Health, Health Behaviors, and Health Care Utilization Among Adults with Serious Psychological Distress Who Receive Federal Housing Assistance

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Abstract

Using newly available U.S. Department of Housing and Urban Development (HUD) administrative data linked with National Health Interview Survey (NHIS) data, this study estimates the prevalence of serious psychological distress (SPD) among non-elderly HUD-assisted adults and examines differences in health, health behaviors, and health care utilization for this population. The linked data estimate that 13% of HUD-assisted adults experience SPD. Controlling for individual characteristics and HUD program type, assisted housing residents who had SPD experienced higher rates of self-reported fair or poor health, chronic disease, and cigarette smoking than HUD-assisted adults without SPD. Adults with SPD had more frequent use of emergency rooms and were more likely than residents without SPD to have more frequent contact with specialists, general doctors, and mental health providers, although they also reported increased levels of unmet health care needs due to affordability. Policy implications are discussed.

Introduction

In the U.S.A., an estimated 18% of adults have a mental illness.[1] While it is difficult to assess the prevalence of psychiatric conditions via national health surveys, serious psychological distress, a metric used to identify severe mental health problems, can be examined.[2, 3] An estimated 4% of U.S. adults have experienced serious psychological distress (SPD) in the past 30 days, indicating a moderate to severe impairment in educational, occupational, or social functioning.[4] Persons with mental illness are more likely to live in poverty and are more likely to face discrimination in the

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rental housing market than other persons.[5–9] Securing stable, safe housing is therefore often a challenge for this population. Mental health policy promotes various types of housing solutions that align with views of psychiatric rehabilitation. Programs vary and range from medical model programs for persons in need of safe, custodial care (e.g., programs that use the Housing First model)[10–12] to empowerment-based programs that prioritize community integration (e.g., housing programs for persons with psychiatric conditions that focus on physical, psychological, and social integration with the community).[13, 14] These programs do not explicitly utilize public and assisted housing as intervention points. Federally funded rental housing assistance programs can provide an opportunity for many low-income persons, including those with mental illness, to obtain decent and affordable housing, yet details about the mental health status of such residents are currently lacking.

Persons with mental illness often have co-occurring chronic conditions which can increase health care utilization.[15] The U.S. Department of Housing and Urban Development (HUD) and other federal agencies that support persons with SPD require additional information about the prevalence of SPD within the HUD-assisted population and about the health, health behaviors, and health care utilization of this population. Such information is needed as HUD and other policymakers seek to connect residents to services and supports across the publicly assisted housing portfolio.[16] Using newly available linked administrative and health survey data, this study fills this gap in the literature, providing nationally representative estimates of the prevalence of SPD among HUD-assisted, non-elderly adults. This study also examines the health, health behaviors, and health care utilization patterns of adults with and without SPD, controlling for individual characteristics and type of housing assistance. This study was not designed to uncover the causal impact of HUD assistance on SPD. The relationship documented here between participation in HUD and SPD is purely associational. The primary goal of the analysis was to document the prevalence of SPD among HUD-assisted adults using linked data while also exploring health disparities for this population.

Literature Review

Given the lower rates of employment and income among persons with SPD, finding housing that is affordable, safe, and accessible is especially challenging. HUD strives to address the housing needs of low-income households, including households that include a person with SPD.[16, 17] Housing assistance for low-income families is provided primarily through three major assistance programs: multifamily (MF) housing, public housing (PH) and the Housing Choice Voucher (HCV) program. Households participating in these programs typically contribute 30% of their income towards rent, and HUD's subsidy pays the remaining rental or operating cost of the building and/or unit.[18] In MF housing programs, private property owners receive subsidies from HUD (i.e., rental subsidies, below-market interest financing, mortgage insurance, and other forms of assistance) to provide all or a certain percentage of their housing units at affordable rates to low-income persons. In MF and PH programs, housing assistance is tied to the property and is not portable. In the HCV, the subsidy follows the tenant when a tenant moves to another property.

State and local public housing agencies (PHAs) are responsible for coordinating PH and HCV programs. Over one million PH units, varying from single-family detached homes to apartment buildings, are occupied nationwide. Tenants contribute a portion of their income towards their monthly rent, based on a complex set of calculations, and can remain in PH as long as program requirements are met. The HCV program is the largest rental housing assistance program in the U.S.A., offering over two million vouchers that low-income families can use to choose and lease affordable rental housing in the private market. PHAs determine program eligibility and a payment voucher standard which represents the amount needed to rent a moderately priced unit in the local housing market. HCV subsidies are paid to landlords directly from PHAs.[18] The multifamily

housing program includes the project-based section 8 program (PBS8) and several other smaller, specialized multifamily programs for special populations such as Section 202 (approximately 125,000 units) and Section 811 housing (approximately 24,000 units). In the PBS8 program, privately owned and managed buildings provide housing to over two million low-income individuals residing in 1.8 million units.[19]

HUD collects some information about disability status as people apply for housing assistance and as they are annually recertified to continue to receive housing assistance. More details about the collection of disability status information is included in the description of measures in the Methods section of this article. HUD provides housing rental assistance to millions of low-income households in the U.S.A. and serves many families which include at least one person with a disability, defined as a person with an ambulatory, cognitive, or sensory limitation.[19] According to HUD's administrative data, approximately 20% of households receiving HUD rental assistance include a person with a disability.[20] More recent research has estimated that 44% of HUD-assisted adults have some form of disability.[21] Estimates of the number of HUD-assisted residents with mental illness have, until recently, been lacking, however. Fenelon et al., using linked HUD administrative and National Health Interview Survey (NHIS) data, found an estimated 10% of current PH, 13% of current HCV, and 12% of current MF adult residents had SPD.[22] Fenelon et al. also found that adults residing in PH experienced less SPD (5.4 percentage points) when compared to persons waiting to enter PH.[22] Although the Fenelon et al. study utilized an interesting methodology to develop a pseudo-waitlist comparison group, the study sought to examine the impact of the receipt of housing assistance on mental health status. Conversely, this study examines the overall prevalence of SPD among non-elderly residents and explores the unique health care needs of adults with SPD in public and assisted housing.

