

The Health Status of Women with Children Living in Public and Assisted Housing: Linkage of the National Health Interview Survey to U.S. Department of Housing and Urban Development Administrative Data

Veronica Helms Garrison

Jacqueline V. Bachand

U.S. Department of Housing and Urban Development, Office of Policy Development and Research

Cindy Zhang

Christine Cox

Cordell Golden

Kimberly A. Lochner

National Center for Health Statistics, Centers for Disease Control and Prevention

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Abstract

For more than a decade, the U.S. Department of Housing and Urban Development (HUD) and the National Center for Health Statistics (NCHS) have partnered to link NCHS national health survey data with HUD administrative records on persons participating in federal public and assisted housing programs.

This study used 2015–18 National Health Interview Survey (NHIS)-HUD linked data to examine women 18–44 years old with children and renting their home who were receiving HUD assistance (n=852) and a comparison population of women of the same age with children, who were low-income renters but did not link to HUD records at the time of their NHIS interview (n=894).

Abstract (continued)

The population of HUD-assisted women differed from the comparison group on key sociodemographic characteristics and health indicators. HUD-assisted women were more likely to report their health as fair or poor and to being a current smoker. HUD-assisted women also were less likely to be uninsured and more likely to have a regular source of care.

The findings in this article are exploratory but demonstrate how the NCHS-HUD-linked data can be a resource for researchers and policymakers in further examining housing status as an important social determinant of health.

Introduction

Social determinants of health (SDOH) are the nonmedical conditions that influence health, such as birthplace, living situation, work, and age (Braveman and Gottlieb, 2014; World Health Organization, n.d.). Within that context, access to safe, affordable, and stable housing is increasingly identified as an important SDOH (Krieger and Higgins, 2002; Swope and Hernández, 2019). A large share of American households experience “worst case housing needs,”¹ a long-standing U.S. Department of Housing and Urban Development (HUD) measure that seeks to quantify the national extent of unmet housing needs for affordable and quality rental housing. A recent HUD report to the U.S. Congress estimated that approximately 8 million renter households faced substantial worst case housing issues in 2019, including 2.2 million households with children, a number that translates to approximately 40 percent of U.S. families with children (Alvarez and Steffen, 2021).

HUD federal housing subsidy programs aim to reduce unmet housing needs by subsidizing rental costs for safe and affordable units and support HUD’s mission to “create strong, sustainable, inclusive communities and quality affordable homes for all” (HUD, n.d.b.). Although public rental assistance programs seek to alleviate housing affordability issues for households with lower incomes, the need for housing assistance greatly outweighs the demand. According to the 2021 American Housing Survey, only approximately one-quarter of renter households eligible for housing assistance receive it (U.S. Census Bureau, 2021).

Women and children represent more than 75 percent of HUD-assisted people. HUD provides housing rental assistance to approximately 9 million people annually, including approximately 4.2 million women and 3.2 million children, including foster children, from birth to age 17 (HUD, 2022). HUD is increasingly committed to better understanding the health and social needs of women and children living in public and assisted housing. The current HUD Strategic Plan for Fiscal Years (FY) 2022–2026 states that “housing is the foundation on which we live, grow, and thrive” and includes a milestone to “improve maternal and child health outcomes” (HUD, n.d.a.).

¹ Worst case housing needs for renter households are defined as having household incomes at or below 50 percent of the Area Median Income, not receiving government housing assistance, and paying more than one-half of their income for rent, living in severely inadequate conditions, or both (<https://www.huduser.gov/portal/sites/default/files/pdf/Worst-Case-Housing-Needs-2021.pdf>).

Further, to support the *White House Blueprint for Addressing the Maternal Health Crisis* report, HUD has committed to conducting interagency research to better understand the unique health and social needs of HUD-assisted women and children (The White House, 2022).

A growing body of research underscores a link between housing stability attributable to federal housing assistance programs and health outcomes. Housing assistance has been shown to be associated with reduced odds of self-reported fair or poor health and psychological distress for participants in the public housing program, but results were not consistent across HUD program types (Fenelon et al., 2017). Another study found that receipt of housing assistance was associated with lower uninsured rates and lower unmet healthcare needs (Simon et al., 2017). A HUD report highlighting the characteristics of HUD-assisted adults found that approximately 74 percent of adults identified as female reported high rates of health conditions, medical diagnoses, and healthcare utilization (Helms, Sperling, and Steffen, 2017).

Previous randomized control trials also showed a strong link between housing status and maternal and child health outcomes. The Family Options Study, a large-scale experiment for homeless families with young children, showed that families who received housing vouchers (the most sustainable and long-term intervention option) reported fewer child separations, decreased maternal psychological distress, decreased economic stress, fewer child behavior problems, and less household food insecurity (Gubits et al., 2016, Shinn et al., 2016). Still, limited data exist that allow for the examination of health outcomes for women with children receiving HUD assistance.

