

Unstable Housing and Kidney Disease: A Primer

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Stable housing is essential for health. Over 580,000 Americans experienced homelessness during one night in 2020, and over 37 million households spend over 30% of their income on housing. Unstable housing has been associated with mortality, acute care utilization, communicable and non-communicable diseases, a higher risk of kidney disease, and kidney disease progression. In this review, we define various forms of unstable housing, provide an overview of the interaction between unstable housing and health, and discuss existing evidence associating housing and kidney disease. We provide historical context for unstable housing in the United States, and detail policy, community, and individual-level factors that contribute to the risk of unstable housing. Unstable housing likely affects kidney health via a complex interplay of individual and structural factors. Various screening tools are available for use by providers. Special considerations should be made when working with individuals experiencing unstable housing to meet their unique needs, facilitate health care engagement, and optimize outcomes. Housing interventions have been shown to improve outcomes and should be examined for their role in kidney disease.

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Stable housing is a fundamental human right, and unstable housing has a profound impact on human health, wellbeing, function, and productivity. The term unstable housing encompasses homelessness and housing insecurity, and housing insecurity refers to housing that is high-cost, overcrowded, or dangerous. Individuals experiencing unstable housing face higher risks of communicable diseases,¹ non-communicable diseases,²⁻⁴ mental health problems,⁵ and greater morbidity^{6,7} and mortality.⁸ There is increasing evidence that housing also affects kidney disease development⁹ and progression.¹⁰ Housing and other health-related social needs may interact with known associations between poverty and structural inequities that propagate racial and ethnic disparities in kidney disease. In this review, we discuss what is known about the impact of housing on kidney health, potential underlying mechanisms, the role of housing interventions, and considerations when caring for patients experiencing unstable housing.

Housing Definitions and Prevalence

The housing spectrum ranges from homelessness to being stably housed.¹ Unstable housing is a term that encompasses both homelessness and housing insecurity, and housing insecurity refers to housing problems other than homelessness. An individual is considered homeless, as defined by the Homeless Emergency Assistance and Rapid Transition to Housing Act of 2009, if they lack a fixed nighttime residence, live in a nighttime residence that is not designed for human habitation, live in temporary living arrangements, will imminently lose their housing within 14 days, or if they are attempting to flee a physically violent or life-threatening housing situation.^{1,11} Over 580,000 Americans experienced homelessness during one night in 2020, and the national rate of homelessness is 17

per 10,000 persons per year.¹² From 2007-2013, the prevalence of homelessness was over 600,000, nadired at 550,000 in 2017, then has steadily climbed since.¹² The prevalence of unstable housing increased in 2020 in the context of COVID-19, although the full effects of the pandemic have yet to be determined.¹²

Housing insecurity is variably defined. An individual is considered to be experiencing housing insecurity if they have difficulty affording housing payments, or live in conditions that are overcrowded (sometimes defined as >1 people-per-room, excepting bathrooms and kitchens) or unsafe.¹³ Cost-burden is a type of housing insecurity that describes households that spend more than 30% of their monthly income on housing payments. Severe cost-burden is defined as a household that spends more than 50% of their monthly income on housing. In 2019, over 20 million renter households were cost-burdened.¹⁴

There is a nationwide shortage of affordable housing for people who are considered extremely low-income, defined as having an income that is at or below the federal poverty level or less than 30% of the area's median income.¹⁵ According to the 2021 National Low-Income Housing Coalition report, there are only 37 affordable rental homes available per 100 extremely low-income households.¹⁵ The shortage of affordable housing has been exacerbated by the economic crisis instigated by the COVID-19 pandemic, during which many Americans lost their jobs or experienced wage stagnation despite increasing housing costs.¹⁵ The Housing Choice Voucher program, the main federal housing program for extremely low-income renters, offers vouchers to pay for a housing unit of the recipient's choice. However, because of chronic underfunding, only 1 in 4 extremely low-income households in need receives assistance.¹⁵

Homelessness and housing insecurity disproportionately affect people of color in the United States. Black and



Figure 1. Risk factors for unstable housing exist at the level of the individual, their community, and policy. Once an individual experiences unstable housing, housing and chronic disease perpetuate one another. Paying for housing and other basic needs might take priority over medical care, leading to new disease or poorly controlled comorbid conditions and higher acute care utilization. Surmounting medical disability makes it difficult to work, further limiting income and maintaining unstable housing.

