



Racial and Ethnic Disparities

Highlights

- Applying the new CKD-EPI creatinine-based equation refitted without a race variable resulted in a lower estimate of the prevalence of CKD stages 3-5 (i.e., eGFR <60 ml/min/1.73m²) in the U.S. of 5.3%, compared with 6.4% with the 2009 equation. The prevalence of stage 3-5 CKD decreased from 7.7% to 5.8% among White individuals and increased from 6.4% to 9.3% among Black individuals.
- The percentage of Black Medicare beneficiaries in the highest category (most deprivation) of neighborhood Social Deprivation Index (SDI; 58.6%) was more than 2.5 times as high as the percentage of White beneficiaries (21.5%). The percentage of Hispanic beneficiaries (65.1%) was 3 times that of White beneficiaries. Only 10.5% of Hispanic and 15.5% of Black beneficiaries lived in neighborhoods in the lowest range of SDI scores (least deprivation).
- Black and Hispanic patients were not less likely to receive angiotensin converting enzyme inhibitors (ACEis) or angiotensin receptor blockers (ARBs), potassium binders, phosphorus binders, or sodium-glucose cotransporter-2 inhibitors (SGLT2is) than White beneficiaries. Hispanic patients were actually more likely to receive all of these medications.
- Black beneficiaries with CKD had higher rates of nephrology visits than White beneficiaries at every stage of CKD.
- Medicare beneficiaries with a higher neighborhood SDI score (more deprivation) were more likely to experience acute kidney injury (AKI) than those living in neighborhoods with less deprivation.
- The rate of ESRD was higher among individuals living in areas with worse SDI scores regardless of race/ethnicity. However, racial/ethnic differences in the rate of ESRD persisted within SDI categories.
- Hispanic individuals in all age groups were more likely to have ESRD caused by diabetes (DM) than White or Black individuals. Black individuals in all age groups were more likely to have ESRD caused by hypertension than White or Hispanic individuals.
- Although White patients were more likely to be dialyzing at home than Black or Hispanic patients within each stratum of neighborhood SDI, differences across levels of SDI were larger than differences among race groups within SDI categories.
- Among all race/ethnicity groups, those living in neighborhoods with higher SDI scores (higher deprivation) were substantially less likely to have been preemptively waitlisted for a kidney transplant. Nevertheless, White patients were more likely to be waitlisted than Black or Hispanic patients from neighborhoods with SDI scores in the same range.
- Within all race/ethnicity groups, patients living in neighborhoods with high SDI scores (more deprivation) had much lower rates of receipt of a living donor kidney transplant. However, large disparities by race/ethnicity persist within and across strata of neighborhood SDI.

Introduction

Racial and ethnic disparities in access to medical care and health outcomes persist in the U.S. Unfortunately, patients with kidney disease experience particularly large and well documented disparities. For example, the incidence of ESRD in 2019 was higher among Black individuals than among other racial groups and was more than 3 times that of the White population (ESRD Volume, Figure 1.4). Black patients with ESRD are less likely to be placed on the waiting list for a kidney transplant and less likely to receive one than their White counterparts. Although these issues have been well studied and have improved in some cases, recent clinical and societal events have highlighted the continued presence of significant racial and ethnic disparities in treatment of patients with CKD and ESRD. Specifically, the routine practice of including Black race as a factor in estimation of glomerular filtration rate (GFR) has been in the spotlight as an example of potentially harmful consideration of race in clinical medicine – that is, as a practice that might introduce or worsen disparities. Further, the COVID-19 pandemic resulted in dramatically higher rates of infection, hospitalization, and death among Black and Hispanic patients than among White patients, uncovering major vulnerability that had been under-recognized, perhaps because of the lower overall mortality of Black and Hispanic patients receiving maintenance dialysis compared with White patients.

Considering the ongoing disparities faced by patients with CKD and these recent developments, this year's ADR includes a special supplement on racial and ethnic disparities. This chapter does not replace race and ethnicity stratified data on key metrics (e.g., incidence and prevalence of CKD and ESRD, rates of kidney transplantation), which are presented throughout the ADR in the relevant chapters. Rather, we have attempted in this supplement to delve further into potential reasons for worse outcomes among Black and Hispanic patients throughout the spectrum of kidney disease, including CKD, AKI, ESRD, and transplantation. Two areas of particular focus are processes of care and social determinants of health, and we examine the extent to which these might contribute to racial and ethnic disparities.

In response to a national call for reevaluation of the use of race in clinical algorithms, the National Kidney Foundation (NKF) and the American Society of Nephrology (ASN) established a joint task force to reassess inclusion of race in the estimation of GFR in the U.S. and implications of this strategy on diagnosis and management of patients with or at risk for kidney disease (Delgado et al., 2021). After 10 months of intense investigation and deliberation, the task force put forth a recommendation that hospitals and laboratories in the U.S. should immediately transition to use of a new refitted GFR estimating equation that does not include race (Delgado et al., 2021; Inker et al., 2021). This chapter includes an examination of how application of this new equation affects estimates of the prevalence of CKD among Black and non-Black individuals in the U.S. and how CKD stage is reclassified in these groups.

