

RESEARCH LETTER

Influenza Vaccination Among Adults With CKD in the United States: Regional, Demographic, and Socioeconomic Differences

To the Editor:

Infection is a leading noncardiovascular cause of morbidity and mortality among individuals with chronic kidney disease (CKD).¹ The Centers for Disease Control and Prevention Advisory Committee on Immunization Practices and the KDIGO (Kidney Disease: Improving Global Outcomes) guidelines (Grade 1A) recommend seasonal influenza vaccination for patients with CKD.^{2,3} Studies have focused on vaccine use among kidney transplant recipients and individuals undergoing dialysis,⁴ and only 70% of patients with end-stage kidney disease are vaccinated.⁵ Despite evidence indicating that vaccination is associated with a lower risk for hospitalizations with pneumonia/influenza, even among patients with CKD with an estimated glomerular filtration rate ≥ 30 mL/min/1.73 m²,^{4,6,7} national vaccination rates in a representative sample of individuals with CKD remain limited. Therefore, we aimed to estimate the prevalence of and disparities in influenza vaccination among patients with CKD in the United States.

We used pooled cross-sectional data from the National Health Interview Survey (NHIS) between 2011 and 2018. The NHIS database is constructed from annual household surveys incorporating complex multistage sampling to provide estimates on the noninstitutionalized US population. Because NHIS data are publicly available and deidentified, this study was exempt from review by the Institutional Review Board Committee.

Individuals who answered “yes” to the following question: “During the past 12 months, have you been told by a doctor or other health professional that you had... weak or failing kidneys? - Do not include kidney stones, bladder infection or incontinence” were considered to have CKD. For the ascertainment of influenza vaccination, individuals who answered “yes” to the following question: “During the past 12 months, have you had a flu vaccination?” were categorized as having received influenza vaccination. Other covariates included age (40-64 and ≥ 65 years), sex, family size (0, 1, and ≥ 2), family income (middle/high income [$\geq 200\%$ of federal poverty limit] and low/poor income [$< 200\%$ of federal poverty limit]), race/ethnicity (non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, and Hispanic), insurance status (insured and uninsured), education level (some college education or more and less than college education), geographic region (Northeast, Midwest, South, and West), usual source of care (yes/no), cardiovascular risk factors, and chronic comorbid conditions.

We used person-level sampling weights to obtain nationally representative results and compared the survey-

weighted proportions of influenza vaccination across sociodemographic characteristics using Rao-Scott χ^2 analyses. We used multivariable survey-specific logistic regression models to assess the association of individual sociodemographic characteristics with influenza vaccination and reported adjusted odds ratios (ORs) and 95% confidence intervals (CIs). To analyze cumulative associations between sociodemographic characteristics and influenza vaccination, we developed a composite model of nongeographic characteristics independently associated with not receiving vaccination. All analyses were performed using Stata, version 14.0 (StataCorp). A detailed methods section is included in [Item S1](#).

Overall, 2.8% of the study population ($n = 5,349$) had CKD, representing 4.1 million US adults annually. Approximately 1 in 3 patients with CKD (31.6%; 95% CI, 30.0%-33.2%), representing 1.3 million adults, did not receive influenza vaccination during the prior year. The general characteristics of the study participants are shown in [Table S1](#). Lack of vaccination was significantly more prevalent among adults aged 40 to 64 years (41.2%), those with a low income (36.4%), without insurance coverage (70.7%), and without a usual source of care (72.4%; [Fig 1](#)). In multivariable analyses, sociodemographic characteristics including lack of insurance (OR, 3.24; 95% CI, 2.13-4.94) and lack of usual source of care (OR, 3.32; 95% CI, 1.76-6.23) were associated with increased adjusted odds of missing influenza vaccination.

Patients with 1, 2, and 3 or more higher-risk sociodemographic characteristics had a stepwise increase in the prevalence of lacking influenza vaccination ([Fig 2](#)). Among adults with 3 or more high-risk characteristics, 73.3% (95% CI, 65.3%-80.0%) lacked influenza vaccination when compared with 20.1% (95% CI, 17.9%-22.5%) among those without any higher-risk characteristic. In adjusted analyses, the presence of 3 or more high-risk characteristics translated into nearly 12-fold higher odds (OR, 11.72; 95% CI, 7.19-19.09) of lacking influenza vaccination.

