

RESEARCH LETTER

Housing Instability and Health Care Engagement Among People With CKD



To the Editor:

Housing instability affects more than 38.1 million American households and is characterized by high housing costs or overcrowded living conditions.^{1,2} Engagement with nephrology care is of interest in this population because housing instability has been associated with risk factors for chronic kidney disease (CKD),³ and homeless persons with CKD are more likely to progress to end-stage kidney disease than people with stable housing.⁴ In the general population, housing instability is associated with not having a usual source of care and postponing medical care.^{1,5} The relation of housing instability to health care use among people with CKD is unknown. We sought to examine whether housing instability was associated with postponing medical care among persons with CKD and hypothesized that those experiencing housing instability would be more likely to report postponing medical care that they believed to be necessary.

We used data from the Healthy Aging in Neighborhoods of Diversity Across the Life Span (HANDLS) study (Baltimore, MD).⁶ HANDLS is a population-based cohort study examining the influence and interaction of race and socioeconomic status on the development of health disparities among minorities and lower-socioeconomic-status groups.⁶ The cohort included 3,720 black and white community-dwelling individuals between the ages of 30 and 64 years who were sampled from 13 socioeconomically diverse neighborhoods. Participants were enrolled between August 2004 and November 2008. Each participant provided written informed consent, and the National Institute of Environmental Health Sciences, National Institutes of Health approved the study protocol (09-AG-N248).

We performed a cross-sectional analysis evaluating the association between housing instability and postponement of medical care at HANDLS visit 4 (September 2013 to September 2017). Individuals were included if they attended visit 4 and had prevalent CKD (estimated glomerular filtration rate < 60 mL/min/1.73 m² and/or urinary albumin-creatinine ratio ≥ 30 mg/g; N = 558).⁷ Individuals were excluded if they had missing data (N = 203), leaving a study population of N = 355. Housing instability was defined as a negative response to the question “Are you able to afford a suitable home for you and your family?” or answering a positive response to “Have you had difficulties making rent or mortgage payments?” Poor health care engagement was defined as a positive response to the question “Have you postponed needed health care since the last HANDLS exam?” at study visit 4. All covariables of interest were ascertained at visit 4.

We compared participant characteristics using χ^2 tests for categorical variables and *t* tests for continuous variables. We

estimated the prevalence of postponing needed health care overall and among those with and without housing instability. We used multivariable log binomial and Poisson regression with robust estimate of variance clustered on neighborhood to quantify associations between housing instability and self-report of postponing medical care that was believed to be needed and adjusted for demographics (age, race, sex, and poverty status), clinical variables (estimated glomerular filtration rate, log-transformed urinary albumin-creatinine ratio, hypertension status, and diabetes status), health insurance status, CKD awareness, food insecurity, and education level. We evaluated for potential effect modification by race by including an interaction term for race × housing instability. As sensitivity analysis, we evaluated associations for HANDLS participants without CKD and tested for effect modification by CKD status.

Among 355 HANDLS participants with CKD, 135 (38%) reported housing instability. Individuals with housing instability were younger (mean [standard deviation] age, 57.8 [9.1] vs 61.1 [8.3] years), were less likely to have a high school degree, and were more likely to be current smokers and report food insecurity than stably housed persons (*P* < 0.05 for all; Table 1).

Overall, 85 (23.9%) participants reported postponement of medical care. Housing instability was associated with

Table 1. Baseline Characteristics According to Housing Status

Variable	No Housing Instability (N = 220)	Housing Instability (N = 135)	<i>P</i>
Age, y	61.6 (8.3)	57.8 (9.1)	<0.001
Male sex at birth	85 (38.6%)	66 (48.9%)	0.06
Black race	148 (67.3%)	97 (71.9%)	0.37
Annual income < 125% federal poverty level	99 (45.0%)	59 (43.7%)	0.81
eGFR, mL/min/1.73 m ²	70.1 (27.5)	77.3 (28.3)	0.02
UACR, mg/g	53 [14-146.5]	64 [31-171]	0.21
Albumin, g/dL	4.19 (0.36)	4.14 (0.37)	0.20
Systolic blood pressure, mm Hg	122.6 (23.0)	122.7 (18.5)	0.98
Diabetes	108 (49.1%)	67 (49.6%)	0.92
Coronary artery disease	22 (10%)	21 (15.6%)	0.12
Chronic obstructive pulmonary disease	36 (16.4%)	16 (11.9%)	0.24
History of stroke	19 (8.6%)	9 (6.7%)	0.50
Current smoker ^a	74 (37.6%)	70 (56.0%)	<0.001
Food insecurity	33 (15.0%)	67 (49.6%)	<0.001
Enough money for medical care	163 (74.1%)	56 (41.5%)	<0.001
≥High school degree	159 (72.3%)	82 (60.7%)	0.02
No health insurance	9 (4.1%)	9 (6.7%)	0.28
Aware of CKD	47 (21.4%)	28 (20.7%)	0.89

Note: Values for categorical variables given as number (percent); values for continuous variables are given as mean (standard deviation) or median [interquartile range].

Abbreviations: CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; UACR, urinary albumin-creatinine ratio.

^aSmoking status was missing for 23 participants in the no housing instability group (total N = 197) and 95 participants in the housing instability group (total N = 125).

