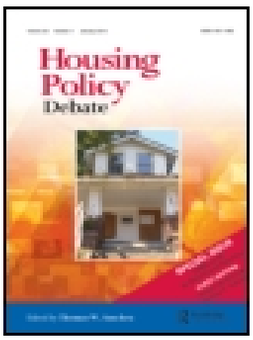

Housing Policy Debate

ISSN: 1051-1482 (Print) 2152-050X (Online) Journal homepage: http://www.tandfonline.com/loi/rhpd20

Health and Health Services Access Among Adults With Disabilities Who Receive Federal Housing Assistance

Debra L. Brucker, Veronica Helms & Teresa Souza

To cite this article: Debra L. Brucker, Veronica Helms & Teresa Souza (2017): Health and Health Services Access Among Adults With Disabilities Who Receive Federal Housing Assistance, Housing Policy Debate, DOI: 10.1080/10511482.2017.1357048

To link to this article: http://dx.doi.org/10.1080/10511482.2017.1357048

Published online: 29 Aug 2017.

HOUSING POLICY DEBATE, 2017
https://doi.org/10.1080/10511482.2017.1357048

Routledge
Taylor & Francis Group

Health and Health Services Access Among Adults With Disabilities Who Receive Federal Housing Assistance

Debra L. Brucker[a], Veronica Helms[b] and Teresa Souza[b]

[a]Institute on Disability, University of New Hampshire, Durham, USA; [b]Office of Policy Development and Research, U.S. Department of Housing and Urban Development, Washington, DC, USA

ABSTRACT

Using newly available U.S. Department of Housing and Urban Development (HUD) administrative data linked with National Health Interview Survey data, this study estimates the prevalence of disability among HUD-assisted adults and examines health disparities for this population. The linked data suggest a much higher prevalence of disability among HUD-assisted adults than previously suggested by HUD administrative data. Controlling for individual characteristics and HUD program type, 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 the 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-care providers. Policy implications are discussed.

ARTICLE HISTORY
Received 2 December 2016
Accepted 15 July 2017

KEYWORDS
Disability; housing assistance; public housing; Housing Choice Vouchers; health; health services

Approximately 13% of the population of the United States lives with some form of cognitive, physical, or sensory disability (Brucker & Houtenville, 2015). As a group, these 40 million people experience significantly lower rates of educational attainment and employment, higher rates of poverty, poorer health outcomes, and higher rates of health care utilization than other individuals (Albrecht & Devlieger, 1999; Brucker, Mitra, Chaitoo, & Mauro, 2015; Miller, Kirk, Kaiser, & Glos, 2014; Steinmetz, 2006). Securing accessible, affordable and safe housing is a common concern for this population as well (Hoffman & Livermore, 2012; National Council on Disability, 2010; Technical Assistance Collaborative and Consortium for Citizens with Disabilities, 2015; U.S. Department of Housing and Urban Development, 2014a).

Federally funded rental-housing assistance provides an opportunity for many persons with disabilities to obtain decent and affordable housing. The U.S. Department of Housing and Urban Development (HUD) is the primary funder of subsidized housing for low-income households in the United States, serving many families which include at least one person with a disability (U.S. Department of Housing and Urban Development, 2016d). According to HUD's administrative data, approximately 20% of households receiving rental assistance from HUD include a person with a disability (Dawkins & Miller, 2015). In recent years, HUD has embraced a "health in all policies" approach which incorporates a "housing as a platform to improve quality of life" (U.S. Department of Housing and Urban Development, 2014b, p. 21) goal into the HUD's strategic plan and fosters new forms of collaboration between health and

CONTACT Debra L. Brucker debra.brucker@unh.edu

housing agencies at the federal, state and community levels (Bostic, Thornton, Rudd, & Sternthal, 2012). One important example is HUD's new 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 (Technical Assistance Collaborative, 2016; U.S. Department of Housing and Urban Development, 2014b).

HUD and other agencies that support persons with disabilities are currently lacking information about the health and health-care utilization of federally assisted housing residents with disabilities. Such information is needed as HUD and other policymakers connect residents to services and supports across the publicly assisted housing portfolio. 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 disability, health status, the prevalence of chronic conditions, and access to health care for adults with and without disabilities, controlling for individual characteristics and type of housing assistance.

Literature Review

Given the lower rates of employment and income among persons with disabilities, finding housing that is affordable, safe, and accessible may be a challenge. Working-age individuals with disabilities have been found to live in lower quality housing and lower quality neighborhoods than persons without disabilities, even when holding income and other demographic characteristics constant (Hoffman & Livermore, 2012). For example, persons with disabilities face challenges and differential treatment when searching for housing in the rental market, including housing discrimination. Additionally, people with mobility impairments may have reduced housing options because of the lack of accessible units (Levy et al., 2015; Malloy, 2008). Poor housing location and quality, in turn, negatively influence individual health, health-care access, and employment opportunities (Bell & Rubin, 2007; Fernandez & Su, 2004; Kleit, 2001; Kushel, Gupta, Gee, & Haas, 2006; Pastor, 2001).

HUD strives to address the housing needs of low-income households, including those containing a person or persons with disabilities. HUD administrative data suggest that 30.4% of HUD-assisted adults have a disability.[1] Housing assistance is provided primarily through three major programs: multifamily (MF), public housing (PH), and Housing Choice Voucher (HCV). Households participating in these programs typically contribute 30% of their income toward rent and HUD's subsidy pays the remaining rental or operating costs of the building and/or unit (Lloyd & Helms, 2016). In MF 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 HCV programs, the subsidy follows the tenant when he or she moves to another property. One example of an MF program is Section 811 supportive housing for persons with disabilities, a program that provides subsidies targeted at low-income nonelderly adults with disabilities who are connected to appropriate supportive services (Lloyd & Helms, 2016). The Section 811 program provides assistance to about 30,000 housing units (Helms, Sperling, & Steffen, 2016).

Local public housing agencies (PHAs) are responsible for coordinating the PH and HCV programs. More than one million PH units, varying from single-family detached homes to apartment buildings, are occupied nationwide. Tenants contribute a portion of their income toward their monthly rent, based on a complex set of calculations, and can remain in PH as long as lease and income requirements are met. The HCV program is the largest rental-housing assistance program in the United States, 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. Subsidies are paid to landlords directly from PHAs (Lloyd & Helms, 2016).

Prior research has found health disparities among housing-assistance populations (Helms et al., 2016). Overall, persons supported by HCV programs, compared with persons supported by PH programs,

experience fewer health problems (Fauth, Leventhal, & Brooks-Gunn, 2004; Leventhal & Brooks-Gunn, 2003; Ludwig et al., 2011; Orr et al., 2003; Rosenbaum & Harris, 2001; U.S. Department of Housing and Urban Development, 2016b). Health outcomes of PH residents have been the focus of much research. PH residents who participated in a focus group in Baltimore, Maryland, for example, were found to perceive their living arrangements as an unhealthy physical environment that limits health and well-being (Hayward et al., 2015). Persons residing in PH units experience lower overall levels of health and high rates of obesity but similar levels of access to care compared with others (Digenis-Bury, Brooks, Chen, Ostrem, & Horsburgh, 2008; Heinrich et al., 2008; Ludwig et al., 2011).

Prior research has also highlighted health disparities among persons with disabilities (Krahn, Walker, & Correa-De-Araujo, 2015). For example, persons with disabilities report lower levels of physical and mental health than persons without disabilities (Steinmetz, 2006). A higher risk of diabetes and obesity has been found among persons with physical disabilities (Smith, Molton, & Jensen, 2016), persons with cognitive limitations (Reichard & Stolzle, 2011), and persons with serious mental illness (Cook et al., 2016), Rates of obesity and cigarette smoking are higher for persons with disabilities (Altman & Bernstein, 2008; Armour et al., 2007; Carroll et al., 2014; Courtney-Long, Stevens, Caraballo, Ramon, & Armour, 2014; Froehlich-Grobe, Lee, & Washburn, 2013). Patterns of health-care utilization differ between persons with and without disabilities as well, as persons with disabilities have increased rates of delaying care due to cost and higher rates of emergency department visits (Albrecht & Devlieger, 1999; Miller et al., 2014; Rasch, Gully, & Chan, 2013).

