

RESEARCH LETTER

Health-Related Social Needs and Kidney Risk Factor Control in an Urban Population



To the Editor:

Individuals experiencing health-related social needs, such as housing and food insecurity, face significant health care barriers and are at increased risk for chronic kidney disease (CKD) and end-stage kidney disease.¹⁻⁵ Maintaining blood pressure at $\leq 130/80$ mm Hg, hemoglobin A_{1c} level of 7%, sodium intake $< 2,000$ mg/d, body mass index (BMI) ≤ 25 kg/m², regular physical activity, and smoking cessation reduce the risk for CKD and CKD progression.⁶ We examined whether experiencing social needs was associated with kidney protective measures and hypothesized that those experiencing social needs would achieve fewer kidney protective measures.

We used data from the Healthy Aging in Neighborhoods of Diversity Across the Life Span (HANDLS) Study (Baltimore, MD).⁷ HANDLS is a population-based cohort examining the influence and interaction of race and socioeconomic status on the development of health disparities.⁷ The cohort includes 3,720 Black and White individuals between the ages of 30 and 64 years who were sampled from 13 socioeconomically diverse neighborhoods. Each participant provided written informed consent, and the National Institute of Environmental Health Sciences, National Institutes of Health, approved the study protocol.

We performed a cross-sectional analysis at HANDLS visit 4 (September 2013 to September 2017). Individuals were included if they attended visit 4 (N = 2,171) and were excluded for missing data (N = 418), leaving a study population of N = 1,753 (Fig S1). There were no substantial differences between included individuals and those who were excluded due to missingness. Having social needs was defined as experiencing housing and/or food insecurity. Food

insecurity was defined as self-report of often or occasionally eating less due to not having enough money for food in the past 12 months.⁸ Housing insecurity was defined as self-report of inability to afford a suitable home or difficulty making rent or mortgage payments.⁹ The outcome was defined as achieving 4 or more protective measures (yes/no) using data from visit 4 (blood pressure $\leq 130/80$ mm Hg, hemoglobin A_{1c} level $\leq 7.5\%$, average 2-day salt intake $< 2,000$ mg/d, BMI ≤ 25 kg/m², self-report of physical activity during leisure time, and current nonsmoker).

We compared participant characteristics using χ^2 tests for categorical variables and t tests for continuous variables. We compared the percentage of participants with the primary outcome and who achieved each individual measure. As our primary analysis, we quantified the association between social needs and achieving 4 or more protective measures. We evaluated for potential effect modification by race by including an interaction term for race \times social needs. As secondary analyses, we quantified associations between social needs and achieving 1 or more, 2, 3, 5, and 6 measures and with each measure independently.

As sensitivity analyses, we used a blood pressure target of $\leq 140/90$ mm Hg and defined the outcome as the number of measures met on a continuous scale ranging from 0 to 6. For all analyses, we used log-binomial regression or Poisson regression with robust estimate of variance when the model failed to converge and adjusted for demographics (age, race, sex, and poverty status) and kidney function (estimated glomerular filtration rate and urinary albumin-creatinine ratio).

Among 1,753 HANDLS participants, 876 (49.9%) reported housing and/or food insecurity (Table 1). Overall, 665 participants met 4 or more measures, 1,339 (76.4%) had blood pressure $\leq 130/80$ mm Hg, 1,595 (91.0%) had hemoglobin A_{1c} levels $\leq 7.5\%$, 686 (39.1%) reported average 2-day salt intake $< 2,000$ mg/d, 421 (24.0%) had

Table 1. Cohort Characteristics According to Social Needs Status

Variable	Without Social Needs (N = 877)	With Social Needs (N = 876)	P
Age, y	57.8 (9.3)	55.0 (8.6)	<0.001
Male sex at birth	358 (40.8%)	365 (41.7%)	0.72
Black race	520 (59.3%)	559 (63.8%)	0.05
Annual income $< 125\%$ of federal poverty level	284 (32.4%)	410 (46.8%)	<0.001
eGFR < 60 mL/min/1.73 m ²	88 (10.0%)	58 (6.6%)	0.01
UACR ≥ 30 mg/g	118 (13.5%)	125 (14.3%)	0.62
eGFR < 60 mL/min/1.73 m ² or UACR ≥ 30 mg/g	179 (20.4%)	163 (18.6%)	0.34
Systolic blood pressure, mm Hg	117.3 (20.6)	117.0 (19.2)	0.72
Diastolic blood pressure, mm Hg	65.5 (11.1)	65.3 (10.6)	0.78
Hemoglobin A _{1c} , %	6.2 (1.2)	6.2 (1.3)	0.93
Body mass index kg/m ²	31.0 (7.6)	30.9 (7.9)	0.68
2-d sodium intake, mg	3,238.2 (1,314.7)	3,206.3 (1,434.4)	0.63
Current smoker	286 (32.6%)	445 (50.8%)	<0.001