Latinx households are more likely to experience housing insecurity and cost-burden than White households. Before the COVID-19 pandemic, 54% of Black renters and 52% of Latinx renters were cost-burdened, compared with 42% of White renters.¹⁴ In September 2020, 23% of Black and 20% of Latinx renters reported being behind on their rent compared with 10% of White renters.¹⁴ Similar differences exist for homeowners; 17% of Black and 18% of Latinx homeowners reported being behind on mortgage payments in September 2020, compared with 7% of White homeowners.¹⁴ The situation is worse for renters earning less than \$25,000 per year, among whom 30% reported being behind on rent in January 2021 (29% of Latinx renters, 36% of Black renters, and 12% of White renters).¹⁵

Root Causes of Housing Insecurity and Homelessness

Although individual experiences are varied, several risk factors for homelessness have been identified (Fig 1). Some studies have shown that Veterans are at a greater risk for homelessness than other adults, and tend to be older, better educated, and more likely to be men than other homeless adults.¹⁶ Among Veterans, risk factors for homelessness include substance use disorders, mental illness, income-related factors, social isolation, adverse childhood experiences, and past incarceration.^{16,17} Mental illness, substance use problems, and history of incarceration are also prevalent among non-Veteran homeless adults.^{5,18,19} For example, in a study that included 714 adults in a supportive housing program, which often

require mental health or substance use diagnoses to qualify for services, 83% of women and 74% of men reported having a mental health diagnosis, and 68% of women and 73% of men reported substance use problems.⁵

A history of childhood abuse is common for women experiencing homelessness, particularly among those with severe mental illness.²⁰ Mothers of homeless families often cite domestic violence as an instigating factor of their homelessness and report that they were forced to choose between living with an abusive partner and unstable housing.^{20,21} The prevalence of homelessness among older adults is increasing and is more common among people who have experienced low-wage work throughout life, sudden crisis (eg, job loss, marital breakdown, illness, death of a spouse or parent), and limited social support.^{22,23}

There are several notable community-level drivers of homelessness, with lack of affordable housing being chief among them. Cities with rapid increases in housing prices have historically seen concurrent increases in residents experiencing homelessness. According to a study conducted by Zillow, communities that spend more than 32% of their income on rent can expect a more rapid increase in homelessness.²⁴ Unemployment, stagnant wages, lack of affordable health care, and other financial resource strain contribute by forcing individuals to choose between paying for their housing and other basic needs.^{25,26} Improving access to health care has been associated with a reduction in evictions. For example, early after Medicaid expansion in California, there were 24.5 fewer evictions per month in each county.²⁷

Racism has been embedded in United States housing policies for decades, driving racial inequities in unstable housing.²⁸⁻³⁸ Intentional segregation of neighborhoods was sought in the early 1900s to ensure that White people resided in separate communities from Black people, other people of color, and members of specific religious groups.³⁸ This was done through the use of federal and private policies such as discriminatory zoning, mortgage discrimination, single-family zoning, restrictive covenants, and redlining. For example, the Housing Act of 1949 was intended to offer “a decent home and suitable living environment for every American family,” but it funded urban renewal programs that displaced many Black households and financed suburban housing that was only available to White individuals.³⁸ This drove White people to suburban neighborhoods and pushed Black families into urban housing projects.