For more than a decade, the HUD Office of Policy Development and Research (PD&R) and the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention have partnered to link NCHS national health survey data with HUD administrative records² on people participating in federal public and assisted housing programs. The availability of those linked data sources provides a unique opportunity to examine housing status as an important social determinant of health for lower-income women with children.

Using the 2015–18 National Health Interview Survey (NHIS) data linked to HUD housing assistance data, this study examined women 18–44 years with children, who were renting their home and receiving HUD assistance, and a comparison population of women of the same age with children, who were low-income renters but did not link to HUD records at the time of their NHIS interview. Leveraging this linked data source may allow for a better understanding of the health status and healthcare access of women with children receiving HUD housing assistance compared with a group likely eligible for housing assistance but not receiving it.

Methods

Data Sources

The discussed study used the National Health Interview Survey linked with HUD administrative data on public and assisted housing programs. The following section provides more information about each data source.

² NCHS Data Linked to HUD Housing Assistance Program Files: <https://www.cdc.gov/nchs/data-linkage/hud.htm>.

National Health Interview Survey. NHIS is a nationally representative cross-sectional household interview survey conducted continuously throughout the year by NCHS. NHIS is designed to monitor the health of the civilian noninstitutionalized U.S. population by collecting data on a broad range of health topics. The sample probability design permits a representative sampling of households and noninstitutional group quarters. The core questionnaire contained four major components for the 2015–18 NHIS. The household composition component collected basic demographic and relationship information for all persons living in the housing unit. The family component collected basic demographic, health insurance, and health information about all family members from a single family member. The sample adult core and sample child core components included one randomly selected adult (aged 18 or older) and one randomly selected child (aged 17 or younger) if the family included children. Detailed information regarding the design, content, use of NHIS, annual sample sizes, and NHIS response rates are available in the annual NHIS Survey Description documents (National Center for Health Statistics, 2016, 2017, 2018, and 2019). For this analysis, information collected from the family, person, and sample adult core components was used. Information collected in the sample adult core component is self-reported unless the person was physically or mentally unable to provide it, in which case a knowledgeable proxy could answer.

HUD Administrative Data on Public and Assisted Housing Programs. HUD is the primary federal agency overseeing domestic housing programs and policies. HUD programs can be lumped broadly into two categories: project-based and tenant-based housing. In project-based housing, the subsidy is tied to a physical unit. HUD project-based programs include the public housing (PH) program and various multifamily housing (MF) programs, such as Project-Based Section 8, Section 811, and Section 202. The subsidy is tied to the household in HUD's sole tenant-based housing program, the Housing Choice Voucher (HCV) program. The HCV program is thus unique from other HUD programs in that HCV households can enter the private housing market and have a greater choice regarding the unit they rent.

HUD collects detailed administrative data on families participating in its programs through administrative forms.³ For PH and HCV programs, data are collected via housing agencies at the local or state level. Data for MF program types are collected through owners of private buildings (NCHS, 2019b). This analysis focused on persons in HUD subsidized housing in HUD's three largest housing assistance programs: HCV, PH, and MF. All three program categories use three factors to determine program eligibility: (1) U.S. citizenship or eligible immigration status, (2) family size, and (3) gross annual income. Some HUD program categories (HCV and PH) can establish waitlist preferences for special populations, such as older adults, unsheltered families, or persons living with a disability, but the presence of those populations in a household does not affect overall program eligibility.

³ Administrative Form HUD-50058, the "Family Report," is used to collect data on the people who participate in the HCV and public housing programs (<https://www.hud.gov/sites/dfiles/OCHCO/documents/50058.PDF>). PHAs participating in the Moving to Work (MTW) demonstration have fewer data requirements; Administrative Form HUD-50058 MTW ("MTW Family Report") is used only by PHAs participating in MTW (http://portal.hud.gov/hudportal/documents/huddoc?id=DOC_10236.pdf). Administrative Form HUD-50059, "Owners Certification of Compliance with HUD's Tenant Eligibility and Rent Procedures," is used to collect data on the people who participate in multifamily programs (<http://portal.hud.gov/hudportal/documents/huddoc?id=50059.pdf>).