According to NHIS data, the overall prevalence of annual influenza vaccination coverage among adults with CKD corresponds to previous reports.⁸ Specifically, Ishigami et al⁷ found that approximately 34% to 40% of patients meeting the criteria for CKD lacked vaccination annually. Despite the KDIGO 2012 clinical guidelines (Grade 1A)³ recommending seasonal influenza immunization for all patients with CKD, current vaccination rates remain suboptimal, particularly among patients without insurance and those with a lower family income. Our study identified particularly vulnerable subgroups with CKD in which focused strategies are urgently needed to ensure equitable access to influenza vaccinations to decrease the corresponding risk for morbidity and mortality associated with influenza infection, especially given the combined burden of coronavirus disease 2019 and influenza during winter months.⁹

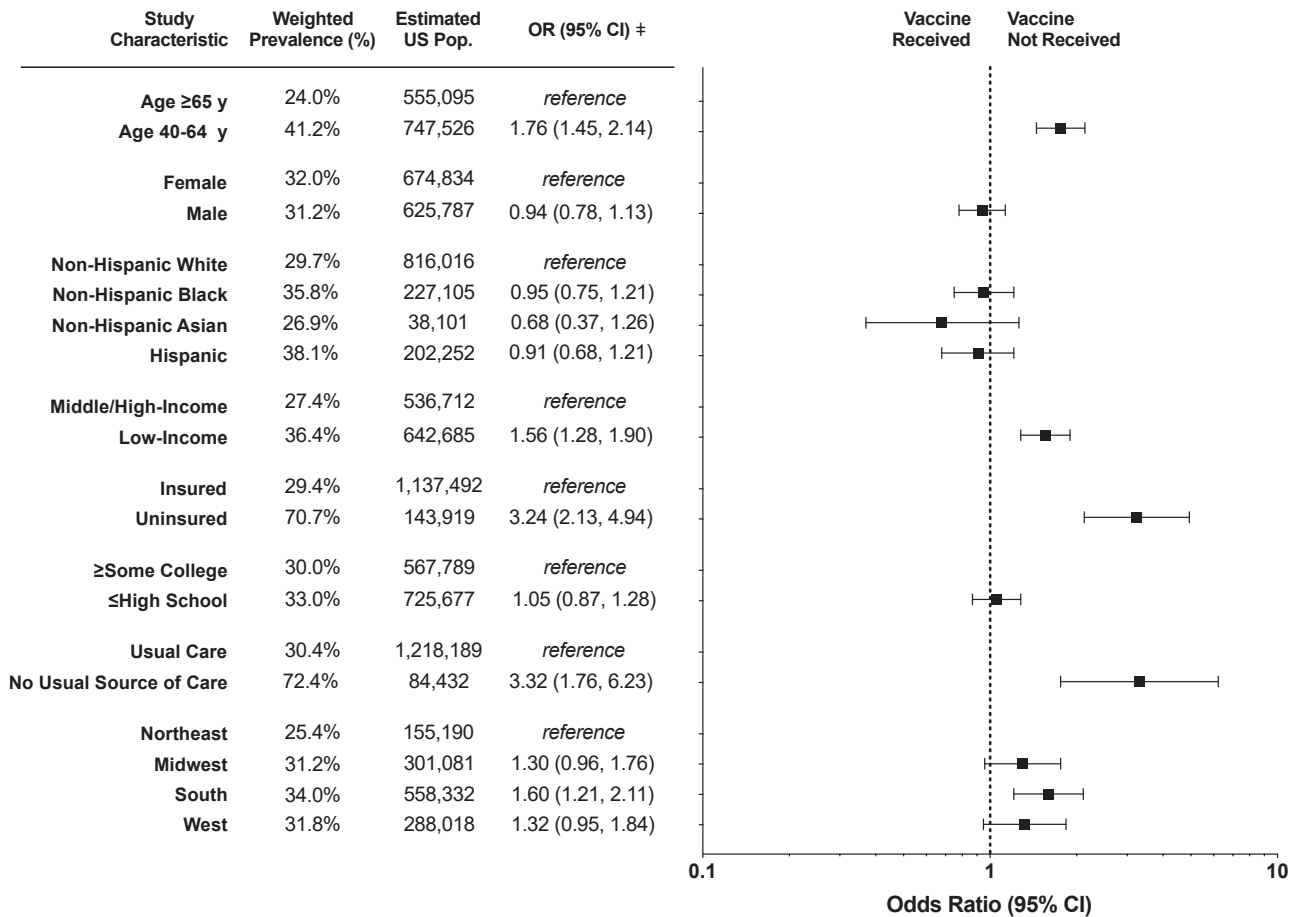


Figure 1. Weighted prevalence and odds ratios (ORs) representing lack of influenza vaccination by sociodemographic characteristics among adults with chronic kidney disease. *Model adjusted for age, sex, race/ethnicity, family income, insurance status, education level, usual source of care, geographic region, cardiovascular risk factors, and comorbid conditions. Error bars indicate 95% CIs. Abbreviation: Pop, population.