The Federal Housing Administration, established in 1934, refused to insure mortgages in and near predominantly Black neighborhoods.^{37,38} Known as redlining, this policy officially linked lending risk to race and income. Although the Fair Housing Act of 1968 was passed to end this practice, historic redlining continues to promote lending discrimination, lower property values, and worse community health today.³⁸ In a 2021 study that examined the impact of historic redlining on resident health in Milwaukee, people who lived in neighborhoods with greater historic redlining were more likely to face lending discrimination and poor physical and mental health.³⁷

Housing and Health Outcomes in the General Population

Homelessness has been associated with higher mortality and acute care utilization in numerous studies.³⁹⁻⁴⁷ In a prospective cohort that included 445 people in Boston from 2000 to 2016, compared with the general Massachusetts population, the standardized mortality ratios were 2.7 and 9.8 for people experiencing homelessness living in sheltered and unsheltered conditions, respectively.⁸ Cause-specific standardized mortality ratios were significantly higher for deaths from cancer, heart disease, chronic substance abuse, liver disease, and HIV/AIDS.⁸ In a retrospective analysis of 18,864 hospital admissions in New York City in 1992, adults experiencing homelessness were admitted for a mean 3-5 days longer than housed adults, and the mean cost of the extra days was \$2,414 per admission.⁶ Homelessness has also been found to be a risk factor for readmission after hospital discharge.⁷

People experiencing homelessness have higher rates of suicide, unintentional injuries, infectious diseases, mental health problems, and substance misuse and abuse.¹ They are more likely to have poorly controlled hypertension and diabetes than the general population.^{2,3} This may be related to a number of factors, including higher barriers to care, inconsistent medical insurance, and competing priorities leading to the postponement of medical care.^{4,8} They are also less likely to undergo lifesaving

cardiovascular procedures and more likely to die from coronary events.⁴ In a cross-sectional study of hospitalizations for cardiovascular conditions among homeless and non-homeless adults, homeless individuals hospitalized with acute myocardial infarction were less likely to undergo coronary angiography, percutaneous coronary interventions, and coronary artery bypass graft than non-homeless adults (39.5% vs 70.9%).⁴ Mortality rates from ST-segment elevation myocardial infarction were 8.3% for homeless adults compared with 6.2% for non-homeless adults.⁴

Housing and Kidney Disease

Kidney disease disproportionately affects individuals living with lower socioeconomic status.⁴⁹⁻⁵⁵ For example, 34% of individuals with newly diagnosed kidney failure live in areas where more than 1 in 5 households live below the federal poverty level.⁵⁶ Kidney disease is associated with a substantial financial burden that increases with disease severity. The estimated per-person annual cost attributed to chronic kidney disease (CKD) was \$1,700 for stage 2, \$3,500 for stage 3, and \$12,700 for stage 4 (adjusted to 2010 dollars).⁵⁷ Individuals living with lower socioeconomic status are more likely to experience unstable housing, and thus kidney disease, through its impact on financial status, which in turn may increase the risk for unstable housing. Nationwide prevalence estimates of homelessness and housing insecurity among people with kidney disease are unknown.

Housing insecurity has been linked to an increased risk of incident kidney disease. In a Baltimore-based longitudinal study that included 1,262 adults, those who reported an inability to afford a suitable home were 3 times more likely to develop albuminuria than individuals who reported stable housing.⁹ Increasing financial resource strain, defined as the number of unmet needs that one experiences (housing insecurity, food insecurity, ability to afford medications, and unemployment) was associated with a 30% higher risk of incident albuminuria and 10% higher risk of rapid estimated glomerular filtration rate decline after a median of 3.5 years of follow up.⁹

Among those with CKD, people experiencing unstable housing are more likely to progress to kidney failure or die than people with CKD and stable housing. In a retrospective cohort study that included 15,343 adults with CKD stages 3-5 in San Francisco, homeless adults had a 1.28 times higher risk of death or kidney failure than housed individuals over a median 2.8 years follow-up.¹⁰ Homeless adults also had higher acute care utilization and lower engagement in outpatient services throughout follow-up.¹⁰ The median number of emergency department visits and hospitalizations was 9 and 5 for homeless adults, respectively, compared with 1 and 1 for housed adults.¹⁰