NHIS-HUD Linked Data. The study used 2015–18 NHIS-HUD linked data. NHIS participants were considered linkage-eligible during the 2015–18 survey years if they provided the last four digits of their Social Security number (SSN4) or an affirmative response to the followup question to allow linkage without SSN4 and sufficient information for linkage, such as date of birth, sex, first name, and last name. Linkage eligibility is distinct from HUD program eligibility, which defines whether a person meets the eligibility criteria for HUD housing assistance. The linkage was conducted using both deterministic and probabilistic approaches. For the probabilistic linkage process, scoring was conducted according to the Fellegi-Sunter methodology (Fellegi and Sunter, 1969). Linkage methods and evaluation of NHIS-HUD linked data, including validation and quality control processes, are described in more detail elsewhere (National Center for Health Statistics, 2022). Due to confidentiality requirements, the restricted-use NCHS-HUD data are accessible only through the NCHS and Federal Statistical Research Data Centers. The linkage of NHIS-HUD data was conducted through a memorandum of understanding between NCHS and HUD. The data linkage work was performed at NCHS with approval provided by NCHS's Research Ethics Review Board.

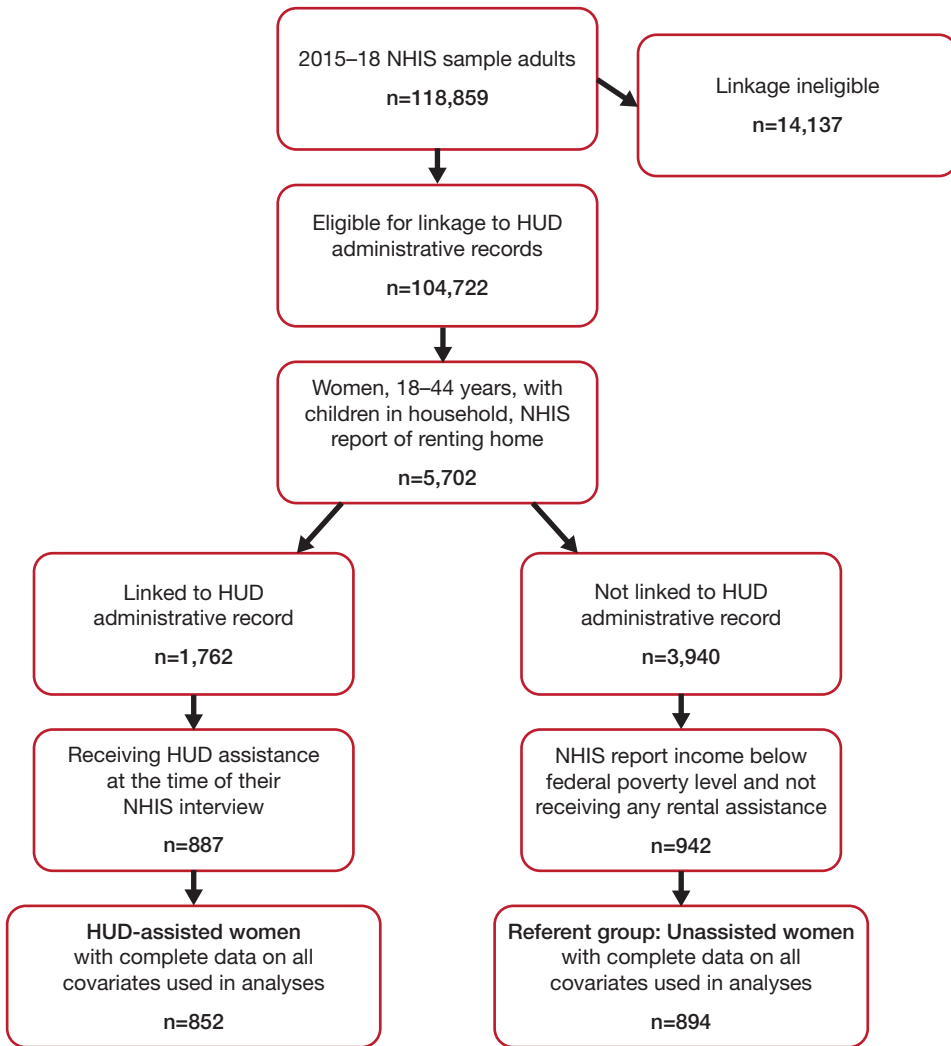
Study Population

For the pooled NHIS years 2015–18, 104,722 (88 percent) sample adults were eligible for linkage to HUD administrative records. The analytic sample was restricted to female NHIS sample adult participants who were eligible for linkage, 18–44 years of age, the parent of at least one child (0–17 years of age) residing in the family household at the time of interview, and renting their home (n=5,702). Among this group, 1,762 were linked to a 2015–18 HUD administrative data record, with 887 determined to be receiving HUD assistance at the time of their NHIS interview, on the basis of episode-level data. An *episode* is defined as a single continuous period of enrollment in a HUD program on the basis of dates of HUD transactions. The group of 3,940 who did not link was further restricted to having a family income below the federal poverty threshold defined by the Census Bureau (U.S. Census Bureau, n.d.) and did not report receiving any type of rental assistance at the time of the NHIS interview (n=942). For the group that did not link to HUD administrative data concurrent with their interview, restricting them to having a family income below the federal poverty level was used to approximate the income requirement for HUD program eligibility. Gross annual income is a significant program eligibility factor, and most HUD-assisted households have annual incomes below the federal poverty threshold.