We then examine use of International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) diagnostic codes related to social determinants of health (SDOH; Z codes). Finding little utilization of these codes, we turn to the Social Deprivation Index (SDI) (Robert Graham Center, 2021), which was developed to quantify levels of disadvantage across small areas, evaluate their associations with health outcomes, and address health inequities. The SDI is a composite measure incorporating seven demographic characteristics collected in the American Community Survey (ACS): percentage of residents living in poverty, percentage with less than 12 years of education, percentage of single parent households, percentage living in rented housing units, percentage living in overcrowded housing units, percentage of households without a car, and percentage of adults under 65 years of age who are non-employed. A disadvantage of the SDI is that, unlike Z codes, it estimates SDOH at the level of an individual's neighborhood rather than at the individual patient level. However, unlike Z codes, which appear to be grossly underutilized, a neighborhood SDI score can be calculated for each patient, allowing examination of the association of SDOH with outcomes that is potentially less biased (but also less direct). We then examine differences in processes of care and outcomes by race and ethnicity across the spectrum of kidney disease and the extent to which SDOH is associated with outcomes independent of race and ethnicity.

Methods

To address racial and ethnic disparities in all phases of CKD, this chapter includes data from several sources. We begin with an examination of the prevalence of CKD stages 3-5 (eGFR <60 ml/min/1.73m²) in the U.S. population using data from the National Health and Nutrition Examination Survey (NHANES) from 2015-2018. In this population, we estimate GFR using the CKD-EPI creatinine-based equation that is in use by most laboratories and health care systems in the U.S. and includes an adjustment term for Black race (Levey et al., 2009). We then estimate GFR using the new CKD-EPI creatinine-based equation that was refitted without a term for Black race (Inker et al., 2021). We compare the prevalence of CKD stages 3-5 according to these two methods and examine reclassification across CKD stages 3-5 using the new equation overall and among strata defined by age, sex, and race/ethnicity.

A key goal of this chapter is to examine how processes of care and outcomes differ by social determinants of health, the conditions of an individual's living, learning, and working environments that affect health risks and outcomes (Centers for Disease Control and Prevention, 2020). We examine use of "Z" codes within Medicare claims data among individuals with CKD and ESRD. Z codes are ICD-10 CM encounter reason codes (Z55-Z65) that can be used to document SDOH data (Centers for Medicare & Medicaid Services, 2021). The main Z code categories and their descriptions are listed below.

- Z55: Problems related to education and literacy
- Z56: Problems related to employment and unemployment
- Z57: Occupational exposure to risk factors
- Z59: Problems related to housing and economic circumstances
- Z60: Problems related to social environment
- Z62: Problems related to upbringing
- Z63: Other problems related to primary support group, including family circumstances
- Z64: Problems related to certain psychosocial circumstances
- Z65: Problems related to other psychosocial circumstances

Because use of Z codes is extremely rare, we use a neighborhood-level social deprivation index to examine associations between SDOH and outcomes. Specifically, we use the U.S. SDI, developed by the Robert Graham Center, the policy institute affiliated with the American Academy of Family Physicians (Phillips et al., 2016; Robert Graham Center, 2021), at the ZIP code Tabulation Area (ZCTA) level (United States Census Bureau, 2020). The domains of the SDI are listed below.

- Income: Percentage of the population with income less than 100% of the federal poverty limit
- Education: Percentage of the population aged ≥25 years with less than 12 years of education
- Employment: Percentage of the population aged ≤65 years that is non-employed
- Housing: Percentage of the population living in renter-occupied housing units
- Housing: Percentage of the population living in crowded housing units
- Household characteristics: Percentage of single-parent households with dependents <18 years of age

- Transportation: Percentage of the population with no car

We examine SDI distribution by race among patients with CKD and ESRD and then examine outcomes by race and SDI. Although this chapter focuses primarily on disparities faced by Black individuals, we also consider Hispanic ethnicity for some outcomes for which a large enough population was available. (However, for several analyses in the CKD population, in particular, the sample was not large enough to allow this, particularly for stratifications within race groups.) In the ESRD population where sample size is less of a concern, we examine the country of origin among Hispanic patients with ESRD overall and by region to better understand the diversity within this ethnic group.

Figure 14.1a Prevalence of CKD using the original versus the newly recommended CKD-EPI creatinine-based equations for estimated GFR, by CKD stage and demographic characteristics

