

Socioeconomic and Racial Disparities Related to Chronic Kidney Disease and Type 2 Diabetes

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Diabetes and chronic kidney disease (CKD) are growing public health problems that have become recognized globally as important causes of premature morbidity and mortality (165). According to the Centers for Disease Control and Prevention's National Diabetes Statistics Report, 2020, the overall estimated prevalence of diabetes (both diagnosed and undiagnosed) among U.S. adults is 13%, with higher rates noted for non-Hispanic Asian (14.7%), Hispanic (14.9%), and non-Hispanic Black Americans (16.9%) (166). Type 2 diabetes accounts for as many as 90–95% of diabetes cases, and among people with type 2 diabetes, an estimated 40% will develop microvascular evidence of diabetic kidney disease (DKD) (165). DKD is defined as urinary albumin excretion >30 mg/g creatinine and/or an estimated glomerular filtration rate (eGFR) <60 mL/min/1.73 m² for at least 3 months in the setting of longstanding diabetes and absence of other causes of CKD (167,168). Furthermore, type 2 diabetes is the leading cause of end-stage renal disease (ESRD) in the United States and worldwide (165). DKD disproportionately affects many racial and ethnic minority populations, as well as those with the lowest levels of education and income (169).

A poor social environment has been cited as a key factor in the historic and contemporary health inequities in the United States. Despite its recognized world leadership in health technology and medical care, the United States continues to rank last or near last among developed nations in preventable deaths (170). Steven A. Schroeder, MD, former president of the Robert Wood Johnson Foundation, has remarked that “Since all the actionable determinants of health—personal behavior, social factors, health care, and the environment—disproportionately affect the poor, strategies to improve national health rankings must focus on this population” (171). This serves as a clear directive to establish greater social equity and justice as part of a broad strategy to improve health outcomes and reduce health disparities.

Theoretical Framework for Adverse Socioeconomic Status and DKD

The major social determinants of health (SDOH) are societal resources such as education, employment, housing, health insurance, access to quality foods, access to quality health care, and more that occur in the setting in which people are born, grow up, live, work, and age (172–174). Inequities in the distribution of these structural and system-level resources with disinvestment in many racial and ethnic minority communities contribute to disparities in DKD incidence, progression, and complications. In

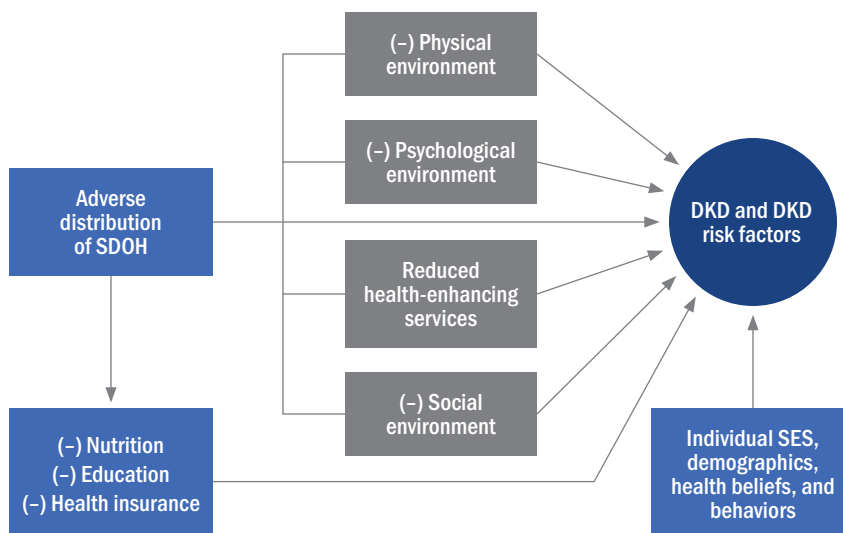
the United States, this maldistribution of resources was established through historic discriminatory laws, policies, and practices specifically designed to disinvest in racial and ethnic minority communities and is termed “structural racism” (175,176). Many of these biased systems and practices continue today, and, with rare exceptions, there have been no efforts to establish equity in the distribution of SDOH to correct for longstanding deficits. This situation perpetuates health inequities and their downstream effects for racial and ethnic disparities for people with or at risk for DKD, as well as many other related medical conditions (175–177). Lack of access and exposure to high-quality SDOH can lead to a cascade of health risks for conditions such as DKD that include, but are not limited to, poor nutrition, being un- or underinsured, psychosocial stress, and depression (172–174,178,179), as well as what is called “weathering”—the health disadvantage resulting from cumulative lifetime exposure to adverse socioeconomic conditions and discrimination (180).