Note: Values expressed as mean (standard deviation) or number (percent).

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

Table 2. Association Between Health-Related Social Needs and Kidney Protective Measures

Outcome	Models Comparing Participants With vs Without Health-Related Social Needs RR (95% CI)	
	Unadjusted (N = 1,753)	Adjusted ^a (N = 1,753)
Primary analysis		
Achieved ≥ 4 measures	0.80 (0.71-0.90)	0.82 (0.72-0.93)
Secondary analyses		
Achieved ≥ 1 measure	1.00 (1.00-1.00)	1.00 (1.00-1.00)
Achieved ≥ 2 measures	0.99 (0.97-1.01)	0.99 (0.98-1.01)
Achieved ≥ 3 measures	0.95 (0.90-1.01)	0.96 (0.91-1.02)
Achieved ≥ 5 measures	0.72 (0.55-0.94)	0.76 (0.58-0.99)
Achieved all 6 measures	0.24 (0.08-0.70)	0.30 (0.10-0.92)
BP $\leq 130/80$ mm Hg	1.01 (0.96-1.01)	1.00 (0.95-1.05)
Hemoglobin A _{1c} $\leq 7.5\%$	0.98 (0.67-1.19)	0.98 (0.95-1.01)
Sodium intake $< 2,000$ mg/d	1.17 (1.04-1.31)	1.22 (1.08-1.37)
BMI ≤ 25 kg/m ²	1.21 (1.02-1.43)	1.15 (0.97-1.37)
Physically active	0.73 (0.64-0.84)	0.72 (0.63-0.83)
Nonsmoker	0.73 (0.67-0.79)	0.79 (0.73-0.86)

Abbreviations: BMI, body mass index; BP, blood pressure; RR, risk ratio.

^aFully adjusted models adjusted for age, race, sex, income $>125\%/<125\%$ of federal poverty level, urinary albumin-creatinine ratio, and estimated glomerular filtration rate.

BMI ≤ 25 kg/m², 558 (31.8%) reported physical activity during leisure time, and 1,022 (58.3%) reported being nonsmokers (Figs S2 and S3).

Compared with those without social needs, those with social needs were less likely to achieve 4 or more measures (unadjusted risk ratio [RR], 0.80; 95% CI, 0.71-0.90; adjusted RR, 0.82, 95% CI 0.72-0.93; Table 2). Individuals with social needs were even less likely to achieve 5 or more and all 6 measures. The adjusted RR for the relation between social needs and achieving 4 or more measures was 0.76 (95% CI, 0.62-0.92) for Whites and 0.87 (95% CI, 0.74-1.02) for Blacks (*P* for interaction = 0.25).

Experiencing social needs was significantly associated with sodium intake (adjusted RR, 1.22; 95% CI, 1.08-1.37), physical activity (adjusted incidence rate ratio [IRR], 0.72; 95% CI, 0.63-0.83), and smoking status (adjusted IRR, 0.79; 95% CI, 0.73-0.86) but not other measures. Findings were similar when we used a blood pressure target of $\leq 140/90$ mm Hg and the outcome was defined using a continuous scale.

Some limitations bear mention. HANDLS does not have traditional measures of housing insecurity, such as housing payment to income ratio. We may not have captured all participants experiencing social needs. Our findings may not be generalizable to nonurban populations. Due to the cross-sectional design, we cannot draw conclusions about temporality or causality, and reverse causality cannot be excluded.

In this cross-sectional study of 1,753 urban-dwelling individuals, people experiencing social needs achieved fewer kidney protective measures. Our work highlights a potential mechanism between previously documented associations between housing insecurity² and food insecurity¹⁰ and the development of kidney disease. Findings appear to be driven by engagement in physical activity during leisure time and smoking status, highlighting

potential intervention targets. Risk reduction efforts specifically targeting kidney protective measures among populations experiencing social needs should be considered.