Table 2. Association Between Housing Instability and Postponement of Medical Care Among People With CKD

Analysis	Incidence Rate Ratio (95% CI)
Unadjusted	1.92 (1.44-2.56)
Model 1	1.73 (1.34-2.23)
Model 2	1.72 (1.36-2.18)
Model 3	1.60 (1.21-2.12)

Note: Model 1 adjusted for demographics (age, race, sex, and poverty level). Model 2 adjusted for demographics and clinical variables (baseline estimated glomerular filtration rate, log-transformed urinary albumin-creatinine ratio, blood pressure, and diabetes). Model 3 adjusted for demographics, clinical variables, health insurance, CKD awareness, food insecurity, and education level. Abbreviations: CKD, chronic kidney disease; CI, confidence interval.

increased risk for postponing medical care in unadjusted (unadjusted incidence rate ratio [IRR], 1.92; 95% confidence interval [CI], 1.44-2.56) and adjusted models (IRR, 1.59; 95% CI, 1.20-2.10; Tables 2 and S1). The relationship between housing instability and postponement of medical care was not modified by race (P for interaction = 0.30). Associations were stronger for people with CKD compared with participants without CKD, although not statistically significant (P interaction = 0.21; Table S2).

Our study had limitations. We lacked data for more traditional indicators of housing instability, such as rent to income ratio or measure of persons per room in the home. Therefore, our study may not have captured all participants experiencing housing instability. Our sample was moderately sized, and findings may not be generalizable to nonurban populations. Due to the cross-sectional design, our findings cannot be used to draw conclusions about temporality or causality.

In this cross-sectional analysis of 355 urban-dwelling individuals with CKD, we found that those experiencing housing instability were more likely to report postponing needed medical care. Postponing medical care could increase risk for poor clinical outcomes in this vulnerable population. Risk reduction efforts specifically targeting persons with CKD who are experiencing housing instability should be considered.

Tessa K. Novick, MD, MSW, MHS, Dingfen Han, PhD, Delphine S. Tuot, MDCM, MAS, Elizabeth A. Jacobs, MD, MAPP, Alan Zonderman, PhD, Michele K. Evans, MD, Deidra C. Crews, MD, ScM

SUPPLEMENTARY MATERIAL

Supplementary File (PDF)

Table S1: Associations between postponing medical care and variables in the fully adjusted model for people with CKD.

Table S2: Association between housing instability and postponement of medical care among people with and without CKD.

ARTICLE INFORMATION

Authors' Affiliations: Department of Internal Medicine, University of Texas at Austin Dell Medical School, Austin, TX (TKN, EAJ); Welch Center for Prevention Epidemiology and Clinical Research, Johns Hopkins University, Baltimore, MD (DH); Division of Nephrology, Department of Medicine, University of California, San Francisco

(DH); UCSF Center for Vulnerable Populations at Zuckerberg San Francisco General Hospital and Trauma Center, San Francisco, CA (DST); National Institute on Aging, National Institutes of Health (AZ, MKE); Division of Nephrology, Department of Medicine, Johns Hopkins University School of Medicine (DCC); and Johns Hopkins Center for Health Equity, Johns Hopkins Medical Institutions, Baltimore, MD (DCC).

Address for Correspondence: Tessa K. Novick, MD, MSW, MHS, 1601 Trinity St, Bldg B, Rm 7.816, Austin, TX 78712. E-mail: Tessa.Novick@austin.utexas.edu

Authors' Contributions: Research idea and study design: TKN, DCC; data acquisition: TKN, DCC; data analysis/interpretation: TKN, DST, EAJ, AZ, MKE, DCC; statistical analysis: TKN, DH; supervision or mentorship: EAJ, DCC. Each author contributed important intellectual content during manuscript drafting or revision and accepts accountability for the overall work by ensuring that questions pertaining to the accuracy or integrity of any portion of the work are appropriately investigated and resolved.

Support: This research was supported in part by the Intramural Research Program of the National Institute of Health (NIH), National Institute on Aging. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. Dr Crews was supported by the Johns Hopkins University President's Frontier Award and grant K24 HL148181 from the National Heart, Lung and Blood Institute, NIH.

Financial Disclosure: The authors declare that they have no relevant financial interests.

Peer Review: Received October 3, 2019. Evaluated by 1 external peer reviewer, with direct editorial input from the Statistical Editor, an Associate Editor, and the Editor-in-Chief. Accepted in revised form December 17, 2019.

Publication Information: © 2020 The Authors. Published by Elsevier Inc. on behalf of the National Kidney Foundation, Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>). Published online March 16, 2020 with doi: [10.1016/j.kme.2019.12.009](https://doi.org/10.1016/j.kme.2019.12.009)

REFERENCES

- Kushel MB, Gupta R, Gee L, Haas JS. Housing instability and food insecurity as barriers to health care among low-income Americans. *J Gen Intern Med.* 2006;21:71-77.
- Harvard University Joint Center for Housing Studies. The state of the nation's housing. https://www.jchs.harvard.edu/sites/default/files/Harvard_JCHS_State_of_the_Nations_Housing_2019.pdf. Accessed September 4, 2019.
- Vijayaraghavan M, Kushel MB, Vittinghoff E, et al. Housing instability and incident hypertension in the CARDIA cohort. *J Urban Health.* 2013;90:427-441.
- Hall YN, Choi AI, Himmelfarb J, Chertow GM, Bindman AB. Homelessness and CKD: a cohort study. *Clin J Am Soc Nephrol.* 2012;7:1094-1102.
- Reid KW, Vittinghoff E, Kushel MB. Association between the level of housing instability, economic standing and health care access: a meta-regression. *J Health Care Poor Underserved.* 2008;19:1212-1228.
- Evans MK, Lepkowski JM, Powe NR, LaVeist T, Kuczmarski MF, Zonderman AB. Healthy aging in neighborhoods of diversity across the life span (HANDLS): overcoming barriers to implementing a longitudinal, epidemiologic, urban study of health, race, and socioeconomic status. *Ethn Dis.* 2010;20:267-275.
- Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2012 clinical practice guideline for the evaluation and management of chronic kidney disease. *Kidney Int Suppl.* 2013;3:1-150.