The final analytic sample was restricted to those with complete information on all variables used in the analyses, resulting in 852 receiving HUD assistance at the time of the NHIS interview, referred to as “HUD-assisted women,” and 894 who did not link to a HUD record, referred to as “unassisted women.” Limiting results to complete information on all variables reduced the sample by approximately 4 percent for the HUD-assisted group and 5 percent for the comparison group. Exhibit 1 provides a complete description of the creation of the analytic sample.

Exhibit 1

Analytic Sample: 2015–18 National Health Interview Survey Sample Adult Participants Linked to U.S. Department of Housing and Urban Development Program Data



HUD = Housing and Urban Development. NHIS = National Health Interview Survey.

Notes: HUD-assisted refers to NHIS sample adults eligible for linkage—women 18–44 years with children and linked to a HUD administrative record concurrent with their NHIS interview. Unassisted renters refers to NHIS sample adults eligible for linkage—women 18–44 years with children, not linked to a HUD administrative record, reported on the NHIS incomes below the federal poverty threshold, and renting their home.

Source: 2015–18 National Health Interview Survey, linked to U.S. Department of Housing and Urban Development (HUD) program data (2015–18)

Measures

All variables examined in this analysis were based on self-reported information at the time of NHIS interview.

Sociodemographic Characteristics. Sociodemographic characteristics of the NHIS adult women with children examined in this article include age at interview (18–24, 25–34, and 35–44), race and Hispanic origin (Hispanic or Latino; Black or African-American non-Hispanic—hereafter, Black; Other non-Hispanic—hereafter, Other; and White non-Hispanic—hereafter, White), educational attainment (less than high school; high school diploma or GED; and some college or higher), marital status (married or living with partner; widowed, divorced, or separated; and never married), region (Northeast, Midwest, South, and West), number of adults in the household (one, two or more), and work status in past 12 months (Yes or No).

Health Characteristics. Five health characteristics were examined, spanning health status, health behavior, and healthcare access. Health status was measured as self-rated health, based on response to the following question: “Would you say your health in general is excellent, very good, good, fair, or poor?” Health status was recoded into fair or poor, good, and very good or excellent. Serious psychological distress was measured using the Kessler 6 index, which consists of six questions asking about various feelings of distress: “During the past 30 days, how often did you feel (1) so sad that nothing could cheer you up, (2) nervous, (3) restless or fidgety, (4) hopeless, (5) that everything was an effort, and (6) worthless?” Response categories included “all,” “most,” “some,” “little,” or “none of the time,” with total values representing a scale of 0–24 points. Consistent with other studies, this variable was recoded with a score of 13 or more, indicating the presence of serious psychological distress (Kessler et al., 2002). Current cigarette smokers were defined as adults who had smoked 100 cigarettes during their entire life and answered “every day” or “some days” to the question, “Do you now smoke cigarettes every day, some days, or not at all?” NHIS-reported health insurance status was recoded into three categories: “public or other health insurance,” “private health insurance,” or “uninsured.” Women were considered to have public health insurance if they reported coverage through Medicare, Medicaid, a State Children’s Health Insurance Program or other state-sponsored health plan, or other government or military health plans. NHIS participants were asked if they had a usual source of health care via the following question: “Is there a place that you usually go to when you are sick or need advice about your health?”

Analytic Approach

Data analysis was performed using SAS software, version 9.4 (published by SAS Institute, Cary NC), and SAS-callable SUDAAN, version 11.03 (published by RTI, Research Triangle Park, NC), a software package that accounts for the complex sample design of NHIS. Estimates in this article were calculated using the NHIS sample adult sampling weights, which account for nonresponse and unequal probabilities of selection and were adjusted further to account for linkage eligibility (National Center for Health Statistics, 2022). Standard errors were estimated, accounting for the NHIS complex survey design. Differences were evaluated with two-sided Wald tests at the 0.05 significance level. All estimates presented in this article met NCHS standards of reliability (Parker et al., 2017).

Results

Characteristics of the Study Population

The study population consisted of 852 HUD-assisted women and 894 unassisted women. Both groups were restricted to women between the ages of 18 and 44, with children aged 0 to 17, who reported renting their homes. Exhibit 2 displays the weighted percentages of the selected sociodemographic characteristics for both groups. Distributions of HUD-assisted and unassisted women were significantly different on all sociodemographic characteristics examined.