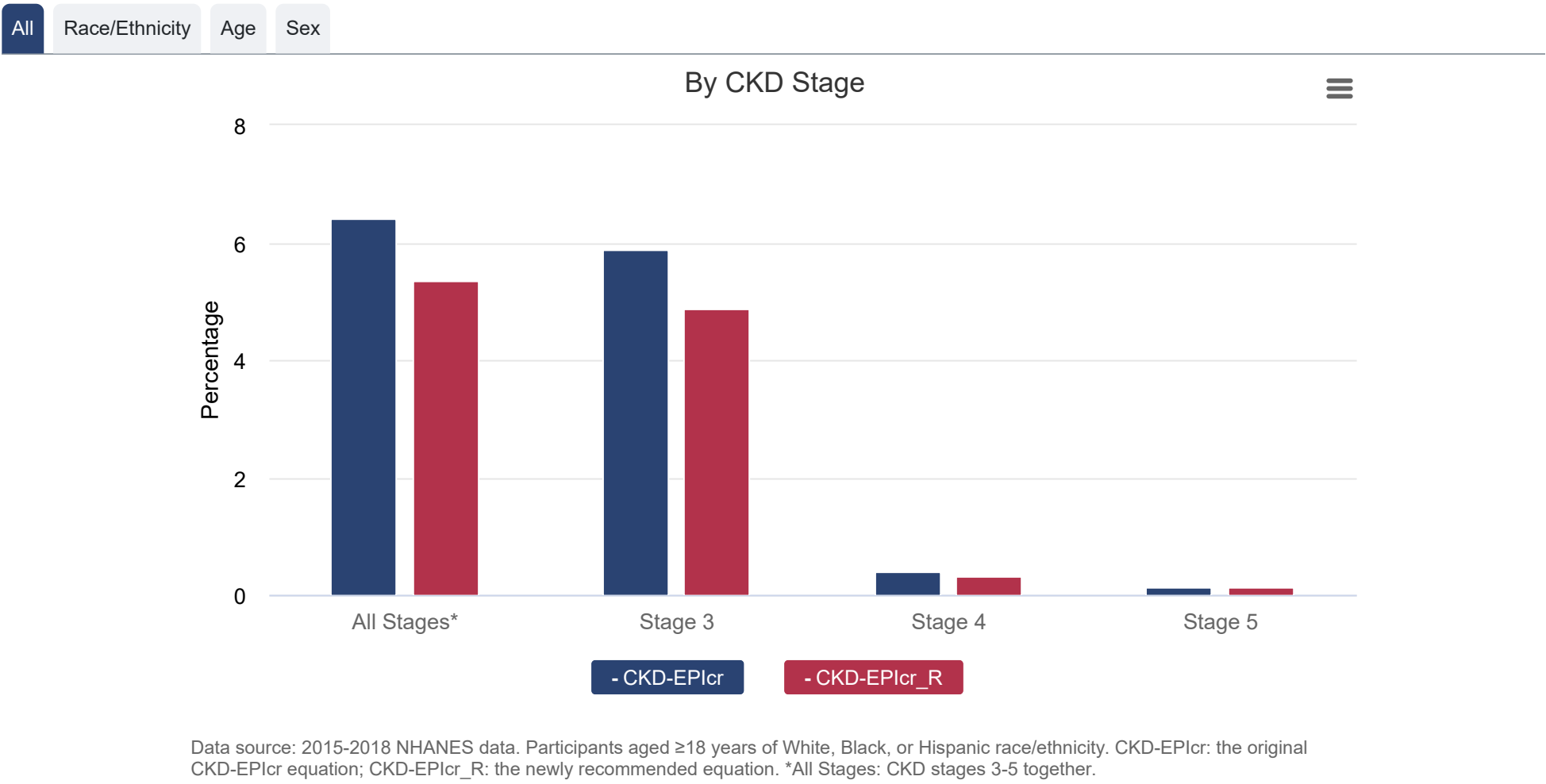


Figure 14.1a shows the prevalence of eGFR <60 ml/min/1.73m² using the CKD-EPI creatinine-based equation (Levey et al., 2009) and using the newly refitted CKD-EPI creatinine-based equation without a term for Black race (Inker et al., 2021) among White, Black, and Hispanic participants in the NHANES from 2015-2018. Using the newly refitted CKD-EPI equation resulted in a lower prevalence of CKD stages 3-5 of 5.3%, compared with 6.4% with the 2009 equation. As expected, most of the difference was in the prevalence of CKD stage 3, which was 4.9% with the new equation compared with 5.9% with the traditional equation.

Use of the new equation decreased the prevalence of CKD from 7.7% to 5.8% among White individuals and from 2.9% to 2.4% among Hispanic individuals but increased the prevalence from 6.4% to 9.3% among Black individuals. Applying the new equation reduced the prevalence of CKD by 19.3% among men and 15.5% among women.

Figure 14.1b Prevalence of CKD using the original versus the newly recommended CKD-EPI creatinine-based equations for estimated GFR, by demographic combinations

