997). Once stable housing is secured, individuals are more likely to use needed health-services and experience better health outcomes (Kushel, Gupta, Gee, & Haas, 2005; Simon et al., 2017). On a practical level, it is also difficult to provide homecare services when older adults do not have a stable home (Bipartisan Policy Center, 2016). By reducing competing needs and improving environmental support for older renters, we would expect that receipt of HUD rental assistance also improves access to health-related services to promote healthy aging in the community.

In addition to the stability effect, the income effect also might help explain the health benefits of living in affordable housing. Evidence suggests that experiencing housing disadvantage creates trade-offs between covering housing expenses and paying for health-related goods and services (e.g., nutritious food, medications, preventive health services) (Alley et al., 2011; Meltzer & Schwartz, 2015; Pollack, Griffin, & Lynch, 2010). Since HUD participants typically pay no more than 30% of their household income toward rent, receipt of rental assistance likely frees up financial resources that can be used on goods and services that improve health.

Receipt of HUD assistance also might impact health through a gateway effect (Fertig & Reingold, 2007) by connecting older adults with other programs that in turn reduce barriers to health-related services and promote healthy aging. For instance, older adults living in public housing or multifamily housing might have access to a service coordinator that connects them to public benefits (e.g., Medicare Saving Programs, SNAP, transportation, or long-term care coordination), which may reduce barriers to health-related services. Geographic proximity also might contribute to the gateway effect if public housing and/or multifamily housing buildings are located near health-related services or if having a housing choice voucher allows older adults to live closer to family caregivers. Drawing from the P-E fit perspective, improved access to homecare and other health-related services (Aim 2) might reduce environmental press and provide a better "match" between the needs of the older adult and their environment to promote adaptation and health. In this way, improved access to health-related services might mediate the association between HUD rental assistance and health/functioning (Aim 3).

Evidence also suggests that experiencing housing disadvantage contributes to elevated stress levels (Singh et al., 2019), which in turn can effect health (Keene et al., 2018). Like the P-

E fit perspective that emphasizes the interaction between a person and their environment (Lawton & Nahemow, 1973), stress has been described as an umbrella term that represents responses when environmental demands outweigh a person's perceived ability to cope effectively (Cohen et al., 2016). Receipt of HUD rental assistance might reduce stress by improving access to health-related services (Aim 2), and/or by directly impacting an individual's ability to cope with environment demands. For instance, having stable housing (stability effect) and more disposable income every month (income effect) would likely reduce stress since older adults would be more confident in their ability to cope with unexpected expenses. Receipt of rental assistance also might directly reduce environmental demands, which in turn could lower stress. For instance, evidence suggests that older adults with rental assistance are more likely to have safety and accessibility features in their home compared to unassisted low-income older renters (Airgood-Obrycki & Molinsky, 2020). In this way, HUD rental assistance might serve as a gateway to an accessible living arrangement that reduces stress and improves health.

Although my dissertation will not test the specific pathways (stability, income, gateway, or stress) that help explain the potential relationship between receipt of HUD rental assistance and healthy aging, examining differences by HUD program type may provide some insight on these effects. For instance, if HUD rental assistance *does not* improve access to health-related services (Aim 2), potentially due to the current policy context (e.g., access to Medicare and Social Security income for most older adults), but receipt of rental assistance *is* associated with better health/functioning (Aim 3), then this suggests support for the stress effect. Since stress and psychological well-being are tightly linked constructs (Epel et al., 2018), a significant association between receipt of HUD assistance and reduced psychological distress would also

suggest that the stress effect helps explain the association between HUD rental assistance and healthy aging.

Implications

To develop prevention focused policy solutions that promote healthy aging among older adults in the community, it is essential to understand the association between affordable housing and a variety of healthy aging outcomes. This project will provide program administrators, researchers, and policy makers with new information on the health, long-term care needs, healthcare use/access, and adverse health events experienced by older HUD renters, a population often not examined in prior research. Using a strong quasi-experimental design, this project will also generate new evidence by examining if receiving HUD rental assistance promotes healthy aging in the community and if potential health benefits are consistent across HUD programs. The results will help improve services to older HUD renters, inform advocacy efforts in response to potential program changes (e.g., cutting HUD funding, shifting services toward market-based approaches), and inform the development of service systems that integrate housing and health. Although this dissertation will not directly test the specific pathways, the results provide an important first step toward better understanding the associations between receipt of rental assistance and healthy aging across different HUD programs and can enhance our understanding of the connection between affordable housing and health in later life.

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Table 1. Summary of HUD Major Rental Assistance Programs

	Tenant-based assistance	Project-based assistance	
	Housing Choice Voucher	*Multifamily Housing*	*Public Housing*
Program administration	State and local Public Housing Agencies	Private building owners contract directly with HUD	State and local Public Housing Agencies
Ownership	Private landlords subsidized by HUD	Private landlords subsidized by HUD	Public Housing Agencies subsidized by HUD
Income Eligibility	At least 75% to extremely low-income households (<30% AMI) and no more than 25% to very low-income households (30-50% AMI)	At least 40% to extremely low-income households (<30% AMI) and remaining units for very low-income (30-50% AMI) or low-income households (50-80% AMI)	At least 40% to extremely low-income households (<30% AMI) and remaining units for very low-income (30-50% AMI) or low-income households (50-80% AMI)
Type of Housing	Participants find housing in the private market and can choose single-family homes, townhouses, apartments, and even their current residence.	Subsidized housing projects where private property owners agree to provide a certain percentage of their housing units at affordable rates for a given time.	Range from scattered-site single-family detached houses to high-rise apartment buildings.
Rental cost to tenants	Generally, 30% of household income	Generally, 30% of household income, but below market rent may be more common	Generally, 30% of household income
Specific HUD programs included	Housing Choice Voucher program; Project-Based Voucher; Section 8 Moderate Rehabilitation; Section 8 Rental Certificate Programs	Project-Based Section 8 (the largest MFH program); Section 202 Supportive Housing for the Elderly Program; Section 236 Multifamily Housing; Rental Assistance Program; Section 811 Supportive Housing for Persons with Disabilities; Section 221(d)(3) Below Market Interest Rate; Section 236 Multifamily Housing; Rent Supplement Program.	Public Housing program

Note. Area Median Income (AMI) are HUD-developed income limits based on the AMI of a given area.
The information included in this table come from the following sources: NCHS (2019a). *A Primer on HUD Programs and Associated Administrative Data; NCHS (2022b). The Linkage of the National Center for Health Statistics (NCHS) Survey Data to U.S. Department of Housing and Urban Development (HUD) Administrative Data: Linkage Methodology and Analytic Considerations.*

Chapter 2. Older Adults with Federal Rental Assistance and Health: A Descriptive Study

Abstract

1.8 million older adults receive federal rental assistance, but surprisingly little is known about their health, especially among the growing number of older housing choice voucher (HCV) holders. This is the first known study to use nationally representative data from the National Health Interview Survey merged with HUD administrative data (2006-2018) to describe the health of older HUD renters (*N*=4,582) living in public housing (PH), multifamily housing (MFH), or receiving an HCV. Bivariate and multivariate logistic regression models examine potential health differences by HUD program type. Among all older HUD renters, 60% had two or more chronic conditions, 28% couldn't afford needed care, and 35% went to the emergency room in the past year. Overall, older HCV holders were significantly more likely to experience health challenges compared to those with project-based assistance. For instance, in the unadjusted model, 74% of HCV holders had a functional limitation compared to 61% of PH residents ($p<.001$) and 69% of MFH residents ($p<.05$). Even after adjusting for potential confounding factors, a statistically significant difference remained. The findings emphasize the health challenges faced by older HCV holders and can inform the development of housing policy that better meets the needs of the aging population.

Introduction

In the United States, population aging is coinciding with a growing affordable housing crisis. As the first baby boomers reached older adulthood roughly a decade ago, the number of older households with severe cost burdens has steadily climbed and reached an all-time high with roughly 5 million older households spending more than half of their income on housing (Joint Center for Housing Studies, 2019). This trend is expected to continue. Among older adults, the likelihood of experiencing severe housing cost burden increases with age (Joint Center for Housing Studies, 2019) and the Census Bureau projects that by 2035 the number of people 80 and over will grow to nearly 24 million, fully doubling since 2016. Severely cost burdened households often face trade-offs between covering housing costs or paying for medications and other health-related expenses (Meltzer & Schwartz, 2015) and evidence suggests that older renters with unaffordable housing costs are more likely to experience health decline (Jenkins Morales & Robert, 2022) and premature nursing home admission (Jenkins Morales & Robert, 2020).

HUD Rental Assistance and Older Adults

The Department of Housing and Urban Development (HUD) is the primary funder of rental assistance in the United States with roughly 1.8 million older households receiving HUD rental assistance in 2021 (HUD, 2021). A growing number of older adults are both aging within subsidized housing arrangements and receiving rental assistance for the first time in later life, but access to subsidized housing falls substantially short of demand, with only 36% of eligible low-income older households receiving assistance (Alvarez & Steffen, 2021). HUD rental assistance typically limits tenant rental payments to 30% of their household income per month and a HUD subsidy cover the remaining costs.

There are three major types of HUD rental assistance programs: public housing (PH), multifamily housing (MFH), and the Housing Choice Voucher (HCV) program. In the case of PH and MFH, the rental subsidy goes to the housing unit, and households apply for admission to publicly (PH) or privately owned (MFH) buildings. In MFH programs, private-property owners receive assistance from HUD, often in the form of rental subsidies and/or below-market financing, to provide units at affordable rates for low-income households for a specific period of time (Alvarez & Steffen, 2021). One example of an MFH program is Section 202 Supportive Housing for the Elderly, which enables nonprofit organizations to build and operate affordable housing for people 62 years and older. Roughly half of all Section 202 buildings have a HUD-funded service coordinator to connect residents with needed services and promote aging in the community (Schwartz, 2021). Among older adults receiving HUD rental assistance in 2021, 44% lived in MFH buildings (16% of which live in Section 202 units), 17% lived in PH, and 39% received an HCV (HUD, 2021).

Since 1993, the proportion of people receiving HUD project-based assistance (PH or MFH) has declined, while the proportion receiving tenant-based assistance (HCV) has increased (Kingsley, 2017). Although HCV holders were historically quite young compared to other households receiving HUD project-based assistance, the program has aged rapidly over the last two decades. In 2000, less than a third of HCV holders were over 50 years old, compared to roughly half of HCV holders today (Reina & Aiken, 2022). Although the HCV program serves the most rapidly aging population, the program was designed to promote housing mobility and provide opportunities for low-income families to move to neighborhoods with more resources, which might conflict with the desire of many older adults to age in place. Housing mobility verses housing *instability* can be hard to differentiate, and older adults with an HCV are likely at

increased risk of experiencing forced moves due to changes in the private rental market, compared to residents of PH (Reina & Aiken, 2022). Evidence also suggests that older households are significantly less successful than younger households in obtaining housing with an HCV (Finkel & Buron, 2001) and it can be challenging for older adults with an HCV to find suitable housing that meets their needs (Mcfadden & Lucio, 2014).

Health and Older HUD Renters

Although 1.8 million older households receive HUD rental assistance, surprisingly little is known about their health. Studies from across the country have documented the health challenges of older HUD renters, but these studies are not nationally representative and primarily focus on PH residents (Cotrell & Carder, 2010; Gonyea et al., 2018; Simning et al., 2012). Nationally representative studies suggest that older adults receiving rental assistance are more likely to have greater health challenges and physical limitations, and less likely to have access to supportive long-term care services compared to unassisted older renters (Gibler, 2003; Parsons et al., 2011). However, these studies used self-report measures of rental assistance, which is significantly underreported in national surveys (Boudreaux et al., 2018) and do not differentiate the type of housing assistance received. Better understanding the health/functioning, barriers to health-related services, and adverse health events experienced by older HUD renters, and potential differences across HUD programs, can help improve services for older HUD renters, inform advocacy efforts in response to potential program changes (e.g., shifting or cutting HUD funding), and provide a helpful foundation for future research at the intersection of affordable housing and health in later life.

In 2016, nationally representative estimates of health indicators among individuals with HUD rental assistance became available for the first time when the National Health Interview Survey (NHIS) was merged with HUD administrative records to create the NHIS-HUD dataset.

NHIS-HUD data provide an underutilized opportunity to examine a nationally representative sample, with valid measures of rental assistance, additional HUD program information, and various health measures from the NHIS. Recent studies using NHIS-HUD data have described the health of HUD-assisted adults (Helms et al., 2017) and found that rental assistance is associated with improved self-rated health, psychological well-being (Fenelon et al., 2017) and healthcare access (Simon et al., 2017), but these studies either do not include or do not examine these effects among older adults. It is important for research to specifically examine the connection between housing and health among the older population since older adults are overrepresented in HUD housing, have access to age-restricted programs (e.g., Medicare, Social Security, Older Americans Act services), and have unique needs associated with the aging process.

Health Differences by HUD Program Type

We also know little about potential health differences among people receiving rental assistance across HUD programs. Helms et al. (2017) mention a forthcoming report that will describe prevalence estimates using NHIS-HUD data by HUD program type, but as of October 2022 this report has not yet been published. A small survey study in Oregon suggests that older adults waiting for PH are more financially and medically vulnerable than older adults on HCV waitlists (Carder et al., 2016). Given that residents with project-based subsidies (PH and MFH) are more likely to have a HUD-funded service coordinator on-site and accessibility features (e.g., grab bars, no-step entrance) in their homes compared to HCV holders (Airgood-Obrycki & Molinsky, 2020), we might expect older adults with project-based assistance to have more health challenges than HCV holders. However, according to data from HUD’s Picture of Subsidized Households (2021), older households (with heads of household or spouses aged 62 or older) with

an HCV are significantly more likely to have a disability[1] compared to those receiving project-based assistance. Differences in disability by HUD program type are also larger among older households compared to households headed by someone 61 years old or younger. Among older households in 2021, 68% of HCV holders compared to 53% of PH residents and 26% of MFH residents have a disability. Whereas, among younger households, 36% of HCV holders compared to 31% of PH residents and 32% of MFH residents have a disability. Although these data suggest potential health differences by HUD program type, they are also limited to one measure of disability that asks HUD participants if a given household member has a disability (yes or no).

The Current Study

This is the first known study to use newly released NHIS-HUD data (2006-2018) to describe the health of older HUD renters. This study also offers a first look at health differences by HUD program type among older HUD renters. Given current gaps in our understanding of the health of older HUD renters this study aims to do the following:

Aim 1: To describe the health, functioning, access to health-related services, and adverse health events experienced by older adults receiving HUD rental assistance. Comparisons to unassisted low-income older renters from the NHIS will be used to provide additional context.

Aim 2: To describe potential differences in the health, functioning, access to health-related services, and adverse health events among older adults receiving HUD rental

[1] The Family Report (HUD form 50058), which asks if a given household member has a disability (yes or no) is used to determine disability status in HUD's Picture of Subsidized Households. HUD defines a disability as: "a physical, mental, or emotional impairment which is expected to be of long continued and indefinite duration, substantially impedes his or her ability to live independently, and is of such a nature that such ability could be improved by more suitable housing conditions."

assistance by HUD program type (housing choice voucher, public housing, multifamily housing).

Methods

Data

This study used thirteen years (2006-2018) of pooled cross-sectional NHIS-HUD data (National Center for Health Statistics Division of Analysis and Epidemiology, 2022). The NHIS is a cross-sectional, multistage survey conducted annually with a nationally representative sample of households in the United States. Within each household/family, one adult was randomly selected for the sample adult module, which was used for this study. NHIS data have been collected since 1957 and include self-reported information on a broad range of health topics. NHIS data were obtained from Integrated Public Use Microdata Samples (IPUMS) Health Surveys (Blewett et al., 2022).

For the 2006-2018 NHIS-HUD sample, 84% of NHIS sample adults were eligible for linkage to HUD data based on consent for record linkage activities and providing the necessary personally identifiable information (National Center for Health Statistics, 2022a). NCHS adjusted weights account for linkage eligibility and were used in all analyses (National Center for Health Statistics, 2022b). More information on the NHIS-HUD data linkage can be found in detail elsewhere (National Center for Health Statistics, 2022b).

The analytic sample used to address the first aim consisted of current HUD renters and unassisted low-income renters 62 years of age and older (N = 7,288). 92% of participants remained in the sample after deleting cases with missing data on the covariates (n = 110) and outcomes (n = 488) of interest. Bivariate analyses comparing participants dropped from the sample (n = 598) to those remaining (N = 7,288) suggest that younger, higher income, White participants are overrepresented in the final analytic sample. The age threshold of 62 was chosen

based on HUD eligibility requirements that are used to determine what constitutes an older household (National Center for Health Statistics, 2019a). To address the second aim, a subsample of only current HUD renters was used (*N* = 4,582). The distribution of current older HUD renters across rental assistance programs appears consistent with national estimates. For example, in 2012 (the midpoint of the pooled cross-sectional data from 2006-2018), 49% of older HUD renters lived in MFH, 29% were HCV holders, and 22% lived in PH (HUD, 2012), which closely aligns with the analytic sample depicted in Table 3 where 49% lived in MFH, 27% were HCV holders, and 24% lived in PH.

Measures

HUD Renter Status. Current HUD renters included NHIS sample adults who received HUD rental assistance at the time of their NHIS interview. Similar to previous work (Helms et al., 2017), comparisons to unassisted low-income older renters were used to provide additional context. Unassisted low-income renters included NHIS-HUD linkage eligible sample adults who self-reported being a renter, did not receive HUD rental assistance at the time of the NHIS interview, and had incomes below the federal poverty level. Since only 36% of income eligible older households receive HUD assistance (Alvarez & Steffen, 2021), this sample of unassisted low-income renters likely consists of older adults who did not receive rental assistance due to limited public resources, or did not apply for assistance.

HUD Program Type. The linked HUD administrative data provides information on HUD's three largest rental assistance programs: public housing (PH), multifamily housing (MFH), and the Housing Choice Voucher (HCV) program. In the case of PH and MFH, the rental subsidy goes to the housing unit, and households apply for admission to publicly (PH) or privately owned (MFH) buildings. PH and MFH are considered project-based assistance since the rental subsidy is tied to a specific housing unit. In contrast, the HCV program is considered

tenant-based assistance since participants find their own housing in the private market and can take their rental assistance subsidy elsewhere if they need to move.

Health Outcomes. Self-reported health outcomes of interest from the NHIS included: self-rated health, serious psychological distress, functional limitations, need for assistance with daily activities, unmet care needs due to cost, transportation barrier to needed care, long-term homecare use, bed disability, hospitalization, and emergency room use. These measures were chosen to give an overall picture of the health/functioning, access to health-related services, and adverse health events experienced by older HUD renters. Dichotomous measures were created for each health outcome to simplify the interpretation of the results and to compare results to previous NHIS-HUD studies that often use dichotomous health measures (Brucker et al., 2018; Fenelon et al., 2017; Simon et al., 2017).

Self-rated health (1=poor/fair; 0=good/very good/excellent) was used to capture the participant's view of their overall health and well-being. Serious psychological distress was measured using the Kessler-6 scale which asks respondents if they felt hopeless, sad, nervous, restless or fidgety, worthless, or that everything was an effort in the past 30 days. Responses ranged from 0 "none of the time" to 4 "almost all of the time." The summed Kessler-6 score ranges from 0 to 24. Similar to previous research, I used a cut off score of 13 or higher to indicate serious psychological distress (Brucker & Helms, 2019; Fenelon et al., 2017).

Nine questions asking participants how difficult it is to perform several specific activities (e.g., pushing large objects, walking a quarter of a mile, climbing stairs, standing, sitting, bending over, reaching over head, grasping small objects, and carrying 10 pounds) without any special equipment were used to measure functional limitation. Participants who reported that any of the nine activities were very difficult or they couldn't perform the activity due to a health

problem were categorized as having a functional limitation. Participants were also asked if they currently needed help from another person related to six activities of daily living (ADL) (e.g., bathing, getting dressed, getting out of bed, eating, using the toilet, or getting around the home) or instrumental activities of daily living (IADL) (e.g., needing help with routine needs, such as everyday household chores, shopping, etc.). Participants who reported needing help on the IADL measure or any of the six ADL measures were categorized as needing ADL/IADL assistance.

Six questions from the NHIS were used to determine if a participant had unmet care needs due to cost. If a participant indicted that they needed, but couldn't afford (or delayed) medical care, dental care, eyeglasses, prescription medications, or mental health care in the past year then they were categorized as having an unmet care need due to cost. Transportation barrier to needed care was determined by one question which asked participants if they delayed getting medical care in the past year because they didn't have transportation. NHIS participants were also asked if they received care at home from a nurse or other health care professional in the past year and if they did, for how many months. Since Medicare typically does not cover long-term care services past 100 days, participants who reported receiving homecare for four months or more were categorized as receiving long-term homecare services.

To determine bed disability, participants were asked approximately how many days illness or injury kept them in bed for more than half the day. Participants who were stuck in bed for more than one week in the past year were categorized as experiencing a bed disability. If a participant reported being hospitalized overnight in the past year, then they were categorized as experiencing a hospitalization. Emergency room use was determined based on participants who reported using the hospital emergency room for their own health during the past year.

Covariates. Sociodemographic covariates from the NHIS included self-reported age (top coded at 85 years old), gender (female = 1; male = 0), race/ethnicity (referent = non-Hispanic White; non-Hispanic Black; or Hispanic; another race/ethnicity), education (referent = less than high school; high school/GED; beyond high school), living arrangement (lives alone = 1; lives with others = 0), health insurance status (referent = Medicare only or other insurance; no insurance; Medicaid[2]), and family income to poverty ratio (referent = <50%; 50%–99%; 100%–199%; >200%). The family income to poverty ratio measure was created by the NCHS based on self-reported total combined income for all family members adjusted for family size, and the corresponding U.S. Census Bureau's poverty thresholds based on the year of the interview. Since self-reported family income was missing for roughly 10% of cases, the NCHS provided imputed values for the family income to poverty ratio measure that were used in all analyses and have been described in detail elsewhere (National Center for Health Statistics, 2019b).

Geographic covariates were created by the NCHS based on the location of the housing unit of the participant at the time of their NHIS interview and included U.S. census region (Northeast, Midwest, South, West) and urban-rural residence at the census block level (1 = urban; 0 = rural). The age of the participant when they started receiving HUD rental assistance (62+ at HUD admission = 1; less than 62 years old at HUD admission = 0) was also included from the HUD administrative data to account for differences in the duration of HUD assistance by program type.

For analyses of health outcomes measuring access to health-related services (e.g., unmet care needs due to cost) or adverse health events (e.g., hospitalization), I control for differences in health/functioning. Most of these health/functioning measures are described above in the health

[2] Most participants with Medicaid also had Medicare.

outcomes section. Number of chronic conditions (referent = none; one; two-three; four or more) was also included as a covariate in these models based on a count of 10 conditions (hypertension, diabetes, coronary heart disease, previous stroke, history of cancer, chronic obstructive pulmonary disease, asthma, renal disease, hepatic disease, and arthritis).