In recent years, HUD has promoted a "health in all policies" approach which incorporates a "housing as a platform to improve quality of life" goal into the department's strategic plan.[16, 23] One important example is HUD's Section 811 Project Rental Assistance Program, which awards housing subsidies to state housing agencies that formally partner with state health and human services agencies to create an integrated housing and services approach for persons with disabilities.[18, 24, 25] Persons with serious mental illness are included in the target population of this program. Such housing provides access to appropriate supportive services such as case management and employment assistance.[26, 27] The Section 811 program is limited in scope, however, providing assistance to about 30,000 housing units.[28] Past health researchers have called for a thorough evaluation of the Section 811 program; as of 2018, HUD had implemented and published a process evaluation of the program and anticipates publishing a more thorough evaluation in 2019.[29] Although the 811 program is included in the NCHS-HUD data linkage (under the umbrella multifamily program category), there is no sufficient sample size to adequately explore the characteristics or outcomes of residents included in this program.

Prior research has found that health disparities vary among HUD-assisted adults.[28, 30] Persons residing in HCV, compared to persons residing in PH, experience fewer health problems including reductions in diabetes, obesity, and psychological distress.[31–36] Persons residing in PH experience lower overall levels of self-reported health and higher rates of obesity but similar levels of access to health care, measured as utilization of services, compared to others.[33, 37, 38]

Research has also highlighted multiple health disparities among persons with disabilities and, particularly, among HUD-assisted adults with disabilities.[21, 39–50] Brucker et al. found that assisted housing residents who have disabilities experienced higher rates of self-reported fair or poor health, asthma, diabetes, hypertension, obesity, and cigarette smoking. Adults with disabilities had more frequent use of emergency rooms and increased concerns with affording necessary health care. HUD-assisted adult residents with disabilities were more likely than residents without disabilities to be connected to the health care system, having higher rates of insurance coverage and more frequent contact with specialists, general doctors, and mental health providers.[21] The research by

Brucker et al., however, focused on the broader population of adults with any activity, functional, or sensory limitation and did not specifically identify persons with mental illness.[21]

In the U.S.A., persons with mental illness are more likely to have co-occurring chronic medical conditions and substance abuse/dependence than other persons, while also experiencing shorter life spans.[51–53] Health behaviors such as poor diet, smoking, and lack of physical activity raise the cardiovascular risk for persons with serious mental illness, resulting in early mortality.[54–56] A higher risk for diabetes and obesity has been found among persons with serious mental illness as well.[57] Persons who have concurrent mental health and chronic medical conditions have been found to have higher rates of acute health care utilization (i.e., hospital or emergency department visits) than other persons.[15] Public health interventions targeted towards persons with serious mental illness have been found to be effective in improving diet and fitness and in reducing smoking.[54, 58–60]

The research conducted here addresses the intersection of these two populations, persons receiving housing assistance and persons with SPD, providing the first detailed look at health, health behaviors, and health care utilization for adults with SPD who are receiving federal housing assistance.

Methods

Data

We used pooled health survey data from the 2006–2012 National Health Interview Survey (NHIS) linked with HUD administrative data on the agency's largest housing assistance programs. We restricted the sample to non-elderly, working-age adults (ages 18 to 61). The NHIS is a population-based health survey that is designed to monitor the health of the civilian, U.S. noninstitutionalized population. Data are collected directly from household members who self-report health status, health behaviors, and health care utilization. NHIS has approximately an 80% response rate.[61] The final analytic sample included 3686 working-age adults (3228 without SPD and 458 with SPD).

HUD administrative data are collected via federal forms (HUD-50058 and HUD-50059) and capture detailed information about families participating in HUD programs. Forms are submitted to HUD via electronic systems. For the PH and HCV programs, data are collected via housing agencies at the local or state level. Data for the MF program type is collected through private building owners.[18] In all cases, the amount of information collected about disability is negligible and is not consistently populated. The HUD administrative data includes a yes-no question about disability that asks about the presence of disability for every member of a HUD-assisted household. Although this measure of disability undoubtedly includes some individuals with serious mental illness, HUD does not have the ability to provide separate statistics for the numbers of residents with different types of disabilities. Public housing authority staff assist applicants in completing HUD forms and in answering this question at the time of application for housing assistance and with every annual eligibility recertification. For households that participate in PH or HCV programs, these conditions classify a person as having a disability:

- A disability as defined in section 223 of the Social Security Act
- 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
- A developmental disability as defined in section 102 of the Developmental Disability Assistance and Bill of Rights Act
- Acquired immune deficiency syndrome (AIDS) or any condition that arises from the etiologic agent for AIDS (HIV)

The definition of disability used in MF programs varies according to specific programs, but generally overlaps with the definition used by PH and HCV programs.[18] No level of detail is collected on the type of disability, however, other than responses to the yes-no question.