The World Health Organization has identified three key elements to improving health at a global level that are highly relevant for reducing disparities: 1) improve the conditions of daily life, 2) tackle the inequitable distribution of power, money, and resources—the global, national, and local structural drivers of those conditions of daily life, and 3) develop a workforce trained in and raise public awareness about SDOH (181). To this end, a conceptual framework capturing key pathways through which socioeconomic disinvestment mediates DKD development, progression, and complications is presented in **Figure 1** (182).

Socioeconomic Status and Key Determinants of Health Values

The World Health Organization's Commission on Social Determinants of Health has found that poor health of low-income individuals is directly related to the social gradient in health within and across countries that is caused by the unequal distribution of power, income, goods, and services, both globally and nationally (181). Importantly, the commission has 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, and DKD (171,181). Socioeconomic status (SES) may considerably affect one's perception and values of seemingly mundane matters such as food, education, language, and worldview (183). These

FIGURE 1 SDOH and DKD. (-) indicates negative or adverse impact. Adapted from Wen M, Browning CR, Cagney KA. *Soc Sci Med* 2003;57:843–860.



perceptions can influence how patients prioritize many competing risks, and providers need to be cognizant of how these competing risks may affect health care recommendations. Key SDOH that most directly affect patients with or at risk for DKD are discussed below.

Nutrition

Low-income and minority communities face disparities in access to quality food caused by what are often described as “food deserts” (184). There are fewer supermarkets and more liquor stores and small convenience stores that sell little fresh produce or nutrient-dense foods and instead sell mostly high-fat, high-sugar, and energy-dense foods (184). Poor nutrition can adversely affect glycemic control and DKD progression.

Green Space Exposure

Low-income and minority communities suffer from reduced green spaces and reduced safety to use such spaces for exercise, a crucial component of DKD care. People who are exposed to more green spaces, especially within their own neighborhood, have been found to have an increased likelihood of physical activity and reduced risks of developing obesity and type 2 diabetes (185). Access to and use of green spaces can increase physical activity levels and thereby moderate the onset and progression of type 2 diabetes and DKD (185).

Education

Level of educational attainment has been shown to be associated with barriers to care in people with DKD. A variety of studies have demonstrated that level of education is related to control of DKD risk factors, as well as progression of DKD (184). Because educational attainment is not uniformly distributed across racial

and ethnic groups, the adverse effects of limited education on DKD development and progression are more heavily levied on racial and ethnic minority populations.

SES

SES has also been shown to be associated with barriers to care for people with DKD. Several studies have demonstrated that higher income level is related to enhanced control of DKD risk factors and reduced progression of DKD (184). Because SES also is not uniformly distributed across racial and ethnic groups, the effects of low SES also have a greater impact on DKD in racial and ethnic minority populations (186).

Health Care Literacy

Health care literacy is commonly recognized as the cognitive skills needed to function effectively in the health care environment. Health care literacy is strongly associated with, but does not necessarily follow, an individual’s level of educational attainment. In general, poor health literacy is associated with increased hospitalizations and emergency room use, reduced use of preventive services, and lower rates of medication adherence (184). Thus, low health care literacy may also contribute to racial and ethnic disparities in health service utilization and health outcomes for patients with DKD (184).

Health Insurance and Access to Care

In the United States, people with DKD who are un- or underinsured are less likely to receive adequate treatment for DKD risk factors such as hypertension, diabetes, and obesity and are also less likely to receive quality DKD care compared to individuals with DKD who have adequate health insurance (184). Racial and ethnic minorities in the United States are more likely to be un- or underinsured,

which contributes to DKD disparities (184). Lack of insurance can affect the affordability of medications and other aspects of care and delay timely nephrology referral for cases in which DKD is progressing, and these delays can contribute to earlier progression to kidney failure (169).

Special Considerations

Several unique aspects of racial and ethnic disparities have received more attention since the beginning of the coronavirus 2019 pandemic, highlighting social injustices and spurring global racial justice protests. In medicine, these events have prompted a closer examination of how race and ethnicity are used in research and clinical care. In the United States, race generally refers to someone's socially assigned phenotypic appearance, whereas ethnicity is commonly defined by culture and language (187). In a racially stratified society, race is a risk factor for racism, and it is racism that is the risk factor for poor health and disease. Race is who society says you are, and racism is what society does to you based on how it has categorized you.

By contrast, ancestry usually refers to one's homeland and, in medicine, the genetic variation within one's homeland. Importantly, ancestry is not directly related to race, although there may be some association, and even ancestry is difficult to ascertain given the tremendous admixture of racial and ethnic groups in the United States. This concept is important in understanding the genetic risk for CKD related to two relatively recently identified independent coding variants in the apolipoprotein L1 gene (APOL1), G1 and G2, which are found almost exclusively in people with recent West African ancestry (188,189). An estimated 13% of Black individuals in the United States have two APOL1 alleles, placing them at high risk for CKD (190), but racial group is a very poor surrogate for trying to identify the presence of APOL1 alleles associated with high risk for CKD. Although the majority of people with a high-risk APOL1 genotype will not develop CKD, there is presently no way to predict who and will not be affected. A two-hit hypothesis has been proposed that suggests that a high-risk APOL1 genotype alone does not lead to CKD, but a second hit, such as activation of a disease state or modifier genes, is required to initiate nephropathy (191). However, people with type 2 diabetes and APOL1 alleles associated with high risk for CKD do not appear to have an increased likelihood of developing DKD (191).