Analysis

The first aim of this study was to provide a broad descriptive summary of the health of older HUD renters. To address the first aim, bivariate analyses were conducted to examine differences in sociodemographic characteristics and health outcomes between current older HUD renters and unassisted low-income older renters. The comparison to unassisted low-income older renters is meant to provide additional context and not to test specific hypotheses about differences between older adults with and without HUD assistance since unobserved differences are expected between these two populations – factors that affect selection into HUD application and participation. Although not the focus of the present study, multivariate logistic regression models controlling for sociodemographic characteristics and survey year were also examined and can be found in the supplementary materials. Predictive margins from the unadjusted and adjusted models were used to obtain percentages for all health outcomes by HUD renter status (Supplementary Table 2).

The second aim of this study was to describe potential differences in health outcomes by the three main types of HUD rental assistance: HCV, MFH, and PH. Only current HUD renters were included in the sample to address the second aim (N = 4,582). Bivariate analyses were conducted to examine potential differences in sociodemographic characteristics and health outcomes by HUD program type. Multivariate logistic regression models adjusting for potential confounding factors and survey year were also examined for each outcome of interest. To

simplify interpretation of the results I generated unadjusted and adjusted estimated probabilities of each health outcome by HUD program type.

All analyses were conducted in Stata Version 16.0 (Stata Corp, College Station, TX) and use the adjusted NHIS sample adult weight which was created by the NCHS to account for both oversampling of specific subgroups and non-response in the NHIS along with linkage eligibility in the NHIS-HUD dataset (National Center for Health Statistics, 2022b).

Results

Table 1 presents weighted sociodemographic characteristics of older HUD renters (n = 4,582) compared to unassisted low-income older renters (n = 2,706) hereafter referred to as unassisted renters. Since unassisted renters only included older adults with incomes below the federal poverty level and HUD rental assistance eligibility is generally based on the local area median income (AMI), older HUD renters were less likely to be in poverty compared to unassisted renters as defined in this study. Compared to unassisted renters, older HUD renters were also more likely to be older, female, Non-Hispanic White or Non-Hispanic Black (compared to Hispanic or another race/ethnicity), a high school graduate, live alone, have health insurance, live in an urban area, and live in the Northeast or Midwest regions of the United States (compared to the West or South).

Describing the Health of Older Adults with HUD Rental Assistance

Table 2 presents a variety of health outcomes by HUD renter status. Roughly half (46%) of older HUD renters rated their health as fair or poor and seven percent experienced serious psychological distress in the last 30 days. The most common chronic conditions were hypertension (73%) and diabetes (35%) with 60% of older HUD renters having two or more chronic physical conditions. 69% of older HUD renters had a functional limitation and 31%

needed assistance with ADL/IADL tasks. Long-term care needs appeared to match homecare use with 10% of older HUD renters needing help with bathing and 10% receiving long-term homecare services in the past year. Roughly one in four (28%) older HUD renters experienced an unmet care need due to cost in the past year, with the most common unmet care need being dental care (15%). 35% of older HUD renters visited the emergency room and 23% stayed overnight in the hospital in the past year, suggesting that the hospital system interacts with more than six hundred thousand older adults receiving HUD rental assistance per year.

The bivariate results examining health differences between older HUD renters and unassisted renters (Table 2) suggest that older HUD renters are more likely to have multiple chronic physical conditions ($p < .001$). Specifically, current HUD renters were significantly more likely to have ever had a diagnosis of arthritis (7.1% vs. 4.8%), cancer (18.0% vs. 13.3%), diabetes (34.7% vs. 30.5%), and hypertension (73.2% vs. 66.8%) compared to unassisted renters. Current older HUD renters were also more likely to have a functional limitation (23.0% vs. 19.5%; $p = .011$), need assistance with ADL/IADL tasks (30.7% vs. 25.3%; $p < .001$), and be hospitalized overnight (30.7% vs. 25.3%; $p < .001$) or visit the emergency room (35.0% vs. 32.2%; $p = .066$) in the past year. Despite experiencing more health challenges and adverse health events, older HUD renters were *less* likely to rate their health as poor or fair (45.9% vs. 49.4%; $p = .033$) and *less* likely to experience unmet care needs due to cost (27.7% vs. 33.5%; $p < .001$) compared to unassisted renters in the bivariate analyses. There was not a statistically significant difference in the likelihood of experiencing serious psychological distress, bed disability for more than one week, or receiving long-term homecare services in the past year by HUD renter status.

As seen in the online supplementary materials, in the multivariate analyses there was not a statistically significant difference by HUD renter status on all health outcomes of interest, except long-term homecare use. After adjusting for sociodemographic characteristics and health factors, current HUD renters were *less* likely to receive long-term homecare services in the past year (4.2% vs. 5.5%; $p < .05$) compared to unassisted renters.

Differences in Health by HUD Program Type

To address the second aim of this study, I examine potential differences in health outcomes by HUD program type (multifamily housing, public housing, housing choice voucher). Table 3 presents bivariate results to describe differences in sociodemographic characteristics and health outcomes among older HUD renters (N = 4,582) by the type of HUD assistance received. Roughly half of the sample lived in MFH, 24.3% living in PH, and 27.0% received an HCV. There was significant geographic variation by HUD program type. HCV holders were overrepresented in the West and South; whereas MFH residents were more likely to live in the Midwest and PH residents were more likely to live in the Northeast ($p = .017$). The average age of older HUD renters in the sample was 73 years old with MFH participants being the oldest (74 years old) and HCV holders being the youngest (72 years old) on average. HCV holders were also the most likely to start receiving HUD rental assistance at a younger age ($p < .001$). Almost half of HCV holders (47.9%) started receiving assistance before age 62 compared to 37.8% of PH residents and only 21.9% of MFH residents. Most older HUD renters lived alone (77.5%) with MFH residents being the most likely to live alone (84.5%; $p < .001$) compared to HCV holders (71.2%) and PH residents (71.1%). HCV holders were the most likely to have family income below the poverty line (55.0%; $p = .023$) compared to PH (52.2%) and MFH (52.8%) residents, whereas PH residents were the most likely to have no health insurance (4.1%; $p = .001$) and less than a high school education (53.4%; $p < .001$).

The bivariate results also suggest important health differences by HUD program type. HCV holders were significantly more likely to experience serious psychological distress (10.0%; $p < .001$), functional limitations (73.5%; $p < .001$), transportation barrier to needed care (10.6%; $p = .01$), and bed disability for more than one week in the past year (19.2%; $p = .012$) compared to PH and MFH residents. Compared to PH residents, HCV holders were significantly more likely to need assistance with ADL/IADL tasks (32.7% vs. 27.8%; $p < .10$), have unmet care needs due to cost (30.5% vs. 24.4%; $p < .05$), and experience a hospitalization in the past year (24.8% vs. 20.1%; $p < .05$). HCV holders were also significantly more likely to report fair or poor health compared to MFH residents (49.5% vs. 42.9%; $p < .01$).

Table 4 presents the results from the full multivariate models and Table 5 presents the predictive probabilities for the unadjusted (bivariate) and adjusted (multivariate) models for each health outcome of interest by HUD program type. As seen in Table 5, even after adjusting for potential confounding factors, HCV holders were significantly more likely to experience serious psychological distress (6.9% vs. 4.3%; $p < .05$), functional limitations (75.4% vs. 64.8%; $p < .001$), and hospitalization (23.4% vs. 19.2%; $p < .10$), compared to PH residents. Compared to MFH residents, HCV holders were also significantly more likely to experience functional limitations (75.4% vs. 70.0%; $p < .05$), transportation barriers to needed care (7.1% vs. 5.1; $p < .10$), hospitalization (23.4% vs. 19.9%; $p < .10$), and bed disability for more than one week in the past year (12.5% vs. 10.1%; $p < .10$). In the adjusted models there was not a statistically significant difference between PH and MFH residents on the health outcomes of interest, apart from functional limitations (results not shown). PH residents were significantly less likely to have a functional limitation compared to MFH residents (64.8% vs. 70.0%; $p < .05$). There was

not a statistically significant difference in long-term homecare use or visiting the emergency room in the past year by HUD program type in both unadjusted and adjusted models.

Discussion

The purpose of this study was to describe the health of older HUD renters (aim one) and examine potential health differences by the type of HUD rental assistance received (aim two). This was the first known study focusing on the *older* population using NHIS-HUD data and the results provide the first picture of health differences between recipients of tenant-based (housing choice vouchers) and project-based (public housing and multifamily housing) assistance using a nationally representative sample.

Understanding the Health of Older HUD Renters

Like previous research using self-report measures of rental assistance (Gibler, 2003; Parsons et al., 2011), the results demonstrate that HUD renters face significant health challenges in later life with roughly half of older HUD renters rating their health as fair or poor. The results suggest opportunities for HUD to partner with chronic disease self-management programs, specifically related to diabetes and heart disease, to help the 60% of older HUD renters who are managing two or more chronic conditions (Henwood et al., 2013). In addition to chronic disease management, more than one in three (35%) older HUD renters went to the emergency room in the past year, suggesting opportunities for emergency room prevention efforts among this population. Compared to 13% of HUD-assisted adults 18-61 years old (Brucker & Helms, 2019), seven percent of older HUD renters experienced serious psychological distress in the past 30 days, suggesting the need for more research to better understand the mental health needs and strengths of HUD-assisted older adults compared to younger populations.

Although only two percent of older HUD renters did not have health insurance, 28% reported needing, but being unable to afford care in the past year. Older HUD renters were also *less* likely to experience unmet care needs due to cost compared to unassisted low-income older renters, but after controlling for differences in health insurance status (since older HUD renters were more likely to have health insurance) and other socioeconomic factors, there was no longer a statistically significant difference by HUD renter status. These findings suggest the importance of access to health insurance to address unmet care needs among this population. Lowering the Medicare eligibility age is one way to reduce unmet care needs since adults 62-64 years old are also considered “older adults” by HUD, whereas Medicare eligibility usually starts at age 65. Policy changes to expand Medicare coverage of dental, vision, and hearing services could also help reduce unmet care needs among older HUD renters and low-income older renters without HUD assistance (Willink et al., 2020).

Overall, in the adjusted models there were no statistically significant differences in the health of older HUD renters compared to unassisted low-income older renters for all outcomes except for long-term homecare use. In the adjusted model, older HUD renters were *less* likely to receive homecare services in the past year compared to unassisted low-income older renters. More research is needed to better understand if this difference is due to a lower need for long-term homecare services, since evidence suggests that older HUD renters are more likely to have accessibility features in their home compared to older unassisted renters (Airgood-Obrycki & Molinsky, 2020), or due to barriers in access to homecare for older adults receiving HUD rental assistance (Gibler, 2003).

Health Challenges Among Older Housing Choice Voucher Holders

The results for the second aim of this study emphasize the health challenges faced by older HCV holders in particular, a population often not examined in prior research. This finding

is consistent with data from HUD's Picture of Subsidized Households, which suggests that disability is more common among older HCV holders compared to PH and MFH residents (HUD, 2021; Reina & Aiken, 2022). This finding should raise concern for policy makers and program administrators since you would expect that residents with the highest level of need would receive the HUD rental assistance program that offers the highest level of support. For instance, since residents of project-based assistance are more likely to have accessibility features and access to a HUD-funded service coordinator (Airgood-Obrycki & Molinsky, 2020), you would expect residents of PH and MFH to have worse health than HCV holders. This logic aligns with the results from Carder et al. (2018), which suggests that having poor health is associated with a preference for PH, rather than the HCV program, and that older adults with a recent hospitalization are more likely to prefer age-restricted housing. Evidence also suggests that it is more challenging for older HCV holders to find appropriate housing (Finkel & Buron, 2001; Mcfadden & Lucio, 2014) and although older adults can benefit from (and might prefer) the choices an HCV provides, we do not know if older adults are remaining in the HCV program because they prefer this option or due to limited access to quality and accessible project-based assistance options.

Since this is the first study to describe health differences by type of HUD rental assistance, it is challenging to situate this finding in the literature, but the political history of HUD rental assistance programs might offer some important insight. For instance, the HOPE VI program launched in 1993 dramatically improved the face of PH through the redevelopment of distressed and underfunded PH, but the program also resulted in a net loss of 39,772 units (Schwartz, 2021). Evidence suggests that 69% of the growth in HCV holders since 1995 comes from transfers from PH or MFH, due primarily to owners of MFH opting out of the program and

changes to PH through the HOPE VI program (Schwartz, 2021). Therefore, it is possible that older HCV holders originally chose to live in PH or MFH, but program changes led to them receiving an HCV. More research is needed to better understand transfers across HUD programs and how potential moves influence the experiences and health of older adults receiving HUD rental assistance. Future research should also explore how to differentiate between forced moves and moves of choice among HUD assisted households, and specifically among the older population who often prefer to age in place.

The results of this study add to the literature by examining a range of health outcomes and demonstrating through multivariate models that health differences by HUD program type persist even after controlling for a variety of confounding factors. The multivariate results suggest that being younger at HUD admission, having Medicaid, and living in the South and West (compared to the Northeast and Midwest) help explain why HCV holders have more health challenges than older adults with project-based assistance, however meaningful health differences remain. For example, even after adjusting for differences in socioeconomic characteristics, 75% of HCV holders had a functional limitation compared to 65% of PH residents. Since this is a cross-sectional study, we do not know how different types of rental assistance impact the health trajectories of older HUD renters; however, research suggests that HCV holders are less likely to benefit from improved health once they start receiving HUD rental assistance, compared to PH and MFH residents (Fenelon et al., 2017).

Although it is possible that HCV holders have worse health trajectories over time compared to residents of PH and MFH, it is also likely that unmeasured factors that impact differential selection into HUD rental assistance programs help explain these health differences. For instance, to reduce the concentration of poverty in PH, the Quality Housing and Work

Responsibility Act of 1998 mandated that at least 40% of households admitted to PH and 75% of all new HCV holders must have extremely low-income (earning less than 30% of the area median income). This policy requires Public Housing Agencies (PHAs) to accept a higher percentage of lower income households for the HCV program compared to PH (Schwartz, 2021). Local prioritization policies (e.g., prioritizing specific populations on the waiting list for rental assistance) can also vary significantly across PHAs and evidence suggests that these policies can influence health outcomes among HUD renters (Cohen-Cline et al., 2022). Future research should explore how geographic variation and differences in local prioritization policies across HUD programs influence health outcomes among older HUD renters.

Limitations

This study provides a first look at the health of older HUD renters and explores differences across HUD programs, but several limitations should be considered when interpreting the results. First, the NHIS uses self-report measures which may impact the validity of measures used in the analyses. For instance, older adults may under report experiencing psychological distress or needing assistance with certain activities due to fear or embarrassment. This study also uses HUD administrative data that was not intended for research purposes and may have errors that impact the age at HUD admission variable as well as HUD program type. Second, although weights that account for differences in linkage eligibility were used in all analyses, since NHIS-HUD data only represent linkage-eligible participants, selection bias due to linkage eligibility likely exists. Also, since the NHIS is a household survey, the study does not include people experiencing homelessness, which likely biases the sample of unassisted low-income older renters used in the aim one analysis. Younger, higher income, White participants are also overrepresented in the final analytic sample, which suggests that this study likely underestimates potential health challenges experienced by older HUD renters and is biased by

income, age, and race. Despite these limitations, this study provides a helpful foundation for future work examining the health of older HUD renters with important implications for policy and programs at the intersection of housing and health.

Conclusion

The population receiving HUD rental assistance has significantly aged over time, yet housing policy and conversations around rental assistance have remained largely unchanged (Reina & Aiken, 2022). The results of this study provide the first nationally representative description of the health of older HUD renters and demonstrate the health challenges faced by older adults with rental assistance, especially among older HCV holders, a population often not examined in prior research. The findings present a call to action to better understand why HCV holders experience more health challenges compared to older adults with project-based assistance. Conversations in housing policy must consider how the HCV program has significantly aged in the past two decades and consider what policy changes are necessary to ensure that older adults have access to affordable housing that matches their changing needs and preferences.

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Tables

Table 1. Sociodemographic Characteristics of HUD Renters and Unassisted Low-Income Renters 62 Years of Age and Older Using Weighted NHIS-HUD Linked Data (2006-2018)

	HUD Renters (*n* = 4,582)	Unassisted Low-Income Renters (*n* = 2,706)	Full Sample (*N* = 7,288)	
	% (SE)	% (SE)	% (SE)	*p*
Mean age (years)	73.22 (.1830)	70.83 (.2043)	72.22 (.1523)	0.000
Female	.6954 (.0103)	.6230 (.0122)	.6652 (.0081)	0.000
Race				0.004
White	.4873 (.0194)	.4496 (.0151)	.4716 (.0135)	
Black	.2377 (.0148)	.1988 (.0118)	.2215 (.0103)	
Another race/ethnicity	.0889 (.0114)	.1070 (.0109)	.0964 (.0083)	
Hispanic	.1861 (.0140)	.2446 (.0136)	.2105 (.0108)	
Education				0.019
Less than high school	.4610 (.0113)	.4973 (.0127)	.4761 (.0086)	
High school or GED	.2879 (.0094)	.2497 (.0102)	.2720 (.0073)	
More than high school	.2511 (.0095)	.2529 (.0109)	.2519 (.0073)	
Live alone	.7750 (.0119)	.5782 (.0131)	.6930 (.0097)	0.000
Family income less than 50% Federal Poverty Level	.0621 (.0048)	.2042 (.0104)	.1213 (.0053)	0.000
Health insurance status				0.000
No health insurance	.02010 (.0034)	.0905 (.0080)	.0494 (.0040)	
Medicaid	.4856 (.0125)	.4768 (.0127)	.4819 (.0094)	
Medicare only/other insurance	.4944 (.0126)	.4327 (.0126)	.4687 (.0095)	
Urban area	.9277 (.0130)	.8799 (.0095)	.9078 (.0090)	0.007
Census region				0.000
Northeast	0.2934 (.0227)	0.2326 (.0148)	0.2680 (.0153)	
Midwest	0.2428 (.0248)	0.1678 (.0115)	0.2115 (.0165)	
South	.2752 (.0207)	.3601 (.0153)	.3106 (.0147)	
West	.1887 (.0186)	.2395 (.0138)	.2099 (.0130)	

Note. *p* values are based on design-based F-test that corrects for the NHIS complex survey design.

Table 2.
Health/Functioning, Access to Health-Related Services, and Adverse Health Events Among HUD Renters and Unassisted Low-Income Renters 62 Years of Age and Older
Weighted NHIS-HUD Linked Data (2006-2018)

	HUD Renters (n = 4,582) % (SE)	Unassisted Low-Income Renters (n = 2,706) % (SE)	Full Sample (N = 7,288) % (SE)	p
Health/functioning				
Fair/poor self-rated health	.4588 (.0102)	.4936 (.0121)	.4733 (.0076)	0.033
Serious psychological distress, past 30 days	.0723 (.0054)	.0702 (.0061)	.0714 (.0042)	0.788
Number of chronic physical conditions				
None	.1289 (.007)	.1825 (.0095)	.1512 (.0057)	0.000
One	.2719 (.0071)	.2865 (.0112)	.278 (.0062)	
Two-three	.4416 (.0091)	.4118 (.0126)	.4292 (.0077)	
Four or more	.1576 (.0074)	.1192 (.0082)	.1416 (.0054)	
Arthritis, ever	.0708 (.0068)	.0481 (.0058)	.0614 (.0047)	0.013
Asthma, current	.1754 (.0073)	.1587 (.009)	.1685 (.0055)	0.161
Ever diagnosed with cancer (any type)	.1796 (.0081)	.1328 (.0076)	.1601 (.006)	0.000
Coronary heart disease, ever	.1825 (.008)	.1675 (.0103)	.1762 (.0063)	0.257
Chronic bronchitis, past year	.1020 (.0058)	.0915 (.0077)	.0977 (.0048)	0.271
Diabetes, ever	.3470 (.0093)	.3048 (.0120)	.3294 (.0074)	0.006
Hypertension, ever	.7316 (.0094)	.6679 (.0117)	.7051 (.0073)	0.000
Kidney problems, past year	.0813 (.0053)	.0829 (.0070)	.0820 (.0043)	0.851
Liver condition, past year	.0354 (.0039)	.0457 (.0056)	.0397 (.0031)	0.135
Stroke, ever	.1454 (.0067)	.1309 (.0084)	.1394 (.0052)	0.186

Table 2. Continued…

	Older HUD Renters % (SE)	Unassisted Low-Income Renters % (SE)	Full Sample % (SE)	*p*
Needs help with ADL/IADL	.3074 (.0111)	.2533 (.0110)	.2849 (.0083)	0.000
Needs help with bath/shower	.0995 (.0058)	.0835 (.0073)	.0928 (.0046)	0.088
Needs help in/out of bed or chairs	.0559 (.0046)	.0539 (.0062)	.0551 (.0038)	0.796
Needs help dressing	.0778 (.0054)	.0685 (.0068)	.0739 (.0042)	0.287
Needs help eating	.0304 (.004)	.0276 (.0047)	.0292 (.003)	0.651
Needs help using the toilet	.0379 (.0039)	.0426 (.0058)	.0399 (.0034)	0.491
Needs help getting around in home	.0517 (.0046)	.0488 (.0061)	.0505 (.0039)	0.692
Needs help with IADL	.2958 (.0109)	.2426 (.0105)	.2736 (.0080)	0.000
Has any functional limitation	.6860 (.0104)	.6330 (.0121)	.6639 (.0077)	0.001
Difficulty push or pull large objects like a living room chair	.4385 (.0112)	.4033 (.0132)	.4239 (.0086)	0.043
Difficulty walking a quarter of a mile--about 3 city blocks	.4515 (.0111)	.3960 (.0124)	.4284 (.0086)	0.001
Difficulty walking up 10 steps without resting	.3937 (.0100)	.3378 (.0119)	.3704 (.0079)	0.000
Difficulty standing or be on your feet for about 2 hours	.5113 (.0110)	.4479 (.0125)	.4849 (.0084)	0.000
Difficulty sitting for about 2 hours	.1263 (.0063)	.1341 (.0088)	.1296 (.0050)	0.482
Difficulty stoop, bend, or kneel	.4292 (.0106)	.3884 (.0118)	.4122 (.0079)	0.011
Difficulty reaching up over your head	.1494 (.0072)	.1465 (.0105)	.1482 (.0062)	0.814
Difficulty using your fingers to grasp or handle small objects	.0961 (.0061)	.0848 (.0077)	.0914 (.0047)	0.265

Table 2. Continued…

	Older HUD Renters % (SE)	Unassisted Low-Income Renters % (SE)	Full Sample % (SE)	*p*
Difficulty lifting or carry something as heavy as 10 lbs	.3461 (.0093)	.2922 (.0120)	.3236 (.0078)	0.000
Access to health-related services				
Any unmet care need due to cost, past year	.2771 (.0095)	.3347 (.0119)	.3011 (.0076)	0.000
Needed but couldn't afford medical care, past year	.1147 (.0066)	.1442 (.0084)	.1270 (.0053)	0.005
Needed but couldn't afford dental care, past year	.1536 (.008)	.1783 (.01)	.1639 (.0061)	0.059
Needed but couldn't afford eyeglasses, past year	.1088 (.0064)	.1571 (.0097)	.1289 (.0056)	0.000
Needed but couldn't afford prescriptions, past year	.0905 (.0061)	.1335 (.0087)	.1084 (.0049)	0.000
Needed but couldn't afford mental health care, past year	.0157 (.0024)	.0238 (.0043)	.0191 (.0024)	0.074
Delayed medical care because lacked transportation	.0810 (.0051)	.0831 (.0063)	.0819 (.0039)	0.798
Received homecare 4 months or more, past year	.0991 (.006)	.0887 (.0076)	.0947 (.0048)	0.276
Adverse health events				
Emergency room visit in past year	.3495 (.0099)	.3220 (.0113)	.3380 (.0075)	0.066
Overnight hospital stay in past year	.2298 (.0079)	.1947 (.0106)	.2152 (.0063)	0.011
Bed disability for more than 1 week, past year	.1563 (.0072)	.1680 (.0091)	.1612 (.0056)	0.321

Note. ADL = activities of daily living; IADL = instrumental activities of daily living
p values are based on design-based F-test that corrects for the NHIS complex survey design.