Data Linkage Respondents were linkage-eligible during the 2006–2012 survey years if they provided sufficient linkage information which included the last four digits of their social security number (SSN), date of birth, sex, first name, and last name. Respondents who refused to answer questions about their housing assistance status were linkage-ineligible. The linkage was mostly a deterministic, rules-based process. During NHIS survey years 2010–2012, approximately 42,000 sample adults were linkage-eligible. Among the linkage-eligible sample adults, approximately 3800 ever linked to HUD administrative data.[61] To assess the representativeness of the linked sample, HUD and NCHS analysts examined the linked data alongside the universe of HUD administrative data during the same time period. Preliminary evaluation of the linked data revealed that characteristics were similar among the two samples.[18]

HUD program type was measured using linked data files to determine HUD assistance type at the time of the NHIS interview. Although NHIS asks respondents about housing rental assistance, previous research suggests that such survey questions are unreliable.[62] HUD provided transaction-level administrative data to NCHS which consisted of one to many transactions per individual for every new admission, recertification, unit change, correction, or program exit.[18] Participation episodes were created using the transaction-level file to allow researchers to determine continuous enrollment. Due to administrative errors, respondents could have been in more than one program at the same time. To avoid episode misclassification, the following hierarchy was used to code current program status: HCV, PH, and MF. Instances of belonging to multiple programs at the same time, however, were less than 15. Details about how the participation episodes were created can be found in the NCHS-HUD linked data documentation.[18] MF housing was considered the reference group for all logistic analyses.

Measures

Independent Variable The key focal variable, SPD, was measured using the Kessler-6 scale which asks respondents how often they have experienced various feelings of distress within the past 30 days. Responses to individual items range from 0 (never) to 4 (almost all the time). The Kessler-6 score is the sum of the values for the six items. Prior research suggests that a score of 13 or higher denotes the presence of "serious psychological distress," indicating either major depressive disorder or other nonspecific psychological distress in population-based studies.[63]

Health Measures Health variables for the analyses were divided into three categories: health status, health care utilization, and health behaviors. Overall, 27 health variables were examined. Each variable was coded in a binary fashion, with a value of one assigned to the following categories:

Health status

1 Fair or poor health status, which represents the two worst categories captured via this self-reported measure with a 5-point Likert scale: excellent, very good, good, fair, and poor.

2 Living with disability, which was defined using the Centers for Disease Control and Prevention complex activity limitation (CAL) definition. A complex activity limitation was identified when an individual reported having one or more limitation related to self-care, socialization, and/or employment[39]
3 Cancer (ever diagnosed)
4 Chronic obstructive pulmonary disease (ever diagnosed)
5 Stroke (ever diagnosed)
6 Heart disease (ever diagnosed)
7 Arthritis (ever diagnosed)
8 Kidney disease (ever diagnosed)
9 Liver disease (ever diagnosed)
10 No natural teeth at the time of the health interview
11 Hypertension (ever diagnosed)
12 Asthma (current)
13 Diabetes (ever diagnosed)
14 Obesity (calculated from self-reported height and weight, body mass index 30 or higher)
15 Cigarette smoker (current)
16 10+ bed days due to injury or illness, which was assessed by examining the number of illness or injury bed days during the preceding 12 months. Bed days were defined as times when the respondent reported being in bed more than half of the day. The measure included days while an overnight patient in a hospital.
17 No health insurance

Health care utilization

18 Seen/talked to a medical specialist, past 12 months
19 Seen/talked to a general doctor, past 12 months
20 Seen/talked to a mental health professional, past 12 months
21 Needed but could not afford health care during the past 12 months (prescription medicines, mental health care or counseling, dental care, or eyeglasses)
22 Two or more emergency room visits, past 12 months
23 No usual source of health care, past 12 months
24 No dental care, prior year
25 Physically inactive, which was defined using recommended metrics developed by the Centers for Disease Control and Prevention based on 2008 physical activity recommendations.[64] A person was defined as physically inactive if they engaged in no light-moderate or vigorous leisure-time physical activity.

Health behaviors

26 Current smoker, which was defined as an adult respondent who reported ever having smoked 100 cigarettes in his or her lifetime and who also reported currently smoking cigarettes.[65]
27 Heavy alcohol user, which was defined as adult respondents who reported having has at least one day of heavy drinking during the prior year. Heavy drinking was defined as five or more drinks for men and four or more drinks for women.

Control Variables Based on previous literature, about health disparities among persons with SPD, the researchers also controlled for individual characteristics including age, sex, race/ethnicity,

disability, region, metropolitan status, poverty level, and health insurance coverage. For age, the authors considered three age groups: young adults (aged 18–24), adults aged 25–44, and adults aged 45–61. Race was collapsed into only two groups (white, non-Hispanic and other) to adhere to confidentiality restrictions. Disability was defined using the Centers for Disease Control and Prevention complex activity limitation (CAL) definition. A complex activity limitation was identified when an individual reported having one or more limitations related to self-care, socialization, and/or employment.[39] Regions included Northeast, Midwest, South, and West. Metropolitan status was measured as urban or rural, following the National Center for Health Statistics' classification scheme.[66] Poverty was measured as "in poverty," according to the official poverty measure, or not. Health insurance status was measured as insured or not, due to the small sample size and the fact that most residents had public insurance. Lastly, HUD program type was examined using three categories which represent HUD's largest rental assistance programs: HCV, MF, and PH.

For the descriptive analyses, the researchers included a larger set of variables, adding educational attainment (did not complete high school, high school diploma or GED, some college (no degree), associate's degree or higher), employment (worked in the past 12 months or not), marital status (married or living with partner; widowed, divorced, or separated; never married), and family type (one adult, no children under 18; multiple adults, no children under 18; one adult, one or more children under 18; multiple adults, one or more children under 18).

Analytical Plan

The authors first ran descriptive statistics to determine the prevalence of SPD among HUD-assisted adults based on certain sociodemographic characteristics. Next, the researchers tested for differences between the subpopulations with and without SPD among demographic variables using chi-square and an alpha of 0.05. The researchers then ran additional tests of association using chi-square, comparing the health status, health care utilization, and health behavior variables between adults with and without SPD. The authors then estimated the percent of HUD-assisted adults with SPD who fell within certain sociodemographic and health measure categories.