Another contentious issue that is relevant for people with DKD is the use of race in the formula for determining eGFR. The commonly used CKD-EPI (Chronic Kidney Disease Epidemiology Collaboration) and MDRD (Modification of Diet in Renal Disease) study equations apply a race modifier of 1.16 and 1.21, respectively, for Black individuals (192,193). The increased value resulting from the modifier may delay care for Black Americans, who are at highest risk for progression to kidney failure (194). In addition, unlike age, race is a social construct and is not a biological variable. The use of race as a biological variable in

individual-level formulas or algorithms is methodologically flawed and termed an "ecological fallacy" (195). Also, because there is a large degree of social and genetic heterogeneity within and across racial groups, assigning a single value to each Black individual represents a substantial aggregation bias (195). This is why we do not add or subtract a given value to each Black person's blood pressure measurement despite group differences in mean blood pressure levels. One's individual blood pressure level is what is measured. Many institutions have eliminated the use of race from the eGFR calculation, but formal recommendations regarding this issue from the National Kidney Foundation/American Society of Nephrology eGFR Workgroup have yet to be announced.

The Way Forward

In its *Standards of Medical Care in Diabetes—2021*, the American Diabetes Association (ADA) included recommendations for improving care and promoting health at a population level, including 1) ensuring that treatment decisions are timely, rely on evidence-based guidelines, and are made collaboratively with patients based on individual preferences, prognoses, and comorbidities; 2) aligning approaches to diabetes management with the Chronic Care Model to emphasize person-centered team care, integrated long-term treatment approaches to diabetes and comorbidities, and ongoing collaborative communication and goal-setting between all team members; 3) ensuring that care systems facilitate team-based care and utilization of patient registries, decision-support tools, and community involvement to meet patient needs; and 4) providing diabetes health care maintenance using reliable and relevant data metrics to improve processes of care and health outcomes, with attention to care costs (196). Although these recommendations are not specific to DKD, a multidimensional support program (i.e., one that includes disease knowledge, self-management, and motivation skills) addressing many of these recommendations has been shown to improve A1C, albuminuria, and physical activity in patients with DKD (197). Multidisciplinary care with a team composed of a primary care provider, nephrologist, diabetes educator, dietitian, social worker, pharmacy specialist, and nephrology nurse was also reported to significantly reduce the annual decline in eGFR (to approximately half the rate) compared to patients with usual care (184).

As noted above, multiple barriers to quality DKD care exist at the community level, especially in high-risk communities, and include having low health literacy, being un- or underinsured, and facing difficulty in accessing quality care. Other important barriers include lack of trust in the health system, which is related to poor treatment, and lack of respect as a fellow American, both within and outside of the health care system (172–174). Effective approaches to counter the impact of the maldistribution of SDOH that disproportionately afflicts racial and ethnic minority communities and DKD care are challenging because of the longstanding disinvestment in racial and ethnic minority communities.

Overcoming these barriers requires additional tailoring to the ADA recommendations summarized above to improve care and promote health at a population level in marginalized communities. The use of lay health educators or patient navigators, mobile clinics, and engagement of community-based and allied health professionals in early DKD management may also be effective (184,198,199). Working with social support networks in interventions that include patients' family members or close friends can assist in implementing and increasing adherence to DKD recommendations for lifestyle, nutrition, and pharmacologic therapy (198,199). With recognition that health literacy, educational attainment, and cultural beliefs and behaviors can vary widely across the diverse array of communities in our nation, several efforts to adapt existing educational materials to enhance DKD messaging should be undertaken and can include the use of novel strategies such as novellas or other short stories, brief videos, and social or digital media (198–200).

Conclusion

DKD remains a major health care issue and is beset by significant disparities in its incidence, progression, and complications.

DKD disproportionately affects racial and ethnic minorities, as well as individuals with more limited education, lower SES, un- or underinsured status, and reduced access to health care. Because many barriers exist, population strategies are needed to increase DKD awareness, activate multidimensional support, and promote timely, high-quality care. The medical community should leverage its privilege to help advance progressive policy changes needed to address the inequitable distribution of SDOH and to fill gaps resulting from long-term disinvestment in racial and ethnic minority communities. Doing so would further efforts to reduce racial and ethnic health disparities and improve trust in the health care system within marginalized communities, improve health outcomes for all members of society, and assist our nation in manifesting its full potential.

See references starting on p. 34.

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