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SUPPLEMENTARY MATERIAL

Supplementary File (PDF)

Figure S1: Derivation of study population

Figure S2: Number of participants who achieved 1 to 6 protective measures

Figure S3: Comparison of the percentage of participants who achieved the primary outcome and each independent measure

ARTICLE INFORMATION

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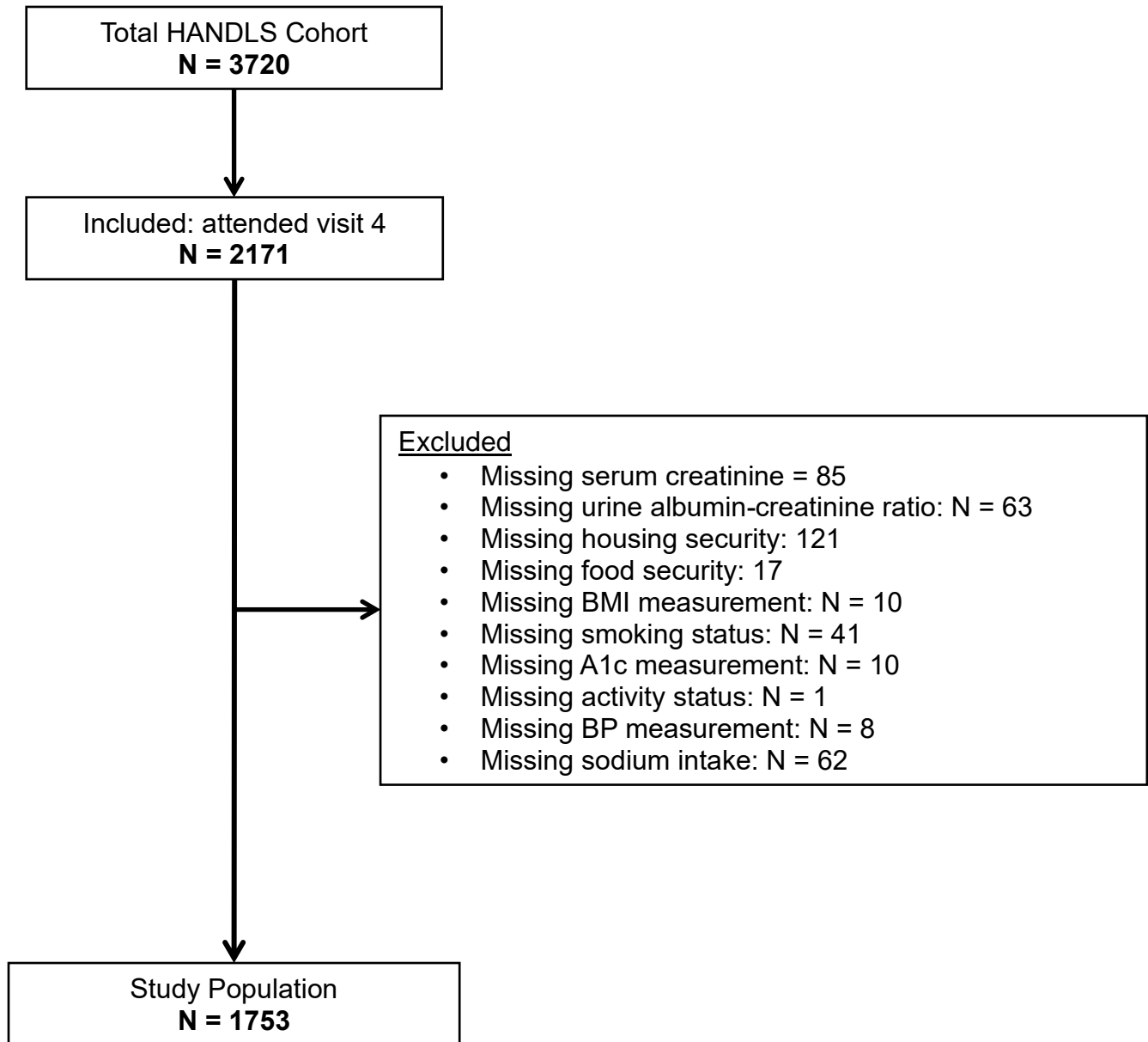
