

Socioeconomic Disparities in Chronic Kidney Disease



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CKD is a national public health problem that afflicts persons of all segments of society. Although racial/ethnic disparities in advanced CKD including dialysis-dependent populations have been well established, the finding of differences in CKD incidence, prevalence, and progression across different socioeconomic groups and racial and ethnic strata has only recently started to receive significant attention. Socioeconomics may exert both interdependent and independent effects on CKD and its complications and may confound racial and ethnic disparities. Socioeconomic constellations influence not only access to quality care for CKD risk factors and CKD treatment but may mediate many of the cultural and environmental determinants of health that are becoming more widely recognized as affecting complex medical disorders. In this article, we have reviewed the available literature pertaining to the role of socioeconomic status and economic factors in both non-dialysis-dependent CKD and ESRD. Advancing our understanding of the role of socioeconomic factors in patients with or at risk for CKD can lead to improved strategies for disease prevention and management.

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Introduction

CKD is a growing public health problem that has become recognized globally as an important cause of premature morbidity and mortality.¹⁻³ Disparities in CKD may be related to many factors such as socioeconomic status (SES), gender, and race/ethnicity.⁴⁻⁶ Rostand and colleagues⁷ brought national attention to this issue for the first time in the early 1980s when they reported a 4-fold higher race-specific risk for developing ESRD among blacks in Jefferson County, AL, in comparison with their white counterparts. A consistently higher rate of ESRD has subsequently been noted among other racial/ethnic groups over the last 30 years.^{8,9} It should be noted that these high rates of ESRD occur despite similar or even lower prevalence rates of early-stage CKD, reinforcing the need to better understand the multiple factors that conspire to influence progression to ESRD.^{9,10} The excess rate of ESRD among minorities not only levies a personal toll on affected families and communities, but the excess prevalence of ESRD accounts for nearly a

third of the \$45 billion (Medicare and non-Medicare) a year in US ESRD costs alone.⁹

Although disparities in CKD prevalence and progression have generally been thought to be a function of racial/ethnic, gender, or genetic differences influencing the prevalence and/or control of CKD risk factors, such as diabetes and hypertension, the role of the social environment and economic conditions has recently gained greater attention as an important element in the pathway from CKD risk to the development and complications of CKD and ESRD.¹¹ Indeed, the social environment has been cited as a key determinant in the persistence of health inequities in the United States. Despite our recognized standing as a world leader in health technology and medical care, the United States ranks near last in preventable deaths among developed nations.¹² Dr Steven Schroeder, former president of the Robert Wood Johnson Foundation, argued that “since the less fortunate are disproportionately affected by actionable social determinants of health, we must focus on this population to improve the health of the American and concentrate our strategies on health behaviors, social factors, health care, and the environment.”¹³ This serves as a clear directive to establish greater social equity as part of a broad strategy to improve health outcomes among many vulnerable populations.

Theoretic Framework for Adverse Socioeconomic Status and Kidney Disease

Socioeconomically disadvantaged populations across the globe exhibit a disproportionate burden of CKD often complicated by the inability to receive evidence-based care leading to suboptimum clinical outcomes.^{2,14} A basic understanding of the vulnerabilities of the disadvantaged populations will facilitate the adaptation and adoption of the necessary policies to support kidney disease treatment and prevention guidelines.² Moreover, the World Health Organization has identified 3 key tenets to improve health at a global level that each reinforce the impact of socioeconomic factors: (1) improve the conditions of daily life, (2) tackle the inequitable distribution of power, money, and resources—the structural drivers of

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those conditions of daily life—globally, nationally, and locally, and (3) develop a workforce trained in the social determinants of health and raise public awareness about the social determinants of health.¹⁵ The increasing impact of social factors and health behaviors has contributed to the growing CKD epidemic positioning the nephrology community to lead the charge and deal with the challenge of providing quality care in the setting of contrasting financial and public health policies to control costs.¹⁶ A conceptual framework emphasizing the importance of socioeconomics as a mediator of key CKD prevention and treatment pathways highlights its vast impact on the CKD epidemic (Fig 1). The figure shows that many of the determinants of CKD, such as obesity, diabetes, hypertension, and endothelial dysfunction, and chronic inflammation, neurohormonal activation, and oxidative stress may have their foundation in socioeconomic deprivation and its outcroppings or extensions. These include, but are not limited to discrimination and segregation, substandard living conditions, limited quality health care to the uninsured or underinsured, limited health literacy, poor educational systems, and chronic stress that result in measureable and quantifiable pathologic factors that contribute to and enhance the development of CKD and eventually to ESRD and premature mortality.^{4,9,17-20}