The cross-sectional collection of NHIS data prevents us from establishing causal relationships and the self-reported nature of the survey may have introduced recall and/or

misclassification biases. Nonetheless, our findings demonstrate that nearly one-third of US patients with CKD did not receive influenza vaccination in the prior year,

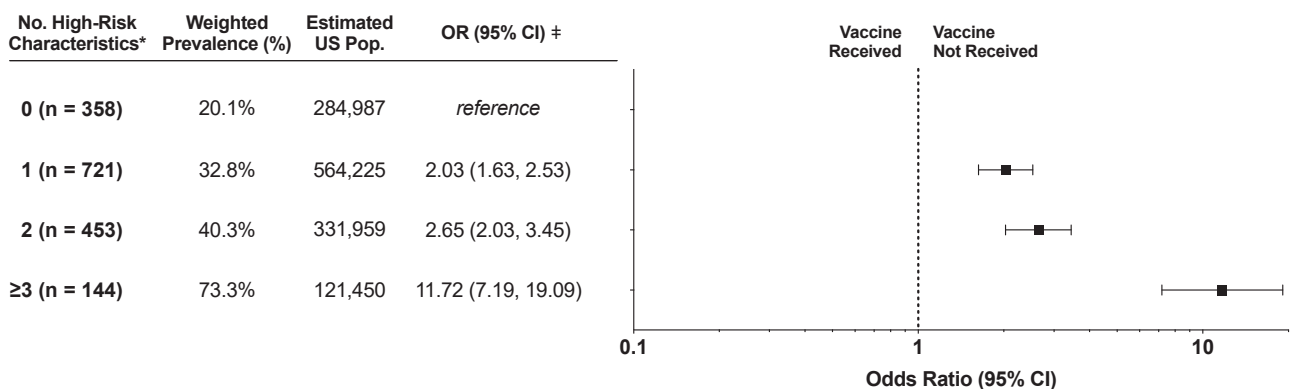


Figure 2. Weighted prevalence and odds ratios (ORs) representing lack of influenza vaccination by number of higher-risk sociodemographic characteristics among adults with chronic kidney disease. *Higher-risk characteristics include age 40 to 64 years, low family income, uninsured status, and lack of usual source of care. ‡Model adjusted for sex, race/ethnicity, education level, geographic region, cardiovascular risk factors, and comorbid conditions. Abbreviation: Pop, population.

which translates to approximately 1.3 million adults annually. These findings should stimulate further research and policy action aimed at enhancing vaccine access, uptake, and coverage among patients with CKD, with special attention to subgroups facing adverse socioeconomic circumstances.

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SUPPLEMENTARY MATERIAL

Supplementary File (PDF)

Item S1. Supplementary Methods

Table S1. General Characteristics of the Study Population by Flu Vaccination Status Among Individuals with Chronic Kidney Disease

ARTICLE INFORMATION

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