Table 3. Sociodemographic Characteristics, Health/Functioning, Access to Health-Related Services, and Adverse Health Events Among Older HUD Renters by HUD Rental Assistance Type (62+ years old) Weighted NHIS-HUD Linked Data (2006-2018)

	Housing Choice Voucher (*n* = 1,238) % (SE)	Multifamily Housing (*n* = 2,231) % (SE)	Public Housing (*n* =1,113) % (SE)	All HUD Renters (*N* = 4,582) % (SE)	*p*
Mean age (years)	71.66 0.31	74.43 0.25	72.68 0.41	73.22 0.18	0.011
62+ at HUD admission	0.5214 (.0214)	0.7815 (.0139)	0.6223 (.0281)	0.6689 (.0121)	0.000
Female	.6983 (.0176)	.7028 (.0150)	.6761 (.0244)	.6954 (.0103)	0.600
Race					0.223
White	.4753 (.0233)	.5332 (.0300)	.4065 (.0483)	.4873 (.0193)	
Black	.2482 (.0188)	.2065 (.0232)	.2895 (.0358)	.2377 (.0148)	
Another race/ethnicity	.0821 (.0122)	.0938 (.0133)	.0873 (.0376)	.0889 (.0114)	
Hispanic	.1944 (.0166)	.1665 (.0218)	.2167 (.0289)	.1861 (.0140)	
Education					0.000
Less than high school	.4611 (.0183)	.4262 (.0175)	.5335 (.0275)	.4610 (.0113)	
High school or GED	.2621 (.0150)	.3024 (.0136)	.2907 (.0225)	.2879 (.0094)	
More than high school	.2768 (.0177)	.2714 (.0151)	.1759 (.0162)	.2511 (.0094)	
Live alone	.7106 (.0209)	.8448 (.0126)	.7114 (.0282)	.7750 (.0119)	0.000
Family income (percent of Federal Poverty Level)					0.023
Less than 50%	.0504 (.0074)	.0669 (.0082)	.0669 (.0084)	.0621 (.0048)	
50%-<100%	.4998 (.0203)	.4615 (.0163)	.4546 (.0231)	.4711 (.0105)	
100%-<200%	.3664 (.0192)	.4035 (.016)	.3648 (.0201)	.3838 (.0103)	
200% or more	.0833 (.0112)	.0682 (.0059)	.1138 (.0143)	.0831 (.0055)	

Table 3. Continued…

	Housing Choice Voucher % (SE)	Multifamily Housing % (SE)	Public Housing % (SE)	All HUD Renters % (SE)	*p*
Health insurance status					0.001
No health insurance	.0177 (.0049)	.0113 (.0027)	.0413 (.0119)	.0201 (.0034)	
Medicaid	.5424 (.0216)	.4595 (.0180)	.4674 (.0306)	.4856 (.0125)	
Medicare only/other insurance	.4399 (.0213)	.5292 (.0180)	.4912 (.0311)	.4944 (.0126)	
Urban area	.9189 (.0134)	.9266 (.0222)	.9413 (.0207)	.9277 (.0130)	0.737
Census region					0.017
Northeast	.2563 (.0246)	.2714 (.0351)	.3868 (.0573)	.2934 (.0225)	
Midwest	.1706 (.0186)	.3071 (.0427)	.2007 (.0450)	.2428 (.0247)	
South	.3104 (.0242)	.2474 (.0339)	.2883 (.0457)	.2752 (.0204)	
West	.2627 (.0255)	.1741 (.0254)	.1243 (.0503)	.1887 (.0184)	
Health/functioning					
Fair/poor self-rated health	.4951 (.0205)	.4286 (.0135)	.4752 (.0233)	.4588 (.0102)	0.022
Serious psychological distress, past 30 days	.1003 (.0114)	.0643 (.0075)	.0532 (.0080)	.0723 (.0054)	0.001
Number of chronic physical conditions					
None	.1245 (.0141)	.1242 (.0094)	.1442 (.0138)	.1289 (.0070)	0.120
One	.2419 (.0150)	.2783 (.0102)	.2971 (.0171)	.2719 (.0071)	
Two-three	.4656 (.0188)	.4353 (.0127)	.4244 (.0185)	.4416 (.0091)	
Four or more	.1680 (.0146)	.1623 (.0100)	.1343 (.0123)	.1576 (.0074)	
Needs ADL/IADL assistance	.3269 (.0173)	.3097 (.0154)	.2777 (.0226)	.3074 (.0111)	0.208
Needs help with bath/shower	.1104 (.0121)	.1006 (.0081)	.0833 (.0099)	.0995 (.0058)	0.220

Table 3. Continued…

	Housing Choice Voucher % (SE)	Multifamily Housing % (SE)	Public Housing % (SE)	All HUD Renters % (SE)	*p*
Needs help in/out of bed or chairs	.0673 (.0103)	.0510 (.0058)	.0516 (.0089)	.0559 (.0046)	0.278
Needs help dressing	.0958 (.0111)	.0710 (.0074)	.0692 (.0096)	.0778 (.0054)	0.085
Needs help eating	.0417 (.0083)	.0264 (.0049)	.0244 (.0063)	.0304 (.0040)	0.101
Needs help using the toilet	.0513 (.0090)	.0325 (.0045)	.0321 (.0065)	.0379 (.0039)	0.056
Needs help getting around in home	.0658 (.0098)	.0424 (.0058)	.0531 (.0093)	.0517 (.0046)	0.085
Needs help with IADL	.3171 (.0171)	.2991 (.0151)	.2617 (.0224)	.2958 (.0109)	0.129
Has any functional limitation	.7352 (.0156)	.6905 (.0141)	.6140 (.0254)	.6860 (.0104)	0.000
Difficulty push or pull large objects like a living room chair	.5007 (.0185)	.4175 (.0158)	.4028 (.0237)	.4385 (.0112)	0.001
Difficulty walking a quarter of a mile--about 3 city blocks	.4798 (.0184)	.4548 (.0146)	.4084 (.0245)	.4515 (.0111)	0.051
Difficulty walking up 10 steps without resting	.3987 (.0190)	.4016 (.0140)	.3708 (.0219)	.3937 (.0100)	0.478
Difficulty standing or be on your feet for about 2 hours	.5437 (.0189)	.5166 (.0148)	.4588 (.0218)	.5113 (.0110)	0.009
Difficulty sitting for about 2 hours	.1497 (.0137)	.1314 (.0086)	.0857 (.012)	.1263 (.0063)	0.003
Difficulty stoop, bend, or kneel	.4648 (.0193)	.4257 (.0134)	.3908 (.0235)	.4292 (.0106)	0.036
Difficulty reaching up over your head	.1698 (.0158)	.1437 (.0083)	.1354 (.0173)	.1494 (.0072)	0.231
Difficulty using your fingers to grasp or handle small objects	.1095 (.0114)	.0929 (.0085)	.0856 (.0143)	.0961 (.0061)	0.374
Difficulty lifting or carry something as heavy as 10 lbs	.3870 (.0198)	.3421 (.0130)	.3022 (.0194)	.3461 (.0093)	0.009
Access to health-related services					
Any unmet care need due to cost, past year	.3045 (.0178)	.2764 (.0129)	.2435 (.0201)	.2771 (.0095)	0.071

Table 3. Continued…

	Housing Choice Voucher	Multifamily Housing	Public Housing	All HUD Renters	
	% (SE)	% (SE)	% (SE)	% (SE)	*p*
Needed but couldn't afford medical care, past year	.1100 (.0113)	.1218 (.0092)	.1058 (.0145)	.1147 (.0066)	0.563
Needed but couldn't afford dental care, past year	.1680 (.0137)	.1526 (.0119)	.1372 (.0163)	.1536 (.0080)	0.368
Needed but couldn't afford eyeglasses, past year	.1312 (.0129)	.0967 (.0078)	.1054 (.0142)	.1088 (.0064)	0.067
Needed but couldn't afford prescriptions, past year	.0978 (.0110)	.0902 (.0078)	.0817 (.0151)	.0905 (.0061)	0.655
Needed but couldn't afford mental health care, past year	.0211 (.0062)	.0154 (.0029)	.0094 (.0039)	.0157 (.0024)	0.235
Delayed care because lacked transportation	.1055 (.0118)	.0678 (.0065)	.0773 (.0103)	.0810 (.0050)	0.010
Received homecare 4 months or more, past year	.0950 (.0105)	.1086 (.0090)	.0844 (.0094)	.0991 (.0059)	0.184
Adverse health events					
Emergency room visit in past year	.3534 (.0174)	.3589 (.0137)	.3248 (.0211)	.3495 (.0099)	0.370
Overnight hospital stay in past year	.2480 (.0165)	.2323 (.0111)	.2013 (.0137)	.2298 (.0079)	0.093
Bed disability for more than 1 week, past year	.1917 (.0148)	.1385 (.0095)	.1482 (.0165)	.1563 (.0072)	0.012

Note. ADL = activities of daily living; IADL = instrumental activities of daily living
p values are based on design-based F-test that corrects for the NHIS complex survey design.

Table 4. Logistic Regression Models Predicting Health Outcomes Among Older HUD Renters Weighted NHIS-HUD Linked Data (N= 4,582)

	Fair/Poor Health		Psychological Distress		Functional Limitation	
HUD Program Type (ref = Housing Choice voucher)						
Multifamily Housing	0.906	0.094	0.822	0.143	0.764*	0.084
Public Housing	0.970	0.121	0.600*	0.127	0.601***	0.076
62+ at HUD admission	0.710**	0.074	0.691*	0.123	0.609***	0.073
Sociodemographic Characteristics						
Age	1.002	0.007	0.951***	0.013	1.059***	0.008
Female	1.032	0.089	1.610**	0.294	2.055***	0.177
Race (ref = White)						
Black	1.138	0.115	0.433***	0.095	0.761*	0.087
Another race	0.969	0.159	0.512*	0.156	0.728†	0.125
Hispanic	1.272†	0.160	0.721	0.158	0.407***	0.050
Education (ref = less than high school)						
High school or GED	0.619***	0.062	0.655*	0.127	0.819*	0.078
More than high school	0.610***	0.064	0.479**	0.103	0.821†	0.093
Family income (ref = less than 50%)						
50%-<100%	1.510*	0.273	2.145*	0.767	1.649**	0.306
100%-<200%	1.360	0.254	2.248*	0.805	1.769**	0.339
200% or more	0.862	0.200	1.489	0.668	1.102	0.251
Live alone	0.759*	0.086	0.819	0.160	1.108	0.130
Health Insurance Status (ref=Medicare only/other insurance)						
No Insurance	0.497*	0.174	1.467	0.952	0.555†	0.183
Medicaid	1.506***	0.137	1.152	0.208	1.532***	0.139
Urban Area	1.243	0.200	1.023	0.249	1.048	0.203
Census region (ref = Northeast)						
Midwest	1.084	0.119	0.814	0.192	1.239	0.165
South	1.218†	0.142	1.075	0.236	1.368*	0.186
West	0.960	0.125	1.254	0.295	1.058	0.151
Health Factors						
Poor/fair self-rated health						
Serious psychological distress						
Number of chronic conditions (ref = none)						
One						
Two-three						
Four or more						
Needs ADL/IADL assistance						
Functional limitation						
Constant	0.722	0.436	1.166	1.275	0.026***	0.017

NOTE: ADL = activities of daily living; IADL = instrumental activities of daily living. All models control for survey year. Odds ratio and standard errors are presented for each model.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 4. Continued... Logistic Regression Models Predicting Health Outcomes Among Older HUD Renters

	Needs ADL/IADL Assistance		Unmet Care Needs Due to Cost		Transportation Barrier	
HUD Program Type						
(ref = Housing Choice voucher)						
Multifamily Housing	0.843	0.092	1.067	0.115	0.700†	0.131
Public Housing	0.826	0.109	0.928	0.122	0.889	0.181
62+ at HUD admission	0.688***	0.072	1.292*	0.152	1.066	0.199
Sociodemographic Characteristics						
Age	1.066***	0.008	0.933***	0.008	0.963**	0.014
Female	1.285**	0.112	1.268*	0.130	1.517**	0.241
Race (ref = White)						
Black	0.894	0.101	0.946	0.106	1.225	0.228
Another race	0.549***	0.094	1.117	0.192	1.329	0.420
Hispanic	0.687**	0.084	1.016	0.152	0.559*	0.141
Education (ref = less than high school)						
High school or GED	0.881	0.090	0.786*	0.087	0.995	0.169
More than high school	1.103	0.119	1.383**	0.150	0.971	0.178
Family income						
(ref = less than 50%)						
50%-<100%	1.126	0.196	1.133	0.213	1.168	0.362
100%-<200%	1.108	0.211	1.368	0.278	1.233	0.375
200% or more	1.241	0.292	0.840	0.214	0.629	0.263
Live alone	1.128	0.136	1.161	0.149	1.132	0.279
Health Insurance Status						
(ref=Medicare only/other insurance)						
No Insurance	0.592	0.231	4.026***	1.303	1.174	0.506
Medicaid	2.103***	0.195	0.626***	0.064	1.031	0.174
Urban Area	1.311	0.246	0.933	0.157	1.087	0.262
Census region						
(ref = Northeast)						
Midwest	1.580**	0.239	1.409*	0.194	0.960	0.225
South	1.208	0.157	1.972***	0.275	1.251	0.260
West	1.063	0.154	2.040***	0.309	0.794	0.220
Health Factors						
Poor/fair self-rated health			1.271*	0.118	1.164	0.214
Serious psychological distress			1.985***	0.336	2.461***	0.477
Number of chronic conditions (ref = none)						
One			1.222	0.191	1.197	0.383
Two-three			1.433*	0.227	1.513	0.464
Four or more			1.715**	0.322	2.504**	0.796
Needs ADL/IADL assistance			1.126	0.127	1.929***	0.313
Functional limitation			1.408**	0.155	1.420†	0.277
Constant	0.002***	0.001	14.947***	10.119	0.218	0.241

NOTE: ADL = activities of daily living; IADL = instrumental activities of daily living. All models control for survey year. Odds ratio and standard errors are presented for each model.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 4. Continued... Logistic Regression Models Predicting Health Outcomes Among Older HUD Renters

	Long-Term Homecare Use		Bed Disability	
HUD Program Type (ref = Housing Choice voucher)				
Multifamily Housing	1.130	0.172	0.786†	0.106
Public Housing	0.888	0.170	1.005	0.164
62+ at HUD admission	1.035	0.178	1.211	0.188
Sociodemographic Characteristics				
Age	1.041***	0.011	0.964**	0.011
Female	1.071	0.167	1.195	0.162
Race (ref = White)				
Black	2.002***	0.335	0.788	0.116
Another race	1.467	0.373	0.848	0.180
Hispanic	1.183	0.234	0.633	0.112
Education (ref = less than high school)				
High school or GED	0.752†	0.116	0.970	0.138
More than high school	0.874	0.132	1.496**	0.210
Family income (ref = less than 50%)				
50%-<100%	0.971	0.253	1.105	0.300
100%-<200%	1.168	0.335	1.080	0.295
200% or more	1.513	0.512	1.162	0.396
Live alone	1.418†	0.272	0.877	0.154
Health Insurance Status (ref=Medicare only/other insurance)				
No Insurance	0.404	0.421	0.476	0.232
Medicaid	2.261***	0.348	0.907	0.108
Urban Area	1.104	0.319	1.169	0.245
Census region (ref = Northeast)				
Midwest	1.083	0.206	0.900	0.160
South	0.564**	0.110	0.929	0.150
West	0.422***	0.101	0.999	0.168
Health Factors				
Poor/fair self-rated health	1.853***	0.274	2.177***	0.299
Serious psychological distress	0.905	0.206	1.815**	0.313
Number of chronic conditions (ref = none)				
One	0.885	0.289	1.501†	0.353
Two-three	1.171	0.372	1.287	0.295
Four or more	1.448	0.454	2.575***	0.590
Needs ADL/IADL assistance	6.037***	0.961	1.953***	0.233
Functional limitation	1.546†	0.360	2.681***	0.489
Constant	0.000***	0.000	0.365	0.349

NOTE: ADL = activities of daily living; IADL = instrumental activities of daily living. All models control for survey year. Odds ratio and standard errors are presented for each model.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 4. Continued... Logistic Regression Models Predicting Health Outcomes Among Older HUD Renters

	Hospitalization		Emergency Room Visit	
HUD Program Type				
(ref = Housing Choice voucher)				
Multifamily Housing	0.809†	0.097	1.084	0.112
Public Housing	0.775†	0.103	1.039	0.130
62+ at HUD admission	1.242	0.171	0.943	0.108
Sociodemographic Characteristics				
Age	1.003	0.009	1.001	0.008
Female	0.799*	0.081	0.910	0.085
Race (ref = White)				
Black	1.059	0.119	1.150	0.132
Another race	1.024	0.190	0.739†	0.116
Hispanic	1.016	0.154	0.873	0.107
Education (ref = less than high school)				
High school or GED	1.095	0.131	1.015	0.108
More than high school	1.087	0.143	1.197†	0.127
Family income				
(ref = less than 50%)				
50%-<100%	0.723	0.168	0.701†	0.129
100%-<200%	0.758	0.186	0.852	0.157
200% or more	0.763	0.233	0.720	0.165
Live alone	1.733***	0.269	1.123	0.143
Health Insurance Status				
(ref=Medicare only/other insurance)				
No Insurance	0.498†	0.204	0.988	0.370
Medicaid	0.945	0.098	1.111	0.115
Urban Area	1.224	0.196	0.861	0.165
Census region				
(ref = Northeast)				
Midwest	1.196	0.160	1.213	0.146
South	1.155	0.152	0.996	0.125
West	0.887	0.139	1.049	0.133
Health Factors				
Poor/fair self-rated health	1.496***	0.171	1.333**	0.120
Serious psychological distress	1.173	0.185	1.774**	0.294
Number of chronic conditions (ref = none)				
One	1.609*	0.301	1.188	0.170
Two-three	1.761**	0.332	1.525**	0.210
Four or more	3.625***	0.728	2.769***	0.440
Needs ADL/IADL assistance	1.353**	0.131	1.291**	0.119
Functional limitation	1.523**	0.205	1.535***	0.159
Constant	0.057***	0.040	0.169**	0.111

NOTE: ADL = activities of daily living; IADL = instrumental activities of daily living. All models control for survey year. Odds ratio and standard errors are presented for each model.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 5. Predictive Margins- Unadjusted and Adjusted Percentages of Health Outcomes Among Older HUD Renters by HUD Program Type

Weighted NHIS-HUD Linked Data (N = 4,582)

	Unadjusted			Adjusted		
	Housing Choice Voucher (referent)	Multifamily Housing	Public Housing	Housing Choice Voucher (referent)	Multifamily Housing	Public Housing
Fair/Poor Health	49.5%	42.9%**	47.5%	47.0%	44.5%	46.2%
Serious Psychological Distress	10.0%	6.4%**	5.3%**	6.9%	5.7%	4.3%*
Functional Limitation	73.5%	69.1%*	61.4%***	75.3%	70.0%*	64.8%***
Needs ADL/IADL Assistance	32.7%	31.0%	27.8%†	31.8%	28.2%	27.8%
Unmet Care Needs Due to Cost	30.5%	27.6%	24.4%*	24.8%	26.1%	23.5%
Transportation Barrier	10.6%	6.8%**	7.7%†	7.1%	5.1%†	6.4%
Long-Term Homecare Use	9.5%	10.9%	8.4%	4.6%	5.2%	4.1%
Bed Disability	19.2%	13.9%**	14.8%†	12.5%	10.1%†	12.5%
Hospitalization	24.8%	23.2%	20.1%*	23.4%	19.9%†	19.2%†
Emergency Room Visit	35.3%	35.9%	32.5%	32.6%	34.4%	33.5%

Note. ADL = activities of daily living; IADL = instrumental activities of daily living.
p values represent statistically significant differences with housing choice voucher holders as the reference group.
†$p<0.10$, *$p<0.05$, **$p<0.01$, ***$p<0.001$

Supplementary Table 1. Logistic Regression Models Predicting Health Outcomes Among Older HUD Renters and Unassisted Low-Income Older Renters (62+ Years Old)
Weighted NHIS-HUD Linked Data (N = 7,288)

	Fair/Poor Health		Serious Psychological Distress		Functional Limitation	
Current HUD renter	0.921	0.065	1.16	0.15	1.035	0.083
Sociodemographic Characteristics						
Age	.985**	0.005	0.949***	0.009	1.030***	0.005
Female	0.953	0.068	1.284†	0.178	1.980***	0.14
Race (ref = White)						
Black	1.133	0.09	0.461***	0.081	0.756**	0.066
Another race	0.904	0.112	0.416**	0.109	0.593***	0.071
Hispanic	1.073	0.098	0.933	0.156	0.419***	0.039
Education (ref = less than high school)						
High school or GED	.657***	0.053	0.827	0.131	0.692***	0.059
More than high school	.611***	0.053	0.624**	0.107	0.751**	0.065
Family income less than 50% FPL	.795*	0.084	0.642*	0.131	0.832†	0.09
Live alone	.785**	0.062	0.929	0.142	1.099	0.09
Health Insurance Status (ref=Medicare only/other insurance)						
No insurance	0.791	0.14	0.848	0.301	0.577**	0.108
Medicaid	1.804***	0.127	1.323*	0.176	1.717***	0.123
Metro Area	1	0.112	0.986	0.193	0.882	0.112
Census region (ref = Northeast)						
Midwest	0.957	0.076	0.944	0.175	1.133	0.114
South	1.271**	0.11	1.085	0.185	1.235*	0.119
West	0.948	0.09	1.209	0.222	1.179	0.118
Health Factors						
Poor/fair self-rated health						
Serious psychological distress						
Number of chronic conditions (ref = none)						
One						
Two-three						
Four or more						
Needs ADL/IADL assistance						
Functional limitation						
Constant	4.228**	1.782	1.271	0.944	0.227***	0.096

NOTE: ADL = activities of daily living; IADL = instrumental activities of daily living.
All models control for survey year. Odds ratio and standard errors are presented for each model.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Supplementary Table 1 Continued... Logistic Regression Models Predicting Health Outcomes Among Older HUD Renters and Unassisted Low-Income Older Renters (62+ Years Old)