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

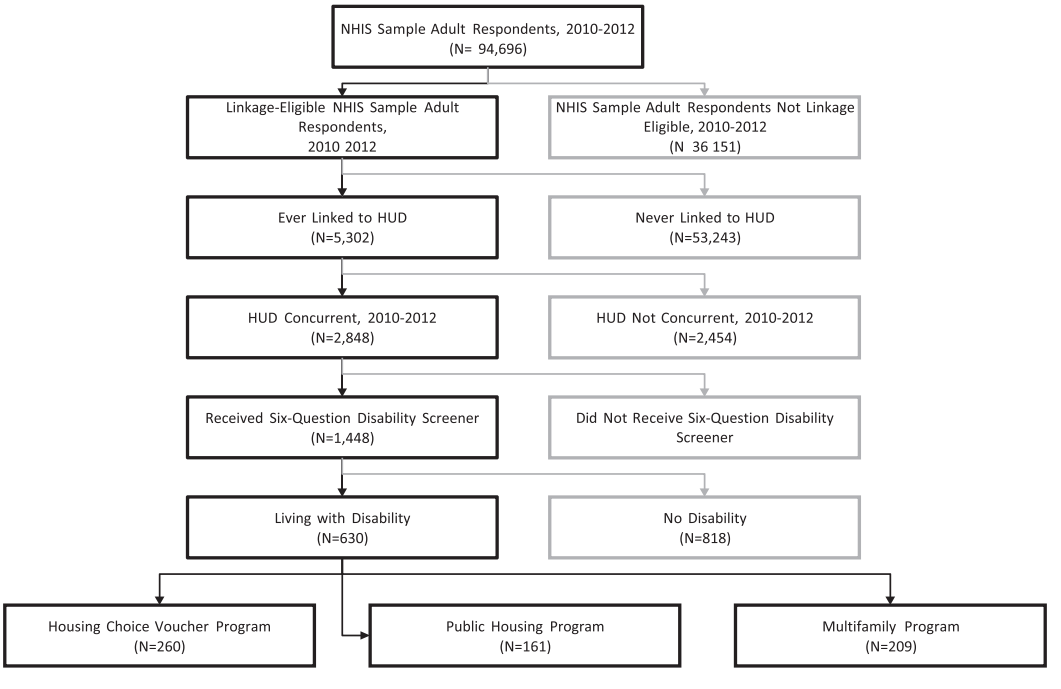

Figure 1. Creation of analytic sample.

Note: The term *HUD concurrent* refers to individuals who received HUD assistance at the time of their NHIS interview. This means that HUD-concurrent individuals could be linked to HUD administrative data on the same date as the health interview. The term *Ever linked to HUD* refers to individuals who were ever linked to HUD administrative data, regardless of the timing of their health interview.

Method

Data

Pooled health survey data from the 2010–2012 National Health Interview Survey (NHIS) were linked with HUD housing administrative data from a similar time period. Figure 1 demonstrates the process used to create the sample, and additional details about the data linkage can be found in the Appendix. The final analytic sample includes 1,448 adults (818 without disabilities and 630 with disabilities, according to the NHIS disability questions added in 2010).

Measures

Health Measures

Health variables for the analyses were divided into two categories: health status and health-care access. Overall, 12 health variables were examined. Each variable was coded in a binary fashion, with a value of 1 assigned to the following categories:

Health status

1. Fair or poor health status.
2. Hypertension (ever diagnosed).
3. Asthma (current).
4. Diabetes (ever diagnosed).
5. Obesity (body mass index 30 or higher).
6. Cigarette smoker (current).

Health-care access

7. No health insurance.
8. Seen/talked to a medical specialist, past 12 months.
9. Seen/talked to a general doctor, past 12 months.
10. Seen/talked to a mental health professional, past 12 months.
11. Needed but could not afford health care during the past 12 months (prescription medicines, mental health care or counseling, dental care, or eyeglasses).
12. Two or more emergency room visits, past 12 months.

Independent Variables

The key focal variable, disability, was measured using six questions initially developed for use in the American Community Survey (ACS) and adopted in several federal surveys. The NHIS respondents that self-reported any of the following six limitations were considered to have a disability: ambulatory, cognitive, hearing, independent living, self-care, or visual. The detailed survey questions used to gather this information are described in the Appendix. The second focal variable, HUD program type, consists of PH, MF, and HCV. Details about the use of the linked files to identify assistance type can be found in the Appendix.

Control Variables

Based on previous literature about health disparities among persons with disabilities, a number of individual characteristics were also controlled for, including age, sex, race/ethnicity, region of the country, metropolitan status, poverty level and health insurance coverage. For age, two groups relevant to HUD federal housing program rules and regulations were considered: persons ages 18 to 61 years and persons ages 62 years and older. The latter group is considered eligible for "elderly adult" housing, assuming that other eligibility criteria are met. Metropolitan status was measured as urban or rural, as per the National Center for Health Statistics' (NCHS) classification scheme (National Center for Health

Statistics, 2016a). Older adults, males, minorities, persons living in the South, persons living in urban areas, persons in poverty, and those with health insurance were considered the reference groups for the multivariate analyses.

Analytical Plan

The first step was to run descriptive sample statistics, determining the prevalence of disability among HUD-assisted households and testing for differences between the subpopulations with and without disabilities using Chi-square. Next, additional tests of association were run using Chi-square, comparing the sample characteristics of residents with disabilities across the three HUD program types. Two variables were collapsed into fewer groupings for this set of analyses to comply with confidentiality restrictions. Age was changed to a binary variable (ages 18 to 61 years, or age 62 years and older) and race/ethnicity was changed to a binary variable (Minority or Non-Hispanic White). Third, differences in the 12 health outcomes between adults with and without disabilities were tested, again using Chi-square.

For multivariate analysis, each health variable was modeled using a separate logistic regression that made it possible to estimate the odds of each health variable while controlling for individual characteristics and HUD program type. Detailed model specifications are included in the Appendix. Odds ratios (ORs), confidence intervals, and significance levels are reported for each independent variable.

Limitations

Although the linked data provide an innovative opportunity to explore disability among HUD-assisted individuals, the study is subject to at least three limitations. Firstly, the NCHS-HUD data linkage universe only represent linkage-eligible individuals; therefore, selection bias due to linkage eligibility exists. To counteract this limitation, weights were developed that account for linkage eligibility (Lloyd & Helms, 2016). Secondly, the administrative data used in this article were not collected or intended for research purposes. 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 (Lloyd & Helms, 2016). Lastly, the NHIS relies solely on self-report for health measures, which may influence the accuracy of estimates.

Results

Table 1 shows the characteristics of the full study sample (n = 1,448) as well as the characteristics of the subpopulations with (n = 630) and without (n = 818) disabilities. The estimates provided are nationally representative estimates of the universe of persons served by HUD housing-assistance programs. An estimated 44% of adults were recorded as having a disability. To test the sensitivity of the disability measure, additional prevalence estimates were run using two alternative measures of disability that have been historically used in the NHIS: basic action difficulties (BAD) and complex activities limitations (CAL). The overall prevalence of disability varies slightly within the study population, with 54% of persons having BAD and 43% having CAL, yet the estimate provided using the six-question screener falls within this range.

A total of 58% of HUD-assisted adults were working age (25 to 61 years), and females were disproportionately represented (74%). Half of the HUD-assisted adults had not worked in the past 12 months, and two thirds were below the official poverty threshold. A total of 16% were not covered by any form of health insurance, whereas 45% received HCVs, 26% resided in PH units, and 29% lived in MF units. The sample is diverse geographically, with more of the sample living in the South (32%) than in other regions of the country. Nearly 85% resided in metropolitan areas.

Table 1. Sociodemographic characteristics of study population, NHIS linked with HUD administrative data, 2010–2012.

	HUD-assisted population (n = 1,448)		No disability (n = 818)		Disability (n = 630)		
Characteristic	%	*SE*	%	*SE*	%	*SE*	Sig.
Age (years)							
18–24	17.9	1.68	26.3	2.47	5.9	1.36	***
25–61	58.0	1.95	58.0	2.35	58.0	2.70	NS
62+	24.1	1.90	15.7	1.70	36.1	2.69	NS
Sex							
Male	25.6	1.58	24.0	2.18	27.9	2.35	NS
Female	74.4	1.58	76.0	2.18	72.1	2.35	NS
Race/ethnicity							
Hispanic	19.5	1.78	19.8	2.17	19.0	2.55	***
Non-Hispanic White	36.3	2.33	30.3	2.49	44.8	3.19	NS
Non-Hispanic Black	40.1	2.28	45.9	2.77	32.0	2.86	NS
Non-Hispanic Other	4.1	0.68	4.0	0.90	4.3	0.99	NS
Highest level of education obtained							
Less than high school	35.2	1.83	31.3	2.30	40.7	2.54	***
High school graduate or GED	31.2	1.78	31.8	2.21	30.5	2.54	NS
Some college/associate's	28.9	1.85	33.3	2.43	22.7	2.14	NS
Bachelor's degree or higher	4.7	0.62	3.6	0.79	6.2	1.06	NS
Work status							
Worked (past 12 months)	38.1	1.76	52.9	2.27	17.1	2.13	***
Did not work (past 12 months)	50.3	1.81	37.7	2.25	68.2	2.62	NS
Never worked	11.6	1.20	9.4	1.44	14.7	1.92	NS
Poverty level							
Below poverty line	67.1	1.68	63.4	2.51	72.3	2.34	*
At or above poverty line	32.9	1.68	36.6	2.51	27.7	2.34	NS
Health insurance coverage status							
Not covered	16.1	1.37	22.3	1.93	7.2	1.26	***
Covered	83.9	1.37	77.7	1.93	92.8	1.26	NS
HUD program							
Housing Choice Voucher program	45.1	2.50	44.7	2.72	45.7	3.40	NS
Public housing	25.6	2.81	26.9	3.04	23.8	3.24	NS
Multifamily housing	29.2	2.66	28.4	3.03	30.4	3.17	NS
Region							
Northeast	27.2	2.52	26.3	2.75	28.4	3.36	NS
Midwest	23.7	2.24	24.4	2.68	22.7	2.84	NS
South	32.3	2.48	34.2	3.05	29.6	2.71	NS
West	16.8	1.76	15.1	2.00	19.2	2.35	NS
Urban							
Nonmetropolitan	15.4	1.83	15.2	2.05	15.5	2.34	NS
Metropolitan	84.6	1.83	84.8	2.05	84.5	2.34	NS