Exhibit 2

Sociodemographic Characteristics of Women 18–44 Years with Lower Incomes, Who Have Children in the Household and Rent Their Housing, by Federal Housing Assistance Status, 2015–18

Characteristic	HUD-assisted Renters (n=852)			Unassisted Renters (n=894)		
	n	%	SE	n	%	SE
Age (years)^a						
18–24	110	15.4	1.9	128	16.3	1.7
25–34	455	51.9	2.2	416	42.2	2.0
35–44	287	32.7	2.2	350	41.5	2.1
Race and Ethnicity^a						
Black, non-Hispanic	411	51.4	2.7	119	14.1	1.5
Other, non-Hispanic	42	4.6	1.0	47	8.3	1.5
White, non-Hispanic	215	23.6	2.2	278	30.2	2.1
Hispanic	184	20.4	2.1	450	47.4	2.2
Marital Status^a						
Married/Living with Partner	123	20.5	1.9	437	61.4	2.0
Widowed/Divorced/Separated	163	15.8	1.5	205	16.2	1.5
Never Married	566	63.8	2.2	252	22.4	1.6
Number of Adults in Household^c						
1	677	66.9	2.1	409	29.4	1.7
2+	175	33.1	2.1	485	70.6	1.7
Region^c						
Northeast	174	22.3	2.7	121	16.7	1.8
Midwest	164	19.9	2.2	129	14.4	1.6
South	383	43.7	3.0	363	40.1	2.3
West	131	14.1	2.1	281	28.8	2.1
Educational Attainment^b						
Less than High School	218	24.7	1.8	331	34.6	2.1
High School Diploma or GED	262	31.9	2.0	265	32.0	2.1
Some College or Higher	372	43.4	2.1	298	33.4	2.0
Work Status: Past 12 Months^c						
Yes	579	67.1	2.0	546	54.8	2.1
No	273	32.9	2.0	348	45.2	2.1

SE = standard error. HUD = U.S. Department of Housing and Urban Development.

^aWald test comparing HUD-assisted renters to unassisted renters, $p < 0.01$.

^bWald test comparing HUD-assisted renters to unassisted renters, $p < 0.001$.

^cWald test comparing HUD-assisted renters to unassisted renters, $p < 0.0001$.

Source: 2015–18 National Health Interview Survey, linked to U.S. Department of Housing and Urban Development (HUD) program data (2015–18)

HUD-assisted women tended to be between the ages of 25 and 34 (51.9 percent), Black (51.4 percent), never married (63.8 percent), and the only adult in their household (66.9 percent). Most unassisted women were Hispanic (47.4 percent) or White (30.2 percent), married or living with a partner (61.4 percent), and had one or more other adults also living in their household (70.6 percent).

When examining the socioeconomic and educational characteristics of the two groups, most HUD-assisted women reported working during the previous year (67.1 percent), and a little more than one-half (54.8 percent) of unassisted women reported working during the previous year. Approximately 24.7 percent of HUD-assisted women with children reported less than a high school diploma, and 43.4 percent reported some college education. Among unassisted women, 34.6 percent reported less than a high school diploma, 32.0 percent reported a high school diploma or GED, and 33.4 percent reported some level of college.

Health Characteristics of the Study Population

Exhibit 3 shows weighted percentages of selected health characteristics. The distributions of self-reported health and current smoking status were significantly different across the two groups. Among HUD-assisted women, 21.0 percent reported their health as fair or poor, and 46.0 percent reported their health status as very good or excellent, whereas 11.3 percent of unassisted women reported their health status as fair or poor, and 54.1 percent reported very good or excellent. The percentage of HUD-assisted women who were current smokers was 1.7 times higher than unassisted women (30.1 percent vs. 17.4 percent); however, reports of serious psychological distress did not differ between the two groups.

Exhibit 3

Health Status and Healthcare Access of Women 18–44 years with Lower Incomes, Who Have Children in the Household and Rent Their Housing, by Federal Housing Assistance Status, 2015–18 (1 of 2)

Characteristic	HUD-assisted Renters (n=852)			Unassisted Renters (n=894)		
	n	%	SE	n	%	SE
Self-reported General Health^a						
Fair/Poor	181	21.0	1.7	117	11.3	1.2
Good	294	33.0	2.0	300	34.6	2.2
Very Good/Excellent	377	46.0	2.2	477	54.1	2.2
Serious Psychological Distress						
Yes	70	8.1	1.3	59	7.1	1.2
No	782	91.9	1.3	835	92.9	1.2
Current Cigarette Smoker^a						
Yes	266	30.1	2.1	170	17.4	1.5
No	586	69.9	2.1	724	82.6	1.5
Health Insurance Status^a						
Public/Other	585	69.0	2.4	471	55.3	2.2
Private	135	15.1	1.7	120	12.2	1.3
Uninsured	132	15.9	1.9	303	32.5	2.0

Exhibit 3

Health Status and Healthcare Access of Women 18–44 years with Lower Incomes, Who Have Children in the Household and Rent Their Housing, by Federal Housing Assistance Status, 2015–18 (2 of 2)

Characteristic	HUD-assisted Renters (n=852)			Unassisted Renters (n=894)		
	n	%	SE	n	%	SE
Usual Source of Care^a						
Yes	709	82.6	1.8	666	71.9	2.0
No	143	17.4	1.8	228	28.1	2.0

SE = standard error. HUD = U.S. Department of Housing and Urban Development.