Individuals experiencing housing insecurity may be less able to engage in recommended kidney protective measures or achieve optimal control of comorbid conditions. In a cross-sectional analysis that included 1,753 adults

with and without kidney disease, those experiencing housing insecurity and/or food insecurity were 18% less likely than those without these social needs to achieve 4 or more of the following measures: blood pressure $\leq 130/80$ mm Hg, hemoglobin A1c $\leq 7.5\%$, average 2-day sodium intake $< 2,000$ mg/day, body mass index ≤ 25 kg/m², self-report of physical activity during leisure time, and being a non-smoker. Those experiencing housing insecurity and/or food insecurity were 70% less likely than those without social needs to achieve all 6 measures.⁵⁸

People experiencing housing insecurity may also be more likely to postpone needed medical care. In a cross-sectional study of 355 individuals with CKD, those who reported inability to afford a suitable home or difficulty making rent or mortgage payments were 1.6 times more likely to report having to postpone needed medical care after adjustment for demographics, kidney function, comorbid conditions, health insurance status, kidney disease awareness, food insecurity, and education level.⁵⁹

There is limited evidence to suggest that the relationships between housing and kidney disease differ by race or ethnicity.^{9,58} Further research is needed using larger cohorts to better understand these relationships.

Underlying Mechanisms of the Housing and Kidney Disease Link

When an individual with medical conditions is living in unstable housing, their health and environment interact in a way that may both impair their health and limit their ability to attain stable housing. For example, people with housing insecurity are more likely to experience coexisting food insecurity, and often sacrifice paying for medications, health care visits, and housing repairs.¹³ Neglected medical care increases the risk for chronic illness, disease progression, and related complications. Medical disability might lead to missed days from work or the inability to maintain employment. Surmounting medical expenses and ongoing financial resource strain then perpetuate housing insecurity.

Unstable housing introduces additional obstacles for people with kidney failure. For the unstably housed, frequent moves and limited transportation might lead to skipped hemodialysis sessions and shortened treatments.⁶⁰ People with kidney failure typically have complicated medication regimens, but housing insecurity might prevent proper medication storage or lead to incorrect use. Numerous dietary restrictions accompany kidney failure, but housing insecurity, food insecurity, and limited control over the types of food available impede adherence. Missed dialysis sessions can precipitate complications such as electrolyte abnormalities, volume overload, confusion, and even death. People experiencing housing insecurity might over-rely on emergency departments for urgent dialysis, resulting in frequent admissions. The ensuing chronic disability and surmounting costs further inhibit the attainment of stable housing.⁶⁰

The location of a home is also important, since neighborhood-level poverty, access to resources, racial segregation,⁶¹ perceived discrimination,⁶² and ability to engage in healthy behaviors⁶³ impact kidney disease risk and progression.⁶⁴ In a cross-sectional analysis that included 23,692 adults in Philadelphia, the lowest tertile of neighborhood socioeconomic index (a composite of neighborhood income, educational attainment, and the percentage of employed persons aged 16 or older in executive, managerial, or professional specialty occupations) was associated with 46% higher risk of CKD compared with the highest tertile.⁶⁵ Among those with CKD, living in a less walkable neighborhood was associated with poor glycemic control.⁶⁵

Climate and housing-related environmental exposures are notable.⁶⁶ There appears to be a dose-response relationship between exposure to ambient fine particulate matter (ie, air pollution) and incident CKD.^{67,68} There is a greater burden of air pollution in lower-income and racially segregated communities.⁶⁹⁻⁷¹ People experiencing unstable housing may have greater exposure to heat-related stress, lower water availability, and poor water quality, which have been linked to acute kidney injury, CKD, and nephrolithiasis.^{66,72-75} More research on the relationship between climate and kidney disease is needed, and policies and interventions mitigating the impact of climate change on health may attenuate kidney-related risks associated with unstable housing.⁷⁶

Unstable housing may also affect health through neurohormonal mechanisms. Acute stress is postulated to lead to kidney disease via increases in blood pressure, heart rate, and decreases in vascular reactivity, mediated by the autonomic nervous system, hypothalamic-pituitary-adrenal axis, inflammatory cytokines, and endothelin-A.^{30,77-81} Over time, with repeated insults, there may be a link between stress, hypertension, sodium and water retention, and CKD. Environmental stressors may also be linked to kidney disease through insulin resistance and the development of diabetes. Stress enhances sympathetic nervous system activity, glucocorticoid secretion, and inflammatory cytokines, which can contribute to higher levels of hypertension, diabetes, and vascular disease—all risk factors for CKD.