*Note.*NHIS = National Health Interview Survey; HUD = U.S. Department of Housing and Urban Development; NS = not significant; *SE* = standard error; Sig. = significance. Significant differences in characteristics between adults with and without disabilities were tested using Chi square.
Source: Authors' analysis of NHIS-HUD data.
*$p < .05$; **$p < .01$; ***$p < .001$.

The distribution of adults with and without disabilities was similar across HUD programs. Some significant differences existed between adults with and without disabilities that were residing in HUD-assisted housing, however. Persons with disabilities were significantly more likely to be older or non-Hispanic White, have lower levels of education, or be below the official poverty line. Adults with disabilities were much less likely to have worked in the past 12 months (17%) compared with adults without disabilities (53%). Lastly, persons with disabilities were significantly more likely to have health insurance compared with persons without disabilities.

Table 2 shows differences in the characteristics of adults with disabilities who were supported by the three types of HUD programs: PH, MF, and HCV. Resident characteristics varied by age, poverty level and region across programs. The MF program was more likely to house adults with disabilities who were age 62 years or older or who were above the official poverty threshold than the other programs.

Table 2. Characteristics of HUD-assisted adults with disability by HUD program type, NHIS linked with HUD administrative data, 2010–2012.

	HCV (n = 260)		PH (n = 161)		MF (n = 209)		
Characteristic	%	*SE*	%	*SE*	%	*SE*	Sig.
Age (years)							
18–61	75.1	3.20	65.1	6.08	46.0	4.83	***
Sex							
Female	71.2	3.61	72.2	4.71	73.4	3.80	NS
Race/ethnicity							
Minority (Black, Hispanic, Other)	58.4	4.09	61.6	7.39	45.6	5.66	NS
Highest level of education obtained							
Less than high school	35.6	3.71	46.4	5.75	43.9	3.90	NS
High school graduate or GED	30.8	3.66	31.6	5.98	29.1	3.73	NS
Some college/associate's	27.0	3.55	15.9	3.39	21.5	3.50	NS
Bachelor's degree or higher	6.6	1.62	6.2	2.19	5.5	1.53	NS
Work status							
Worked (past 12 months)	19.3	3.49	14.9	3.72	15.5	2.65	NS
Did not work (past 12 months)	65.3	3.85	67.3	5.97	73.3	3.39	NS
Never worked	15.5	2.79	17.8	4.68	11.2	2.52	NS
Poverty level							
Below poverty line	75.4	3.56	79.3	3.86	62.1	3.62	**
Region							
Northeast	21.1	3.59	38.8	8.63	31.3	6.17	*
Midwest	17.6	3.04	21.9	5.98	31.1	6.52	NS
South	32.7	3.90	30.1	6.98	24.6	4.24	NS
West	28.5	3.96	9.2	4.16	13.1	3.25	NS
Urban							
Metropolitan (Urban)	88.1	2.49	80.7	5.27	81.9	5.55	NS

Note. HUD = U.S. Department of Housing and Urban Development; NHIS = National Health Interview Survey; HCV = Housing Choice Voucher; MF = multifamily; NS = not significant; PH = public housing; *SE* = standard error; Sig. = significance. Significant differences in characteristics between adults with and without disabilities were tested using Chi square.
Source: Authors' analysis of NHIS-HUD data.
*p < .05; **p < .01; ***p < .001.

Persons with disabilities were similarly distributed across programs in terms of gender, race, educational attainment, work status, and metropolitan status.

Table 3 shows health characteristics for the total sample population and by disability status. Compared with adults without disabilities, adults with disabilities who were living in HUD-assisted housing were significantly more likely to experience fair or poor health, be diagnosed with diabetes or hypertension, be obese, have asthma, or currently smoke. Adults with disabilities were significantly more likely to have seen a specialist, general doctor or mental health professional in the past 12 months, and were also more likely to report struggling to afford needed health-care services (dental, glasses, prescriptions, or mental health care). Lastly, adult HUD-assisted housing residents with disabilities were more likely to report having two or more emergency room visits in the past 12 months.

Table 4 shows selected results from the logistic regressions which predicted the likelihood of each health measure, controlling for individual characteristics as well as HUD program type. Full results are included in the Appendix. These results confirm the bivariate findings, as adults with disabilities were significantly more likely to experience lower levels of health. Adult residents with disabilities had poorer health overall, even when controlling for individual characteristics and program type. Adult tenants with disabilities had higher odds of poor or fair health status (odds ratio, OR: 7.37, p < .001), diabetes (OR: 3.63, p < .001), asthma (OR: 2.07, p < .001), hypertension (OR: 4.02, p < .001), obesity (OR: 1.93, p < .001) and smoking (OR: 1.92, p < .001) than adults who did not have disabilities. Residents with disabilities were also more likely to be connected to the health-care system than other adults, having increased odds of seeing a specialist, general doctor or mental health professional in the past year. Adults with disabilities had significantly lower odds of lacking health-care coverage (OR: 0.26, p < .001) than other persons, yet residents with disabilities still stated that they could not afford needed health care (OR: 3.78, p < .001). In addition, residents with disabilities had more visits to the emergency room (OR: 2.13, p < .001) than residents without disabilities.

Table 3. Health characteristics of study population, NHIS linked with HUD administrative data, 2010–2012.

	HUD-assisted population (n = 1,448)		No disability (n = 818)		Disability (n = 630)		
Characteristic	%	*SE*	%	*SE*	%	*SE*	Sig.
Self-reported health							
Excellent, very good, or good	67.7	1.47	85.7	1.33	42.0	2.44	***
Fair or Poor	32.3	1.47	14.3	1.33	58.0	2.44	
Diabetes							
Never diagnosed	82.5	1.32	91.3	1.10	69.9	2.42	***
Ever diagnosed	17.5	1.32	8.7	1.10	30.1	2.42	
Hypertension							
Never diagnosed	59.0	1.89	73.4	2.08	38.5	2.63	***
Ever diagnosed	41.0	1.89	26.7	2.08	61.5	2.63	
Obese							
No	54.7	1.70	60.7	2.24	46.2	2.50	***
Yes	45.3	1.70	39.3	2.24	53.8	2.50	
Current asthma							
No	82.9	1.26	87.3	1.65	76.7	1.78	***
Yes	17.1	1.26	12.8	1.65	23.4	1.78	
Current cigarette smoker							
No	70.5	1.47	74.4	2.03	65.0	2.44	**
Yes	29.5	1.47	25.6	2.03	35.0	2.44	
Seen a specialist (past 12 months)							
No	75.8	1.38	87.8	1.42	58.9	2.68	***
Yes	24.2	1.38	12.3	1.42	41.1	2.68	
Seen a general doctor (past 12 months)							
No	27.4	1.78	36.8	2.37	13.9	1.95	***
Yes	72.6	1.78	63.2	2.37	86.1	1.95	
Seen a mental health doctor (past 12 months)							
No	81.4	1.20	90.6	1.24	68.1	2.42	***
Yes	18.7	1.20	9.4	1.24	31.9	2.42	
Affording needed services (past 12 months)							
Could afford needed services	66.4	1.72	74.3	2.16	55.1	2.67	***
Could not afford needed services	33.6	1.72	25.7	2.16	44.9	2.67	
Emergency room visits, past 12 months							
0–1	77.6	1.30	82.4	1.70	70.6	2.23	***
2+	22.4	1.30	17.6	1.70	29.4	2.23	

Note. NHIS = National Health Interview Survey; HUD = U.S. Department of Housing and Urban Development; *SE* = standard error; Sig. = significance. Significant differences in characteristics between adults with and without disabilities were tested using Chi square.
Source: Authors' analysis of NHIS-HUD data.
*$p < .05$; **$p < .01$; ***$p < .001$.