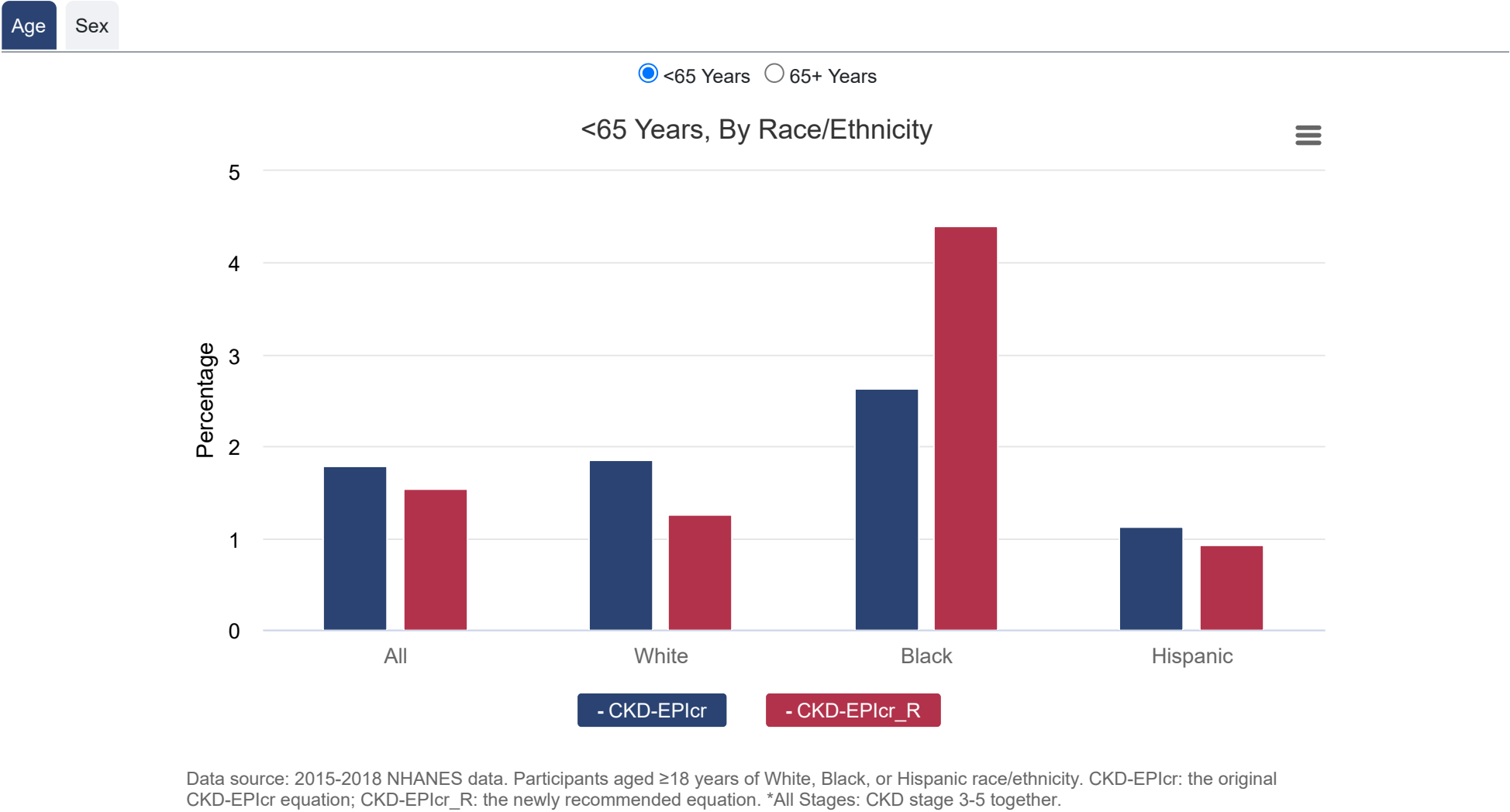


Figure 14.1b examines changes in prevalence of CKD in subgroups defined by race/ethnicity in combination with age and sex. The magnitude of the increase in CKD prevalence using the new equation among Black individuals was greater among men than among women. Although the absolute increase in prevalence of CKD among younger Black individuals using the new equation was smaller than the increase among older individuals, the relative increase among younger Black individuals was 69% compared with a 36.0% increase among older Black individuals.