For multivariate analyses, the researchers modeled each health variable using a separate logistic regression to estimate the odds of each health measure while controlling for the aforementioned individual characteristics (age, sex, family type, race/ethnicity, region, metropolitan status, poverty status, and insurance status) and HUD program type. The models estimated a health measure, H of individual i. H is a function of the particular combination of SPD status (D), HUD program type (P), other individual characteristics (X), and unobservable factors (e) as follows:

$$H = f(D, P, X, e).$$

Odds ratios (ORs), confidence intervals, and significance levels are reported for persons with SPD on each health measure, controlling for other covariates.

Limitations

Although the linked data provides an innovative opportunity to explore SPD among HUD-assisted individuals, the study is subject to at least six limitations. First, the NCHS-HUD data linkage universe only represents linkage-eligible individuals; therefore, selection bias due to linkage eligibility exists. To counteract this limitation, weights were developed that account for linkage eligibility.[18] Secondly, administrative data are not collected for nor intended for research purposes. Third, transaction-level administrative data were combined by HUD analysts into episode-level data to help researchers identify periods of continuous enrollment, but episode

misclassification may exist due to administrative errors. For example, end of participation forms are not consistently submitted for all HUD programs; therefore, HUD analysts used specific timing algorithms to account for program participation. Specific thresholds were used to deem a household "inactive" when end of participation forms were not completed.[18] Fourth, the NHIS relies solely on self-report for health measures, which may influence the accuracy of estimates. Fifth, analyses simply explore the association among persons with SPD and these health variables; timing was not assessed in relation to the development of SPD. Prior research suggests that HUD program type matters. Fenelon found that entering PH reduces SPD but that persons entering HCV and MF do not experience changes in SPD; therefore, more research is needed to assess the timing of receipt of housing assistance and SPD.[22] Lastly, since 27 health outcomes were assessed, it is likely that at least one significant finding occurred due to chance.

Results

Table 1 displays sociodemographic characteristics for the full sample and also for adults with and without SPD. Provided estimates are nationally representative of the universe of HUD-assisted, non-elderly adults. Most (46%) HUD-assisted working-age adults were between the ages of 25 and 44. Consistent with the universe of HUD administrative not linked to health data, females were disproportionately represented (76%) as were non-whites (66%). The largest percentage of HUD-assisted adults lived in the South (35%). Most (69%) were living in families that had incomes below the official poverty line. More than half (52%) were never married. Sixty-four percent had a high school education or less. About half (49%) had worked in the past 12 months. The most common family type was one adult and one or more children (33%). Twenty-two percent were not covered by any form of health insurance. Fifty-three percent of HUD-assisted adults received HCVs, 23% resided in PH, and 24% lived in MF housing. Eighty-four percent resided in metropolitan areas.

An estimated 13% of HUD-assisted adults had SPD. The distribution of adults with and without SPD was similar across all three HUD programs examined. Overall, larger proportions of older adults (age 45–61); white, non-Hispanic residents; adults living in official poverty according to the federal poverty line; or adults who were widowed, separated, or divorced had SPD. Note that the official poverty line is lower than guidelines used by HUD to determine eligibility for rental housing assistance. Rates of SPD were similar across HUD assistance type, levels of educational attainment, region, sex, and urbanicity. Rates of employment were significantly lower among adults with SPD, with only 24% reporting any work in the past 12 months. More than half (52%) of adults without SPD worked during the past 12 months. SPD was also more common among single adult, no children families than among other family types.

Table 2 shows health characteristics of non-elderly HUD-assisted adults with and without SPD. Persons with SPD had lower levels of self-reported health than persons without SPD. Sixty-four percent of those with SPD, for example, were in fair or poor health, compared to 27% of those without SPD ($p < .001$). HUD-assisted adults with SPD had higher rates of emergency room visits in the past year ($p < .001$). Eighty-one percent of HUD-assisted adults with SPD met the criteria for disability, compared to 32% of HUD-assisted adults without SPD ($p < .001$). Persons with SPD were more likely to have concurrent chronic diseases and diagnoses, including arthritis, asthma, cancer, chronic obstructive pulmonary disease, diabetes, stroke, heart disease, hypertension, or liver disease. HUD-assisted non-elderly adults with SPD were also more likely to have poor oral health, with nearly 20% having no natural teeth. In comparison, 12% of HUD-assisted non-elderly adults without SPD had no natural teeth.

Persons with SPD had higher rates of utilization of the health care system than others. HUD-assisted adults with SPD were significantly more likely to have visited a general doctor ($p < .001$), mental health professional ($p < .001$), or specialist ($p < .001$) and to have received home health care

Table 1

Sociodemographic characteristics of non-elderly, HUD-assisted adults by presence of serious psychological distress, 2006–2012