	Needs ADL/IADL Assistance		Unmet Care Needs		Transportation Barrier	
Current HUD renter	1.052	0.084	0.939	0.071	0.931	0.102
Sociodemographic Characteristics						
Age	1.050***	0.005	0.940***	0.005	0.971**	0.008
Female	1.325***	0.102	1.149†	0.096	1.280*	0.153
Race (ref = White)						
Black	1.013	0.096	0.899	0.082	1.200	0.179
Another race	0.622**	0.097	1.121	0.155	1.152	0.276
Hispanic	0.759**	0.077	0.982	0.11	0.687*	0.130
Education (ref = less than high school)						
High school or GED	0.884	0.074	0.858†	0.073	0.979	0.129
More than high school	1.045	0.093	1.390***	0.121	0.855	0.119
Family income less than 50% FPL	1.024	0.118	0.835	0.094	0.989	0.192
Live alone	1.175†	0.102	1.122	0.102	1.381*	0.211
Health Insurance Status (ref=Medicare only/other insurance)						
No insurance	0.422**	0.115	2.698***	0.52	1.176	0.321
Medicaid	2.037***	0.159	0.683***	0.053	1.080	0.131
Metro Area	1.062	0.133	0.983	0.113	0.753	0.140
Census region (ref = Northeast)						
Midwest	1.339*	0.163	1.610***	0.182	1.109	0.207
South	1.035	0.105	2.169***	0.222	1.444*	0.248
West	1.202	0.137	2.338***	0.267	1.141	0.206
Health Factors						
Poor/fair self-rated health			1.291**	0.099	1.431*	0.201
Serious psychological distress			2.154***	0.29	2.304***	0.345
Number of chronic conditions (ref = none)						
One			1.228†	0.15	0.978	0.211
Two-three			1.362*	0.167	1.378	0.283
Four or more			1.527**	0.224	2.183**	0.509
Needs ADL/IADL assistance			1.037	0.091	1.495**	0.184
Functional limitation			1.422***	0.132	1.334†	0.216
Constant	0.004***	0.002	11.228***	5.04	0.207*	0.155

NOTE: ADL = activities of daily living; IADL = instrumental activities of daily living.
All models control for survey year. Odds ratio and standard errors are presented for each model.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Supplementary Table 1 Continued... Logistic Regression Models Predicting Health Outcomes Among Older HUD Renters and Unassisted Low-Income Older Renters (62+ Years Old)

	Long-Term Homecare Use		Bed Disability		Hospitalization		Emergency Room Visit	
Current HUD renter	0.748*	0.086	0.885	0.084	1.062	0.091	1.059	0.075
Sociodemographic Characteristics								
Age	1.035***	0.008	0.973***	0.007	1.003	0.006	0.999	0.005
Female	0.999	0.124	1.153	0.129	0.795**	0.066	0.899	0.067
Race (ref = White)								
Black	1.611**	0.229	0.871	0.102	0.987	0.091	1.034	0.093
Another race	1.114	0.233	0.816	0.146	0.887	0.133	0.634**	0.084
Hispanic	0.829	0.157	0.571***	0.081	0.777*	0.095	0.806*	0.082
Education (ref = less than high school)								
High school or GED	0.918	0.123	0.911	0.104	1.034	0.101	0.980	0.087
More than high school	0.978	0.134	1.663***	0.190	1.060	0.104	1.114	0.102
Family income less than 50% FPL	1.020	0.174	0.984	0.146	1.217	0.167	1.051	0.118
Live alone	1.492*	0.233	0.925	0.103	1.436**	0.154	1.029	0.085
Health Insurance Status (ref=Medicare only/other insurance)								
No insurance	0.550	0.380	1.063	0.284	0.681	0.180	0.958	0.179
Medicaid	2.046***	0.253	1.083	0.102	1.042	0.091	1.111	0.081
Metro Area	1.136	0.261	0.865	0.131	1.149	0.157	0.916	0.125
Census region (ref = Northeast)								
Midwest	0.953	0.157	0.855	0.118	1.059	0.118	1.063	0.110
South	0.581***	0.088	0.963	0.121	1.086	0.119	1.075	0.104
West	0.503***	0.094	1.127	0.148	0.984	0.124	1.047	0.104
Health Factors								
Poor/fair self-rated health	1.650***	0.209	2.118***	0.210	1.378***	0.121	1.382***	0.101
Serious psychological distress	0.847	0.160	1.875***	0.251	1.085	0.150	1.703***	0.225
Number of chronic conditions (ref = none)								
One	1.165	0.257	1.314	0.247	1.835***	0.282	1.424**	0.166
Two-three	1.196	0.266	1.477*	0.275	2.106***	0.313	1.790***	0.199
Four or more	1.488†	0.348	2.958***	0.583	4.677***	0.755	3.424***	0.470
Needs ADL/IADL assistance	6.9423***	0.922	1.960***	0.186	1.388***	0.119	1.308***	0.099
Functional limitation	1.548*	0.299	2.492***	0.351	1.584***	0.175	1.46***	0.117
Constant	0.001***	0.000	0.291*	0.183	0.038***	0.019	0.192***	0.085

NOTE: ADL = activities of daily living; IADL = instrumental activities of daily living.
All models control for survey year. Odds ratio and standard errors are presented for each model.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Supplementary Table 2.
Predictive Margins- Unadjusted and Adjusted Percentages of Health Outcomes Among HUD Renters and Unassisted Low-Income Renters 62 Years of Age and Older
Weighted NHIS-HUD Linked Data (2006-2018) (*N* = 7,288)

	Unadjusted			Adjusted		
	HUD renter	Unassisted renter	Difference	HUD renter	Unassisted Renter	Difference
Fair/Poor Health	45.9%	49.4%	-3.5%*	46.3%	48.4%	-2.1%
Serious Psychological Distress	7.2%	7.0%	0.2%	6.4%	5.5%	0.8%
Functional Limitation	68.6%	63.3%	5.3%**	68.1%	67.3%	0.7%
Needs ADL/IADL assistance	30.7%	25.3%	5.4%***	27.1%	26.1%	1.0%
Unmet Care Needs Due to Cost	27.7%	33.5%	-5.8%***	27.1%	28.3%	-1.3%
Transportation Barrier	8.1%	8.3%	-0.2%	6.2%	6.7%	-0.4%
Long-Term Homecare Use	9.9%	8.9%	1.0%	4.2%	5.5%	-1.3%*
Bed Disability	15.6%	16.8%	-1.2%	11.0%	12.3%	-1.3%
Hospitalization	23.0%	19.5%	3.5%*	19.5%	18.6%	0.9%
Emergency Room Visit	34.9%	32.2%	2.7%†	32.9%	31.7%	1.2%

Note. ADL = activities of daily living; IADL = instrumental activities of daily living.
p values represent statistically significant differences between older HUD renters and unassisted low-income older renters.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Chapter 3: HUD Rental Assistance and Access to Health-Related Services Among Older Adults

Abstract

Objective: To examine if receipt of HUD rental assistance is associated with improved access to health-related services among low-income older adults.

Methods: Data are from 13 years (2006-2018) of the National Health Interview Survey (NHIS) merged with longitudinal HUD administrative data (N = 5,247). Multivariate logistic regression models examine if current older HUD renters are less likely to have unmet care needs and more likely to use long-term homecare services compared to future older HUD renters, who will start receiving rental assistance within two years after their NHIS interview (the average HUD waitlist duration). This pseudo-waitlist comparison group mitigates the potential impact of selection into HUD assistance, a common limitation of prior work.

Results: In the unadjusted model, 34.6% of future HUD renters experienced an unmet care need compared to 27.9% of current HUD renters ($p <.05$). However, after adjusting for sociodemographic characteristics, specifically health insurance, the difference was no longer statistically significant. Current HUD renters (10.1%) were slightly more likely to receive homecare services compared to future HUD renters (8.3%) in the unadjusted model ($p =.24$). However, in the fully adjusted model, current HUD renters were *less* likely to receive homecare services than future HUD renters ($p <.10$).

Discussion: Differences in access to health insurance may help explain why current older HUD renters are less likely to have unmet care needs than future older HUD renters. More research is needed to examine if current HUD renters are less likely to *need* homecare services or due to barriers in access to homecare services.

Introduction

The number of older adults spending more than half of their income on housing expenses has reached an all-time high with roughly 5 million older households struggling to afford their home (Joint Center for Housing Studies, 2019). The Department of Housing and Urban Development (HUD) is the primary funder of rental assistance in the United States, but only 36 percent of income-eligible older households receive assistance due to insufficient public resources (Alvarez & Steffen, 2021). Low-income older adults waiting for housing assistance experience homelessness, housing instability, food insecurity, poor health, and high hospital use and often face trade-offs between covering housing expenses or paying for food, medications, and other health-related expenses (Carder, Kohon, Limburg, & Becker, 2018). Evidence suggests that older renters living in unaffordable housing are more likely to experience unnecessary nursing home placement (Jenkins Morales & Robert, 2020) and health decline over time (Jenkins Morales & Robert, 2022).

Evidence also suggests that receipt of HUD rental assistance might improve access to health-related services, but little is known about this connection among the older population. Simon and colleagues (2017) used data from the National Health Interview Survey (NHIS) merged with HUD administrative data (NHIS-HUD) to compare current HUD renters to future HUD renters who will receive HUD rental assistance within two years (the average HUD waitlist duration) *after* their NHIS interview. This pseudo-waitlist comparison group mitigates the potential impact of selection into HUD assistance, a common limitation of prior work (Fenelon et al., 2017). The results suggest that current HUD renters have improved access to health insurance and other health-related services (e.g., medical care, prescription medications, mental health care, dental services, etc.), but the study excluded all participants who received disability

benefits or were over the age of 65, a significant portion of the population receiving rental assistance. Although the large majority of Americans aged 65 and over are Medicare beneficiaries, a considerable portion still experience unmet care needs. For instance, 28% of older HUD renters and 33% of low-income older renters without HUD assistance couldn't afford needed care in the past year (Jenkins Morales, 2022), and it is not known if receipt of rental assistance improves access to health-related services among this population.

It is also not known if receipt of rental assistance improves access to community-based long-term care (LTC) services, which remains a significant unaddressed need for older adults in the United States. Approximately 70 percent of older Americans will need ongoing help with activities of daily living (e.g., preparing meals, dressing, managing medications) at some point in their lives, and Medicare only partially covers post-acute LTC services for a limited time (usually 100 days) (U.S. Department of Health and Human Services, 2019). Medicaid, the federal-state health insurance program for people with low-income, is the nation's largest payer of LTC services, but access to community-based LTC services is limited and older adults spend over two years on average waiting for services (Musumeci et al., 2019). One study comparing HUD-assisted older adults with Medicare and Medicaid to unassisted older adults with Medicare and Medicaid in the community found that HUD-assisted older adults were more likely to use Medicaid LTC services but less likely to use acute care, even after controlling for health differences (The Lewin Group, 2016). The researchers concluded that HUD-assisted older adults might be more aware of Medicaid covered LTC services, but their analysis excludes housing choice voucher recipients (39% of older HUD renters), was limited to 12 geographic areas, and the comparison group does not address selection into HUD rental assistance (The Lewin Group, 2016). In contrast to the Lewin Group (2016), Jenkins Morales (2022) found that older current

HUD renters were *less* likely to receive long-term homecare services compared to unassisted low-income older renters after adjusting for health differences; however, this study design also failed to sufficiently address potential selection bias.

Although older adults are overrepresented among HUD-assisted households and a growing number of older people need rental assistance, we know surprisingly little about the connection between receipt of HUD rental assistance and access to health-related services among this population. Examining this connection specifically among the older population is important since older adults are more likely to have a disability, need LTC services, and have access to different age-restricted programs compared to the younger population. These differences present unique challenges and opportunities to improve services that integrate housing and health to better meet the needs of the aging population.

Conceptual Framework

As seen in Figure 1, I draw from the Behavioral Model for Vulnerable Populations (Gelberg et al., 2000) to better understand the association between HUD rental assistance and access to health-related services. In addition to the Behavioral Model, I also draw from the conceptualization of health care access developed by Levesque et al. (2013) and from the housing literature that suggests specific pathways connecting housing assistance and access to health services. According to the Behavioral Model (Gelberg et al., 2000), predisposing characteristics, enabling factors, and need factors influence health behavior. Predisposing charactertistics are based on the sociostructural characteristics of an individual (e.g., age, race, gender) and can either deter or encourage health service use. Enabling factors are the resources that could effect access to health services (e.g., financial resources, family support). Need, both perceived by the individual and evaluated by others, is the precipitating factor that causes the

individual to seek health services (e.g., poor mental or physical health). In the Behavioral Model (Gelberg et al., 2000), health care utilization is used as a proxy measure for access, since realized access is often easier to measure than potential access. Levesque et al. (2013) build from the Behavioral Model and other conceptual frameworks to describe the process that connects health care needs and use of services. Levesque et al. (2013) define access as the opportunity to have health care needs fulfilled and posit that access depends on the accessibility of providers, organizations, systems and how those macro-level factors interact with the ability of populations, communities, and individuals to access services.

Housing researchers have also proposed specific pathways that connect receipt of rental assitance and access to health services (Fertig & Reingold, 2007; Simon et al., 2017). Although I will not directly test these effects, I describe them here to better understand why we would expect receipt of HUD rental assistance to improve access to health services among older adults. Drawing from the Behavioral Model (Gelberg et al., 2000), and what has been referred to in the literature as a "stability effect" (Simon et al., 2017), older adults experiencing housing insecurity might neglect their health as they manage competing needs (e.g., securing shelter, food, etc.) (Gelberg et al., 1997). Once stable housing is secured, individuals are more likely to use needed health services (Kushel, Gupta, Gee, & Haas, 2005; Simon et al., 2017).

The "income effect" also might help explain the health benefits of living in affordable housing. Evidence suggests that experiencing housing disadvantage creates trade-offs between covering housing expenses and paying for health-related goods and services (e.g. nutritious food, medications, preventive health services) (Alley et al., 2011; Meltzer & Schwartz, 2015; Pollack, Griffin, & Lynch, 2010). Since HUD participants typically pay no more than 30% of their

household income toward rent, receipt of rental assistance likely frees up financial resources that can be used on health services (Simon et al., 2017).

Receipt of HUD assistance also might impact access to health services through a "gateway effect" (Fertig & Reingold, 2007) by connecting older adults with other programs that in turn reduce barriers to health services. For instance, older adults receiving project-based assistance might have access to a service coordinator that connects them to public benefits (e.g., Medicare Saving Programs, transportation assistance, or long-term care coordination) or live in buildings that are located near a variety of services.

The Current Study

The purpose of this study was to examine if receipt of HUD rental assistance improves access to health-related services among older adults. Similar to Simon et al. (2017), I used a pseudo-waitlist comparison group and compared current HUD renters to future HUD renters who received rental assistance within two years after their NHIS interview. To measure access to health-related services two outcome measure were used[3]: (1) experiencing an unmet care need due to cost in the past year (2) use of long-term homecare services in the past year. I hypothesize that current HUD renters will be *less* likely to have unmet care needs and *more* likely to receive long-term homecare services than future HUD renters. I also examine potential differences in the association between receipt of HUD rental assistance and access to health-related services by HUD program type, which includes: the Housing Choice Voucher (HCV) program, multifamily housing (MFH), and public housing (PH).

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[3] Although not the focus of the present study, the results for experiencing a transportation barrier (delayed getting medical care due because didn't have transportation) as the outcome of interest are available online in the supplementary materials.

Methods

Data

I use pooled cross-sectional data from 13 years (2006-2018) of the National Health Interview Survey merged with longitudinal HUD administrative data (NHIS-HUD) (National Center for Health Statistics Division of Analysis and Epidemiology, 2022). Although NHIS-HUD data are available starting in 1999, I chose to use data after 2005 since HUD administrative systems improved data quality in the early 2000s (National Center for Health Statistics, 2019a). NHIS data were obtained from Integrated Public Use Microdata Samples (IPUMS) created by researchers at the University of Minnesota (Blewett et al., 2022). The NHIS is conducted annually and collects data on a broad range of health characteristics among the civilian, noninstitutionalized population in the United States. A nationally representative sample of households are selected using a multistage area probability design that involves oversampling of specific populations. Within each household, one adult is randomly selected for the sample adult module, which was used in the present study. For the 2006-2018 sample, 84% of NHIS sample adults were eligible for linkage to HUD administrative data based on consent for record linkage activities and providing adequate personally identifiable information (National Center for Health Statistics, 2022a). The HUD administrative data were collected by local public housing agencies and private building owners and included participants' dates of enrollment, basic demographic information, and the type of HUD rental assistance received. More information on the NHIS-HUD data linkage can be found in detail elsewhere (National Center for Health Statistics, 2022b).

The analytic sample used in the present study consisted of current HUD renters (those who had HUD rental assistance at the time of their NHIS interview) and future HUD renters (those who would start receiving HUD rental assistance within two years after their NHIS

interview) aged 62 and over (*N* = 5,247). The age threshold of 62 was chosen based on the HUD definition of an older household (National Center for Health Statistics, 2019a). 95% of older adults remained in the sample after deleting cases with missing data on covariates (*n* = 231) and outcomes (*n* = 52) of interest. Bivariate analyses comparing participants dropped from the sample (*n* = 283) to those remaining (*N* = 5,247) suggest that the final analytic sample underrepresents participants who are older, lower income, live with others, and who identify as Hispanic or another race/ethnicity.

Measures

Main Independent Variables. HUD assistance status was the primary independent variable of interest and determined by the timing of the NHIS interview in relation to receipt of HUD rental assistance. Current HUD renters were receiving HUD rental assistance at the time of their NHIS interview, whereas future HUD renters would receive HUD rental assistance within two years after their NHIS interview. As a comparison group, future HUD renters represent the best estimate of those on the waiting list for HUD rental assistance since the average HUD waitlist duration is roughly two years (HUD, 2021). The HUD administrative data also provide information on the specific type of rental assistance received. Housing choice vouchers (HCV) are a form of tenant-based assistance that allow participants to rent in the private market. Multifamily housing (MFH) and public housing (PH) are forms of project-based assistance where the rental subsidy is tied to a specific housing unit. PH buildings are owned and operated by public housing agencies, whereas MFH buildings are privately owned and include the Section 202 Supportive Housing for the Elderly program, which enables nonprofit organizations to build and operate affordable housing for people 62 years and older.

Access to Health-Related Services Outcomes. Unmet care needs due to cost and long-term homecare use were the outcomes used to measure access to health-related services. If a

participant needed, but couldn't afford (or delayed) medical care, dental care, eyeglasses, prescription medications, or mental health care in the past year then they were considered to have an unmet care need. Participants were also asked if they received care at home from a nurse or other health care professional in the past year and if they did, for how many months. Since Medicare generally does not cover long-term care services past 100 days, participants who received homecare for four months or more were categorized as receiving long-term homecare services in the past year.

Predisposing Characteristics. Self-reported age (top coded at 85 years old), gender (female = 1; male = 0), education (referent = less than high school; high school/GED; beyond high school), and race/ethnicity (referent = non-Hispanic White; non-Hispanic Black; or Hispanic; another race/ethnicity) were included as sociostructural characteristics of the individual that can influence access to health-related services based on the status of a person in the community.

Enabling Factors. Health insurance status (referent = Medicare only or other insurance; no insurance; Medicaid[4]), living arrangement (lives alone = 1; lives with others = 0), and family income to poverty ratio (referent = <50%; 50%–99%; 100%–199%; >200%) were included as enabling factors that can facilitate or impede use of health services. The family income to poverty ratio measure was created by the National Center for Health Statistics (NCHS) based on the family size, self-reported total combined income for all family members, and the U.S. Census Bureau's poverty thresholds in the year of the interview. Since self-reported family income was missing for approximately 10% of cases, the NCHS provided imputed values for the family income to poverty ratio measure that were used in all analyses and have been described in detail

[4] Most participants with Medicaid also had Medicare.

elsewhere (National Center for Health Statistics, 2019b). From the HUD administrative data, the age of the participant when they started receiving HUD rental assistance (62+ at HUD admission = 1; less than 62 years old at HUD admission = 0) was also included since older adults who started receiving rental assistance at younger ages likely have different health trajectories than older adults who received HUD assistance for the first time in later life. Contextual enabling characteristics included U.S. census region (Northeast, Midwest, South, West) and urban-rural residence at the census block level (1 = urban; 0 = rural).

Need Factors. Self-rated health (1=poor/fair; 0=good/very good/excellent) was used as a measure of perceived need to describe how the participant views their own general health status. Number of chronic conditions (referent = none; one; two-three; four or more) was included as a more objective measure of need based on a count of 10 conditions (hypertension, diabetes, coronary heart disease, previous stroke, history of cancer, chronic obstructive pulmonary disease, asthma, renal disease, hepatic disease, and arthritis). Participants who reported that at least one of nine activities (e.g., pushing large objects, walking a quarter of a mile, climbing stairs, standing, sitting, bending over, reaching over head, grasping small objects, and carrying 10 pounds) were very difficult, or they couldn't perform the activity due to a health problem were considered to have a functional limitation. Participants were also asked if they currently needed help from another person related to six activities of daily living (ADL) (e.g., getting dressed, bathing, using the toilet, getting out of bed, eating, or getting around the home) or instrumental activities of daily living (IADL) (e.g., help with routine needs, such as household chores, shopping, etc.). Participants who reported needing help on any of the ADL measures or the IADL measure were categorized as needing ADL/IADL assistance. The Kessler-6 scale of psychological distress was used as a measure of mental health, and asks respondents if they felt hopeless, sad, nervous,

restless or fidgety, worthless, or that everything was an effort in the past 30 days. Similar to previous research, a cut off score of 13 or higher was used to identify participants with serious psychological distress (Brucker & Helms, 2019; Fenelon et al., 2017).

Analysis

It is often difficult to assess the effects of participation in rental assistance programs due to unobserved differences between those who receive rental assistance and those who do not. Analyses that compare people who receive rental assistance to those who do not (e.g., low-income renters without assistance) cannot adequately control for unobserved differences between these two groups. For instance, we know that older adults seek HUD rental assistance for financial and health reasons (Carder et al., 2018), and that older HUD renters are more likely to have multiple chronic conditions, functional limitations, and be hospitalized in the last year compared to unassisted low-income older renters (Jenkins Morales, 2022). The analytic strategy used in this study mitigates the potential impact of selection into HUD assistance by comparing current HUD renters to future HUD renters who will start receiving rental assistance within two years after their NHIS interview (the average HUD waitlist duration). Use of this pseudo-waitlist comparison group has successfully been used in prior work (Fenelon et al., 2017; Simon et al., 2017; Wong et al., 2018).

Bivariate analyses were used to first examine differences between current and future HUD renters. Drawing from the Behavioral Model (Gelberg et al., 2000), a stepwise approach was used to examine the association between HUD rental assistance and access to health-related services (e.g., use of homecare and unmet care needs) before (Model 1) and after adjusting for predisposing characteristics and enabling factors (Model 2) and need factors (Model 3). This stepwise approach facilitates examination of potential mediators that help explain the association between receipt of HUD rental assistance and access to health-related services. To examine

potential differences by HUD program type, I added interaction terms between rental assistance type (HCV, PH, MFH) and housing status (current vs. future HUD renter) in the final model (Model 4). Models 2-4 also control for survey year. I used the margins command in Stata to generate unadjusted and adjusted estimated probabilities of each outcome by HUD assistance status and program type. All analyses were conducted in Stata Version 16.0 (Stata Corp, College Station, TX) and used the adjusted NHIS sample adult weight, which was created by the NCHS to account for both linkage eligibility in the NHIS-HUD dataset and oversampling of specific subgroups and non-response in the NHIS (National Center for Health Statistics, 2022b).