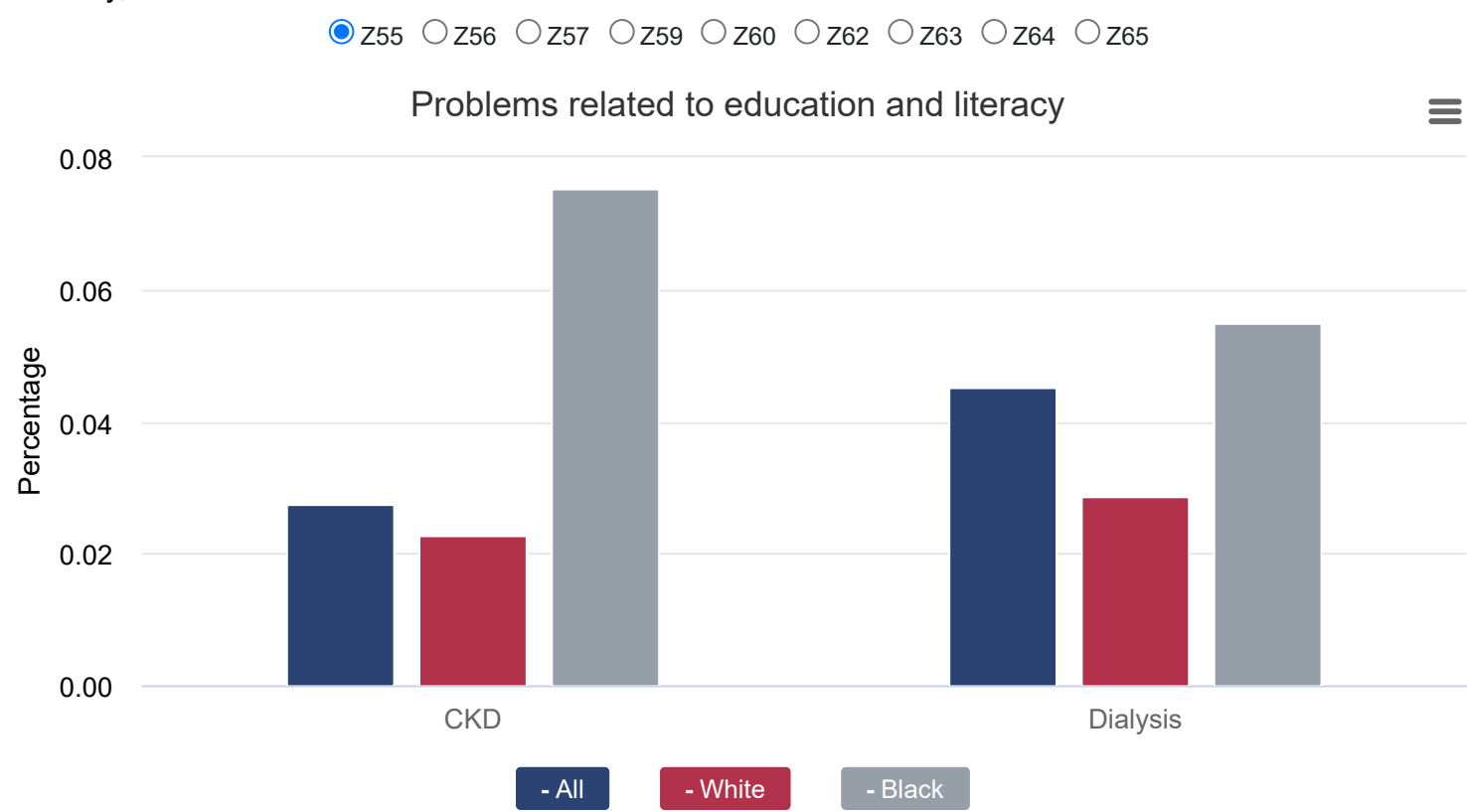
Table 14.1 Reclassification among CKD stages using the original versus the newly recommended CKD-EPI creatinine-based equations for eGFR, by demographic characteristics

NKF-ASN newly recommended CKD-EPI creatinine-based equation											
All						White					
	eGFR ≥60	Stage 3a	Stage 3b	Stage 4	Stage 5	eGFR ≥60	Stage 3a	Stage 3b	Stage 4	Stage 5	
Original CKD-EPI creatinine-based equation	eGFR ≥60	99.65	0.35	-	-	-	100.00	-	-	-	-
	Stage 3a	32.06	66.39	1.55	-	-	34.97	65.03	-	-	-
	Stage 3b	-	25.59	72.45	1.96	-	-	32.28	67.72	-	-
	Stage 4	-	-	24.09	72.98	2.98	-	-	30.67	69.33	-
	Stage 5	-	-	-	8.75	91.25	-	-	-	12.72	87.28
	Black					Hispanic					
	eGFR>60	96.82	3.18	-	-	-	100	-	-	-	-
	Stage 3a	-	81.16	18.84	-	-	27.02	72.98	-	-	-
	Stage 3b	-	-	85.44	14.56	-	-	15.16	84.84	-	-
	Stage 4	-	-	-	85.25	14.75	-	-	16.33	83.67	-
	Stage 5	-	-	-	-	100.0	-	-	-	11.21	88.79
	Aged <65 Years					Aged ≥65 Years					
	eGFR>60	99.79	0.21	-	-	-	98.93	1.07	-	-	-
	Stage 3a	32.46	66.04	1.50	-	-	31.92	66.51	1.56	-	-
	Stage 3b	-	28.76	58.83	12.41	-	-	25.27	73.84	0.90	-
	Stage 4	-	-	19.53	76.36	4.11	-	-	25.58	71.88	2.55
	Stage 5	-	-	-	6.13	93.87	-	-	-	12.11	87.89
	Female					Male					
	eGFR>60	99.64	0.36	-	-	-	99.68	0.32	-	-	-
	Stage 3a	30.07	68.46	1.48	-	-	34.42	63.95	1.63	-	-
	Stage 3b	-	30.80	68.27	0.93	-	-	16.09	80.07	3.83	-
	Stage 4	-	-	21.41	76.99	1.60	-	-	28.71	66.07	5.22
	Stage 5	-	-	-	23.18	76.82	-	-	-	-	100.00

Data source: 2015-2018 NHANES data. Participants aged ≥18 years of White, Black, or Hispanic race/ethnicity.

Table 14.1 shows reclassification of individuals among CKD stages when converting from the 2009 CKD-EPI equation with a coefficient for Black race to the newly recommended CKD-EPI creatinine-based equation. At all stages, a substantial percentage of White and Hispanic individuals are reclassified into a less severe stage of CKD using the new equation, whereas smaller percentages of Black individuals are reclassified into more severe stages of CKD. For example, approximately one third of White individuals with CKD stage 3a according to the older equation are classified as having an eGFR >60 ml/min/1.73m² with the new equation, and one third of patients with CKD stage 3b are reclassified as having stage 3a. By contrast, approximately 18% of Black individuals with CKD stage 3a, 15% of those with stage 3b, and 15% of those with stage 4 are reclassified as stage 3b, 4, and 5, respectively.