	HUD-assisted adults aged 18–61 ($N = 3686$)		HUD-assisted adults aged 18–61 with no serious psychological distress ($N = 3228$)		HUD-assisted adults aged 18–61 with serious psychological distress ($N = 458$)		Significance
	N	% (SE)	N	% (SE)	N	% (SE)	
	3686	100	3228	87.2 (0.78)	458	12.8 (0.78)	
Age							
18–24	623	21.4 (1.17)	583	23.0 (1.26)	40	10.6 (2.06)	< 0.001
25–44	1736	45.5 (1.10)	1549	46.4 (1.27)	187	39.4 (3.16)	
45–61	327	33.1 (1.15)	1096	30.6 (1.18)	231	50.0 (3.65)	
Sex							
Male	737	24.5 (1.12)	632	24.2 (1.16)	105	27.1 (3.42)	0.411
Female	2949	75.5 (1.12)	2596	75.8 (1.16)	353	72.9 (3.42)	
Minority status							
White, non-Hispanic	1057	33.6 (1.95)	874	31.9 (1.91)	183	44.9 (3.48)	< 0.001
Other	2629	66.4 (1.95)	2354	68.9 (1.91	275	55.1 (3.28)	
Region							
Northeast	796	21.6 (1.92)	696	21.7 (1.94)	91	20.9 (3.26)	0.8822
Midwest	950	27.8 (2.46)	821	27.4 (2.37)	120	29.5 (4.52)	
South	1363	34.8 (2.09)	1181	35.1 (2.14)	172	33.1 (3.28)	
West	610	15.9 (1.79)	530	15.8 (1.77)	75	16.6 (2.96)	
Poverty status							
< 100% FPL	2628	69.4 (1.14)	2262	68.3 (1.30)	365	76.5 (2.98)	0.014
≥ 100%	1048	30.7 (1.14)	956	31.7 (1.30)	92	23.5 (2.98)	
Marital status							
Married or living with partner	457	20.3 (1.05)	407	20.3 (1.06)	50	20.4 (3.41)	< 0.001

Table 1
(continued)

	HUD-assisted adults aged 18–61 ($N = 3686$)		HUD-assisted adults aged 18–61 with no serious psychological distress ($N = 3228$)		HUD-assisted adults aged 18–61 with serious psychological distress ($N = 458$)		Significance
	N	% (SE)	*N*	% (SE)	*N*	% (SE)	
Widowed, divorced, or separated	1173	27.7 (1.03)	965	25.9 (1.06)	208	40.2 (3.10)	
Never married	2052	52.0 (1.27)	1853	53.8 (1.32)	199	39.5 (2.96)	
Highest level of education							
Did not complete HS	1128	30.4 (0.97)	961	29.9 (1.00)	167	34.1 (3.18)	0.5841
High school diploma or GED	1217	33.8 (1.10)	1070	33.9 (1.10)	147	33.1 (3.10)	
Some college, no degree	833	22.6 (0.97)	742	23.0 (1.03)	91	20.4 (2.53)	
Associate's degree or higher	502	13.1 (0.83)	451	13.3 (0.85)	51	12.4 (2.87)	
Work status							
Worked, past 12 months	1796	48.5 (1.17)	1663	52.1 (1.21)	118	24.1 (2.59)	< 0.001
Did not work, past 12 months	1920	51.5 (1.17)	1562	47.9 (1.21)	340	75.9 (2.59)	
Family type							
One adult, no child(ren) under 18	1196	25.0 (1.13)	960	22.8 (1.11)	225	39.4 (3.22)	< 0.001
Multiple adults, no child(ren) under 18	334	14.9 (0.79)	292	14.3 (0.88)	37	17.9 (3.26)	
One adult, 1+ child(ren) under 18	1603	32.5 (1.05)	1450	33.9 (1.13)	142	23.5 (2.54)	
Multiple adults, 1+ child(ren) under 18	586	27.7 (1.13)	526	29.0 (1.19)	54	19.2 (3.44)	
Urbanity							
Rural	569	15.7 (1.65)	502	16.0 (1.72)	67	13.6 (2.10)	0.2318
Urban	3117	84.3 (1.64)	2726	84.0 (1.72)	391	86.4 (2.10)	
Health insurance status							
Insurance	2936	78.1 (0.89)	2528	77.7 (0.94)	384	80.6 (3.2)	0.3889
No Insurance	775	21.9	692	22.3	74	19.4 (3.2)	

Table 1
(continued)

	HUD-assisted adults aged 18–61 ($N = 3686$)		HUD-assisted adults aged 18–61 with no serious psychological distress ($N = 3228$)		HUD-assisted adults aged 18–61 with serious psychological distress ($N = 458$)		Significance
	N	% (SE)	*N*	% (SE)	*N*	% (SE)	
		(0.89)		(0.94)			
HUD program							
Public housing	914	22.9 (2.48)	801	23.2 (2.48)	104	20.5 (3.53)	0.576
Multifamily housing	906	24.3 (2.80)	782	24.2 (2.78)	118	25.5 (4.21)	
Housing choice voucher	1899	52.9 (2.51)	1645	52.6 (2.48)	236	54.0 (4.18)	

($p < .001$) in the prior year. HUD-assisted adults with SPD were significantly more likely to report having unmet medical needs due to costs ($p < .001$), however, which suggests that their frequent interaction with health care providers was not fully addressing their health care needs. Persons with SPD had similar rates of lacking a usual source of care as others.

In terms of health behaviors, persons with SPD were more likely to be physically inactive ($p < .001$) and to be smokers ($p < .001$) than persons without SPD. Rates of heavy alcohol use were similar.

Table 3 shows the proportion of HUD-assisted, non-elderly adults with SPD within certain sociodemographic and health measure categories. Nineteen percent of HUD-assisted adults aged 45 to 61, 11% of adults aged 25 to 44, and 6% of adults age 18 to 24 experienced SPD. Among HUD-assisted non-elderly adults, 17% of whites and 11% of persons of other races experienced SPD. Rates were similar by region and sex, between 12 and 14%. Fourteen percent of HUD-assisted adults living below the official federal poverty measure experienced SPD, compared to 10% of those with incomes above the poverty line. More than half of tenants who were never married experienced SPD. Approximately 19% of those who did not work in the past year and 20% of residents living in one adult, no children families reported SPD. Rates of SPD were similar across housing assistance program types: 12% of PH residents, 14% of MF residents, and 13% of HCV residents experienced SPD.