^aWald test comparing HUD-assisted to unassisted renters, $p < 0.0001$.

Source: 2015–18 National Health Interview Survey, linked to U.S. Department of Housing and Urban Development program data (2015–18)

When examining measures related to access to care, health insurance coverage and having a usual source of care varied between the two groups. Most HUD-assisted women reported having public health insurance (69.0 percent), and 15.9 percent reported being uninsured, whereas unassisted women reported higher levels of being uninsured (32.5 percent) and having no usual source of care (28.1 percent).

Discussion

Using the linked 2015–18 NHIS-HUD data, this article presents a descriptive summary of health characteristics and healthcare access for women with children receiving HUD assistance. The findings in this article build upon two recent HUD “health pictures” of adults and children receiving HUD assistance (Helms, Sperling, and Steffen, 2017; Helms et al., 2018) and further support initiatives to better understand the health needs of HUD-assisted women and children (HUD, n.d.a.; The White House, 2022). The study examined women 18–44 years old with children, who were renting their home and receiving HUD assistance, and a comparison population of women of the same age with children, who were low-income renters but did not link to HUD records at the time of their NHIS interview. Because income is a significant factor for HUD program eligibility and only approximately one in four households eligible for housing assistance receive it, the comparison population attempts to reflect women with children who are eligible for housing assistance but are not receiving it. The population of HUD-assisted women differed from the comparison group on key sociodemographic characteristics and health indicators.

Although HUD-assisted and unassisted women had similar percentages of women who were 18–24 years old, approximately 50 percent and 30 percent of HUD-assisted women were 25–34 and 35–44 years of age, respectively, compared with approximately 40 percent of unassisted women in each of those age groups. Most HUD-assisted women were Black non-Hispanic, although nearly one-half of unassisted women were Hispanic. Only approximately one in five HUD-assisted women reported being married or living with a partner, and two-thirds reported being the only adult in their household. Among unassisted women, most (61 percent) reported being married or living with a partner. Compared with unassisted women, a larger proportion of HUD-assisted women reported working in the past year and receiving some college education.

HUD-assisted women reported higher levels of fair or poor health status, with approximately one-fifth self-reporting this outcome (21 percent), compared with approximately 11 percent among unassisted women, although reported levels of serious psychological distress were similar between the two groups. Consistent with previous literature, nearly one-third of HUD-assisted women were current smokers at the time of their health interview (Helms, King, and Ashley, 2017), whereas less than 20 percent of unassisted women were current smokers. Demographic factors may account for differences in current smoking. For example, unassisted women were more likely to be Hispanic, and Hispanics have lower prevalence estimates of current smoking (Arrazola et al., 2023). HUD-assisted women had higher reported levels of public health insurance and lower levels of uninsured status compared with unassisted women. Fewer than 20 percent of HUD-assisted women and 28 percent of unassisted women reported no usual source of care, suggesting an area for future research between having health insurance and access to health care among this population.

The objective of this study has been to demonstrate how the NCHS-HUD linked data can serve as a resource for researchers and policymakers in further examining housing status as an important social determinant of health. The findings are exploratory and raise additional questions about the health of HUD-assisted women that could be addressed with additional research examining education level, work status, and receipt of housing assistance among lower-income, female-led households with children. For example, do HUD-assisted women have higher levels of public health insurance and lower levels of uninsured status because they can more successfully navigate complex social safety net systems due to their education? Does the stability of federal housing assistance programs allow women to pursue additional education? Do lower-income women with higher levels of education possess the skills and knowledge needed to obtain housing assistance?

Limitations

NHIS participants eligible for linkage to HUD records are a self-selected subset of the initial survey participants and may differ from those not eligible for linkage. In this study, 88 percent of sample adults in the 2015–18 NHIS were eligible for linkage. The NHIS sample weights were adjusted using variables that influence the probability of linkage eligibility while maintaining population totals to mitigate linkage-eligibility bias. This weight adjustment is similar to nonresponse adjustment (Aram et al., 2021).