Only one significant difference is noted by program type, with those receiving HCVs having significantly higher odds of having asthma than residents in PH units (OR: 1.60, $p < .05$).

Adults ages 62 years and older living in HUD-assisted housing had significantly higher odds of reporting fair or poor health status (OR: 1.92, $p < .01$), diabetes (OR: 3.47, $p < .001$), and hypertension (OR: 6.24, $p < .001$) than younger adults. They also had higher odds of having seen a general doctor in the past 12 months (OR: 1.69, $p < .01$).

Discussion and Conclusions

The findings shared here show that adults with disabilities represent a significant share of the population assisted by HUD and face a number of health disparities, providing strong support for better access to health-related services to HUD tenants. Key findings are discussed in detail below.

Table 4. Logistic regressions of health measures, NHIS linked with HUD administrative data, 2010–2012.

		Disability		HUD program category			Age (years)	
Model		Yes	No	HCV	PH	MF	18–61	62+
Poor/fair health status,	*OR*	7.37	–	0.82	–	0.84	–	1.92
n = 1,445	*95% CI*	[5.43, 9.99]	–	[0.59, 1.14]	–	[0.57, 1.24]	–	[1.31, 2.83]
	Sig.	***	–	NS	–	NS	–	**
Diabetes (ever diagnosed),	*OR*	3.63	–	1.02	–	0.85	–	3.47
n = 1,411	*95% CI*	[2.48, 5.33]	–	[0.67, 1.56]	–	[0.55, 1.31]	–	[2.36, 5.12]
	Sig.	***	–	NS	–	NS	–	***
Current asthma,	*OR*	2.07	–	1.60	–	1.18	–	0.81
n = 1,444	*95% CI*	[1.47, 2.91]	–	[1.00, 2.56]	–	[0.76, 1.86]	–	[0.51, 1.30]
	Sig.	***	–	*	–	NS	–	NS
Hypertension (ever diagnosed),	*OR*	4.02	–	0.75	–	0.88	–	6.24
n = 1,443	*95% CI*	[2.90, 5.58]	–	[0.53, 1.06]	–	[0.60, 1.28]	–	[4.24, 9.18]
	Sig.	***	–	NS	–	NS	–	***
Obesity,	*OR*	1.93	–	1.02	–	1.02	–	0.81
n = 1,446	*95% CI*	[1.44, 2.58]	–	[0.73, 1.44]	–	[0.72, 1.44]	–	[0.59, 1.10]
	Sig.	***	–	NS	–	NS	–	NS
Current cigarette smoker,	*OR*	1.92	–	1.14	–	0.91	–	0.31
n = 1,445	*95% CI*	[1.36, 2.70]	–	[0.76, 1.70]	–	[0.61, 1.36]	–	[0.21, 0.44]
	Sig.	***	–	NS	–	NS	–	***
Seen a specialist (past 12 months),	*OR*	4.24	–	1.11	–	1.47	–	1.14
n = 1,445	*95% CI*	[2.96, 6.08]	–	[0.77, 1.62]	–	[0.97, 2.22]	–	[0.81, 1.61]
	Sig.	***	–	NS	–	NS	–	NS
Seen a general doctor (past 12 months)	*OR*	2.97	–	1.18	–	1.01	–	1.69
n = 1,446	*95% CI*	[2.08, 4.25]	–	[0.80, 1.74]	–	[0.68, 1.51]	–	[1.14, 2.50]
	Sig.	***	–	NS	–	NS	–	**
Seen a mental health doctor (past 12 months)	*OR*	4.86	–	1.40	–	0.90	–	0.27
n = 1,445	*95% CI*	[3.25, 7.25]	–	[0.82, 2.39]	–	[0.51, 1.58]	–	[0.15, 0.48]
	Sig.	***	–	NS	–	NS	–	***
Could not afford needed care,	*OR*	3.78	–	1.40	–	1.41	–	0.53
n = 1,446	*95% CI*	[2.62, 5.44]	–	[0.91, 2.16]	–	[0.88, 2.26]	–	[0.35, 0.80]
	Sig.	***	–	NS	–	NS	–	**
Two or more ER visits (past 12 months),	*OR*	2.13	–	1.16	–	1.20	–	0.58
n = 1,445	*95% CI*	[1.49, 3.05]	–	[0.76, 1.76]	–	[0.81, 1.76]	–	[0.36, 0.91]
	Sig.	***	–	NS	–	NS	–	*
No health insurance coverage,	*OR*	0.26	–	0.98	–	0.77	X	X
n = 1,446	*95% CI*	[0.17, 0.40]	–	[0.61, 1.58]	–	[0.42, 1.42]	X	X
	Sig.	***	–	NS	–	NS	X	X

Note. NHIS = National Health Interview Survey; HUD = U.S. Department of Housing and Urban Development; CI = confidence interval; HCV = Housing Choice Voucher; MF = multifamily; NS = not significant; OR = odds ratio; PH = public housing; *Sig.* = significance. X indicates that cell sizes are too small to report due to confidentiality restrictions. Significant differences in characteristics between adults with and without disabilities were tested using Chi square.

Source: Authors' analysis of NHIS-HUD data.

*$p < .05$; **$p < .01$; ***$p < .001$.

First, results using linked data suggest that persons with disabilities comprise a large portion of adult residents (44%). This nationally representative percentage is much larger than previous estimates generated utilizing HUD administrative data (30.4%) and reaffirms calls for coordination between housing and health programs that target persons with disabilities and programs such as HUD Section 811 Project Rental Assistance (Technical Assistance Collaborative, 2016; U.S. Department of Housing and Urban Development, 2014a, 2016e). To test the sensitivity of the disability measure used herein, other measures of disability (BAD and CAL) were used that confirmed the higher prevalence of disability among HUD-assisted persons.

Second, adults with disabilities are fairly evenly distributed among HUD's three primary rental-housing assistance programs—PH, MF and HCV. Although MF includes a program that is specifically targeted at persons with disabilities (i.e., the Section 811 Program), the program is relatively small, and persons with disabilities are attracted to and targeted by all HUD-assisted programs (Dawkins & Miller, 2015; Khadduri & Locke, 2013). MF has a large number of properties designated to elderly households that include persons with disabilities. PH and HCV can be targeted to persons with disabilities through designated properties or vouchers or through a local system of admission preference that PHAs can establish for special populations. In recent years, HUD has urged PHAs to use their system of admission preference to help persons with disabilities who are transitioning from institutions or who are at serious risk of institutionalization (U.S. Department of Housing and Urban Development, 2012). Recent research has found that targeting housing vouchers at nonelderly persons with disabilities living in nursing homes has increased the rate of transition to the community by 8.7 percentage points in three of five locations where these special vouchers were made available (Hoffman, Kehn, & Lipson, 2017).

Third, adults with disabilities who are residing in HUD-assisted housing are more likely than residents without disabilities to be in fair or poor health and experience co-occurring chronic conditions including asthma, diabetes and hypertension, as well as being more likely to be obese. Adults in MF elderly housing can address some of their health-related needs through service coordinators—social services staff who provide information and referral to assist frail, elderly residents in maintaining their independence (Levine & Johns, 2008). Service coordinators can be paid in part by the housing subsidy or by a HUD-funded grant. A recent study found on-site service coordinators in approximately two thirds of a nonrepresentative sample of MF properties for elderly households (Sanders et al., 2015). As part of several initiatives to improve coordination with U.S. Department of Health and Human Services (HHS) programs, HUD is testing a new enhanced service coordination model that will add a part-time wellness nurse and a full-time service coordinator to improve collaboration with health programs to promote aging in place, improve health outcomes, and reduce overall health-care costs. The program is targeted at MF housing designated to elderly households, and was developed based on both an environmental scan of promising service coordination models and results from the evaluation of the Support and Services at Home program in Vermont (Kandilov, Keyes, van Hasselt, Edwards, & Siegfried, 2016; U.S. Department of Health and Human Services, 2012; U.S. Department of Housing and Urban Development, 2016a, 2016c). Future evaluation and research can help determine if these new models of service coordination and the collaboration with HHS have an impact on health outcomes for persons with disabilities.

Fourth, adult residents with disabilities are more likely to smoke cigarettes than residents without disabilities. Prior research has found that even when controlling for sociodemographic characteristics, HUD-assisted adult cigarette smokers are more likely to report disability when compared to nonsmokers (Helms, King, & Ashley, 2017; U.S. Department of Housing and Urban Development, 2015, 2016f). HUD recently provided smoke-free guidance in an effort to make all PH units smoke-free and offers a number of resources designed to assist public-housing authorities, owners and residents in achieving smoke-free environments throughout housing-assistance programs (Geller, Rees, & Brooks, 2016; U.S. Department of Housing and Urban Development, 2016f). Future research can examine whether such changes improve overall health for residents with disabilities by reducing individual-level cigarette-smoking behaviors and reducing exposure to secondhand smoke.