Housing Interventions

The provision of housing in conjunction with medical care has the potential to impact morbidity, mortality, and quality of life. Permanent supportive housing is a housing intervention used for people who experience chronic homelessness and have disabling conditions. Many programs use a Housing First approach, which means that they do not require a person to address their disabling conditions (ie, substance abuse and mental illness) before qualifying for housing because having a home is crucial for them to address the condition. Permanent supportive housing programs combine a home with supportive

Box 1. Special Considerations When Caring for Individuals Experiencing Unstable Housing With or at Risk for Kidney Disease

For all individuals with kidney disease:

- Discuss the logistics of their living situation before prescribing medications or lifestyle changes (eg, discuss availability of safe restrooms before prescribing diuretics, availability of ambient temperature storage for medications, proximity to healthy food)
- Simplify medication lists and avoid short-acting medications requiring dosing multiple times per day
- Consider pharmacy delivery programs that deliver to shelters or other locations
- Discuss kidney replacement therapy early and often; make plans for vascular access earlier in the course of kidney disease to avoid use of emergency catheters in the event of gaps in care
- Bundle appointments so that pharmacy visits, laboratory tests, and physician visits can be done at the same time to minimize transportation needs
- Ask about and prioritize the individual's physical safety
- Involve case management and social work early and often to assist with housing resources and address other barriers to care
- Avoid using potentially stigmatizing language in the medical record (eg, "non-compliant") which could affect dialysis placement or transplant candidacy

Additional considerations for people treated with dialysis:

- Provide education on how to reduce environmental harm to vascular access, and consider providing extra care supplies in the event they miss dialysis sessions
- Administer medications during dialysis when possible
- Work closely with social work to arrange flexible transportation and prioritize patient safety

services, ranging from case management to mental health services and medical care.³⁸

Permanent supportive housing interventions have been shown to keep people housed longer, decrease acute care utilization, and increase outpatient utilization.^{38,82-86} The US federal government has been partnering with local housing agencies for several years to provide permanent supportive housing for specific populations, including individuals with HIV/AIDS, persons with mental illness, and also Veterans.³⁸ Given the impact of housing on health outcomes, several medical institutions across the country have also invested in housing for specific patient populations.⁸⁷ Permanent supportive housing should be considered for individuals with kidney disease, particularly those with kidney failure.⁶⁰ Housing interventions may facilitate greater dialysis engagement, lower acute care utilization and hospitalization, and enable greater use of home dialysis modalities, transplant, and palliative care.⁶⁰

Community house hemodialysis is a housing intervention being explored in New Zealand.⁸⁸ Individuals with kidney failure use a shared house to perform home hemodialysis independent of nursing or medical supervision. This involves a partnership between non-profit

organizations that supply the home and dialysis providers that provide the dialysis. This intervention enables individuals to do home dialysis, who otherwise would not be able to dialyze in their own homes because of a variety of circumstances.⁸⁹ In a qualitative semi-structured interview study, community house patients reported that it reduced the perceived burden on family, offered flexibility and freedom, and enabled them to gain better control of their health while gaining a community of support.⁸⁹ While a community house is not a long-term solution to homelessness, it might enable dialysis patients experiencing housing insecurity to use home dialysis modalities and should be explored further.