Table 4 shows selected results from the logistic regressions which predicted the likelihood of each health measure, controlling for age, sex, binary minority race/ethnicity status (white or minority), region, binary urban/rural status (urban or rural), poverty status, HUD program type (PH, MF, or HCV), and binary insurance status (insured or uninsured). The results confirm the bivariate findings, as adults with SPD were significantly more likely to experience lower levels of health and higher rates of health care utilization, even when controlling for individual-level characteristics and HUD program type. Adult tenants with SPD had higher odds of poor or fair

Table 2
Health characteristics of non-elderly, HUD-assisted adults, 2006–2012

	HUD-assisted adults aged 18–61 ($N = 3686$)		HUD-assisted adults aged 18–61 with no serious psychological distress ($N = 3228$)		HUD-assisted adults aged 18–61 with serious psychological distress ($N = 458$)		Significance
	N	% (SE)	*N*	% (SE)	*N*	% (SE)	
	3686	100	3228	87.2 (0.78)	458	12.8 (0.78)	
Health status							
Excellent or very good	1291	35.6 (1.12)	1240	39.5 (1.19)	51	9.12 (1.60)	< 0.001
Good	1182	32.2 (1.03)	1073	33.1 (1.32)	109	26.6 (3.08)	
Fair or poor	1212	32.2 (1.09)	914	27.4 (1.06)	298	64.3 (3.17)	
Emergency room visits							
0	2019	55.0 (1.11)	1846	57.0 (1.18)	173	41.1 (3.41)	< 0.001
1	735	20.3 (0.85)	638	20.3 (0.95)	97	20.4 (2.54)	
2+	928	24.7 (0.90)	743	22.7 (0.88)	185	38.6 (3.18)	
Productivity lost							
10+ bed days	522	15.7 (0.91)	355	12.4 (0.84)	167	40.3 (3.31)	< 0.001
Conditions and diagnoses							
Living with a disability	1465	38.3 (1.24)	1097	32.1 (1.19)	368	80.9 (2.71)	< 0.001
Obese	2636	72.2 (0.95)	2314	72.2 (1.04)	322	72.3 (2.74)	0.9697
Cancer, ever diagnosed	201	5.39 (0.55)	145	4.40 (0.51)	56	12.1 (1.76)	< 0.001
Chronic obstructive pulmonary disease, ever diagnosed	394	11.4 (0.73)	287	9.02 (0.70)	107	27.9 (3.32)	< 0.001
Stroke, ever diagnosed	164	4.05 (0.41)	121	3.34 (0.41)	43	8.89 (1.76)	< 0.01
Current asthma	609	16.8 (0.88)	489	15.0 (0.88)	120	29.1 (3.09)	< 0.001
Heart disease, ever diagnosed	494	13.4 (0.86)	379	11.5 (0.75)	115	27.7 (3.33)	< 0.001
Arthritis, ever diagnosed	971	25.6 (1.03)	758	22.4 (0.91)	213	47.8 (3.70)	< 0.001
Hypertension, ever	1092	28.1	882	25.2 (1.00)	210	47.8 (3.46)	< 0.001

Table 2
(continued)

	HUD-assisted adults aged 18–61 ($N = 3686$)		HUD-assisted adults aged 18–61 with no serious psychological distress ($N = 3228$)		HUD-assisted adults aged 18–61 with serious psychological distress ($N = 458$)		Significance
	N	% (SE)	N	% (SE)	N	% (SE)	
diagnosed		(0.98)					
Kidney disease, ever diagnosed	142	3.96 (0.46)	108	3.46 (0.48)	34	7.35 (1.57)	0.0181
Liver disease, ever diagnosed	123	3.48 (0.39)	90	2.73 (0.39)	33	8.61 (1.65)	< 0.01
No natural teeth	361	9.77 (0.69)	288	8.31 (0.59)	73	19.7 (3.71)	< 0.01
Diabetes, ever diagnosed	489	13.2 (0.77)	397	11.5 (0.69)	92	24.8 (3.36)	< 0.001
Access and utilization							
General doctor visit, prior year	2518	67.5 (1.20)	2152	65.8 (1.22)	366	78.5 (2.96)	< 0.001
Received home health care, prior year	191	4.68 (0.45)	145	4.02 (0.48)	46	9.20 (1.61)	< 0.01
Visited mental health professional, prior year	805	21.5 (1.07)	574	17.5 (1.00)	231	48.8 (3.09)	< 0.001
No usual source of health care	494	14.1 (0.89)	439	14.4 (0.92)	55	12.5 (2.13)	0.3934
Specialist visit, prior year	961	26.1 (1.06)	762	23.6 (1.12)	199	43.2 (3.26)	< 0.001
Unmet need medical care due to cost, prior year	1409	37.6 (1.30)	1148	34.7 (1.32)	261	57.5 (3.42)	< 0.001
No dental care, prior visit	1970	52.8 (1.12)	1691	51.5 (1.16)	279	61.9 (3.24)	< 0.01
Health behaviors							
Physically inactive	1810	49.6 (1.23)	1529	47.5 (1.33)	281	64.1 (3.07)	< 0.001
Smoker	1416	38.7 (1.44)	1161	36.4 (1.55)	255	54.2 (3.55)	< 0.001
Heavy alcohol user	161	4.35 (0.45)	134	4.01 (0.45)	27	6.66 (1.56)	0.095

health status (OR 3.98, $p < .001$), two or more emergency room visits (OR 2.08, $p < .001$), and ten or more bed days lost to injury or illness (OR 4.22, $p < .001$). HUD-assisted non-elderly adults with SPD had higher odds of most chronic conditions and diagnoses as well, although rates of obesity and kidney disease did not significantly differ.