Results

Table 1 describes the sample and presents differences in predisposing characteristics, enabling factors, need factors, and access to health-related services among current (n = 4,673) and future (n = 574) HUD renters. Future HUD renters were more likely to live in MFH (55.9% vs. 47.9%) and less likely to live in PH (17.8% vs. 22.9%) or receive an HCV (26.3% vs. 29.2%) compared to current HUD renters (p = .099). National HUD estimates from 2012 (the midpoint of the pooled cross-sectional data from 2006-2018) suggest that 49% of older households lived in MFH, 29% were HCV holders, and 22% lived in PH (HUD, 2012), which is consistent with the distribution of the full sample across HUD programs shown in Table 1. The average age of participants was 73 years old, with future HUD renters being 1.7 years younger on average than current HUD renters (p = .001). Roughly half of the sample identified as non-Hispanic White (50.0%) and graduated from high school (55.0%), with future HUD renters more likely to be non-Hispanic White (57.9% vs. 48.7%; p = .012) and a high school graduate (61.1% vs. 54.0%; p = .040) compared to current older HUD renters.

Most participants were over the age of 62 when they first started receiving HUD rental assistance (69.7%), lived alone (74.9%), had incomes below the federal poverty level (51.3%), and the large majority lived in a metropolitan area (92.8%). At the time of their NHIS interview, future HUD renters were significantly less likely to live alone (56.2% vs. 77.9%; $p < .001$) or live in an urban area (88.4% vs. 92.8%; $p = .024$) compared to current HUD renters, but there was no significant difference by census region between the two groups. Current HUD renters were significantly more likely to live below the federal poverty line (53.5% vs. 37.5%; p <.001) and have Medicaid (48.9% vs. 38.4%; p <.001) compared to future HUD renters. Only 2.6% of the sample did not have health insurance, but future HUD renters were significantly *more* likely to not have health insurance compared to current HUD renters (6.4% vs. 2.0%; $p < .001$). Roughly half of the sample (46.7%) rated their health as fair or poor and most participants had at least two chronic physical conditions (60.2%) and a functional limitation (68.8%), with 30% needing assistance with ADL/IADL tasks. Current HUD renters were more likely to need ADL/IADL assistance (31.5% vs. 21.1%; $p < .001$) and less likely to experience serious psychological distress (7.6% vs. 10.7%; $p = .068$) compared to future HUD renters. Despite current HUD renters being more likely to need assistance with ADL/IADL tasks, there was not a statistically significant difference in use of long-term homecare services between current and future HUD renters (10.1% vs. 8.3%; $p = .243$).

As seen in Table 1, more than a quarter of the sample (28.8%) experienced an unmet care need due to cost in the past year, with current HUD renters less likely to experience unmet care needs than future HUD renters (27.9% vs. 34.6% ; $p = .011$). The most common unmet care need was among participants who needed, but could not afford dental care (15.9%), with 19.0% of future HUD renters and 15.4% of current HUD renters experiencing an unmet dental care need in

the past year ($p = .082$). Although future HUD renters were more likely than current HUD renters to experience unmet care needs on all five measures (medical care, dental care, eyeglasses, prescription medications, and mental health care), the largest difference was seen in access to prescription medications, with 16.3% of future HUD renters compared to 9.1% of current HUD renters being unable to afford medications in the past year ($p < .001$).

Unmet Care Needs Due to Cost

I hypothesized that current HUD renters would be *less* likely to experience unmet care needs compared to future HUD renters. As seen in Table 2, the results from the unadjusted model (M1) align with my hypothesis -- current HUD renters were significantly less likely to have an unmet care need compared to future HUD renters (OR = 0.73, $SE = 0.09$; $p <.05$). However, contrary to my hypothesis, after adjusting for differences in predisposing characteristics and enabling factors, specifically health insurance status, there was no longer a statistically significant difference in the likelihood of experiencing an unmet care need between current and future HUD renters. Compared to older adults with only Medicare, participants with Medicaid (and in most cases Medicare as well) were significantly *less* likely to experience an unmet care need (OR = 0.69, $SE = 0.07$; $p <.001$) and participants without health insurance were significantly *more* likely to have an unmet care need in the past year (OR = 2.69, $SE = 0.78$; $p <.01$). Since future HUD renters were significantly less likely to have Medicaid and more likely to be uninsured than current HUD renters (as seen in Table 1), these differences in health insurance coverage help explain why there is no longer a statistically significant difference in unmet care needs between future and current HUD renters in the adjusted model. Future HUD renters were also more likely than current HUD renters to experience serious psychological distress in the past year, which was associated with 2.1 times greater odds of having an unmet care need (OR = 2.11, $SE = 0.33$; $p <.001$).

Long-Term Homecare Use

I also hypothesized that current HUD renters would be *more* likely to use long-term homecare services compared to future HUD renters. As seen in the unadjusted model (M1) in Table 3, current HUD renters were more likely than future HUD renters to receive long-term homecare services in the past year, but the difference was not statistically significant. Contrary to my hypothesis, after predisposing characteristics and enabling factors were added in Model 2, current HUD renters were *less* likely than future HUD renters to receive long-term homecare services. According to Model 2, being older, younger at HUD admission, more likely to be non-Hispanic Black (compared to non-Hispanic White), less likely to be a high school graduate, and more likely to have Medicaid helped explain why current HUD renters were more likely to have long-term homecare services than future HUD renters in Model 1. After accounting for differences in need factors in Model 3, current HUD renters were even more likely to not receive long-term homecare services compared to future HUD renters and the difference reached statistical significance (OR = 0.68, $SE = 0.15$; $p < .10$). As seen in Table 4, in the unadjusted model (M1) 10.1% of current HUD renters compared to 8.3% of future HUD renters received long-term homecare services, but after adjusting for differences in predisposing characteristics, enabling factors, and need factors (M3) the predicted probability of current HUD renters receiving homecare services was 4.4% compared to 6.3% for future HUD renters ($p < .10$). Table 3 Model 3 also shows that needing ADL/IADL assistance was associated with 6.1 times greater odds of receiving long-term homecare services (OR = 6.10, $SE = 0.92$; $p < .001$). As seen in Table 1, current HUD renters were significantly more likely to need ADL/IADL assistance than future HUD renters (31.5% vs. 21.1%; $p < .001$), which further mediated the association between HUD assistance status and receipt of long-term homecare services.

Differences in Access to Health-Related Services by HUD Program Type

As seen in Model 4 of Tables 2 and 3, the interaction between HUD rental assistance status (current vs. future HUD renter) and HUD program type (HCV, PH, and MFH) was not statistically significant for both outcomes suggesting that the association between HUD assistance and access to health-related services is similar across HUD programs. Although the interactions did not reach statistical significance, there are patterns that are worth mentioning for future research to explore. As seen in Table 4, for the unmet care needs analysis, current HUD renters were less likely to have unmet care needs than future HUD in the unadjusted models across all HUD programs. Although not statistically significant, current HUD renters were also less likely to have unmet care needs than future HUD renters among HCV holders and residents of MFH in the adjusted models, but among PH residents, current HUD renters were slightly *more* likely to have unmet care needs than future HUD renters (27.1% vs. 24.6%).

Although the interaction did not quite reach statistical significance ($p = 0.101$), the results from the adjusted homecare model suggest that residents of MFH, compared to HCV holders, might be less likely to use long-term homecare services once they start receiving HUD rental assistance. As seen in Table 4, among MFH residents current HUD renters (10.3%) were *less* likely to use long-term homecare services than future HUD renters (15.9%), but among HCV holders current HUD renters (9.2%) were slightly *more* likely to receive homecare services than future HUD renters (8.2%). Like residents of MFH, current HUD renters (8.4%) living in PH were *less* likely to receive long-term homecare services than future HUD renters (10.9%) in the adjusted model, but the difference was not as large.

Discussion

This is the first known study to examine if receipt of HUD rental assistance improves access to health-related services among a nationally representative sample of older adults. Use of a pseudo-waitlist comparison group reduces the possibility of selection bias compared to previous analytic approaches (e.g., comparing HUD renters to unassisted low-income renters). The stepwise approach also allows for examination of potential mediating factors that help explain the connection between receipt of HUD rental assistance and access to health-related services and explore potential variation in outcomes by the type of HUD rental assistance received. Overall, the results provide mixed support for my hypothesis that receipt of HUD rental assistance improves access to health-related services among older adults.

HUD Rental Assistance and Unmet Care Needs

Consistent with my hypothesis, in the unadjusted model current HUD renters were significantly less likely than future HUD renters to experience an unmet care need due to cost in the past year. However, after adjusting for predisposing characteristics and enabling factors, the association was no longer statistically significant. This finding is inconsistent with the work of Simon and colleagues (2017) who found that among adults 18-64 without a disability, there was still a statistically significant difference between current and future HUD renters even after controlling for predisposing characteristics and enabling factors. Taken together, these results suggest that adults 18-64 without a disability are more likely to experience reduced unmet care needs due to receipt of HUD rental assistance than older adults. The results also suggest the importance of access to health insurance as a mediator between HUD assistance and experiencing unmet care needs. Research suggests that among the younger population without disabilities, receipt of HUD rental assistance improves access to health insurance, which in turn partially explains why HUD rental assistance reduces the likelihood of having unmet care needs (Simon et al., 2017). Since older adults are more likely to have Medicare than the younger

population, you would expect that access to HUD rental assistance does not significantly improve access to health insurance. However, given the complexity of the United States healthcare system, the results of this study suggest that this assumption should be explored in future research. For instance, receiving Medicaid was associated with a reduced likelihood of experiencing an unmet care need compared to older adults with only Medicare. If receipt of HUD rental assistance improves access to Medicaid among older adults with Medicare, then unmet care needs would also likely decline.

HUD also defines an older adult as anyone over the age of 62, whereas Medicare eligibility typically begins at age 65. Therefore, older HUD renters between 62-64 years old are at greater risk of being uninsured or underinsured and experiencing unmet care needs. Overall, the results emphasize the importance of access to health insurance on unmet care needs, which can be achieved through changes to public policy. For instance, lowering the Medicare eligibility age or expanding covered services (e.g., dental care) and expanding access to Medicaid by lowering income and asset limits, would likely reduce unmet care needs among older adults experiencing housing insecurity.

Like Simon et al. (2017), I also find that the association between HUD assistance and unmet care needs did not generally differ by the type of HUD assistance received in the unadjusted or adjusted models. However, Simon et al. (2017) found that current compared to future PH residents were the *least* likely to experience unmet care needs (39.4% vs. 50.2%, $p < .05$) among adults 18-64 without a disability; whereas this study focusing on older adults found that PH residents were the *most* likely to experience unmet care needs in the adjusted model (27.1% vs. 24.6%), although the difference was not statistically significant. Future research with

larger samples should explore if and why PH residents might be more likely to have unmet care needs in later life than MFH residents or HCV holders.

HUD Rental Assistance and Long-Term Homecare Use

Consistent with my hypothesis, current HUD renters were *more* likely to receive long-term homecare services than future HUD renters in the unadjusted model, although the difference was not statistically significant. However, inconsistent with my hypothesis, after adjusting for predisposing, enabling, and need factors, current HUD renters were *less* likely to receive long-term homecare services than future HUD renters ($p < .10$). This result is consistent with the work of Jenkins Morales (2022), which compared current older HUD renters to unassisted low-income older renters, but inconsistent with the work of the Lewin Group (2016), which compared older current HUD renters with Medicare and Medicaid to dual enrollees in the community without HUD assistance.

This result could be explained by several factors that should be explored in future research. First, similar to the results for the unmet care needs analysis, health insurance partially mediated the association between HUD assistance status and receipt of homecare services. Current HUD renters were more likely to have Medicaid and having Medicaid was significantly associated with receipt of homecare services ($p < .001$). When health insurance was not included in the final model, current HUD renters were still less likely to receive homecare services than future HUD renters, but the difference did not reach statistical significance (results not shown). Since research suggests that receipt of HUD rental assistance improves access to health insurance (Simon et al., 2017), it is possible that current HUD renters have improved access to Medicaid, which in turn contributes to homecare use.

However, it is surprising that in the unadjusted model there was not a statistically significant difference in long-term homecare use between current and future HUD renters

considering that current HUD renters were significantly *more* likely to need assistance with ADL/IADL tasks compared to future HUD renters ($p < .001$). This could suggest that current HUD renters are more likely to experience barriers to homecare use than future HUD renters, or that receipt of HUD rental assistance changes the perceived and/or actual need for homecare services. For instance, evidence suggests that older HUD renters are more likely to have accessibility features in their home compared to unassisted older renters, especially among recipients of project-based assistance (MFH or PH) (Airgood-Obrycki & Molinsky, 2020). Having more environmental support (e.g., grab bars, no-step entrance) may reduce the need for long-term homecare services among older HUD renters. The results from the interaction testing differences in the association between HUD assistance and homecare use by HUD program type provide some support for this assertion, although the difference did not quite reach statistical significance ($p = .101$). In the adjusted model, current residents of MFH, which includes the Section 202 Supportive Housing for the Elderly program, were *less* likely to received long-term homecare services compared to future HUD renters (10.3% vs. 15.9%). However, among participants of the HCV program, there was little difference in receipt of homecare services, with current HUD renters being slightly *more* likely to use homecare services than future HUD renters (9.2% vs. 8.2%). Since residents of MFH likely have more environmental support compared to HCV holders, this might suggest that changes in the *need* for homecare services among those with project-based assistance partially explains why current HUD renters are less likely to receive long-term homecare services than future HUD renters.

Limitations

Although this study provides new evidence to better understand the connection between receipt of HUD rental assistance and access to health-related services among older adults, several limitations should be considered. Using the pseudo-waitlist comparison group does improve

upon other work comparing current HUD renters to unassisted low-income renters in the community; however, this analytic approach is not without limitations. For instance, although I control for age at HUD admission, there are likely unobserved differences between older current HUD renters, who often aged within HUD housing arrangements, compared to future HUD renters who are receiving assistance for the first time in later life. Since older adults seek HUD rental assistance for financial and health reasons (Carder et al., 2018), it is also challenging to disentangle if receipt of HUD assistance caused the change in access to health-services, or if the health crisis resolved over time, which coincided with receipt of HUD assistance.

The sample also overrepresents younger, higher income, White participants who live alone, and since the NHIS is a household survey, does not include people experiencing homelessness. On a practical level, it is difficult to provide homecare services when older adults do not have a stable home (Bipartisan Policy Center, 2016), so not including future HUD renters who are unhoused may bias the results. The comparison group of future HUD renters also does not include participants who died or were institutionalized before having the opportunity to receive HUD rental assistance, which may downwardly bias the results. Although NCHS generated weights were used in all analyses to account for differences in linkage eligibly in the NHIS-HUD dataset, there is likely still some level of selection bias based on linkage eligibility.

Levesque et al. (2013) define access to health services as the opportunity to have health care needs fulfilled and identify that realized access (use of services) is easier to measure than potential access. Although the unmet care need measures capture barriers to potential access and not use of services, the NHIS does not include measures of unmet care needs related to long-term care services. Therefore, this study relies on use of long-term homecare services as an imperfect measure of access. Future research with stronger measures of potential access, rather than use, is

needed to better understand the association between receipt of HUD rental assistance and access to long-term care services in the community.

Conclusion

Despite these limitations, this study uses an innovative pseudo-waitlist comparison group to examine the association between receipt of HUD rental assistance and access to health-related services among older adults, a population with unique needs that is often overlooked in the housing literature (Reina & Aiken, 2022). The results suggest the importance of health insurance in promoting access to health-related services and highlight the need for future research to explore if and how HUD rental assistance may improve access to health insurance among the older population. More research is also needed to examine if older HUD renters experience barriers to receiving homecare services or if receipt of HUD rental assistance provides more environmental support and reduces the need for long-term care. Given the aging of the population and the growing need for affordable housing in the United States, the results of this study provide a helpful foundation for future work to better understand the connection between housing and access to health services in later life and can inform programs and policies designed to promote healthy aging in the community.

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Tables & Figures

Figure 1. Operationalized Conceptual Model Drawing from the Behavioral Model for Vulnerable Populations (Gelberg et al., 2000)

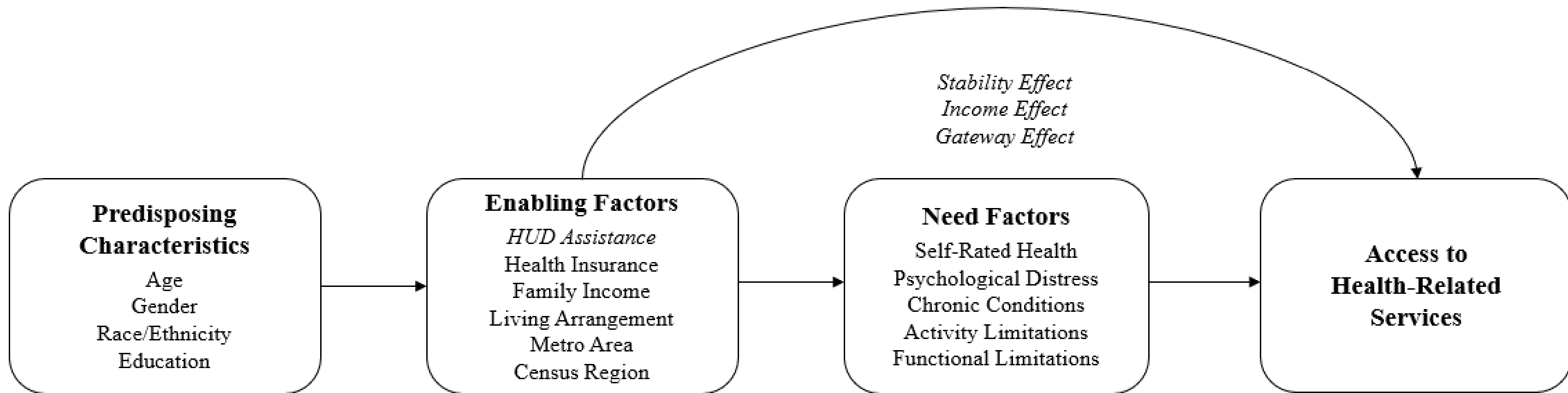

Table 1. Predisposing Characteristics, Enabling Factors, Need Factors, and Access to Health-Related Services Among Older Future and Current HUD Renters
Weighted NHIS-HUD Linked Data (N=5,247)

	Future HUD Renters (*n*= 574) % (SE)	Current HUD Renters (*n*= 4, 673) % (SE)	Full Sample (N=5,247) % (SE)	*p*
HUD program type				0.099
Housing choice voucher	.2634 (.025)	.2915 (.0183)	.2876 (.0166)	
Multifamily housing	.5589 (.0327)	.4793 (.0247)	.4903 (.0222)	
Public housing	.1777 (.0284)	.2291 (.0231)	.222 (.0208)	
Predisposing Characteristics				
Mean age (years)	71.53 .4644	73.24 .1848	73.00 .1781973	0.001
Female	.6636 (.0241)	.6983 (.0104)	.6934 (.0099)	0.159
Race				0.012
Non-Hispanic White	.5793 (.0275)	.4873 (.0195)	.5001 (.0176)	
Non-Hispanic Black	.1942 (.0198)	.2379 (.015)	.2318 (.0135)	
Another race/ethnicity	.096 (.0161)	.089 (.0113)	.09 (.0099)	
Hispanic	.1305 (.0176)	.1858 (.0139)	.1781 (.0127)	
Education				0.040
Less than high school	.3889 (.0255)	.4602 (.0112)	.4503 (.0107)	
High school or GED	.3215 (.0254)	.2874 (.0096)	.2921 (.0088)	
More than high school	.2896 (.0243)	.2524 (.0095)	.2575 (.0092)	
Enabling Factors				
62+ at HUD admission	.8608 (.0188)	.6701 (.0121)	.6965 (.0108)	0.000
Live alone	.5618 (.0291)	.7789 (.0117)	.7488 (.0114)	0.000

Table 1. Continued…

	Future HUD Renters (*n*= 574) % (SE)	Current HUD Renters (*n*= 4, 673) % (SE)	Full Sample (N=5,247) % (SE)	*p*
Family income (percent of Federal Poverty Line)				0.000
Less than 50%	.0538 (.0116)	.0615 (.0047)	.0604 (.0045)	
50%-<100%	.3216 (.0257)	.4737 (.0105)	.4526 (.0099)	
100%-<200%	.4261 (.029)	.3817 (.0102)	.3878 (.01)	
200% or more	.1986 (.0238)	.0831 (.0055)	.0991 (.0059)	
Health insurance status				0.000
No health insurance	.0637 (.015)	.0198 (.0033)	.0259 (.0036)	
Medicaid	.3836 (.025)	.4885 (.0123)	.4739 (.0114)	
Medicare only/other insurance	.5527 (.0277)	.4917 (.0124)	.5002 (.0116)	
Urban area	.8841 (.0179)	.9279 (.013)	.9218 (.012)	0.024
Census region				0.403
Northeast	.2701 (.0311)	.2945 (.0227)	.2911 (.0207)	
Midwest	.2449 (.0294)	.2424 (.0249)	.2428 (.0225)	
South	.3244 (.0306)	.2729 (.0204)	.28 (.019)	
West	.1606 (.0193)	.1902 (.0185)	.1861 (.0163)	
Need Factors				
Fair/poor self-rated health	.4825 (.0251)	.4646 (.01)	.467 (.0092)	0.512
Serious psychological distress, past 30 days	.1072 (.0184)	.0758 (.0054)	.0802 (.0053)	0.068

Table 1. Continued…

	Future HUD Renters (*n*= 574) % (SE)	Current HUD Renters (*n*= 4, 673) % (SE)	Full Sample (N=5,247) % (SE)	*p*
Number of chronic physical conditions				0.234
None	.1501 (.0188)	.1279 (.0069)	.1309 (.0065)	
One	.2574 (.0221)	.2691 (.007)	.2675 (.0068)	
Two-three	.4692 (.0269)	.4451 (.009)	.4485 (.0086)	
Four or more	.1233 (.0176)	.1579 (.0073)	.1531 (.0068)	
Needs ADL/IADL assistance	.211 (.0223)	.3146 (.011)	.3003 (.0104)	0.000
Has any functional limitation	.6681 (.0242)	.6913 (.0103)	.6881 (.0098)	0.352
Access to Health-Related Services				
Any unmet care need due to cost, past year	0.3458 (.0259)	0.2791 (.0096)	0.2883 (.0092)	0.011
Needed but couldn't afford or delayed medical care	.1624 (.0215)	.1158 (.0066)	.1222 (.0064)	0.023
Needed but couldn't afford dental care	.1903 (.0203)	.1542 (.0081)	.1592 (.0075)	0.082
Needed but couldn't afford eyeglasses	.1464 (.0189)	.1094 (.0064)	.1145 (.0063)	0.036
Needed but couldn't afford prescription medicines	.1631 (.0216)	.0908 (.006)	.1008 (.0059)	0.000
Needed but couldn't afford mental health care	.0342 (.0129)	.0156 (.0024)	.0182 (.0028)	0.052
Received homecare 4 months or more, past year	.0827 (.0143)	.101 (.006)	.0985 (.0058)	0.243

Note. ADL = activities of daily living; IADL = instrumental activities of daily living.
p values are based on design-based F-test that corrects for the NHIS complex survey design.