Socioeconomic Class and Key Determinants of Health Values

The World Health Organization Commission on Social Determinants of Health has found that poor health of low-income persons is directly related to the social gradient in health within and across countries caused by the unequal distribution of power, income, goods, and services, globally and nationally.¹⁵ Importantly, they have noted that unequal and unfair social policies, poor economic arrangements, and bad politics conspire to cause much of the health inequity in the world. This has been seen dramatically for many years in infectious disease morbidity and mortality and now more recently in chronic diseases such as cardiovascular disease, diabetes, CKD, and others.²¹ Table 1 highlights the influence of socioeconomic class including income on the context of patient specific needs, values, and preferences. An individual's SES may actually considerably affect one's perception of seemingly mundane matters such as food, education, language, and time. Indeed, although these concepts may be apparent and easily recognizable in other social disciplines, their presence and implications may be lost or concealed to many in the medical arena. Therefore, an understanding of how SES may influence world views

is critical for health professionals to truly understand the diverse patients they care for and how to better connect with them to optimize the effectiveness of traditional health strategies and recommendations.

Socioeconomic Status and Non-Dialysis-Dependent CKD

Several studies have highlighted a strong association between SES and the incidence, prevalence, and complications of CKD.²²⁻³² In an analysis of over 14,000 adults in the third National Health and Nutrition Examination Survey III, we found the presence of poverty, defined as less than 200% federal poverty level (FPL), was associated with a 35% greater odds of prevalent microalbuminuria and a 78% greater odds of prevalent macroalbuminuria.²² However, after adjusting for age, sex, race, education, obesity, hypertension, diabetes, reduced estimated glomerular filtration rate (eGFR), and medication use, the odds of prevalent microalbuminuria was less robust but still significant (18%; $P < .05$), but the association with macroalbuminuria was

no longer significant. Importantly, even after multiple statistical adjustments, racial/ethnic differences in macroalbuminuria were more apparent among the subset of less affluent study participants than in those greater than 200% FPL.²² Similarly, albuminuria was found to be associated with lower self-reported annual household income in over 22,500 adult participants of 45 years and older in the Reasons for Geographic and Racial Differences in Stroke Study, where Crews and others²³ also found that after multiple adjustments, the self-reported annual household income less than

\$20,000/y vs more than \$75,000/y had a 1.34 greater odds of albumin to creatinine ratio of 30 to 300 mg/g and 2.36 odds of albumin to creatinine ratio more than 300 mg/g for all participants, and the relationship was more robust for blacks than whites, suggesting that the effect of SES may be a determinant of racial disparities in albuminuria.

An analysis from the baseline examination data of the Jackson Heart Study assessed CKD status (albuminuria or eGFR <60 mL/min/1.73 m²) in over 3400 African American adults living in the Tri-County region of the Jackson, MS, metropolitan area, and found that high SES participants (family income at least 3.5 times the FPL or having at least 1 undergraduate degree) were associated with a 41% lower odds of prevalent CKD than their less affluent counterparts.²⁵ In a cohort of nearly 2500 community-dwelling black and white adults aged 30 to 64 years residing in Baltimore City, MD, stratified by SES (household income $<125\%$ FPL or higher). Crews and colleagues²⁶ found that low SES was independently

CLINICAL SUMMARY

- Socioeconomic factors influence not only access to high-quality care for the treatment of CKD and its risk factors, but they may also mediate biological, cultural, and environmental determinants that impact CKD.
- Socioeconomic factors may also influence epigenetic changes and factors associated with progression of CKD to ESRD and its complications, including early death.
- Evidence-based initiatives to mitigate the effects of socioeconomic deprivation extend from using social media and local networks to increased CKD awareness and to primary intervention strategies aimed at addressing risk factors for CKD among vulnerable communities and high-risk individuals.
- Understanding the vulnerabilities of disadvantaged populations will facilitate the global adaptation and adoption of CKD treatment and prevention guidelines

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