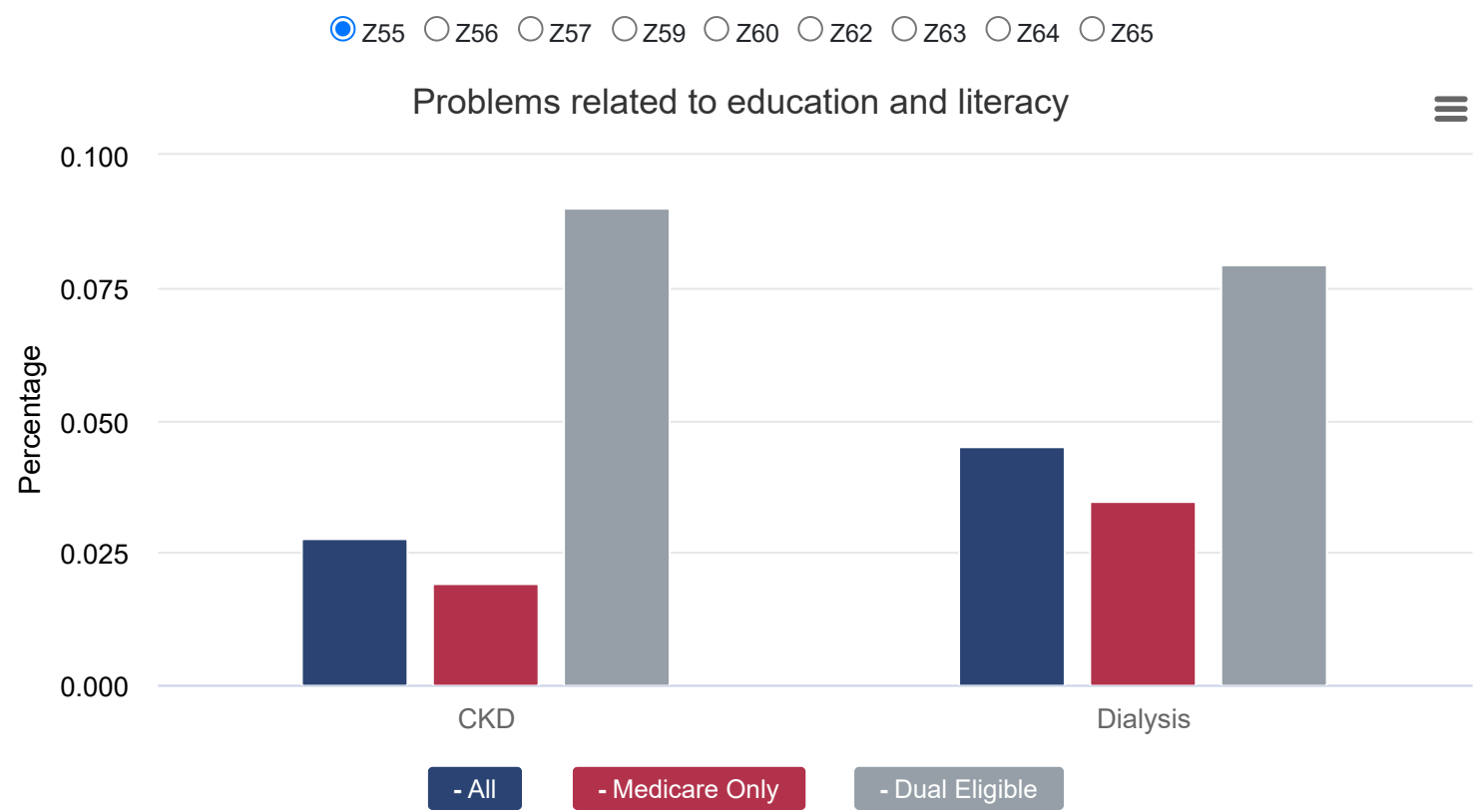
Figure 14.2a Percentage of patients with claims including Medicare Social Determinants of Health codes in older CKD and dialysis patients, by race/ethnicity, 2019



Data source: Medicare 5% random sample database (for CKD cohort) and USRDS ESRD database (for dialysis cohort). CKD cohort: December 31, 2019 point prevalent Medicare fee-for-service (FFS) beneficiaries with Parts A and B, aged ≥ 66 years, with diagnosis of CKD stages 3-5, and of White, Black, or Hispanic race/ethnicity. Dialysis cohort: 2019 period prevalent dialysis patients, covered by Medicare FFS Parts A and B and of White, Black, or Hispanic race/ethnicity.

Figure 14.2a presents the frequency of use of Medicare “Z” codes that can be used to document data on SDOH by race among older Medicare beneficiaries with CKD and ESRD. No Z code was used among more than 1% of beneficiaries aged ≥ 66 years with CKD or ESRD. Problems related to housing and economic circumstances (Z59), problems related to the social environment (Z60), and other problems related to primary support group (Z63) were the most commonly used codes. Problems related to housing and economic circumstances include homelessness, inadequate or unstable housing, extreme poverty, and low income among other specific circumstances. These codes were used more frequently in encounters with Black patients, particularly for beneficiaries with ESRD (1.06% for Black patients vs. 0.81% for White patients). However, the code for problems related to the social environment (Z60), which can include problems with living alone, social exclusion and rejection, and being the target of adverse discrimination and persecution, was used slightly more commonly among White beneficiaries with ESRD (0.85% vs. 0.67% among Black beneficiaries). Problems related to primary support group (Z63), which includes separation and divorce, death of a family member, and alcoholism or addiction in the family, among other problems, was also used slightly more commonly among White beneficiaries.