This analytic strategy cannot fully account for unobserved characteristics that distinguish those who apply for and receive housing assistance versus those who do not. Although previous studies using the NHIS-HUD linked data have employed the use of a “pseudo-waitlist” group (Simon et al., 2017) or took into account those who had applied but entered assistance at a later date (Fenelon et al., 2017), focusing on women 18–44 years of age with children prohibited such approaches due to smaller sample sizes in this study. Using that information would have further restricted the sample because waitlist information is unavailable for multifamily housing programs in HUD administrative records. The comparison group that did not link to HUD administrative records likely represents a population eligible for housing assistance but not receiving it because gross annual income is the most significant federal housing assistance eligibility factor, and demand for housing assistance outweighs supply.

Finally, examinations by HUD program category were not possible due to limited sample sizes. Future planned linkages between NHIS and HUD administrative data may allow aggregation of more NHIS years, increasing sample size and allowing for more examinations of selection bias and differences across HUD program categories.

Conclusion

The findings in this article are exploratory. The objective has been to present preliminary estimates and to demonstrate how the NCHS-HUD linked data can serve as a resource for researchers and policymakers in further examining housing status as an important social determinant of health.

Authors

Veronica Helms Garrison is a social science analyst (team lead, data and research) at the U.S. Department of Housing and Urban Development, Office of Policy Development and Research. Jacqueline V. Bachand is a social science analyst at the U.S. Department of Housing and Urban Development, Office of Policy Development and Research. Cindy Zhang is an information technology specialist, Division of Analysis and Epidemiology, National Center for Health Statistics, Centers for Disease Control and Prevention. Christine Cox is a statistical consultant, Division of Analysis and Epidemiology, National Center for Health Statistics, Centers for Disease Control and Prevention. Cordell Golden is the Data Linkage Methodology and Analysis Branch chief, Division of Analysis and Epidemiology, National Center for Health Statistics, Centers for Disease Control and Prevention. Kimberly A. Lochner is the associate director for science, Division of Analysis and Epidemiology, National Center for Health Statistics, Centers for Disease Control and Prevention.

References

- Alvarez, Thyria, and Barry L. Steffen. 2021. *Worst Case Housing Needs: 2021 Report to Congress*. Prepared for the U.S. Department of Housing and Urban Development, Office of Policy Development and Research. Washington, DC: Government Printing Office. <https://www.huduser.gov/portal/sites/default/files/pdf/Worst-Case-Housing-Needs-2021.pdf>.
- Aram, Jonathan, Cindy Zhang, Cordell Golden, Carla E. Zelaya, Christine S. Cox, Yeats Ye, and Lisa B. Mirel. 2021. "Assessing Linkage Eligibility Bias in the National Health Interview Survey," *Vital and Health Statistics 2* (186).
- Arrazola, René A., Todd Griffin, Natasha B. Lunsford, Deirdre Kittner, Philip Bammeke, Elizabeth A. Courtney-Long, and Brian S. Armour. 2023. "US Cigarette Smoking Disparities by Race and Ethnicity—Keep Going and Going!" *Preventing Chronic Disease 20* (220375).
- Braveman, Paula, and Laura Gottlieb. 2014. "The Social Determinants of Health: It's Time to Consider the Causes of the Causes," *Public Health Reports 129* (1, Supplementary Issue 2): 19–31.

Fellegi, Ivan P., and Alan B. Sunter. 1969. "A Theory for Record Linkage," *Journal of the American Statistical Association* 64 (328): 1183–210.

Fenelon, Andrew, Patrick Mayne, Alan E. Simon, Lauren M. Rosen, Veronica Helms, Patricia Lloyd, Jon Sperling, and Barry L. Steffen. 2017. "Housing Assistance Programs and Adult Health in the United States," *American Journal of Public Health* 107 (4): 571–78. <https://doi.org/10.2105/AJPH.2016.303649>.

Gubits, Daniel, Marybeth Sinn, Michelle Wood, Stephen Bell, Samuel Dastrup, Claudia D. Solari, Scott R. Brown, Debi McInnis, Tom McCall, and Utsav Kattel. 2016. *Family Options Study: 3-Year Impacts of Housing and Services Interventions for Homeless Families*. Prepared for the U.S. Department of Housing and Urban Development, Office of Policy Development and Research. Washington, DC: Government Printing Office. <https://www.huduser.gov/portal/sites/default/files/pdf/Family-Options-Study-Full-Report.pdf>.

Helms, Veronica E., Brian A. King, and Peter J. Ashley. 2017. "Cigarette Smoking and Adverse Health Outcomes Among Adults Receiving Federal Housing Assistance," *Preventive Medicine* 99: 171–177.

Helms, Veronica E., Jon Sperling, and Barry L. Steffen. 2017. *A Health Picture of HUD-Assisted Adults, 2006–2012: HUD Administrative Data Linked with the National Health Interview Survey*. Prepared for the U.S. Department of Housing and Urban Development, Office of Policy Development and Research. Washington, DC: Government Printing Office. <https://housingis.org/sites/default/files/Health-Picture-of-HUD.pdf>.