Fifth, adult tenants with disabilities are more likely to have health-insurance coverage, even when controlling for age and other individual characteristics. The sample size limitations of the current study preclude a more detailed examination of insurance status by both age and disability status. It is confirmed however that insurance rates varied substantially by age among HUD-assisted adults, with 99% of HUD-assisted adults ages 62 years and older having health-insurance coverage. In comparison, 72% of 18- to 24-year-olds and 81% of 25- to 61-year-olds had health-insurance coverage. These stark differences suggest that further research on insurance rates among nonelderly HUD-assisted adults with disabilities is needed.

Sixth, HUD-assisted adults with disabilities are more likely to have frequent contact with health-care providers than other residents. The analysis conducted here, however, cannot specify whether residents with disabilities are receiving fully adequate access to care. Other research has suggested, for example, that adults with disabilities face transportation and other barriers when accessing health care (Brucker & Rollins, 2016). Additional research can attempt to uncover the extent to which health-care needs might not be addressed for residents with disabilities.

Seventh, although housing assistance makes housing more affordable for adults with disabilities, assisted households still face huge challenges in finding an accessible unit in the rental market. Data from the American Housing Survey indicate that fewer than 4% of housing units could be considered livable by people with moderate mobility difficulties, and that 0.15% of units are wheelchair accessible (Chan & Ellen, 2017). In addition, over 50% of rental households with mobility impairments report having steps present at their home entrance, and approximately 25% of renters report living up a flight of stairs without an elevator (Greiman & Ravesloot, 2015). Although HUD-assisted households are disproportionally more likely to live in accessible units (Bo'sher, Chan, Ellen, Karfunkel, & Liao, 2015), very little is known about the adequacy of HUD-assisted housing stock in meeting the needs of persons with disabilities.

Lastly, older adults (persons age 62 years or older) fare differently on health measures than persons with disabilities. Whereas older adults are more likely report poor or fair health status or have diabetes and/or hypertension than younger adults, they are less likely to have asthma and are less likely to smoke. They have similar access to health-care specialists, are more likely to have seen a general doctor, and less likely to have seen a mental health professional than younger adults. These different patterns of health status and health-care utilization suggest that programs to support elderly adults should differ from those developed to support nonelderly adults with disabilities.

As shown here, adults with disabilities who reside in HUD-assisted housing face a number of health disparities. Such information can be used by federal, state and local housing and health care policymakers as they assess needs, develop targeted programs, and monitor progress in improving the health of residents with disabilities.

Note

1. This percentage is based on the authors' analysis of administrative data for the sample of HUD-assisted adults that were matched to National Health Interview Survey data.

Acknowledgments

The findings and conclusions of this study are those of the authors and do not represent the opinions or policies of either the U.S. Department of Health and Human Services (DHHS) or the U.S. Department of Housing and Urban Development (HUD). The authors retain sole responsibility for any errors or omissions.

Disclosure Statement

No potential conflict of interest was reported by the authors.

Funding

A portion of the work on this project was funded by the U.S. Department of Health and Human Services (DHHS) National Institute for Disability, Independent Living and Rehabilitation Research [grant H133B130015].

Notes on Contributors

Debra L. Brucker, MPA, PhD is a research assistant professor at the University of New Hampshire's Institute on Disability. She studies the economic, health and social well-being of persons with disabilities. She earned her undergraduate and Master of Public Administration degrees from the University of Delaware. She completed her PhD in urban planning and public policy at Rutgers University's Edward J Bloustein School for Planning and Public Policy.

Veronica Helms, MPH, is a social scientist at the U.S. Department of Housing and Urban Development, Office of Policy Development and Research. Her research focuses on data linkage, housing as a social determinant of health, health equity and social justice. She is also a part-time doctoral candidate at the Johns Hopkins Bloomberg School of Public Health.

Teresa Souza obtained a PhD in Urban Studies and Planning from the University of Maryland and received her undergraduate and master degrees from the School of Architecture and Urbanism, University of Sao Paulo, Brazil. She worked in the design, implementation, and evaluation of housing programs in Latin America before joining the Office of Policy Development and Research at the U.S. Department of Housing and Urban Development, where she works in the evaluation of housing programs for the elderly and for people with disabilities. She is the co-author of the *2009 Worst Case Housing Needs of People with Disabilities Report*.

References

Albrecht, G. L., & Devlieger, P. J. (1999). The disability paradox: High quality of life against all odds. *Social Science and Medicine, 48*, 977–988.

Altman, B. M., & Bernstein, A. (2008). *Disability and health in the United States, 2001–2005*. Hyattsville, MD: U.S. Department of Health and Human Services.

Armour, B. S., Campbell, V. A., Crews, J. E., Malarcher, A., Maurice, E., & Richard, R. A. (2007). State-level prevalence of cigarette smoking and treatment advice, by disability status, United States, 2004. *Preventing Chronic Disease, 4*(4), 1–11.

Bell, J. E., & Rubin, V. (2007). *Why place matters: Building a movement for healthy communities*. Oakland, CA: PolicyLink.

Bo'sher, L., Chan, S., Ellen, I. G., Karfunkel, B., & Liao, H. -L. (2015). *Accessibility of America's housing stock: Analysis of the 2011 American Housing Survey (AHS)*. Washington, DC: HUD.

Bostic, R. W., Thornton, R. L. J., Rudd, E. C., & Sternthal, M. J. (2012). Health in all policies: The role of the U.S. Department of Housing and Urban Development and present and future challenges. *Health Affairs, 31*, 2130–2137. doi:10.1377/hlthaff.2011.1014

Brucker, D. L., & Houtenville, A. J. (2015). People with disabilities in the United States. *Archives of Physical Medicine and Rehabilitation, 96*, 771–774. doi:10.1016/apmr.2015.02.024

Brucker, D. L., Mitra, S., Chaitoo, N., & Mauro, J. (2015). More likely to be poor whatever the measure: Working-age persons with disabilities in the United States. *Social Science Quarterly, 96*, 273–296. doi:10.1111/ssqu.12098

Brucker, D. L., & Rollins, N. R. (2016). Trips to medical care for persons with disabilities: Evidence from the National Household Travel Survey. *Disability and Health Journal, 9*, 539–543. doi:10.1016/j.dhjo.2016.01.001

Carroll, D. D., Courtney-Long, E. A., Stevens, A. C., Sloan, M. L., Lullo, C., Visser, S. N., … Armour, B. S. (2014). Vital signs: Disability and physical activity—United States, 2009-2012. *Morbidity and Mortality Weekly Report, 63*, 407–413.

Chan, S., & Ellen, I. G. (2017). Housing for an aging population. *Housing Policy Debate, 27*, 167–192.

Cook, J. A., Razzano, L., Jonikas, J., Swarbrick, M. A., Steigman, P. J., Hamilton, M. M., … Santos, A. B. (2016). Correlates of co-occurring diabetes and obesity among community mental health program members with serious mental illness. *Psychiatric Services, 67*, 1269–1271.

Courtney-Long, E. A., Stevens, A. C., Caraballo, R., Ramon, I., & Armour, B. S. (2014). Disparities in current cigarette smoking prevalence by type of disability, 2009-2011. *Public Health Reports, 129*, 252–260.

Dawkins, C. J., & Miller, M. (2015). A picture of disability and designated housing. College Park: University of Maryland. Retrieved from https://www.huduser.gov/portal/sites/default/files/pdf/mdrt_disability_designated_housing.pdf

Digenis-Bury, E. C., Brooks, D. R., Chen, L., Ostrem, M., & Horsburgh, C. R. (2008). Use of a population-based survey to describe the health of Boston public housing residents. *American Journal of Public Health, 98*, 85–91.

Fauth, R. C., Leventhal, T., & Brooks-Gunn, J. (2004). Short-term effects of moving from public housing in poor to middle-class neighborhoods on low-income, minority adults' outcomes. *Social Science and Medicine, 59*, 2271–2284.

Fernandez, R. M., & Su, C. (2004). Space in the study of labor markets. *Annual Review of Sociology, 30*, 545–569. doi:10.1146/annurev.soc.29.010202.100034

Froehlich-Grobe, K., Lee, J., & Washburn, R. A. (2013). Disparities in obesity and related conditions among Americans with disabilities. *American Journal of Preventive Medicine, 45*, 83–90.

Geller, A. C., Rees, V. W., & Brooks, D. R. (2016). The proposal for smoke-free public housing: Benefits, challenges, and opportunities for 2 million residents. *JAMA, 315*, 1105–1106.