Table 2. Stepwise Logistic Regression Models (Odds Ratios & Standard Errors) Predicting Unmet Care Needs Due to Cost Among Older Current and Future HUD Renters
Weighted NHIS-HUD Linked Data (2006-2018) (N=5,247)

	M1		M2		M3		M4	
Current HUD renter	0.732*	0.090	0.859	0.112	0.905	0.118	0.821	0.189
HUD Program Type (ref = Housing choice voucher)								
Multifamily Housing			1.048	0.105	1.099	0.110	1.031	0.283
Public Housing			0.850	0.104	0.922	0.112	0.679	0.253
Predisposing Characteristics								
Age			0.937***	0.007	0.932***	0.007	0.932***	0.007
Female			1.305**	0.128	1.234*	0.121	1.232*	0.121
Race (ref = White)								
Black			0.839†	0.089	0.889	0.096	0.888	0.096
Another race			0.880	0.135	0.978	0.153	0.975	0.152
Hispanic			0.862	0.123	0.965	0.139	0.966	0.140
Education (ref=less than high school)								
High school or GED			0.768*	0.082	0.841	0.090	0.840	0.090
More than high school			1.214†	0.127	1.352**	0.143	1.349**	0.142
Enabling Factors								
62+ at HUD admission			1.081	0.115	1.249*	0.137	1.249*	0.136
Family income (ref = less than 50%)								
50%-<100%			1.136	0.194	1.008	0.174	1.011	0.172
100%-<200%			1.375†	0.258	1.222	0.232	1.226	0.231
200% or more			0.864	0.211	0.823	0.204	0.838	0.204
Live alone			1.118	0.132	1.156	0.136	1.157	0.135
Health Insurance Status (ref=Medicare only/other insurance)								
No insurance			2.685**	0.777	3.226***	0.977	3.261***	0.961
Medicaid			0.690***	0.065	0.595***	0.059	0.597***	0.059
Urban Area			0.889	0.146	0.876	0.143	0.871	0.143
Census region (ref = Northeast)								
Midwest			1.377*	0.180	1.317*	0.177	1.328*	0.179
South			2.016***	0.261	1.969***	0.255	1.973***	0.256
West			2.166***	0.292	2.213***	0.304	2.223***	0.305

Table 2 Continued... Stepwise Logistic Regression Models (Odds Ratios & Standard Errors) Predicting Unmet Care Needs Due to Cost Among Older Current and Future HUD Renters
Weighted NHIS-HUD Linked Data (2006-2018) (N=5,247)

	M1		M2		M3		M4	
Need Factors								
Poor/fair self-rated health					1.315**	0.116	1.317**	0.116
Serious psychological distress					2.113***	0.330	2.109***	0.330
Number of chronic conditions (ref=none)								
One					1.291†	0.187	1.291†	0.187
Two-three					1.460**	0.209	1.461**	0.208
Four or more					1.687**	0.300	1.692**	0.301
ADL/IADL difficulty					1.138	0.118	1.135	0.118
Functional limitation					1.447***	0.152	1.450***	0.152
Interactions (ref = Housing Choice Voucher)								
Public housing X Current HUD							1.415	0.565
Multifamily housing X Current HUD							1.076	0.314
Constant	0.529***	0.060	27.864***	16.868	18.099***	11.132	19.686***	12.729

Note. ADL = activities of daily living; IADL = instrumental activities of daily living.
Models 2, 3, & 4 control for survey year. Odds ratio and standard errors are presented for each model.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 3. Stepwise Logistic Regression Models (Odds Ratios & Standard Errors) Predicting Long-Term Homecare Use Among Older Current and Future HUD Renters
Weighted NHIS-HUD Linked Data (2006-2018) (N=5,247)

	M1		M2		M3		M4	
Current HUD renter	1.247	0.236	0.842	0.163	0.685†	0.150	1.177	0.445
HUD Program Type (ref = housing choice voucher)								
Multifamily Housing			1.116	0.154	1.272†	0.183	2.588*	1.218
Public Housing			0.805	0.141	0.932	0.176	1.478	1.373
Predisposing Characteristics								
Age			1.065***	0.011	1.042***	0.011	1.043***	0.011
Female			1.112	0.148	0.918	0.132	0.907	0.128
Race (ref = White)								
Black			1.806***	0.252	1.913***	0.292	1.932***	0.297
Another race			1.042	0.237	1.380	0.333	1.374	0.334
Hispanic			1.036	0.203	1.213	0.253	1.222	0.253
Education (ref=less than high school)								
High school or GED			0.753*	0.108	0.817	0.123	0.811	0.120
More than high school			0.927	0.120	0.899	0.132	0.888	0.131
Enabling Factors								
62+ at HUD admission			0.771†	0.121	0.968	0.160	0.968	0.160
Family income (ref = less than 50%)								
50%-<100%			1.011	0.255	0.942	0.244	0.937	0.241
100%-<200%			1.003	0.277	0.947	0.270	0.944	0.266
200% or more			1.279	0.365	1.340	0.413	1.308	0.406
Live alone			1.304	0.228	1.410†	0.256	1.430*	0.258
Health Insurance Status (ref=Medicare only/other insurance)								
No insurance			0.162†	0.166	0.230	0.238	0.229	0.237
Medicaid			3.019***	0.457	2.190***	0.324	2.199***	0.326
Urban Area			1.257	0.325	1.167	0.281	1.179	0.289
Census region (ref = Northeast)								
Midwest			1.337	0.238	1.159	0.225	1.156	0.220
South			0.669*	0.113	0.580**	0.104	0.575**	0.103
West			0.515**	0.116	0.442***	0.101	0.440***	0.101

Table 3. Continued... Stepwise Logistic Regression Models (Odds Ratios & Standard Errors) Predicting Long-Term Homecare Use Among Older Current and Future HUD Renters
Weighted NHIS-HUD Linked Data (2006-2018) (N=5,247)

	M1		M2		M3		M4	
Need Factors								
Poor/fair self-rated health					1.847***	0.267	1.845***	0.267
Serious psychological distress					0.798	0.162	0.806	0.164
Number of chronic conditions (ref=none)								
One					0.998	0.314	0.997	0.311
Two-three					1.254	0.376	1.259	0.375
Four or more					1.665†	0.495	1.661†	0.489
ADL/IADL difficulty					6.103***	0.917	6.157***	0.911
Functional limitation					1.635*	0.366	1.645*	0.367
Interactions (ref = Housing Choice Voucher)								
Public housing X Current HUD							0.592	0.562
Multifamily housing X Current HUD							0.445	0.219
Constant	0.090	0.017	0.000***	0.000	0.000***	0.000	0.000***	0.000

Note. ADL = activities of daily living; IADL = instrumental activities of daily living.
Models 2, 3, & 4 control for survey year. Odds ratio and standard errors are presented for each model.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 4. Predictive Margins- Unadjusted and Adjusted Percentages of Access to Health-Related Services Outcomes Among Older Current and Future HUD Renters by HUD Program Type
Weighted NHIS-HUD Linked Data

	Unmet Care Needs Due to Cost						**Long-Term Homecare Use**					
	Unadjusted (M1)			Adjusted (M3)			Unadjusted (M1)			Adjusted (M3)		
	Current HUD Renter	Future HUD Renter	Difference	Current HUD Renter	Future HUD Renter	Difference	Current HUD Renter	Future HUD Renter	Difference	Current HUD Renter	Future HUD Renter	Difference
Housing Choice Voucher	30.5%	38.1%	-7.6%	27.8%	31.4%	-3.6%	9.6%	6.6%	3.0%	9.2%	8.2%	1.1%
Public Housing	24.4%	27.6%	-3.2%	27.1%	24.6%	2.5%	8.4%	6.0%	2.4%	8.4%	10.9%	-2.5%
Multifamily Housing	28.0%	35.1%	-7.1%	29.7%	32.0%	-2.3%	11.2%	9.7%	1.5%	10.3%	15.9%	-5.6%
All HUD Programs	27.9%	34.6%	-6.7%	25.9%	27.8%	-1.9%	10.1%	8.3%	1.8%	4.4%	6.3%	-1.9%

Supplementary Table 1.
Stepwise Logistic Regression Models (Odds Ratios & Standard Errors) Predicting Transportation Barrier to Needed Medical Care Among Older Current and Future HUD Renters
Weighted NHIS-HUD Linked Data (62+ 2006-2018) (N=5,247)

	M1		M2		M3		M4	
Current HUD renter	1.283	0.273	1.092	0.235	1.113	0.238	1.233	0.488
HUD Program Type (ref = Housing choice voucher)								
Multifamily Housing			0.700*	0.112	0.724†	0.122	0.947	0.446
Public Housing			0.756	0.138	0.828	0.154	0.554	0.361
Predisposing Characteristics								
Age			0.975*	0.011	0.966**	0.012	0.966**	0.012
Female			1.567**	0.228	1.420*	0.208	1.411*	0.205
Race (ref = White)								
Black			1.158	0.193	1.310	0.229	1.314	0.231
Another race			1.040	0.303	1.271	0.373	1.266	0.373
Hispanic			0.540**	0.124	0.634†	0.154	0.638†	0.154
Education (ref=less than high school)								
High school or GED			0.980	0.162	1.063	0.184	1.063	0.184
More than high school			0.961	0.158	1.009	0.176	1.005	0.176
Enabling Factors								
62+ at HUD admission			0.787	0.130	0.968	0.159	0.974	0.161
Family income (ref = less than 50%)								
50%-<100%			1.396	0.396	1.216	0.353	1.205	0.347
100%-<200%			1.491	0.419	1.270	0.362	1.252	0.355
200% or more			0.579	0.230	0.530	0.207	0.525	0.207
Live alone			1.117	0.235	1.108	0.242	1.109	0.243
Health Insurance Status (ref=Medicare only/other insurance)								
No insurance			0.879	0.322	1.077	0.407	1.064	0.400
Medicaid			1.177	0.181	0.933	0.150	0.933	0.150
Urban Area			1.344	0.311	1.307	0.296	1.296	0.297
Census region (ref = Northeast)								
Midwest			1.097	0.223	0.970	0.212	0.977	0.214
South			1.305	0.238	1.208	0.235	1.212	0.236
West			0.796	0.192	0.760	0.188	0.767	0.190

Supplementary Table 1. Continued... Stepwise Logistic Regression Models (Odds Ratios & Standard Errors) Predicting Transportation Barrier to Needed Medical Care Among Older Current and Future HUD RentersWeighted NHIS-HUD Linked Data (62+ 2006-2018) (N=5,247)

	M1		M2		M3		M4	
Need Factors								
Poor/fair self-rated health					1.129	0.192	1.132	0.192
Serious psychological distress					2.419***	0.451	2.417***	0.447
Number of chronic conditions (ref=none)								
One					1.562	0.470	1.571	0.472
Two-three					1.754†	0.508	1.762†	0.511
Four or more					2.918***	0.891	2.942***	0.900
ADL/IADL difficulty					1.973***	0.305	1.979***	0.304
Functional limitation					1.412†	0.265	1.417†	0.266
Interactions (ref = Housing Choice Voucher)								
Public housing X Current HUD							1.533	1.042
Multifamily housing X Current HUD							0.733	0.368
Constant			0.245	0.230	0.164†	0.162	0.150†	0.157

Note. ADL = activities of daily living; IADL = instrumental activities of daily living. Models 2, 3, & 4 control for survey year. Odds ratio and standard errors are presented for each model.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Supplementary Table 2.
Predictive Margins- Unadjusted and Adjusted Percentages of Experiencing a Transportation Barrier to Needed Medical Care Among Older Concurrent and Future HUD Renters Over by HUD Program Type
Weighted NHIS-HUD Linked Data

	Unadjusted (M1)			Adjusted (M4)		
	Current HUD Renter	Future HUD Renter	Difference	Current HUD Renter	Future HUD Renter	Difference
Housing Choice Voucher	10.7%	8.5%	2.2%	9.5%	7.9%	1.5%
Public Housing	7.8%	3.5%	4.3%	8.3%	4.7%	3.5%
Multifamily Housing	6.8%	6.5%	0.3%	6.9%	7.6%	-0.6%
All HUD Programs	8.2%	6.5%	1.7%	5.9%	5.3%	0.6%

Chapter 4: HUD Rental Assistance is Associated with Better Health Among Older Adults

Abstract

Background and Objective: Access to affordable housing is a growing need for the aging population. Research suggests that receipt of rental assistance can improve health, but studies often exclude or do not specifically examine the older population. The purpose of this study is to test if rental assistance is associated with healthy aging among low-income older adults.

Research Design and Methods: Data are from 13 years (2006-2018) of the National Health Interview Survey (NHIS) merged with HUD administrative data (***N*=5,322**). Multivariate logistic regression models test differences in healthy aging outcomes between current older HUD renters and future older HUD renters who will start receiving rental assistance within two years (the average HUD waitlist duration) after their NHIS interview. Comparing current to future HUD renters mitigates the potential impact of selection into HUD assistance.

Results: In the adjusted models, older current HUD renters were less likely to report fair/poor health (OR = 0.82, $SE = 0.10$; $p <.10$) or experience serious psychological distress (OR = 0.62, $SE = 0.14$; $p < .05$) compared to future HUD renters. Among older public housing residents and housing choice voucher holders, current HUD renters were less likely to have a functional limitation compared to future HUD renters (OR = 0.66, $SE = 0.13$; $p < .05$), but not among participants of HUD multifamily housing programs.

Discussion and Implications: Receipt of HUD rental assistance may improve health and functioning among older adults. Expanded access to affordable housing options could promote healthy aging in the community.

Background and Objectives

Promoting healthy aging is a national policy priority and there is growing recognition of housing as a social determinant of health (Braveman et al., 2011; Hasbrouck, 2021; Maqbool et al., 2015; Taylor, 2018). Given that population aging is coinciding with a growing housing crisis, it is essential to better understand if and how access to affordable housing can promote healthy aging in the community (Joint Center for Housing Studies, 2019). However, surprisingly little is known about the link between affordable housing and health among older adults. Studies using nationally representative survey data from the Health and Retirement Study provide evidence that use of senior housing for low- and moderate-income older adults promotes a variety of healthy aging outcomes (Kim, Kwon, & Park, 2018; Park, Han, Kim, & Dunkle, 2017; Park, Kim, & Han, 2018), but we cannot disentangle what specific factors related to living in senior housing are protective. For example, is living in a congregate setting necessary to achieve these healthy aging outcomes or would simply lowering housing costs in the community produce similar results? A recent study using the National Health and Aging Trends Study found that low- and moderate-income older renters with housing cost burden, defined as spending more than 30% of their income on rent, were more likely to experience health decline over time (Jenkins Morales & Robert, 2022), but we do not know if receipt of rental assistance would improve the health of these older renters and what programs are most effective. Studies have found that receipt of assistance is associated with improved self-rated health and mental well-being, but these studies either exclude or do not specifically examine these effects among older adults (Denary et al., 2021; Fenelon et al., 2017, 2018).

Evidence also suggests potential differences in the association between receipt of HUD rental assistance and health by age. For instance, Wong and colleagues (2018) found that receipt

of HUD rental assistance was associated with increased physical activity among adults 18-64 years old, but not among older adults. Simon and colleagues (2017) found that among adults 18-64 without a disability, receipt of HUD rental assistance improved access to health-related services. However, a similar study by Jenkins Morales (2022a) found that receipt of HUD rental assistance was not significantly associated with improved access to health-related services among older adults, potentially due to the current policy context (e.g., access to Medicare and Social Security income for most older adults). Given that older people have unique needs (e.g., more likely to have multiple chronic conditions) and resources (e.g., more likely to have access to health insurance) compared to younger people, it is necessary to better understand the connection between affordable housing and health among the growing older population. The purpose of this study is to address this gap in the literature by examining if receipt of rental assistance from the Department of Housing and Urban Development (HUD) promotes healthy aging among older adults and test if there are any differences in healthy aging outcomes by the type of HUD rental assistance received.

HUD Rental Assistance and Older Adults

HUD is the nation's largest provider of rental assistance, serving 1.8 million older households in 2021 (HUD, 2021). Across HUD's rental assistance programs, households typically pay 30% of their income towards rent with a HUD subsidy covering the remaining costs. The three largest HUD rental assistance programs include: the Housing Choice Voucher (HCV) program, multifamily housing (MFH), and public housing (PH). The HCV program is a form of tenant-based assistance, meaning that HCV holders find housing in the private rental market, and they can take their HCV with them to another rental unit if they move. PH and MFH are types of project-based assistance where the HUD rental subsidy is tied to a specific unit in a PH or MFH building. PH buildings are owned and operated by local Public Housing Agencies,

whereas MFH buildings are privately owned and often receive below-market financing to provide affordable units for a specific period of time. In 2021, approximately 39% of older households receiving HUD rental assistance participated in the HCV program and the remaining 61% received project-based assistance in PH (17%) or MFH (44%) (HUD, 2021). A recent descriptive study suggests that older HCV holders have worse health than older adults receiving project-based assistance, but based on the study design, we do not know if older HCV holders are less likely to experience the potential health benefits associated with receipt of HUD rental assistance, or if they enter the HCV program in worse health (Jenkins Morales, 2022b).

Conceptual Framework

Figure 1 depicts the conceptual framework that informs this study. I draw from the Person-Environment (P-E) fit perspective (Lawton & Nahemow, 1973) and from a growing body of literature examining housing as a social determinant of health (Fertig & Reingold, 2007; Keene et al., 2018; Simon et al., 2017; Taylor, 2018). The P-E fit perspective posits that individuals thrive in environments where their individual capacities are aligned with environmental demands and opportunities (Lawton & Nahemow, 1973). When environmental press (the interaction between individual capacities and environmental demands) is too strong, older adults are more likely to experience negative outcomes. The World Health Organization (2015) and others have drawn from the P-E fit perspective to conceptualize healthy aging as a *process* of developing and maintaining functional ability that enables well-being as we grow older. In this way, healthy aging is not meant to describe a disease-free state that differentiates between healthy and unhealthy older adults; rather, it reflects the functional ability of older adults by considering their physical and mental capacities, their environmental context, and the interaction between an individual's capacity and their environment.

Drawing from the P-E fit perspective, receipt of HUD rental assistance may improve access to environmental resources (e.g., accessibility features inside the home, aging services, etc.), which in turn would reduce environmental press and provide a better “fit” between the needs of the older adult and their environment to promote adaptation and health. In this way, improved access to environmental resources might mediate the association between HUD rental assistance and healthy aging. Evidence also suggests that experiencing housing disadvantage contributes to elevated stress levels (Singh et al., 2019), which in turn can effect health (Keene et al., 2018). Stress has been described as an umbrella term that represents experiences when environmental demands outweigh a person’s perceived ability to cope effectively (Cohen et al., 2016). Receipt of HUD rental assistance might reduce stress by improving access to environmental resources, and/or by directly impacting an individual’s ability to cope with environment demands (stress effect). For instance, having stable housing (stability effect) and more disposable income every month (income effect) would likely reduce stress since older adults would be more confident in their ability to cope with unexpected expenses. Receipt of rental assistance also might directly reduce environmental demands, which in turn could lower stress. For instance, evidence suggests that older adults with rental assistance are more likely to have safety and accessibility features in their home compared to unassisted low-income older renters (Airgood-Obrycki & Molinsky, 2020). In this way, HUD rental assistance might serve as a gateway to an accessible living arrangement that reduces stress and promotes healthy aging (gateway effect).

We also know from the literature that the association between HUD rental assistance and health might vary by the type of HUD rental assistance received. For instance, a 2017 study by Fenelon and colleagues found that among all adults 18 years and older, HUD rental assistance

was associated with improved self-rated health among residents of PH and MFH, but not among HCV holders. Among adults and children in the United States, studies also suggest that PH, but not MFH or the HCV program, is associated with positive mental health outcomes (Fenelon et al., 2017, 2018). Given what we know about differences in HUD rental assistance programs, it is possible that the HCV program does not improve housing stability and/or access to environmental resources through the gateway effect to the same extent as other HUD programs. For instance, Airgood-Obrycki and Molinsky (2020), found that older adults with project-based assistance (PH and MFH) were more likely to have accessibility features (e.g., grab bars, no-step entrance) in their home compared to older HCV holders.

The Current Study

The purpose of this study was to examine if receipt of HUD rental assistance promotes healthy aging among older adults. Similar to Fenelon and colleagues (2017), I compare current HUD renters to future HUD renters who will receive HUD rental assistance within two years after their NHIS interview (the average HUD waitlist duration) (HUD, 2021). Use of future HUD renters as a "pseudo-waitlist" comparison group mitigates the potential impact of selection into HUD assistance since Public Housing Agencies often prioritize populations with more health challenges, and evidence suggests that older adults seek HUD rental assistance for both financial *and* health reasons (Carder et al., 2018). To measure healthy aging three outcome measures were used: self-rated health, serious psychological distress, and functional limitation. Drawing from the conceptual model (Figure 1), I hypothesize that current older HUD renters will be less likely to rate their health as poor or fair, experience serious psychological distress, or have a functional limitation compared to future HUD renters. I also examine if older HUD renters experience the same healthy aging outcomes regardless of the type of HUD rental assistance received. Based on prior studies (Airgood-Obrycki & Molinsky, 2020; Fenelon et al., 2017), I hypothesize that older

HUD renters with project-based assistance (PH or MFH) will be more likely to experience potential health benefits compared to those with tenant-based assistance (HCV).

Research Design and Methods

Data

I use 13 years of pooled cross-sectional data (2006-2018) from the National Health Interview Survey (NHIS) merged with longitudinal HUD administrative data. The NHIS-HUD dataset offers a unique opportunity to examine a nationally representative sample, with valid measures of HUD rental assistance, additional HUD program information, and various health measures from the NHIS (National Center for Health Statistics Division of Analysis and Epidemiology, 2022). The NHIS is conducted annually on a nationally representative sample of households in the United States using a multistage area probability design. One adult in each household is randomly selected to complete the sample adult module, which was used for this study. NHIS data were obtained from Integrated Public Use Microdata Samples (IPUMS) created by researchers at the University of Minnesota (Blewett et al., 2022). Data from NHIS participants were linked to HUD administrative records if participants provided consent for record linkage activities and the necessary personally identifiable information (National Center for Health Statistics, 2022a). For the 2006-2018 sample, 84% of NHIS sample adults were eligible for linkage. Weights generated by the National Center for Health Statistics (NCHS) adjust for differences between the linkage eligible and ineligible populations. More information on the NHIS-HUD data linkage can be found in detail elsewhere (National Center for Health Statistics, 2022b).