Practical Considerations for Working with People Experiencing Unstable Housing

Several considerations are important when working with individuals experiencing unstable housing (Box 1). Identifying housing issues is best done through non-judgmental and compassionate discussion in which the provider already has a rapport with the individual. Several screening tools are available (Table 1).^{83,90-97} To develop the right care plan for a patient, conversations about housing should focus on factors that are important for clinical care, including where medications are stored, access to refrigeration, access to healthy food, access to restrooms, exposure to temperature extremes, and physical safety. Care plans should be developed in a way that accommodates these factors. For example, if the individual does not have access to a restroom, they might avoid taking short-acting diuretics and alternative medications should be prescribed. Traveling to pharmacies and storing medications is often challenging for people with unstable housing, and they may try to alternate medications or spread them out to avoid running out, leading providers to incorrectly think that they need to add more medications to optimize control. Limiting the number of medications and choosing longer-acting medications is preferable over agents that require multiple doses per day.

CONCLUSION

Stable housing is essential for health. Unstable housing has been associated with mortality, acute care utilization, communicable and non-communicable diseases, a higher risk of kidney disease, and kidney disease progression. The link between housing and kidney disease is likely a complex interplay between individual and structural factors. Housing interventions have been shown to improve outcomes and should be considered for individuals with kidney disease. The kidney community must advocate for more extremely low-income housing and rental support, given the impact of housing on health and the ability to provide high-quality care. Special considerations should be made when caring for individuals experiencing unstable housing to meet their unique needs, facilitate health care engagement, and optimize outcomes.

Table 1. Examples of Screening Questions That Can Be Used to Identify Unstable Housing Among People With or at Risk For Kidney Disease

Protocol for Responding to and Assessing Patients' Assets, Risks and Experiences (PRAPARE) ⁸⁵	Accountable Health Communities Health-related Social Needs Screening Tool ^{94,96}	American Academy of Family Physicians: The EveryONE Project ⁹⁵	Veterans Health Administration ⁹⁷	Health LEADS ⁹³
<p>1. What is your housing situation today?</p> <p>a) I have housing</p> <p>b) I do not have housing (staying with others, in a hotel, in a shelter, living outside on the street, on a beach, in a car, or in a park)</p> <p>2. Are you worried about losing your housing?</p> <p>a) Yes</p> <p>b) No</p>	<p>1. What is your living situation today?</p> <p>a) I have a steady place to live</p> <p>b) I have a place to live today but I am worried about losing it in the future</p> <p>c) I do not have a steady place to live (I am temporarily staying with others, in a hotel, in a shelter, living outside on the street, on a beach, in a car, abandoned building, bus or train station, or in a park)</p> <p>2. Think about the place where you live. Do you have problems with any of the following?</p> <p>a) Pests such as bugs, ants, or mice</p> <p>b) Mold</p> <p>c) Lead paint or pipes</p> <p>d) Lack of heat</p> <p>e) Oven or stove not working</p> <p>f) Smoke detectors missing or not working</p> <p>g) Water leaks</p> <p>h) None of the above</p>	<p>1. Are you worried or concerned that in the next 2 months you may not have stable housing that you own, rent, or stay in as a part of a household?</p> <p>a) Yes</p> <p>b) No</p> <p>2. Think about the place where you live. Do you have problems with any of the following?</p> <p>a) Bug infestation</p> <p>b) Mold</p> <p>c) Lead paint or pipes</p> <p>d) Inadequate heat</p> <p>e) Oven or stove not working</p> <p>f) No or not working smoke detectors</p> <p>g) Water leaks</p> <p>h) None of the above</p>	<p>1. In the past 2 months, have you been living in stable housing that you own, rent or stay in as part of a household?</p> <p>a) Yes, living in stable housing</p> <p>b) No</p> <p>2. If you answered yes to living in stable housing, are you worried or concerned that in the next 2 months you may NOT have stable housing that you own, rent, or stay in as part of a household?</p> <p>a) Yes, worried about housing in the near future</p> <p>b) No, not worried about housing in the near future</p>	<p>1. Are you worried that in the next 2 months, you may not have stable housing?</p>

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