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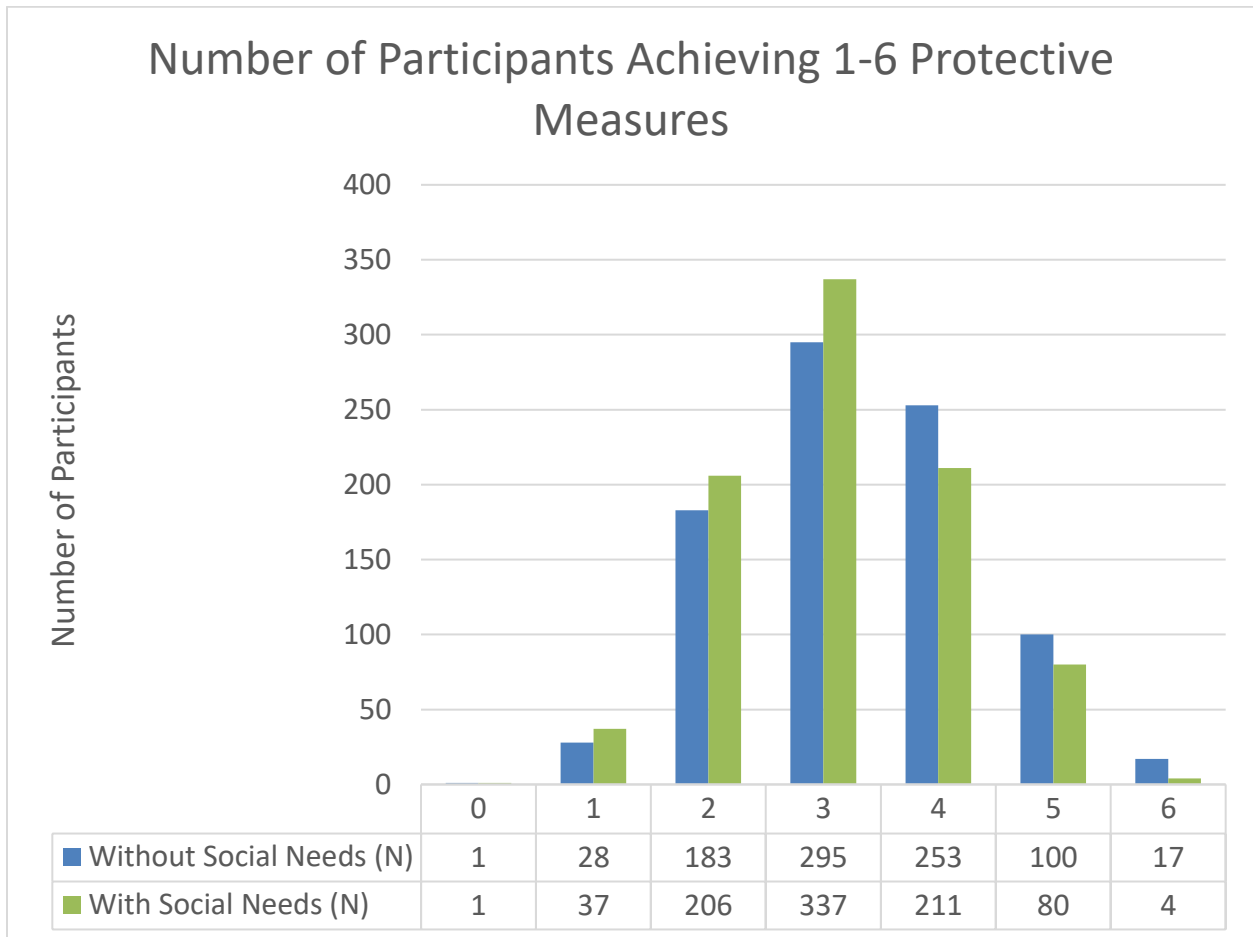
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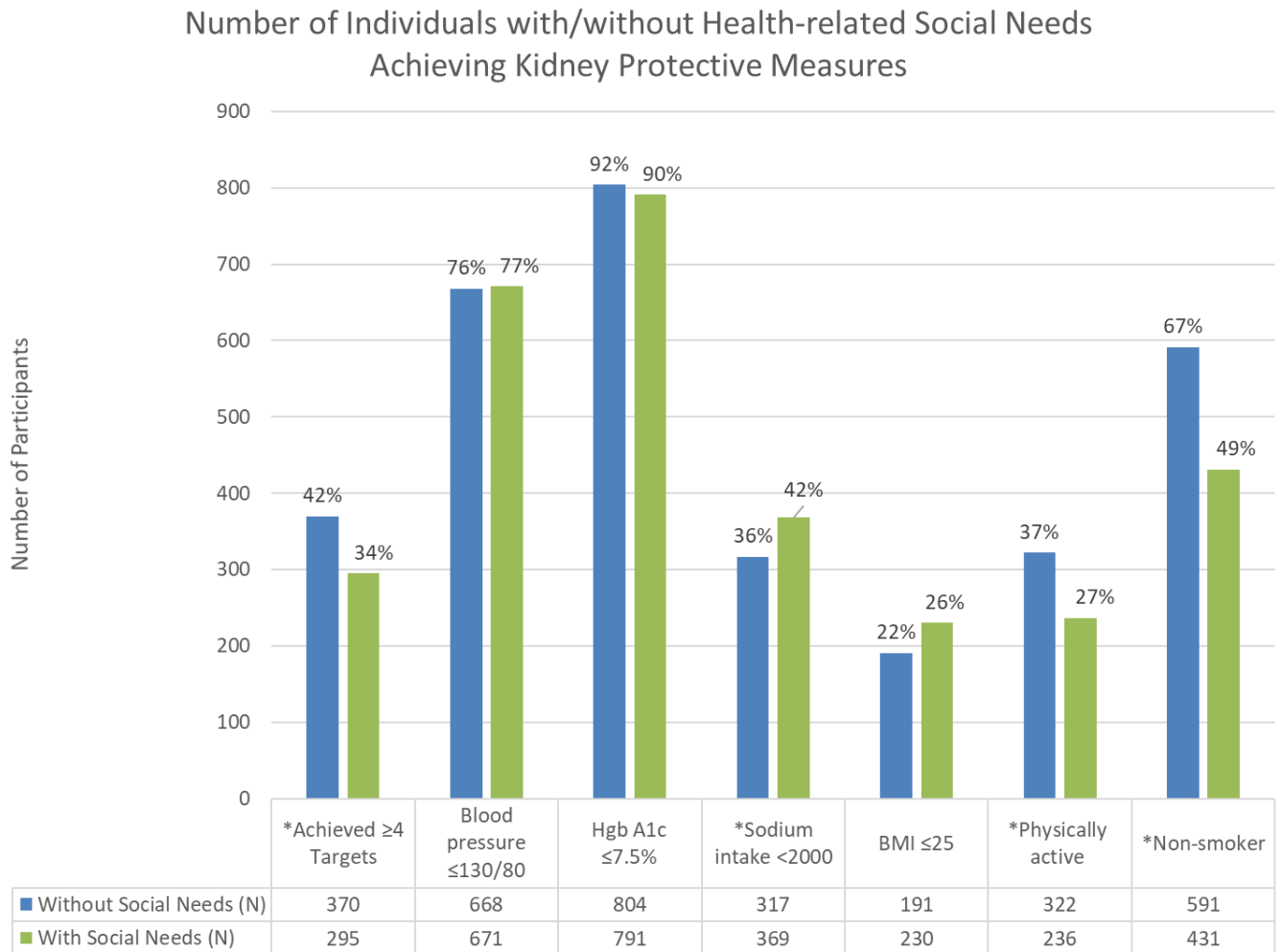
Supplemental Figure S1. Derivation of study population.



Supplemental Figure S2. Number of participants who achieved 1-6 protective measures.



Supplemental Figure S3. Comparison of the number of participants who achieved the primary outcome and each independent measure.



*P-value <0.05

Abbreviations: BMI – body mass index

Units: BMI – kg/m²; Blood pressure – mmHg; Sodium intake – mg/day

Having social needs was defined as reporting housing and/or food insecurity. Food insecurity was defined as often or occasionally eating less due to not having enough money for food in the past 12 months. Housing insecurity was defined as inability to afford a suitable home, or difficulty making rent or mortgage payments.