The analytic sample used for this study consisted of current HUD renters (NHIS participants who were receiving HUD rental assistance at the time of their interview) and future HUD renters (NHIS participants who would receive HUD rental assistance within two years

after their interview) who were 62 years of age or older at the time of their NHIS interview (*N* = 5,322). I use the age threshold of 62 to correspond with the HUD definition of an "older" household (National Center for Health Statistics, 2019a). 96% of participants in the analytic sample remained in the study after dropping cases with missing data on covariates (*n* = 50) and outcomes of interest (*n* = 158). Bivariate analyses comparing participants dropped from the study (*n* = 208) to those remaining suggest that participants who are younger, White, and live alone are overrepresented in the final analytic sample (*N* = 5,322).

Measures

Healthy Aging Outcomes. Self-rated health, serious psychological distress, and having a functional limitation were the healthy aging outcomes of interest. These measures were self-reported by participants in the NHIS and were chosen to capture both mental and physical health as well as participants' perception of their own health status. Binary measures of each healthy aging outcome were used to ease interpretation of the results and to compare the results to previous NHIS-HUD research that used similar measures (Brucker et al., 2018; Fenelon et al., 2017; Simon et al., 2017). Self-rated health (1=poor/fair; 0=good/very good/excellent) was used to measure the participant's view of their overall health and well-being. The Kessler-6 scale was used to measure serious psychological distress and asks respondents if they felt hopeless, sad, nervous, restless or fidgety, worthless, or that everything was an effort in the past 30 days. Responses ranged from 0 "none of the time" to 4 "almost all of the time" with the summed Kessler-6 score ranging from 0 to 24. Similar to previous research, I used a cut off score of 13 or higher to indicate serious psychological distress (Brucker & Helms, 2019; Fenelon et al., 2017). Functional limitation was measured using nine questions asking participants how difficult it was to perform specific activities (e.g., pushing large objects, walking a quarter of a mile, standing, sitting, climbing stairs, reaching over head, bending over, carrying 10 pounds, and grasping

small objects) without any special equipment. Participants were considered to have a functional limitation if they reported that any of the nine activities were very difficult or they couldn't perform the activity due to a health problem.

HUD Assistance Status. HUD assistance status was determined by the timing of the NHIS interview in relation to receipt of HUD rental assistance. Current HUD renters were receiving HUD rental assistance at the time of their NHIS interview and future HUD renters would receive rental assistance within two years *after* their NHIS interview. Future HUD renters act as a pseudo-waitlist comparison group since the average amount of time people spend waiting for HUD rental assistance is two years (HUD, 2021).

HUD Program Type. HUD administrative data were used to determine the type of HUD assistance received at the time of the NHIS interview (for current HUD renters) or the first type of assistance received (for future HUD renters) and includes the three primary HUD rental assistance programs: public housing (PH), multifamily housing (MFH), and the Housing Choice Voucher (HCV) program. PH and MFH are considered project-based assistance since the HUD subsidy is tied to a specific housing unit that is privately owned, in the case of the MFH program, or own and operated by local Public Housing Agencies, in the case of the PH program. The MFH program includes a number of distinct HUD programs, including Project-Based Section 8 (the largest MFH program) and Section 202 Supportive Housing for the Elderly program. In the HCV program, assistance is considered tenant-based since participants find their own housing in the private rental market and the subsidy is not tied to a specific housing unit.

Covariates. Sociodemographic covariates from the NHIS included self-reported age (top coded at 85 years old), gender (female = 1; male = 0), race/ethnicity (referent = non-Hispanic White; non-Hispanic Black; or Hispanic; another race/ethnicity), education (referent = less than

high school; high school/GED; beyond high school), living arrangement (lives alone = 1; lives with others = 0), health insurance status (referent = Medicare only or other insurance; no insurance; Medicaid[5]), and family income to poverty ratio (referent = <50%; 50%–99%; 100%–199%; >200%). The family income to poverty ratio measure was created by the NCHS based on self-reported total combined income for all family members adjusted for family size, and the corresponding U.S. Census Bureau's poverty thresholds in the year of the interview. Since family income information was missing for approximately 10% of cases, the NCHS provided imputed values for the family income to poverty ratio measure that were used in all analyses and have been described in detail elsewhere (National Center for Health Statistics, 2019b). The age of the participant when they started receiving HUD rental assistance (62+ at HUD admission = 1; less than 62 years old at HUD admission = 0) was also included from the HUD administrative data as a proxy measure for duration of HUD assistance. Geographic covariates included U.S. census region (Northeast, Midwest, South, West) and urban-rural residence at the census block level (1 = urban; 0 = rural), which were created by the NCHS based on the location of the participant's home at the time of their NHIS interview.

Analysis

The analytic strategy mitigates the potential impact of selection into HUD assistance, a common limitation of prior work, by comparing current HUD renters to future HUD renters who will receive rental assistance within two years of their NHIS interview (the average HUD waitlist duration). This pseudo-waitlist comparison group has been successfully used in prior NHIS-HUD studies (Fenelon et al., 2017; Simon et al., 2017; Wong et al., 2018). First, I examined potential differences in sociodemographic characteristics between current and future HUD

[5] Most participants with Medicaid also had Medicare.

renters using chi-square and t-tests. Next, I created multivariate models to examine if current HUD renters were less likely than future HUD renters to rate their health as poor/fair, experience serious psychological distress, or have a functional limitation, after controlling for differences in sociodemographic characteristics, HUD program type, age at HUD admission, and survey year. To examine potential differences in the association between HUD rental assistance status and healthy aging by the type of HUD rental assistance received, I added an interaction term between HUD assistance status and HUD program type to the final adjusted model. In the results section (Tables 2 and 3), I present three models (M1 the unadjusted model, M2 the adjusted model, and M3 the adjusted model with the interaction). To simplify the interpretation of the logistic regression results, I used the margins command in Stata to generate unadjusted and adjusted estimated probabilities of each healthy aging outcome by HUD assistance status and HUD program type (Table 4). All analyses were conducted in Stata Version 16.0 (Stata Corp, College Station, TX) and used the adjusted NHIS sample adult weight which accounts for linkage eligibility in the NHIS-HUD dataset, non-response, and the complex sample design of the NHIS (National Center for Health Statistics, 2022b).

Results

Table 1 describes the sample and presents bivariate differences in sociodemographic characteristics between current (n = 4,740) and future (n = 582) older HUD renters. Current HUD renters were less likely to be residents of MFH (47.7% vs. 56.1%) and more likely to be HCV holders (29.3% vs. 26.1%) and residents of PH (23.0% vs. 17.8%) compared to future HUD renters (p = .079). The distribution of older HUD renters across rental assistance programs

is consistent with 2012[6] national estimates from HUD's Picture of Subsidized Households, which suggest that 49% of older HUD renters lived in MFH, 29% were HCV holders, and 22% lived in PH.

Current older HUD renters were 1.7 years older on average than future HUD renters with the average age of the full sample being 73 years old ($p < .001$). Most older HUD renters started receiving rental assistance for the first time in later life, with future HUD renters being more likely to receive HUD rental assistance after the age of 62 compared to current HUD renters (86.2% vs. 67.1%; $p < .001$). Future HUD renters were also more likely to be White (57.9% vs. 48.7%; $p = .014$), a high school graduate (61.3% vs. 53.8%; $p = .028$), have family income above the federal poverty line (62.4% vs. 46.3%; $p < .001$), to live with others (43.8% vs. 22.1%; $p < .001$), and less likely to live in an urban area (88.6% vs. 92.9%; $p = .025$). 87% of the total sample had Medicare (results not shown), with future HUD renters being less likely to have Medicaid (37.9% vs. 49.2%) and more likely to be uninsured (6.6% vs. 2.0%) compared to current HUD renters ($p < .001$).

Self-Rated Health

Testing my hypothesis that current HUD renters would be less likely than future HUD renters to rate their health as fair or poor, Table 2 shows that although there was not a statistically significant difference in self-rated health in the unadjusted model (M1), after controlling for potential confounding factors in M2, current HUD renters were less likely to rate their health as fair or poor compared to future HUD renters (OR = 0.82, $SE = 0.10$; $p < .10$). Consistent with my hypothesis, the estimated probabilities shown in Table 4 suggest that in the

[6] 2012 was chosen as the midpoint of the pooled cross-sectional NHIS-HUD data from 2006-2018 used in this study.

adjusted model 46.0% of current HUD renters and 51.2% of future HUD renters (5% difference) reported having fair or poor health.

As seen in Model 3 Table 2 and the predictive probabilities by HUD program type shown in Table 4, the results do not support my second hypothesis that older HUD renters with an HCV would be less likely to experience potential health benefits due to receipt of rental assistance compared to residents of PH or MFH. There was not a statistically significant interaction between HUD assistance status (current vs. future renter) and HUD program type (HCV, PH, MFH), and at the trend level, the results suggest that residents of MFH are less likely to experience a positive change in self-rated health compared to PH residents and HCV holders (Model 3, Table 2). As evidence of this, the predictive probabilities from the adjusted model in Table 4 show the smallest difference between current and future HUD renters participating in the MFH program (1.6%) compared to residents of PH (10.4%) or HCV holders (7.4%), although the difference was not statistically significant.

Serious Psychological Distress

In support of my first hypothesis, the results suggest that HUD rental assistance is associated with a lower likelihood of experiencing serious psychological distress. As seen in Table 2, in the unadjusted model (M1), current HUD renters were less likely to experience serious psychological distress in the past 30 days compared to future HUD renters (OR = 0.70, *SE* = 0.15; $p < .10$), and the magnitude of this association slightly strengthened after controlling for differences in sociodemographic characteristics (M3) (OR = 0.62, *SE* = 0.14; $p < .05$). The estimated probabilities shown in Table 4 suggest that in the adjusted model, 6.0% of current HUD renters and 9.4% of future HUD renters (3.4% difference) experienced serious psychological distress.

Contrary to my second hypothesis, HUD program type did not moderate the association between HUD assistance status and serious psychological distress as seen in Table 2, Model 3. Although not a statistically significant interaction, the predicted probabilities from the adjusted model shown in Table 4 suggest that at the trend level, PH residents are less likely to experience improved mental health compared to MFH residents and HCV holders. For instance, there was a smaller difference in the likelihood of experiencing serious psychological distress between current and future HUD renters participating in the PH program (1.1%) compared to residents of MFH (4.1%) or HCV holders (5.3%).

Functional Limitations

Inconsistent with my first hypothesis that current HUD renters would be less likely to have a functional limitation than future HUD renters, there was not a statistically significant difference in having a functional limitation by HUD assistance status in the unadjusted or adjusted models for the full sample (Table 3).

However, the predictive probabilities in Table 4 by HUD program type show that among older PH residents and HCV holders, current HUD renters were less likely to have a functional limitation compared to future HUD renters, but not among MFH residents. The results presented in Supplementary Table 1 show that when only PH residents and HCV holders were included in the sample ($n = 2{,}696$), the results from the adjusted model support my hypothesis that current HUD renters are less likely to have a functional limitation than future HUD renters (OR = 0.66, $SE = 0.13$; $p < .05$). Although this result supports my first hypothesis, it is inconsistent with my second hypothesis that HCV holders would be less likely to experience the health benefits associated with receipt of HUD rental assistance compared to residents of PH or MFH. As seen in Model 3 Table 3, the interaction terms comparing MFH and PH residents to HCV holders were not statistically significant, but residents of MFH compared only to residents of PH (results

not shown) were significantly *less* likely to benefit from receipt of HUD rental assistance ($p <$ .09). The predictive probabilities shown in Table 4 are useful to interpret this interaction. As seen in the adjusted model in Table 4, current MFH residents were slightly *more* likely than future MFH residents to have a functional limitation (68.4% vs. 67.1%) and current PH residents were *less* likely to have a functional limitation compared to future PH residents (63.0% vs. 73.1%). The estimated probabilities also suggest that current HCV holders were less likely than future HCV holders to have a functional limitation, but the difference was not as large (73.1% vs. 78.6%).

Discussion and Implications

The purpose of this study was to examine if HUD rental assistance promotes healthy aging and to explore potential differences in health outcomes among older adults by the type of HUD rental assistance received. This is the first known study using NHIS-HUD data to examine the association between receipt of HUD rental assistance and self-rated health and psychological distress among older adults, examine functional limitations as an outcome of interest, and control for age at HUD admission. Use of the pseudo-waitlist method, comparing current HUD renters to future HUD renters, reduced the possibility of selection bias compared to other analytic approaches (e.g., comparing HUD renters to unassisted low-income renters). The results of this study provide new evidence that receipt of HUD rental assistance promotes health and functioning in older adulthood and generates important questions for future research to examine if and why health outcomes might differ by the type of rental assistance received.

HUD Assistance and Health Among Older Adults

Overall, the results provide some support for my first hypothesis that receipt of HUD rental assistance is associated with better health among older adults, but the results do not

support my second hypothesis that older HUD renters with project-based assistance (PH or MFH) will be more likely to experience potential health benefits compared to those with tenant-based assistance (HCV). In most cases, the interaction between HUD rental assistance status and HUD program type did not reach statistical significance, suggesting that the type of HUD program received does not change the association between receipt of HUD assistance and healthy aging outcomes. However, at the trend level, the results suggest that residents of PH are the *most* likely to experience better self-rated health and fewer functional limitations after receiving HUD rental assistance, but that MFH residents, rather than HCV holders, are the *least* likely to experience these health benefits. This finding is inconsistent with the work of Fenelon and colleagues (2017) who found that among all adults 18 years and older, living in PH or MFH, but not receiving an HCV, was associated with better self-rated health. They also found that residents of PH, but not HCV holders or MFH residents, experienced improved psychological well-being, whereas this study found that older HCV holders were the most likely to experience improved psychological well-being. Taken together, these results suggest that older adults might be more likely to experience health benefits associated with the HCV program compared to younger populations. This inconsistency is surprising since the HCV program was primarily designed to improve the well-being of families with children (Reina & Aiken, 2022), and research suggests that HCV holders are less likely to have accessibility features in their homes compared to residents of PH and MFH, which older residents are more likely to benefit from (Airgood-Obrycki & Molinsky, 2020). More research is needed to better understand if and why receiving certain types of HUD rental assistance is associated with improved health outcomes and to examine potential differences by age.

The results of this study, and previous studies using NHIS-HUD data, suggest that residents of PH are generally the most likely to experience positive health outcomes compared to those receiving other types of HUD rental assistance. For instance, studies suggest that receipt of PH is associated with improved self-rated health and psychological well-being among adults (Fenelon et al., 2017), lower likelihood of experiencing unmet care needs among adults 18-64 without a disability (Simon et al., 2017), and better mental health outcomes among children ages 2-17 (Fenelon et al., 2018). Previous studies have often conflated the economic and health challenges of PH residents for the effects of the program itself (Fenelon, 2022), but these NHIS-HUD studies all use the pseudo-waitlist method which helps mitigate selection bias.

Interestingly, as the evidence grows that receipt of PH assistance promotes a variety of positive health outcomes across the life course, the availability of PH continues to decline in the United States. Between 1994 and 2019, the stock of PH declined by 30% with the loss of more than 422,000 units (Schwartz, 2021). Policy makers and program administrators interested in improving health outcomes for low-income Americans should consider how investments in PH can help reach this goal. More research is also needed to better understand if and why PH, in comparison to other market-based affordable housing options, is more likely to be associated with positive health outcomes in NHIS-HUD studies. For instance, are PH residents more likely to receive additional services from local non-profits? Or are PH residents less likely to experience unwanted moves that are associated with negative health outcomes? Longitudinal study designs that examine health changes over time across different HUD programs would also be helpful to determine if PH residents do experience better health outcomes and how health trajectories might differ by age, gender, and race.

Although this study did not explicitly test the specific pathways (stability, income, gateway, or stress) that help explain the association between receipt of HUD rental assistance and healthy aging, the results provide some insight on these effects in the context of the current literature. For instance, Jenkins Morales (2022a) found that receipt of HUD rental assistance is not associated with improved access to health-related services, but the results of this study suggest that older adults still experience improved health and functioning due to receipt of HUD rental assistance, even among HCV holders. Taken together, these results suggest that the gateway effect is not necessary to improve the health of older HUD renters and that simply lowering housing costs in the community can produce positive health outcomes (income effect). However, more research is needed to better understand how older HCV holders may benefit from the program beyond the rental subsidy (Reina & Aiken, 2022). For instance, does receipt of an HCV allow older adults with care needs to live closer (or with) family caregivers? Since stress and psychological distress are tightly linked constructs (Epel et al., 2018), the results also suggest that the stress pathway likely helps explain the association between receipt of HUD rental assistance and healthy aging. Even though these observations provide some insight on potential pathways, more research specifically focused on the interconnected nature of these pathways is needed to better understand why access to affordable housing improves health and how rental assistance programs can best leverage these connections.

The results of this study also suggest that among older HUD renters, those who start receiving rental assistance later in life (62 years or older) are less likely to have poor health than those who started receiving HUD rental assistance before the age of 62. Since current HUD renters were more likely to start receiving HUD rental assistance at younger ages than future HUD renters, controlling for age at HUD admission strengthened the association between receipt

of HUD assistance and the healthy aging outcomes. This was the first study using NHIS-HUD data and the pseudo-waitlist method to control for age at HUD admission and the results suggest that previous studies not controlling for age at HUD admission might underestimate the influence of HUD rental assistance on improved health.

Limitations

Although this study provides new evidence that receipt of HUD rental assistance is associated with improved health and functioning among older adults, several limitations should be considered. First, since older adults seek HUD rental assistance for financial and health reasons (Carder et al., 2018), it is hard to disentangle if receipt of HUD assistance caused the change in health and functioning, or if the potential health crisis that prompted the need for rental assistance resolved over time, which coincided with receipt of HUD assistance. Although I control for age at HUD admission, there are likely unobserved differences between current and future HUD renters which may bias the results. There are also likely unobserved differences that impact selection into a particular HUD program that should be explored in future research. For instance, family caregiver involvement, individual preferences, and neighborhood/regional contextual factors all may influence which HUD program an older adult participates in and are correlated with the health outcomes of interest. Although some of the control measures used in this study roughly capture these differences (e.g., live alone, Census region, urban-rural residence), more research is needed to examine how and why specific HUD programs influence healthy aging.

This study also relies on self-report measures of health from the NHIS and HUD administrative data that were not intended for research purposes. Although I conceptualized healthy aging as the interaction between an individual's capacity and their environment, the measures available in the NHIS to operationalize this concept were limited. Future research with

stronger measures that capture the interaction between the person and their environment (e.g., the ability to complete household tasks with and without assistive devices) and longitudinal data that can examine the *process* of adaptation over time is needed to better understand the association between access to affordable housing and healthy aging.

The sample underrepresents older, lower income participants and those who live with others, which may bias the results. Since the NHIS is a household survey, people experiencing homelessness who might receive HUD assistance in the future are not included in the sample, which may downwardly bias the results. The comparison group of future HUD renters also does not include participants who died or moved to a nursing home while waiting to receive HUD rental assistance. Although NCHS generated weights were used in all analyses to account for differences in linkage eligibly, there is likely still some level of selection bias based on linkage eligibility in the NHIS-HUD dataset. Despite these limitations, this study uses an innovative pseudo-waitlist comparison group, which mitigates the potential impact of selection into HUD assistance, a common limitation of prior work, and provides strong evidence that receipt of HUD rental assistance improves the health and functioning of older adults, a population often not examined in prior studies.

Conclusion

Consistent with recent studies suggesting that living in unaffordable housing is associated with health decline and unnecessary nursing home placement among low- and moderate-income older renters (Jenkins Morales & Robert, 2020, 2022), this study suggests that receipt of HUD rental assistance may help address these problems by improving the health and functioning of low-income older adults living in the community. There is growing recognition that changes in the housing sector can influence health outcomes and the results of this study support policies and programs that recognize this connection. For example, the Healthy People initiative, which

sets measurable objectives to improve the health and well-being of people nationwide, now includes an objective to reduce housing cost burden, the proportion of families spending more than 30% of their income on housing (Hasbrouck, 2021). In order to effectively distribute limited public resources, the results of this study also suggest the need for future research to examine what models of rental assistance are preferred by older renters and have the potential to improve the health and well-being of this growing population.

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Tables & Figures

Figure 1. Operationalized Conceptual Framework Drawing from the Person-Environment Fit Perspective Describing the Association between Receipt of HUD Rental Assistance and Healthy Aging

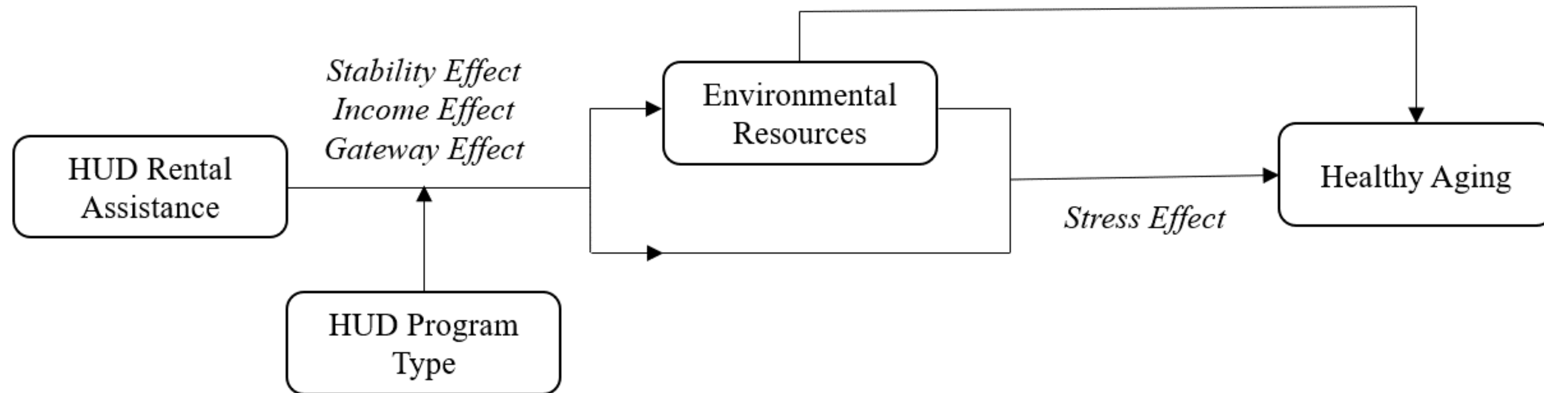

Table 1. Characteristics of Current and Future HUD Renters Aged 62 Years and Over Weighted NHIS-HUD Linked Data (N=5,322)

	Future HUD Renters (*n*=582)	Current HUD Renters (*n*=4,740)	Full Sample (*N*=5,322)	
	% (SE)	% (SE)	% (SE)	*p*
HUD program type				0.0792
Housing choice voucher	.2607	.293	.2885	
	(.0244)	(.0185)	(.0167)	
Multifamily housing	.5611	.4773	.4889	
	(.0324)	(.0248)	(.0222)	
Public housing	.1782	.2298	.2226	
	(.028)	(.0235)	(.0212)	
Mean age (years)	71.58	73.28	73.05	0.000
	0.46	0.18	0.18	
62+ at HUD admission	.8615	.671	.6974	0.000
	(.0184)	(.0119)	(.0107)	
Female	.667	.700	.6954	0.175
	(.0238)	(.0102)	(.0097)	
Race				0.014
White	.5786	.4868	.4995	
	(.0277)	(.0195)	(.0175)	
Black	.1946	.2365	.2307	
	(.0198)	(.0149)	(.0134)	
Another race/ethnicity	.0945	.0896	.0902	
	(.016)	(.0111)	(.0097)	
Hispanic	.1324	.1871	.1796	
	(.0177)	(.0139)	(.0126)	
Education				0.028
Less than high school	.3875	.4619	.4516	
	(.0255)	(.0112)	(.0107)	
High school or GED	.3195	.2865	.2911	
	(.0251)	(.0095)	(.0088)	
More than high school	.293	.2515	.2573	
	(.0242)	(.0094)	(.0091)	
Live alone	.5624	.7789	.749	0.000
	(.0291)	(.0116)	(.0113)	

Table 1. Continued... Characteristics of Current and Future HUD Renters Aged 62 Years and OverWeighted NHIS-HUD Linked Data (N=5,322)

	Future HUD Renters (*n*=582)	Current HUD Renters (*n*=4,740)	Full Sample (*N*=5,322)	
	% (SE)	% (SE)	% (SE)	*p*
Family income (percent of Federal Poverty Level)				0.000
Less than 50%	.0562	.0621	.0613	
	(.0119)	(.0048)	(.0045)	
50%-<100%	.3198	.4752	.4537	
	(.0258)	(.0104)	(.0098)	
100%-<200%	.4218	.3797	.3855	
	(.0284)	(.01)	(.0097)	
200% or more	.2022	.0831	.0995	
	(.0236)	(.0055)	(.0059)	
Health insurance status				0.000
No health insurance	.066	.0195	.0259	
	(.015)	(.0032)	(.0036)	
Medicaid	.3793	.4924	.4767	
	(.0248)	(.0123)	(.0114)	
Medicare only/other insurance	.5546	.4881	.4974	
	(.0271)	(.0124)	(.0116)	
Urban area	.8859	.9288	.9228	0.025
	(.0176)	(.0128)	(.0119)	
Census region				0.380
Northeast	.2694	.2942	.2907	
	(.0308)	(.0228)	(.0208)	
Midwest	.2444	.242	.2424	
	(.0296)	(.0249)	(.0226)	
South	.3249	.2726	.2798	
	(.0304)	(.0203)	(.019)	
West	.1614	.1912	.1871	
	(.0188)	(.0183)	(.0163)	
Fair/poor self-rated health	.4753	.4684	.4694	0.798
	(.0247)	(.0102)	(.0094)	
Serious psychological distress, past 30 days	.1056	.0762	.0802	0.082
	(.018)	(.0054)	(.0052)	
Has any functional limitation	.6720	.6919	.6897	0.352
	(.0242)	(.0103)	(.0098)	

Note.*p* values are based on design-based F-test that corrects for the NHIS complex survey design.