Gordon, E. L., Chipungu, S., Bagley, L. M., & Zanakos, S. I. (2005). *Improving housing subsidy surveys: Data collection techniques for identifying the housing subsidy status of survey respondents*. Washington, DC: HUD.

Greiman, L., & Ravesloot, C. (2015). Housing characteristics of households with wheeled mobility device users from the American Housing Survey: Do people live in homes that facilitate community participation? *Community Development, 47*, 63–74. doi: 10.1080/15575330.2015.1108989

Hayward, E., Chidinma, I., Young, J. H., Potti, K., Jones, P., III, Pollack, C. E., & Gudzune, K. A. (2015). Linking social and built environmental factors to the health of public housing residents: A focus group study. *BMC Public Health, 15*, 187. doi:10/.1186/s12889-015-17109

Heinrich, K. M., Lee, R. E., Regan, G. R., Reese-Smith, J. Y., Howard, H. H., Haddock, C. K., … Ahluwalia, J. S. (2008). How does the built environment relate to body mass index and obesity prevalence among public housing residents? *American Journal of Health Promotion, 22*, 187–194.

Helms, V. E., King, B. A., & Ashley P. J. (2017). Cigarette smoking and adverse health outcomes among adults receiving federal housing assistance. *Preventive Medicine, 99*, 171–177.

Helms, V. E., Sperling, J., & Steffen, B. (2016). *A health picture of HUD-assisted adults, 2006–2012*. Washington, DC: HUD.

Hoffman, D., Kehn, M. E., & Lipson, D. J. (2017). The missing link: Examining the impact of housing vouchers and community-based services and supports on transitions from nursing facilities to the community. *Journal of Disability Policy Studies, 27*, 243–251.

Hoffman, D., & Livermore, G. (2012). The house next door: A comparison of residences by disability status using new measures in the American Housing Survey. *Cityscape, 14*, 5–34.

Kandilov, A. M. G., Keyes, V., van Hasselt, M., Edwards, P., & Siegfried, N. R. (2016). *Support and services at home (SASH) evaluation: Second annual report*. Washington, DC: DHHS. Retrieved from https://aspe.hhs.gov/basic-report/support-and-services-home-sash-evaluation-second-annual-report

Khadduri, J., & Locke, G. (2013). *Making subsidized rental housing a platform for improved health for vulnerable populations*. Cambridge, MA: Abt Associates. Retrieved from https://www.abtassociates.com/CMSPages/GetFile.aspx?guid=01e6eb97-c2fb-41dd-9542-f4a7f1a612da

Kleit, R. G. (2001). The role of neighborhood social networks in scattered-site public housing residents' search for jobs. *Housing Policy Debate, 12*, 541–573. doi:10.1080/10511482.2001.9521418

Krahn, G. L., Walker, D. K., & Correa-De-Araujo, R. (2015). Persons with disabilities as an unrecognized health disparity population. *American Journal of Public Health, 105*(Suppl 2), S19–206.

Kushel, M. B., Gupta, R., Gee, L., & Haas, J. S. (2006). Housing instability and food insecurity as barriers to health care among low-income Americans. *Journal of General Internal Medicine, 21*, 71–77. doi:10.1111/j.1525-1497.2005.00278.x

Leventhal, T., & Brooks-Gunn, J. (2003). Moving to opportunity: An experimental study of neighborhood effects on mental health. *American Journal of Public Health, 93*, 1576–1582.

Levine, C. A., & Johns, A. R. (2008). *Multi-family property managers' satisfaction with service coordinators*. Washington, DC: HUD. Retrieved from https://www.huduser.gov/Publications/PDF/Multifamily-prop.pdf

Levy, D. K., Turner, M. A., Santos, R., Wissoker, D., Aranda, C. L., Pitingolo, R., & Ho, H. (2015). *Discrimination in the rental housing market against people who are deaf and people who use wheelchairs: National study findings*. Washington, DC: HUD. Retrieved from https://www.huduser.gov/portal/publications/fairhsg/hds_disability.html

Lloyd, P. C., & Helms, V. E. (2016). *NCHS-HUD linked data: Analytic considerations and guidelines*. Hyattsville, MD: National Center for Health Statistics.

Lloyd, P. C., Helms V. E., Simon A., Golden, C., Brittain, J., Call, E., …Star, C. S. (2016). *Linkage of 1999-2012 National Health Interview Survey (NHIS) and 1999–2012 National Health Examination Survey (NHANES) to administrative records from the U.S. Department of Housing and Urban Development's (HUD)*. Hyattsville, MD: National Center for Health Statistics.

Ludwig, J., Sanbonmatsu, L., Gennetian, L., Adam, E., Duncan, G. J., Katz, L. F., … McDade, T. W. (2011). Neighborhoods, obesity and diabetes—a randomized social experiment. *New England Journal of Medicine, 365*, 1509–1519.

Malloy, R. P. (2008). Inclusion by design: Accessible housing and the mobility impaired. *Hastings Law Journal, 60*(4), 1–95.

Miller, N. A., Kirk, A., Kaiser, M. J., & Glos, L. (2014). The relation between health insurance and health care disparities among adults with disabilities. *American Journal of Public Health, 104*, e85–e93. doi:10.2105/AJPH.2013.301478

National Center for Health Statistics. (2016a). *NCHS urban-rural classification scheme for counties*. Hyattsville, MD: Author. Retrieved from www.cdc.gov/nchs/data_access/urban_rural.htm

National Center for Health Statistics. (2016b). *NHIS-HUD linked file sample sizes and percentage linked among sample adults and sample children, by survey and age at interview*. Hyattsville, MD: Author. Retrieved from https://www.cdc.gov/nchs/data/datalinkage/hud_table_2.pdf

National Center for Health Statistics. (2016c). *NCHS-HUD linked data: Analytic considerations and guidelines*. Hyattsville, MD: Author.

National Council on Disability. (2010). *The state of housing in America in the 21st century: A disability perspective*. Washington, DC: Author.

Orr, L., Feins, J. D., Jacob, R., Beecroft, E. Sanbonmatsu., L., Katz, L. F., … Kling, J. R. (2003). *Moving to opportunity for fair housing demonstration program: Interim impacts evaluation*. Washington, DC: HUD. Retrieved from http://www.huduser.org/Publications/pdf/MTOFullReport.pdf

Pastor, J. M. (2001). Geography and opportunity. In N. J. Smelser, W. J. Wilson, & F. Mitchell (Eds.), *America becoming: Racial trends and their consequences* (Vol. 1, pp. 435–468). Washington, DC: National Academies Press.

Rasch, E. K., Gully, S. P., & Chan, L. (2013). Use of emergency department among working age adults with disabilities: A problem of access and service needs. *Health Services Research, 48*, 1334–1358. doi:10.1111/1475-6773.12025

Reichard, A., & Stolzle, H. (2011). Diabetes among adults with cognitive limitations compared to individuals with no cognitive disabilities. *Intellectual and Developmental Disabilities, 49*, 141–154.

Rosenbaum, E., & Harris, L. E. (2001). Residential mobility and opportunities: Early impacts of the moving to opportunities demonstration program in Chicago. *Housing Policy Debate, 12*, 321–346.

Sanders, A., Smathers, K., Patterson, T., Stone, R., Khan, J., Marshall, J., & Alecxih, L. (2015). *Service availability in HUD-assisted seniors housing: Findings from a survey on the availability of onsite services in HUD-assisted seniors housing*. Washington, DC: LeadingAge Center for Housing Plus Services. Retrived from https://www.leadingage.org/uploadedFiles/Content/Centers/Center_for_Housing_Plus_Services/Research/Service%20Availability%20in%20HUD-Assisted%20Senior%20Housing.pdf

Smith, A. E., Molton, I. R., & Jensen, M. P. (2016). Self-reported incidence and age of onset of chronic comorbid medical conditions in adults aging with long-term physical disability. *Disability & Health Journal, 9*, 533–538.

Steinmetz, E. (2006). *Americans with disabilities, 2002*. Washington, DC: U.S. Census Bureau.

Technical Assistance Collaborative. (2016). *TAC resource center on supportive housing: HUD's Section 811 Program*. Boston, MA: Author. Retrieved from https://811resourcecenter.tacinc.org/policy-programs/hud-section-811-program-information

Technical Assistance Collaborative and Consortium for Citizens with Disabilities. (2015). *Priced out in 2014*. Boston, MA: Author.