Helms, Veronica E., Barry L. Steffen, Elizabeth C. Rudd, and Jon Sperling. 2018. *A Health Picture of HUD-Assisted Children, 2006–2012: HUD Administrative Data Linked with the National Health Interview Survey*. Prepared for the U.S. Department of Housing and Urban Development, Office of Policy Development and Research. Washington, DC: Government Printing Office. <https://www.huduser.gov/portal/portal/sites/default/files/pdf/Health-Picture-of-HUD-Assisted-Children.pdf>.

Kessler, Ronald C., Gavin Andrews, Lisa J. Colpe, E. Hiripi, Daniel K. Mroczek, Sharon Lise Normand, Ellen E. Walters, and Alan M. Zaslavsky. 2002. "Short Screening Scales to Monitor Population Prevalences and Trends in Non-specific Psychological Distress," *Psychological Medicine* 32 (6): 959–76.

Krieger, James, and Donna L. Higgins. 2002. "Housing and Health: Time Again for Public Health Action," *American Journal of Public Health* 92 (5): 758–68. <https://doi.org/10.2105/AJPH.92.5.758>.

National Center for Health Statistics. 2022. *The Linkage of the National Center for Health Statistics (NCHS) Survey Data to U.S. Department of Housing and Urban Development (HUD) Administrative Data: Linkage Methodology and Analytic Considerations*. Prepared for the Centers for Disease Control and Prevention, National Center for Health Statistics, Division of Analysis and Epidemiology. Hyattsville, MD: Government Publishing Office. <https://www.cdc.gov/nchs/data/datalinkage/NCHS-HUD-Linked-Data-Methodology-and-Analytic-Considerations.pdf>.

- . 2019a. *2018 National Health Interview Survey*. <https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm>.
- . 2019b. *A Primer on HUD Programs and Associated Administrative Data*. <https://www.cdc.gov/nchs/data/datalinkage/primer-on-hud-programs.pdf>.
- . 2018. *2017 National Health Interview Survey*. <https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm>.
- . 2017. *2016 National Health Interview Survey*. <https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm>.
- . 2016. *2015 National Health Interview Survey*. <https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm>.
- Parker, Jennifer D., Makram Talih, Donald J. Malec, Vladislav Beresovsky, Margaret Carroll, Joe F. Gonzalez, Jr., Brady E. Hamilton, Deborah D. Ingram, Kenneth Kochanek, Frances McCarty, Chris Moriarity, Iris Shimizu, Alexander Strashny, and Brian W. Ward. 2017. “National Center for Health Statistics Data Presentation Standards for Proportions: Data Evaluation and Methods Research,” *Vital Health Statistics 2* (175).
- Shinn, Marybeth, Michelle Wood, Stephen Bell, Samuel Dastrup, Claudia D. Solari, Scott R. Brown, Debi McInnis, Tom McCall, and Utsav Kattel. 2016. *Family Options Study: 3-Year Impacts of Housing and Services Interventions for Homeless Families*. Washington, DC: U.S. Department of Housing and Urban Development, Office of Policy Development and Research. <https://www.huduser.gov/portal/sites/default/files/pdf/Family-Options-Study-Full-Report.pdf>.
- Simon, Alan E., Andrew Fenelon, Veronica Helms, Patricia C. Lloyd, and Lauren M. Rossen. 2017. “HUD Housing Assistance Associated with Lower Uninsurance Rates and Unmet Medical Need,” *Health Affairs* 36 (6): 1016–23.
- Swope, Carolyn B., and Diana Hernández. 2019. “Housing as a Determinant of Health Equity: A Conceptual Model,” *Social Science & Medicine* 243 (112571). <https://doi.org/10.1016/j.socscimed.2019.112571>.
- U.S. Census Bureau. n.d. *Poverty Thresholds*. <https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html>.
- . 2021. *American Housing Survey (AHS)*. https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s_areas=00000&rs_year=2021&rs_tablename=TABLE1&rs_bygroup1=1&rs_bygroup2=1&rs_filtergroup1=1&rs_filtergroup2=1.
- U.S. Department of Housing and Urban Development (HUD). n.d.a. *FY 2022–2026 HUD Strategic Plan*. <https://www.hud.gov/HUD-FY22-26-Strategic-Plan-Focus-Areas>.
- . n.d.b. *Mission*. <https://www.hud.gov/about/mission>.

———. 2022. *2022 December Extract Standardized Across the Public and Indian Housing Information Center and the Tenant Rental Assistance Certification System*. Unpublished dataset, April 2023.

The White House. 2022. *White House Blueprint for Addressing the Maternal Health Crisis*. <https://www.whitehouse.gov/wp-content/uploads/2022/06/Maternal-Health-Blueprint.pdf>.

World Health Organization. n.d. *Social Determinants of Health*. https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1.