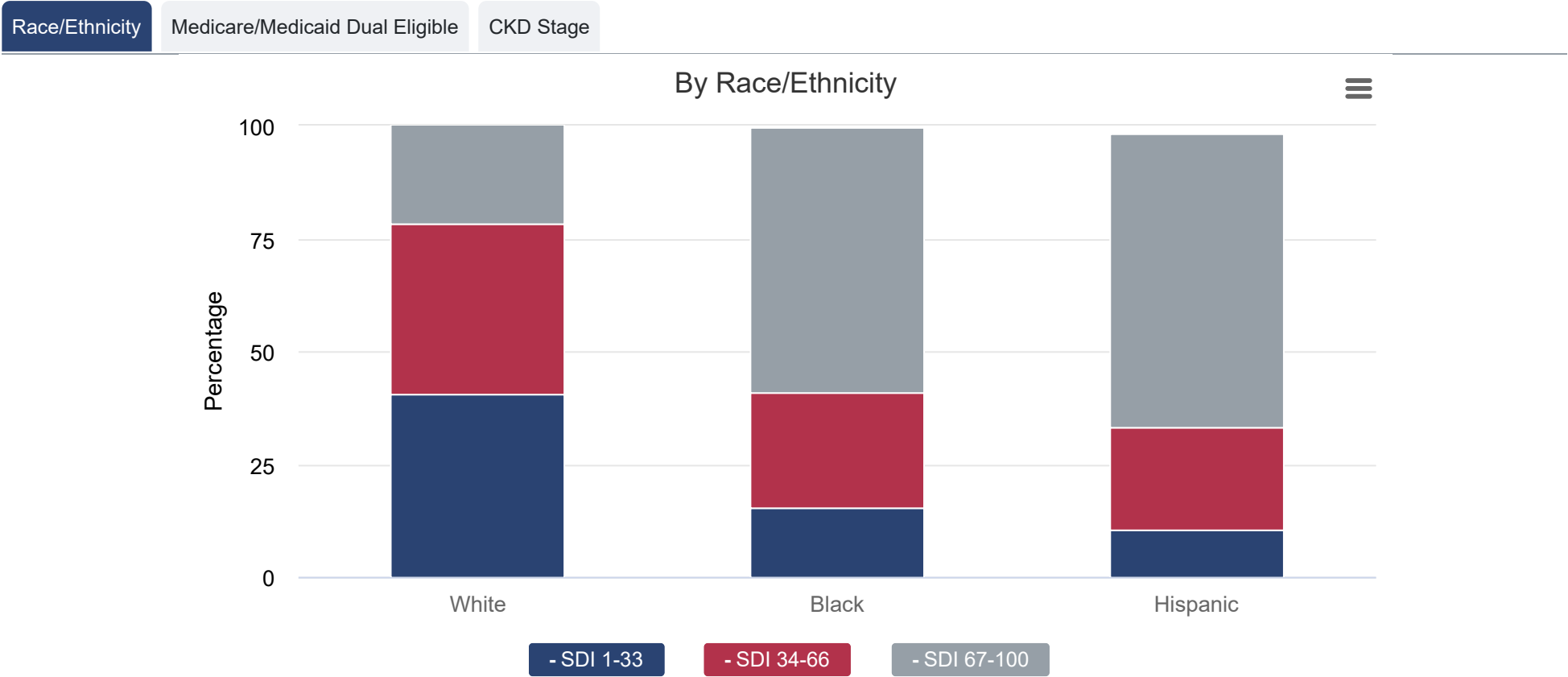
Figure 14.2b Percentage of patients with Medicare claims with Social Determinants of Health codes in older CKD and dialysis patients, by Medicare/Medicaid dual eligible status, 2019



Data source: Medicare 5% random sample database (for CKD cohort) and USRDS ESRD database (for dialysis cohort). CKD cohort: December 31, 2019 point prevalent beneficiaries covered by Medicare FFS for Parts A and B, aged ≥66 years, with diagnosis of CKD stages 3-5, and of White, Black, or Hispanic race/ethnicity. Dialysis cohort: 2019 period prevalent dialysis patients covered by Medicare FFS Parts A and B and of White, Black, or Hispanic ethnicity.

Dual eligibility for Medicare and Medicaid is often used as a proxy for low socioeconomic status. Figure 14.2b examines the frequency of Medicare “Z” codes that can be used to document data on SDOH by dual eligible status. All Z codes are used more often among dually eligible beneficiaries, but these codes are rarely used even in this population.