U.S. Department of Health and Human Services. (2012). *The "value added" of linking publicly assisted housing for low-income older adults with enhanced services: A literature synthesis and environmental scan*. Washington, DC: Author. Retrived from https://aspe.hhs.gov/report/value-added-linking-publicly-assisted-housing-low-income-older-adults-enhanced-services-literature-syntheses-and-environmental-scan

U.S. Department of Housing and Urban Development. (2012). *NOTICE PIH-2012-31: Assisted housing for persons with disabilities under Olmstead implementation efforts to provide community-based options rather than institutional settings*. Washington, DC: Author. Retrieved from https://portal.hud.gov/huddoc/pih2012-31.pdf

U.S. Department of Housing and Urban Development. (2014a). *Section 811 project rental assistance—Bringing permanent supportive housing to scale: Status report to Congress*. Washington, DC: Author. Retrieved from https://portal.hud.gov/hudportal/documents/huddoc?id=Sec811_Congressional_Rpt.pdf

U.S. Department of Housing and Urban Development. (2014b). *Strategic plan 2014–2018*. Washington, DC: Author. Retrieved from https://portal.hud.gov/hudportal/documents/huddoc?id=hudstrategicplan2014-2018.pdf

U.S. Department of Housing and Urban Development. (2015). FR 5597-P-02. Instituting smoke-free public housing. Retrieved from https://www.regulations.gov/#!documentDetail;D=HUD-2015-0101-0001

U.S. Department of Housing and Urban Development. (2016a). *FY2015 supportive services demonstration for elderly households in HUD-assisted multi-family housing programs NOFA*. Washington, DC: Author. Retrieved from https://portal.hud.gov/hudportal/HUD?src=/program_offices/administration/grants/fundsavail/nofa2015/ssdemo

U.S. Department of Housing and Urban Development. (2016b). *FY 2017 congressional justifications: Housing for persons with disabilities (Section 811)*. Washington, DC: Author. Retrieved from https://portal.hud.gov/hudportal/documents/huddoc?id=27-HSNGforPersons.w.Disab.pdf

U.S. Department of Housing and Urban Development. (2016c). *HUD offers approximately $15 million in grants to test a new approach to help low-income seniors age in place*. Washington, DC: Author. Retrieved from https://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2016/HUDNo_16_005

U.S. Department of Housing and Urban Development. (2016d). *Picture of subsidized housing: 2015*. Washington, DC: Author. Retrieved from https://www.huduser.org/portal/datasets/picture/yearlydata.html

U.S. Department of Housing and Urban Development. (2016e). *Section 811 supportive housing for persons with disabilities program*. Washington, DC: Author. Retrieved from https://portal.hud.gov/hudportal/HUD?src=program_offices/housing/mfh/grants/section811ptl

U.S. Department of Housing and Urban Development. (2016f). *Smoke-free multifamily housing toolkits*. Washington, DC: Author. Retrieved from https://portal.hud.gov/hudportal/HUD?src=/smokefreetoolkits1

Appendix: Technical Notes

Data

NHIS

The National Health Interview Survey (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 outcomes. In 2010, the NHIS started including the six disability questions that have been widely adopted in major federal surveys. The NHIS has approximately an 80% response rate (National Center for Health Statistics, 2016b).

HUD Administrative Data

U.S. Department of Housing and Urban Development (HUD) administrative data are collected via federal forms and capture detailed information about families participating in HUD programs. Forms are submitted to HUD via electronic systems. For the public housing (PH) and Housing Choice Voucher (HCV) programs, data are collected via housing agencies at the local or state level. Data for the MF program type are collected through owners of private buildings (Lloyd & Helms, 2016). In all cases, the amount of information collected about disability is negligible. The HUD administrative data include a yes/no question about disability that asks about the presence of disability for every member of a HUD-assisted household. Households complete HUD forms and answer this question at the time of entry into housing assistance and with every annual recertification. For households that participate in PH or HCV programs, the following 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 the person's 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 Disabilities Assistance and Bill of Rights Act.
- Acquired immune deficiency syndrome (AIDS) or any condition that arises from the etiologic agent for AIDS (human immunodeficiency virus; HIV). (NCHS, 2016c, p. 32).

The definition of disability used in multifamily programs varies according to specific programs, but generally overlaps with the definition used by PH and HCV programs (for more detail, consult Appendix F of Lloyd & Helms, 2016). No level of detail is collected on disability, however, other than responses to the yes/no question.

Data Linkage

Respondents were linkage-eligible during the 2010–2012 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 classified as linkage-ineligible. The linkage was mostly a deterministic, rules-based process. During the period 2010–2012, approximately 42,000 sample adults were linkage-eligible. Among the linkage-eligible sample adults, approximately 3,800 ever linked to HUD administrative data (National Center for Health Statistics, 2016b). To assess the representativeness of the linked sample, HUD and National Center for Health Statistics 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 the characteristics were similar among the two samples (Lloyd et al., 2016). In addition, additional analyses were conducted to examine the characteristics of persons identified as disabled in each of the data sets (administrative and linked data). The minor differences that exist could likely be explained by programmatic policies and differences in the self-report of limitations.

Measures

Persons affirming the presence of any of the following limitations were considered to have a disability:

(1) Is [the respondent] deaf or does [the respondent] have serious difficulty hearing? (Asked for persons 1 year of age and older).
(2) Is [the respondent] blind or does [the respondent] have serious difficulty seeing even when wearing glasses? (Asked for persons 1 year of age and older).
Because of a physical, mental or emotional condition ….

(3) Does [the respondent] have serious difficulty concentrating, remembering, or making decisions? (Asked for persons 5 years of age and older).
(4) Does [the respondent] have serious difficulty walking or climbing stairs? (Asked for persons 5 years of age and older).
(5) Does [the respondent] have difficulty dressing or bathing? (Asked for persons 5 years of age and older).
(6) Does [the respondent] have difficulty doing errands alone such as visiting a doctor's office or shopping? (Asked for persons 15 years of age and older).

HUD program type was measured using linked data files to determine HUD assistance status at the time of the NHIS interview. Although the NHIS asks respondents about housing rental assistance, previous research suggests that such survey questions are unreliable (Gordon, Chipungu, Bagley, & Zanakos, 2005). 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 (Lloyd & Helms, 2016). Participation episodes were created using the transaction-level file to allow researchers to determine continuous enrollment. Since respondents could have been in more than one program at the same time due to administrative errors and episode misclassification, the following hierarchy was used to code current program status: HCV, PH, and MF. Details about how the participation episodes were created can be found in the NCHS-HUD linked data documentation (Lloyd & Helms, 2016). MF housing was considered the reference group for the logistic analyses.

Multivariate Analysis

For the multivariate analysis, each health outcome was modeled using a separate logistic regression. The models estimate the health outcome H of the individual i, where H is a function of the particular combination of disability 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 each independent variable.

Table A1. Logistic regression of health and health services: NHIS linked with HUD administrative data, 2010–2012.

		Disability		Age		Sex		Race		HUD program category		
Model		Yes	No	18–61	62+	Female	Male	Non-Hispanic White	Minority	HCV	PH	MF
Poor/fair health status,	*OR*	7.37	–	–	1.92	–	0.97	–	0.99	0.82	–	0.84
n = 1,445	*95% CI*	[5.43, 9.99]	–	–	[1.31, 2.83]	–	[0.73, 1.36]	–	[1.08, 2.35]	[0.59, 1.14]	–	[0.57, 1.24]
	Sig.	***	–	–	**	–	NS	–	NS	NS	–	NS
Diabetes (ever diagnosed),	*OR*	3.63	–	–	3.47	–	1.46	–	1.00	1.02	–	0.85
n = 1,411	*95% CI*	[2.48, 5.33]	–	–	[2.36, 5.12]	–	[1.01, 2.12]	–	[0.68, 1.46]	[0.67, 1.56]	–	[0.55, 1.31]
	Sig.	***	–	–	***	–	*	–	NS	NS	–	NS
Current asthma,	*OR*	2.07	–	–	0.81	–	0.76	–	0.9	1.6	–	1.18
n = 1,444	*95% CI*	[1.47, 2.91]	–	–	[0.51, 1.30]	–	[0.47, 1.25]	–	[0.60, 1.35]	[1.00, 2.56]	–	[0.76, 1.86]
	Sig.	***	–	–	NS	–	NS	–	NS	*	–	NS
Hypertension (ever diagnosed),	*OR*	4.02	–	–	6.24	–	0.99	–	1.23	0.75	–	0.88
n = 1,443	*95% CI*	[2.90, 5.58]	–	–	[4.24, 9.18]	–	[0.72, 1.36]	–	[0.88, 1.70]	[0.53, 1.06]	–	0.60, 1.28
	Sig.	***	–	–	***	–	NS	–	NS	NS	–	NS
Obesity,	*OR*	1.93	–	–	0.81	–	0.58	–	1.02	1.02	–	1.02
n = 1,446	*95% CI*	[1.44, 2.58]	–	–	[0.59, 1.10]	–	[0.44, 0.78]	–	[0.76, 1.39]	[0.73, 1.44]	–	[0.72, 1.44]
	Sig.	***	–	–	NS	–	**	–	NS	NS	–	NS
Current cigarette smoker,	*OR*	1.92	–	–	0.31	–	1.32	–	0.73	1.14	–	0.91
n = 1,445	*95% CI*	[1.36, 2.70]	–	–	[0.21, 0.44]	–	[0.93, 1.89]	–	[0.54, 0.97]	[0.76, 1.70]	–	[0.61, 1.36]
	Sig.	***	–	–	***	–	NS	–	*	NS	–	NS
Seen a specialist, past 12 months,	*OR*	4.24	–	–	1.14	–	1.21	–	0.86	1.11	–	1.47
n = 1,445	*95% CI*	[2.96, 6.08]	–	–	[0.81, 1.61]	–	[0.89, 1.64]	–	[0.62, 1.18]	[0.77, 1.62]	–	[0.97, 2.22]
	Sig.	***	–	–	NS	–	NS	–	NS	NS	–	NS
Seen a general doctor, past 12 months,	*OR*	2.97	–	–	1.69	–	0.75	–	0.93	1.18	–	1.01
n = 1,446	*95% CI*	[2.08, 4.25]	–	–	[1.14, 2.50]	–	[0.51, 1.11]	–	[0.60, 1.43]	[0.80, 1.74]	–	[0.68, 1.51]
	Sig.	***	–	–	**	–	NS	–	NS	NS	–	NS