Table 2. Stepwise Regression Models Predicting Self-Rated Health and Serious Psychological Distress Among Older Current and Future HUD Renters Using Weighted NHIS-HUD Linked Data (62+ years old, 2006-2018) (*N*=5,322)

	Poor/Fair Health						Serious Psychological Distress					
	M1		M2		M3		M1		M2		M3	
Current HUD renter	0.973	0.105	0.815†	0.099	0.729	0.158	0.699†	0.145	0.619*	0.141	0.563	0.209
HUD Program Type (ref = Housing Choice Voucher)												
Multifamily Housing			0.882	0.085	0.714	0.180			0.862	0.140	0.814	0.359
Public Housing			0.957	0.114	1.073	0.360			0.686†	0.141	0.487	0.299
Sociodemographic Characteristics												
Age			1.002	0.006	1.002	0.006			0.962**	0.012	0.962**	0.012
62+ at HUD admission			0.696***	0.066	0.692***	0.066			0.578**	0.101	0.578**	0.101
Female			0.986	0.081	0.992	0.081			1.241	0.219	1.242	0.220
Race (ref = White)												
Black			1.092	0.097	1.089	0.097			0.420***	0.083	0.419***	0.083
Another race			0.891	0.128	0.892	0.128			0.489**	0.127	0.487**	0.127
Hispanic			1.143	0.141	1.136	0.141			0.713	0.148	0.713	0.148
Education (ref=less than high school)												
High school or GED			0.633***	0.059	0.635***	0.060			0.723†	0.138	0.722†	0.137
More than high school			0.618***	0.061	0.619***	0.061			0.498***	0.092	0.495***	0.091
Family income (ref = less than 50%)												
50%-<100%			1.336†	0.210	1.344†	0.211			1.960*	0.613	1.968*	0.616

Table 2. Continued... Stepwise Regression Models Predicting Self-Rated Health and Serious Psychological Distress Among Older Current and Future HUD Renters Using Weighted NHIS-HUD Linked Data (62+ years old, 2006-2018) (N=5,322)

	Poor/Fair Health						Serious Psychological Distress					
	M1		M2		M3		M1		M2		M3	
100%-<200%			1.153	0.181	1.161	0.182			2.131*	0.666	2.140*	0.668
200% or more			0.859	0.170	0.864	0.170			1.370	0.486	1.405	0.493
Live alone			0.750**	0.078	0.746**	0.078			0.775	0.131	0.775	0.130
Health Insurance Status (ref=Medicare only/other insurance)												
No insurance			0.841	0.243	0.836	0.241			1.066	0.566	1.079	0.570
Medicaid			1.652***	0.142	1.650***	0.142			1.273	0.218	1.278	0.219
Urban Area			1.170	0.167	1.169	0.167			0.820	0.173	0.817	0.171
Census region (ref = Northeast)												
Midwest			1.089	0.115	1.077	0.114			0.962	0.194	0.973	0.200
South			1.186	0.125	1.183	0.125			1.093	0.212	1.095	0.214
West			1.012	0.120	1.004	0.119			1.140	0.231	1.148	0.235
Interactions (ref = Housing Choice Voucher)												
Multifamily Housing X Current HUD					1.283	0.336					1.065	0.501
Public Housing X Current HUD					0.881	0.306					1.488	0.930
Constant	0.906	0.090	1.125	0.584	1.242	0.694			1.629	1.546	1.778	1.827

Note. Models 2 and 3 control for survey year. Odds ratio and standard errors are presented for each model.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 3. Stepwise Regression Models Predicting Functional Limitations Among Older Current and Future HUD Renters Using Weighted NHIS-HUD Linked Data (62+ years old, 2006-2018) (N=5,322)

	M1		M2		M3	
Current HUD renter	1.096	0.124	0.865	0.117	0.720	0.172
HUD Program Type (ref = Housing Choice Voucher)						
Multifamily Housing			0.734**	0.072	0.527*	0.141
Public Housing			0.607***	0.071	0.723	0.243
Sociodemographic Characteristics						
Age			1.053***	0.007	1.053***	0.007
62+ at HUD admission			0.634***	0.071	0.628***	0.070
Female			1.920***	0.152	1.940***	0.154
Race (ref = White)						
Black			0.725**	0.078	0.722**	0.078
Another race			0.624**	0.091	0.624**	0.090
Hispanic			0.385***	0.045	0.381***	0.045
Education (ref=less than high school)						
High school or GED			0.757**	0.068	0.760**	0.068
More than high school			0.780*	0.086	0.784*	0.087
Family income (ref = less than 50%)						
50%-<100%			1.645**	0.283	1.662**	0.289
100%-<200%			1.597**	0.284	1.614**	0.289
200% or more			1.119	0.242	1.130	0.244

Table 3. Continued... Stepwise Regression Models Predicting Functional Limitations Among Older Current and Future HUD Renters Using Weighted NHIS-HUD Linked Data (62+ years old, 2006-2018) (N=5,322)

	M1		M2		M3	
Live alone			1.026	0.111	1.019	0.110
Health Insurance Status (ref=Medicare only/other insurance)						
No insurance			0.714	0.212	0.706	0.207
Medicaid			1.506***	0.134	1.502***	0.133
Urban Area			1.028	0.189	1.026	0.191
Census region (ref = Northeast)						
Midwest			1.239	0.162	1.214	0.157
South			1.284†	0.166	1.280†	0.167
West			1.073	0.145	1.059	0.143
Interactions (ref = Housing Choice Voucher)						
Multifamily Housing X Current HUD					1.481	0.427
Public Housing X Current HUD					0.826	0.295
Constant			0.059***	0.034	0.069***	0.041

Note. Models 2 and 3 control for survey year. Odds ratio and standard errors are presented for each model.
†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 4. Predictive Margins- Unadjusted and Adjusted Percentages of Healthy Aging Outcomes Among Current and Future HUD Renters 62 Years and Older by HUD Program Type
Weighted NHIS-HUD Linked Data (2006-2018)

	Fair/Poor Self-Rated Health						**Serious Psychological Distress**						**Functional Limitations**					
	Unadjusted			Adjusted			Unadjusted			Adjusted			Unadjusted			Adjusted		
	Current	Future	Dif.	Current	Future	Dif.	Current	Future	Dif.	Current	Future	Dif.	Current	Future	Dif.	Current	Future	Dif.
Housing Choice Voucher	50.8%	55.0%	-4.2%	47.6%	55.0%	-7.4%	10.1%	12.7%	-2.6%	8.4%	13.7%	-5.3%	74.2%	75.2%	-1.0%	73.1%	78.6%	-5.5%
Public Housing	48.1%	54.4%	-6.3%	46.3%	56.7%	-10.4%	6.3%	7.6%	-1.3%	6.3%	7.4%	-1.1%	62.0%	65.6%	-3.6%	63.0%	73.1%	-10.2%
Multifamily Housing	43.8%	41.9%	2.0%	45.5%	47.1%	-1.6%	6.8%	10.5%	-3.7%	7.4%	11.6%	-4.1%	69.6%	64.0%	5.6%	68.4%	67.1%	1.3%
All HUD Programs	46.8%	47.5%	-0.7%	46.0%	51.2%	-5.1%	7.6%	10.6%	-2.9%	6.0%	9.4%	-3.4%	69.2%	67.2%	2.0%	70.3%	73.2%	-2.9%

Note. Dif. is the difference in the estimated probabilities between current HUD renters and future HUD renters. Estimated probabilities for the specific HUD program in the adjusted models are generated from Model 3 in Table 2, which includes an interaction between HUD assistance status and HUD program type. The estimated probabilities for all HUD programs were generated from Model 1 (unadjusted) and Model 2 (adjusted) in Table 2, which did not include the interaction.

Supplementary Table 1.
Stepwise Regression Model Predicting Functional Limitation Among Older Current and Future HUD Renters, Excluding Multifamily Housing Participants
Weighted NHIS-HUD Linked Data (62+ 2006-2018) (*N*=2,696)

	Functional Limitation					
	M1		M2		M3	
Current HUD renter	0.889	0.145	0.666*	0.129	0.701	0.173
HUD Program Type (ref = Housing choice voucher)						
Public Housing			0.622***	0.074	0.690	0.239
Sociodemographic Characteristics						
Age			1.055***	0.011	1.055***	0.011
62+ at HUD admission			0.655*	0.108	0.655*	0.108
Female			1.990***	0.232	1.989***	0.232
Race (ref = White)						
Black			0.590**	0.089	0.591**	0.089
Another race			0.606*	0.133	0.607*	0.133
Hispanic			0.344***	0.061	0.344***	0.061
Education (ref=less than high school)						
High school or GED			0.858	0.117	0.858	0.117
More than high school			0.801	0.130	0.801	0.130
Family income (ref = less than 50%)						
50%-<100%			1.964**	0.412	1.959**	0.413
100%-<200%			1.636*	0.398	1.630*	0.397
200% or more			1.280	0.350	1.268	0.344
Live alone			0.948	0.127	0.948	0.128

Supplementary Table 1. Continued... Stepwise Regression Model Predicting Functional Limitation Among Older Current and Future HUD Renters, Excluding Multifamily Housing ParticipantsWeighted NHIS-HUD Linked Data (62+ 2006-2018) (*N*=2,696)

	Functional Limitation					
	M1		M2		M3	
Health Insurance Status (ref=Medicare only/other insurance)						
No insurance			0.611	0.248	0.608	0.244
Medicaid			1.862***	0.225	1.859***	0.224
Urban Area			0.826	0.251	0.829	0.253
Census region (ref = Northeast)						
Midwest			1.373†	0.246	1.365†	0.242
South			1.383†	0.238	1.382†	0.237
West			1.150	0.224	1.149	0.224
Interactions (ref = Housing Choice Voucher)						
Public housing X Current HUD					0.890	0.331
Constant	2.481***	0.395	0.065**	0.055	0.062**	0.053

Note. Models 2 and 3 control for survey year. Odds ratio and standard errors are presented for each model.

Chapter 5. Conclusion

The three papers in this dissertation were presented and completed in a distinct order since the results of each paper build from each other. Although each of the three papers had its own discussion section, I conclude this dissertation with additional discussion of how the results collectively improve our understanding of the connection between affordable housing and healthy aging. I will also discuss remaining questions and limitations that future research should address. The implications for policy and programs to better meet the needs of older low-income renters will also be presented.

Dissertation Overview

The purpose of this dissertation was to describe the health of older HUD renters and examine if receipt of HUD rental assistance promotes healthy aging. The three papers included in this dissertation are the first known studies focused on the older population to use nationally representative NHIS-HUD data. Unlike other nationally representative surveys that rely on self-reported measures of housing assistance, the NHIS-HUD linked data provide valid measures of housing assistance, including the specific type of HUD rental assistance received, and the timing of that assistance. Use of NHIS-HUD data allows researchers to use the pseudo-waitlist method to compare current HUD renters to future HUD renters who will start receiving rental assistance within two years (the average HUD waitlist duration) after their NHIS interview. Previous NHIS-HUD studies using the pseudo-waitlist method have either not included or not specifically examined the association between receipt of rental assistance and health among older adults (Boudreaux et al., 2020; Fenelon et al., 2017, 2018; Simon et al., 2017). Given that older people have unique needs associated with the aging process and access to different resources (e.g.,

Medicare, Social Security, Older Americans Act services) compared to younger people, this dissertation fills an important gap in the literature.

I draw from the Person-Environment (P-E) fit perspective and hypothesize that receipt of HUD rental assistance reduces environmental press to provide a better “fit” between the older adult and their home environment to promote adaptation and healthy aging in later life. Although I did not explicitly test the specific pathways (stability, income, gateway, or stress) that help explain the potential relationship between receipt of HUD rental assistance and healthy aging, the intention was to provide some insight on these pathways. I do this by examining a variety of healthy aging outcomes that align with different pathways (e.g., improved access to health-related services supports the gateway effect and reduced likelihood of serious psychological distress supports the stress effect) and examining potential differences in healthy aging outcomes by the type of HUD rental assistance received since HUD programs provide different types/levels of environmental support. For instance, research suggests that residents of public housing (PH) or multifamily housing (MFH) units are more likely to have accessibility features in their homes (more environmental support) compared to housing choice voucher (HCV) holders (Airgood-Obrycki & Molinsky, 2020).

Summary of Results

The results of this dissertation provide a helpful foundation for future research examining the association between receipt of rental assistance and health among the older population. The first paper demonstrates that older HUD renters face considerable health challenges and that older HCV holders are significantly more likely to experience health challenges compared to older HUD renters with project-based assistance (PH or MFH). This finding is concerning since you would expect that residents with the highest level of need would receive the HUD rental assistance program that offers the highest level of support (e.g., more accessibility features, HUD

program coordinators onsite, etc.). The results also emphasize that more research is needed to fully understand *why* older HCV holders have worse health than those with project-based assistance and how rental assistance programs can adapt to make sure that older adults have access to affordable housing that matches their changing needs and preferences. For instance, are older adults with higher care needs choosing the HCV program because they can live closer to (or with) family members, or are older adults with worse health participating in the HCV program because it is the only option for rental assistance due to PH closures and/or limited geographic proximity?

The second paper suggests that receipt of HUD rental assistance does not significantly improve access to health-related services among older adults. However, the results also suggest the importance of health insurance coverage as a mediator between HUD assistance and access to health-related services and indicate the need for future research to examine if and how HUD rental assistance programs improve access to more comprehensive health insurance coverage (e.g., connecting Medicare beneficiaries to Medicaid, enrolling participants in Medicare savings programs, etc.). In the adjusted model, receipt of HUD rental assistance was associated with a lower likelihood of receiving long-term homecare services, especially among residents of MFH. Future research should examine if this difference represents a lower level of need for homecare services among older HUD renters (e.g., due to improved access to accessibility features in the home) or due to barriers in access to homecare services.

Despite HUD rental assistance not significantly improving access to health-related services (second paper), the results from the third paper suggest that receipt of HUD rental assistance is associated with better self-rated health and psychological well-being. In addition, among older PH residents and HCV holders, but not among older MFH residents, rental

assistance was also associated with better physical functioning. In contrast to other NHIS-HUD studies that found HCV holders did not experience improved health among adults and children (Fenelon et al., 2017, 2018), the findings from the third paper suggest that older HCV holders do experience health benefits associated with receipt of HUD rental assistance. These findings generate important questions for future research to examine if and why health outcomes might differ by age and the type of rental assistance received.

As previously stated, the results from the third paper suggest that receipt of HUD rental assistance improves health and functioning among older adults. The results from the second paper suggest that receipt of HUD rental assistance is associated with a lower likelihood of receiving long-term homecare services. Taken together, these results suggest that older HUD renters are less likely to use long-term homecare services than future HUD renters due to a lower *need* for homecare services, rather than due to barriers in access to homecare services. However, we would also expect that since MFH residents were the most likely to no longer need long-term homecare services (second paper) they would also be the most likely to experience improvement in physical functioning, but this was not the case. In the third paper, MFH residents did not experience significant improvement in physical functioning. Limitations related to the pseudo-waitlist method might help explain this inconsistency and will be discussed later.

Pathways Connecting Affordable Housing and Healthy Aging

Even though I did not explicitly test the specific pathways (stability, income, gateway, or stress) that help explain the association between receipt of HUD rental assistance and healthy aging, the results of this dissertation provide some information on these potential pathways that can be explored in future research. Overall, the results suggest that the gateway effect (e.g., connecting older adults with other programs that in turn reduce barriers to health-related services and promote healthy aging) may not be necessary to improve the health of older HUD renters

and that the stability, income, and stress pathways work together to promote health in later life. However, this result could suggest that there are missed opportunities within our current housing and healthcare systems to leverage the gateway effect and use housing as a platform to improve health. Policy makers and program administrators should consider how to strengthen the stability, income, stress, and gateway pathways to develop and improve systems that effectively integrate housing and health to support healthy aging in the community.

Drawing from the P-E fit perspective, it was hypothesized that improved access to homecare and other health-related services (second paper) might reduce environmental press and provide a better “fit” between the changing needs of the older adult and their environment to promote adaptation and health. In this way, improved access to health-related services might mediate the association between HUD rental assistance and health/functioning (third paper) and provide support for the gateway effect. However, the results suggest that HUD rental assistance *does not* significantly improve access to health-related services (second paper), potentially due to the current policy context (e.g., access to Medicare and Social Security income for most older adults), but receipt of rental assistance *is* associated with better health/functioning (third paper). The results from the third paper also suggest that receipt of HUD rental assistance is associated with a lower likelihood of experiencing serious psychological distress. Since stress and psychological distress are tightly linked constructs (Epel et al., 2018), this result provides evidence that the stress pathway likely helps explain the association between receipt of HUD rental assistance and healthy aging.

To better understand the association between affordable housing and healthy aging I also examined potential differences in healthy aging outcomes by the type of HUD rental assistance received since HUD programs provide different types/levels of environmental support. I

hypothesized that HCV holders would be less likely to experience health benefits associated with receipt of HUD rental assistance compared to those with project-based assistance since those with project-based assistance are more likely to have accessibility features in their homes, and access to a HUD program coordinator (which would support the gateway effect). However, the results did not support my hypothesis and suggest that older adults do experience positive health outcomes after receiving an HCV. Older HCV holders likely benefit from the stability effect (e.g., better able to manage competing needs), income effect (e.g., having more disposable income to spend on health-related services) and stress effect (e.g., belief in ability to cope with environmental demands). It is also possible that older HCV holders benefit from a gateway effect, but more research is needed to better understand the benefits of the HCV program for older people (Reina & Aiken, 2022). For instance, does the HCV program improve access to neighborhoods with more support for older HCV holders? Since use of an HCV is not limited to specific PH or MFH buildings are older HCV holders more likely to stay in their neighborhood and benefit from established social support networks?

The results from the third paper suggest that older adults who move to a MFH building are significantly less likely to experience improved physical functioning compared to those who live in PH. This finding is surprising since MFH is more likely to include specialized programs to better meet the needs of older adults. However, omitted variable bias may influence this result and should be explored in future research. For instance, differences in family caregiver involvement, individual preferences, and neighborhood/regional contextual factors can influence both health outcomes and selection into the MFH program. Longitudinal study designs that examine health changes over time across different HUD programs are needed to better

understand if and how specific HUD programs impact the health of participants across the life course.

Overall, the results provide some insight on the pathways connecting affordable housing and healthy aging, however the study design and interconnected nature of these pathways limited the ability of this dissertation to make strong claims about these connections. In order to effectively distribute limited public resources, future research should examine what models of rental assistance are preferred by older renters and have the potential to improve the health and well-being among the growing older population. Better understanding the pathways that connect affordable housing and health can inform the development of programs that leverage these limited resources.

Concluding Thoughts

Similar to Reina and Aiken (2022), the results of this dissertation highlight the needs of older HCV holders and call for more research to better understand this growing population. In addition to more research, innovative programs that connect older HCV holders, and those waiting for housing assistance, to health promoting services are also needed. Although it is easier (and still important) to reach low-income older adults in congregate settings (e.g., large PH buildings), local Area Agencies on Aging and other organizations serving older adults should consider how partnerships and programs can reach older HCV holders and those waiting for housing assistance.

The results also suggest that receipt of HUD rental assistance has important health benefits for older people and serves as a reminder to not conflate the health challenges faced by older HUD renters for the effects of the program itself (Fenelon, 2022). For instance, the first paper did not find any statistically significant health differences in the multivariate models (with

the exception of homecare use) when comparing older current HUD renters to unassisted low-income renters. Although the comparison in this case was only meant to provide additional context when describing the health of older HUD renters, the results could also be incorrectly interpreted to mean that receipt of HUD rental assistance does not improve the health of older HUD renters, since there was not significant difference between the two groups. However, the results from the third paper, which better addresses potential selection bias by comparing current to future HUD renters, suggest that receipt of HUD rental does improve the health of older HUD renters. Similarly, the first descriptive paper found that older HCV holders have worse health compared to residents of PH or MFH, but the third paper with a quasi-experimental design found that older HCV holders experience improved health from participating in the program.

Overall, the results of this dissertation suggest that receipt of HUD rental assistance promotes healthy aging among older adults in the community. Drawing from the P-E fit perspective, receipt of HUD rental assistance likely lowers environmental press and provides a better match between the older adult and their home environment. Although the results also suggest that certain pathways (stability, income, gateway, and stress) help explain this relationship, more research is needed to better understand these pathways and how different rental assistance programs effect health among older adults. The results of this dissertation support policies and programs that recognize the important connection between housing and health in later life and can inform HUD programs to improve services to older HUD renters. Policy makers and program administrators interested in improving health outcomes among low-income older adults should consider how additional investments in affordable housing can help reach this goal.

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