Table 3

Percent of individuals with serious psychological distress by subgroup among non-elderly, HUD-assisted adults, 2006–2012

	Percentage (%)	Standard error
Sociodemographics		
Age		
18–24	6.36	1.24
25–44	11.1	1.01
45–61	19.4	1.81
Sex		
Male	14.2	2.02
Female	12.4	0.79
Minority status		
White, non-Hispanic	17.2	1.46
Other	10.6	0.78
Region		
Northeast	12.4	1.71
Midwest	13.7	1.81
South	12.2	1.04
West	13.3	1.71
Poverty status		
< 100% FPL	14.2	0.94
≥ 100%	9.85	1.47
Marital status		
Married or living with partner	20.2	1.04
Widowed, divorced, or separated	27.8	1.03
Never married	52.0	1.27
Highest level of education		
Did not complete HS	14.4	1.40
High school diploma or GED	12.5	1.24
Some college, no degree	11.6	1.54
Associate's degree or higher	12	2.77
Work status		
Worked, past 12 months	6.37	0.74
Did not work, past 12 months	18.9	1.25
Family type		
One adult, no child(ren) under 18	20.3	1.52
Multiple adults, no child(ren) under 18	15.5	3.03
One adult, 1+ child(ren) under 18	9.26	1.06
Multiple adults, 1+ child(ren) under 18	8.89	1.63
Urbanity		
Urban	11.1	1.42
Rural	13.2	0.88
Health insurance status		
Insurance	13.3	0.92
No insurance	11.4	1.90
HUD program		
Public housing	11.5	1.34

Table 3
(continued)

	Percentage (%)	Standard error
Multifamily housing	13.5	1.65
Housing choice voucher	13.1	1.15
General health status		
Health status		
Excellent or very good	3.28	0.60
Good	10.6	1.32
Fair or poor	25.6	1.76
Emergency room visits		
0	9.53	1.02
1	12.8	1.70
2+	19.9	1.69
Productivity lost		
10+ bed days	30.9	2.57
Conditions and diagnoses		
Living with a disability	26.9	1.64
Obese	12.6	0.91
Cancer, ever diagnosed	28.8	3.57
Chronic obstructive pulmonary disease, ever diagnosed	31.2	3.67
Stroke, ever diagnosed	28.1	5.02
Current asthma	22.2	2.61
Heart disease, ever diagnosed	26.1	3.05
Arthritis, ever diagnosed	23.9	2.10
Hypertension, ever diagnosed	21.8	2.04
Kidney disease, ever diagnosed	23.8	4.71
Liver disease, ever diagnosed	31.6	5.54
No natural teeth	25.8	4.60
Diabetes, ever diagnosed	23.9	3.21
Access and utilization		
General doctor visit, prior year	14.9	1.09
Received home health care, prior year	25.2	4.24
Visited mental health professional, prior year	29.0	1.98
No usual source of health care	11.4	1.78
Specialist visit, prior year	21.2	1.94
Unmet need medical care due to cost, prior year	19.6	1.58
No dental care, prior visit	15.0	1.20
Health behaviors		
Physically inactive	16.6	1.36
Smoker	18.0	1.32
Heavy alcohol user	19.6	4.02

Residents with SPD were more likely to be connected to the health care system than other adults, having increased odds of seeing a general doctor (OR 1.69, $p < .01$), mental health professional (OR 3.92, $p < .001$),

Table 4

Adjusted logit models estimating association between health outcomes among non-elderly, HUD-assisted adults with serious psychological distress versus adults without serious psychological distress, NHIS-HUD linked data, 2006–2012

Outcome	Unadjusted %	Adjusted odds ratio (AOR)	95% confidence interval (95% CI)	*p* value
General health status				
Self-reported health status as fair or poor	32.2	3.98	(2.93, 5.41)	< 0.0001
2+ emergency rooms visits, prior year	24.7	2.08	(1.57, 2.75)	< 0.0001
10+ bed days due to injury or illness, prior year	15.7	4.22	(3.12, 5.69)	< 0.0001
Chronic conditions and diagnoses				
Living with a disability	38.3	10.0	(7.06, 14.3)	< 0.0001
Obese	72.2	0.88	(0.65, 1.19)	0.4037
Cancer, ever diagnosed	5.39	2.14	(1.37, 3.36)	0.0010
Chronic obstructive pulmonary disease, ever diagnosed	11.4	3.07	(2.03, 4.65)	< 0.0000
Stroke, ever diagnosed	4.05	2.01	(1.18, 3.43)	0.0103
Current asthma	16.8	2.24	(1.64, 3.07)	< 0.0001
Heart disease, ever diagnosed	13.4	2.17	(1.54, 3.07)	< 0.0001
Arthritis, ever diagnosed	25.6	2.40	(1.79, 3.23)	< 0.0001
Hypertension, ever diagnosed	28.1	2.15	(1.57, 2.93)	< 0.0001
Kidney disease, ever diagnosed	3.96	1.64	(0.88, 3.05)	0.1168
Liver disease, ever diagnosed	3.48	2.54	(1.47, 4.39)	0.0009
No natural teeth	9.77	1.86	(1.15, 3.01)	0.0134
Diabetes, ever diagnosed	13.2	1.91	(1.31, 2.79)	0.0008
Access and utilization				
General doctor visit, prior year	67.5	1.69	(1.17, 2.43)	0.0052
Received home health care, prior year	4.68	1.71	(1.02, 2.87)	0.0424
Visited mental health professional, prior year	21.5	3.92	(2.83, 5.42)	< 0.0001
No usual source of health care	14.1	1.04	(0.67, 1.62)	0.8647
Specialist visit, prior year	26.1	2.01	(1.46, 2.77)	< 0.0001
Unmet need medical care due to cost, prior year	37.6	2.45	(1.83, 3.28)	< 0.0001
No dental care, prior visit	52.8	1.41	(1.06, 1.89)	0.0185
Health behaviors				
Physically inactive	49.6	1.87	(1.41, 2.48)	< 0.0001
Smoker	38.7	1.81	(1.30, 2.52)	0.0005
Heavy alcohol user	4.35	1.78	(1.00, 3.19)	0.0514