(*Continued*)

Table A1. (*Continued*).

		Disability		Age		Sex		Race		HUD program category		
Model		Yes	No	18–61	62+	Female	Male	Non-Hispanic White	Minority	HCV	PH	MF
Seen a mental health doctor, past 12 months,	*OR*	4.86	–	–	0.27	–	0.59	–	0.51	1.40	–	0.90
n = 1,445	*95% CI*	[3.25, 7.25]	–	–	[0.15, 0.48]	–	[0.40, 0.87]	–	[0.33, 0.77]	[0.82, 2.39]	–	[0.51, 1.58]
	Sig.	***	–	–	***	–	**	–	**	NS	–	NS
Could not afford needed care,	*OR*	3.78	–	–	0.53	–	0.88	–	0.87	1.40	–	1.41
n = 1,446	*95% CI*	[2.62, 5.44]	–	–	[0.35, 0.80]	–	[0.59, 1.30]	–	[0.60, 1.27]	[0.91, 2.16]	–	[0.88, 2.26]
	Sig.	***	–	–	**	–	NS	–	NS	NS	–	NS
Two or more ER visits, past 12 months,	*OR*	2.13	–	–	0.58	–	0.71	–	1.61	1.16	–	1.20
n = 1,445	*95% CI*	[1.49, 3.05]	–	–	[0.36, 0.91]	–	[0.50, 1.02]	–	[1.13, 2.28]	[0.76, 1.76]	–	[0.81, 1.76]
	Sig.	***	–	–	*	–	NS	–	**	NS	–	NS
No health insurance coverage,	*OR*	0.26	–	X	X	–	1.43	–	1.11	0.98	–	0.77
n = 1,446	*95% CI*	[0.17, 0.40]	–	X	X	–	[0.80, 2.53]	–	[0.76, 1.64]	[0.61, 1.58]	–	[0.42, 1.42]
	Sig.	***	–	X	X	–	NS	–	NS	NS	–	NS

		Region				Urban status		Poverty level		Health insurance	
Model		Northeast	Midwest	South	West	Urban	Rural	In poverty	Not in poverty	Covered	Not covered
Poor/fair health status,	*OR*	0.86	0.52	–	0.93	–	1.10	–	1.59	–	0.71
n = 1,445	*95% CI*	[0.54, 1.36]	[0.35, 0.76]	–	[0.60, 1.43]	–	[0.71, 1.72]	–	[1.08, 2.35]	–	[0.47, 1.10]
	Sig.	NS	***	–	NS	–	NS	–	*	–	NS
Diabetes (ever diagnosed),	*OR*	1.35	1.14	–	1.79	–	1.36	–	1.12	–	1.25
n = 1,411	*95% CI*	[0.82, 2.24]	[0.72, 1.82]	–	[1.05, 3.05]	–	[0.88, 2.10]	–	[0.78, 1.63]	–	[0.62, 2.53]
	Sig.	NS	NS	–	*	–	NS	–	NS	–	NS
Current asthma,	*OR*	1.30	1.40	–	1.18	–	1.20	–	1.58	–	0.89
n = 1,444	*95% CI*	[0.83, 2.03]	[0.81, 2.43]	–	[0.67, 2.08]	–	[0.59, 2.43]	–	[1.07, 2.31]	–	[0.52, 1.55]
	Sig.	NS	NS	–	NS	–	NS	–	*	–	NS
Hypertension (ever diagnosed),	*OR*	0.49	0.65	–	0.57	–	0.80	–	0.91	–	0.90
n = 1,443	*95% CI*	[0.32, 0.76]	[0.44, 0.95]	–	[0.33, 0.98]	–	[0.55, 1.17]	–	[0.67, 1.25]	–	[0.61, 1.32]
	Sig.	**	*	–	*	–	NS	–	NS	–	NS

Obesity,	*OR*	0.71	0.70	–	0.79	–	0.98	–	1.01	–	0.94
n = 1,446	*95% CI*	[0.48, 1.06]	[0.47, 1.06]	–	[0.54, 1.17]	–	[0.67, 1.43]	–	[0.77, 1.33]	–	[0.64, 1.38]
	Sig.	NS	NS	–	NS	–	NS	–	NS	–	NS
Current cigarette smoker,	*OR*	0.87	1.22	–	0.86	–	1.00	–	1.67	–	1.24
n = 1,445	*95% CI*	[0.58, 1.32]	[0.85, 1.75]	–	[0.54, 1.34]	–	[0.69, 1.44]	–	[1.22, 2.29]	–	[0.80, 1.92]
	Sig.	NS	NS	–	NS	–	NS	–	**	–	NS
Seen a specialist, past 12 months,	*OR*	0.97	0.78	–	0.63	–	0.84	–	0.85	–	0.02
n = 1,445	*95% CI*	[0.61, 1.54]	[0.51, 1.19]	–	[0.37, 1.05]	–	[0.52, 1.33]	–	[0.60, 1.21]	–	[0.01, 0.04]
	Sig.	NS	NS	–	NS	–	NS	–	NS	–	***
Seen a general doctor, past 12 months,	*OR*	1.59	1.43	–	0.85	–	1.11	–	0.81	–	0.36
n = 1,446	*95% CI*	[0.91, 2.78]	[0.91, 2.26]	–	[0.49, 1.46]	–	[0.71, 1.75]	–	[0.55, 1.17]	–	[0.23, 0.55]
	Sig.	NS	NS	–	NS	–	NS	–	NS	–	***
Seen a mental health doctor, past 12 months,	*OR*	1.21	1.09	–	0.96	–	0.67	–	1.13	–	0.33
n = 1,445	*95% CI*	[0.77, 1.91]	[0.67, 1.78]	–	[0.52, 1.78]	–	[0.38, 1.18]	–	[0.74, 1.72]	–	[0.17, 0.64]
	Sig.	NS	NS	–	NS	–	NS	–	NS	–	**
Could not afford needed care,	*OR*	0.47	0.75	–	1.32	–	0.72	–	0.84	–	4.59
n = 1,446	*95% CI*	[0.30, 0.73]	[0.50, 1.13]	–	[0.84, 2.08]	–	[0.44, 1.16]	–	[0.60, 1.27]	–	[3.01, 7.01]
	Sig.	**	NS	–	NS	–	NS	–	NS	–	***
Two or more ER visits, past 12 months,	*OR*	0.71	0.90	–	0.75	–	1.29	–	1.45	–	0.39
n = 1,445	*95% CI*	[0.45, 1.13]	[0.64, 1.27]	–	[0.47, 1.21]	–	[0.89, 1.88]	–	[0.96, 2.20]	–	[0.24, 0.64]
	Sig.	NS	NS	–	NS	–	NS	–	NS	–	***
No health insurance coverage,	*OR*	0.24	0.98	–	0.52	–	0.99	–	1.81	X	X
n = 1,446	*95% CI*	[0.12, 0.46]	[0.60, 1.59]	–	[0.29, 0.93]	–	[0.56, 1.75]	–	[1.17, 2.81]	X	X
	Sig.	***	NS	–	*	–	NS	–	**	X	X

Note. NHIS = National Health Interview Survey; HUD = U.S. Department of Housing and Urban Development; HCV = Housing Choice Vouchers; PH = public housing; MF = multifamily; CI = confidence interval; *Sig.* = significance; NS= not significant; OR = odds ratio. X indicates that cell sizes are too small to report due to confidentiality restrictions.
Source: Authors' analysis of NHIS-HUD data.
*$p < .05$, **$p < .01$, ***$p < .001$.