Unadjusted percentage indicates percentage with outcome among all HUD-assisted adults regardless of mental health status. All models control for age, sex, binary minority race/ethnicity status (white or minority), region, binary urban/rural status (urban or rural), poverty status, HUD program type (PH, MF, or HCV), and binary insurance status (insured or uninsured)

NHIS National Health Interview Survey, *HUD* United States Department of Housing and Urban Development

or other specialist (OR 2.01, $p < .001$) in the past year. Adults with SPD had higher odds of having unmet medical needs due to affordability (OR 2.45, $p < .001$), however, suggesting that the frequency of contact noted above was not sufficient to address all of the complex health care needs for residents with SPD. In addition, residents with SPD had higher odds of lacking dental care (OR 1.41, $p < .05$) which aligns with their having higher odds of having no natural teeth (OR 1.86, $p < .05$).

Discussion

Shared findings show that HUD-assisted adults with SPD represent a significant share of the non-elderly adult population receiving HUD housing rental assistance, across all program types. Key findings and associated policy implications are discussed in more detail below.

First, rates of SPD are much higher (13%) among HUD-assisted residents than they are among the general adult population (4%) and the low-income adult population (9%).[8] As HUD programs seek to promote social mobility, health equity, and population health among HUD-assisted residents, consideration for the mental health needs of residents must remain in the forefront. Concurrently providing mental health and other supports to residents can assure that programmatic goals are achieved. During the past decade, several support services platforms have emerged as promising models to promote positive health outcomes among unique populations. Public health agencies can partner with local health and social service agencies to ensure that access to mental health services is provided to residents with mental health conditions. For example, some home-visiting programs specifically assess and address mental health needs. Given that HUD has specific information about the geographic location of its residents, home-visiting programs could collaborate with housing providers to provide target, coordinated mental health services. Additionally, some federally qualified health centers (FQHC) are co-located with public housing developments. If public housing authority staff were to foster stronger relationships with FQHC administrators, particularly those that integrate behavioral health into primary care, streamlined services are possible. Lastly, a recent survey of several large public housing authorities revealed that some housing authorities are addressing mental health services by utilizing housing as a platform to improve quality of life. Among housing authorities surveyed, several reported programs or initiatives that address mental health conditions, including anxiety, depression, post-traumatic stress disorder, schizophrenia, and bipolar disorder. Additionally, 55% of public housing authorities reported partnerships with local behavioral health providers.[67]

Second, the population experiencing SPD is dispersed among PH, MF, and HCV. While some of these housing programs may be linked to mental health services via co-location, others may not. For example, persons residing in PH and MF properties may have access to social services that serve the entire PH community. For residents receiving vouchers, their ability to choose their housing location may lead to decreased access to needed health and social services. More research is needed to fully understand this relationship.

Third, non-elderly adults with SPD who are residing in HUD-assisted housing are more likely than residents without SPD to self-report their health as fair or poor health and to have had two or more emergency room visits, and to have had ten or more bed days due to injury or illness in the prior year. These high rates suggest that HUD-assisted adults with SPD represent a high-needs population that could greatly benefit from preventative measures that could improve overall health and reduce emergency room visits. Although this kind of detail is not available in the NHIS, more information about the specific role that mental health plays in each of these measures could determine how cost-effective targeted programs could be.

Fourth, HUD-assisted adults with SPD were more likely to experience co-occurring chronic conditions including asthma, chronic obstructive pulmonary disease, diabetes, heart disease, and hypertension. They were also more likely to have been diagnosed with cancer or liver disease and to have no natural teeth. Behavioral health homes and medical health homes based in community

mental health centers are often structured as partnerships between community mental health centers and Federally Qualified Health Centers.[26] State and local housing authorities could potentially partner with behavioral health homes to improve the odds that adult residents with SPD are not only receiving mental health services but also receiving coordinated medical care. While these findings suggest that adult residents with SPD are better connected to health and mental health professionals than other residents, being more likely to have seen a general doctor, mental health professional, or specialist in the prior year, room for improvement exists. HUD-assisted non-elderly adults with SPD were significantly more likely, for example, to state that they had unmet medical care needs due to costs than HUD-assisted adults without SPD. This suggests that these residents still have unmet health needs. Other research has found that persons with serious mental illness who receive services at a behavioral health home have improved cardiovascular outcomes.[68] Understanding how linkages to behavioral health homes for HUD-assisted residents improve not only mental but also physical health is an area in need of further research.

Fifth, adult residents with SPD are more likely engage in unhealthy behaviors. For example, they were more likely to be physically inactive and to smoke cigarettes than others. These unhealthy behaviors point to the need for targeted public health interventions for this population. HUD recently established a federal rule to make all PH development smoke-free. Associated smoke-free guidance offers resources designed to assist public housing authorities, owners, and residents in achieving smoke-free environments throughout housing assistance programs.[69] Future research can examine whether such changes improve overall health for residents with SPD by reducing individual-level cigarette smoking behaviors and reducing exposure to secondhand smoke.

Implications for Behavioral Health

In sum, adults with SPD who reside in HUD-assisted housing face many health disparities. Such information can be used by federal, state, and local housing, health care and behavioral health care providers, and policymakers as they assess the needs of this unique population. By adding to the body of literature regarding the prevalence of HUD-assisted adults with SPD, policymakers can now utilize this data to form strategic relationships with health partners and develop targeted programs such as behavioral health medical homes to improve the health of HUD-assisted residents with SPD.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

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