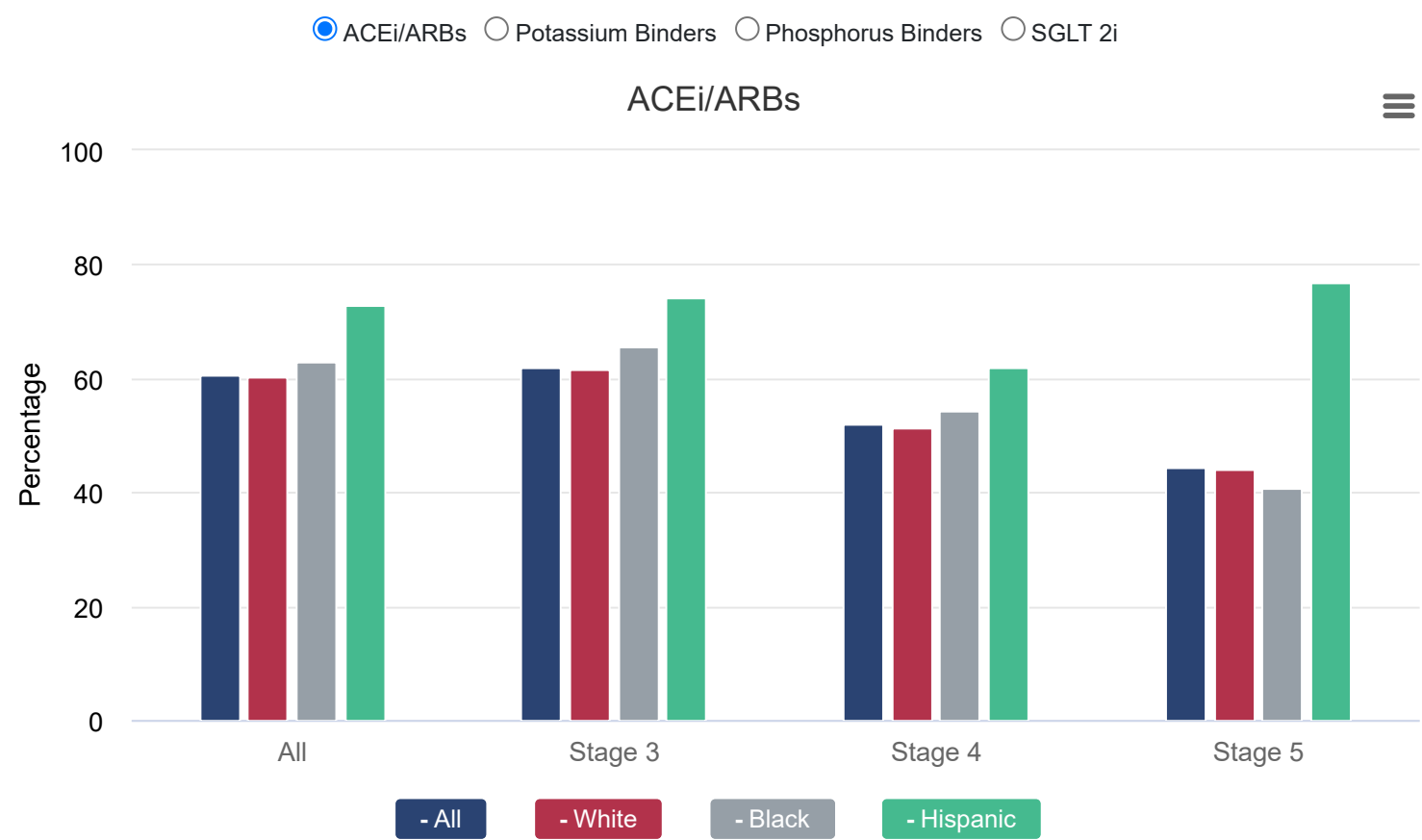
Figure 14.2c Distribution of Social Deprivation Index score in older patients with CKD, by race/ethnicity, Medicare/Medicaid dual eligible, and CKD stage, 2019



Data source: Medicare 5% random sample database. December 31, 2019 point prevalent beneficiaries covered by Medicare FFS Parts A and B, aged ≥66 years, with diagnosis of CKD stages 3-5, and of White, Black, or Hispanic race/ethnicity. SDI score from <https://www.graham-center.org/rgc/maps-data-tools/sdi/social-deprivation-index.html> and linked by patient ZIP Code Tabulation Areas code.

The SDI is a composite measure incorporating seven demographic characteristics of neighborhoods collected in the American Community Survey (ACS): percentage of the population living in poverty, percentage with less than 12 years of education, percentage of single parent households, percentage living in rented housing units, percentage living in overcrowded housing units, percentage of households without a car, and percentage of adults under 65 years of age who are non-employed. Figure 14.2c shows the percentage of older beneficiaries with CKD who have SDI scores in the lower (less deprivation), middle, and upper third of the range (which is 0-100) by race/ethnicity, Medicare and Medicaid dual eligibility status, and CKD stage. The percentage in the highest SDI category was more than 2.5 times as high among Black beneficiaries and 3 times higher among Hispanic beneficiaries (58.6% and 65.1%, respectively) as among White beneficiaries (21.5%). Only 10.5% of Hispanic and 15.5% of Black beneficiaries lived in neighborhoods in the lowest range of SDI scores (least deprivation). Almost half of dually eligible beneficiaries had SDI scores in the highest category. The percentage with highest SDI scores increased with advancing CKD stage.

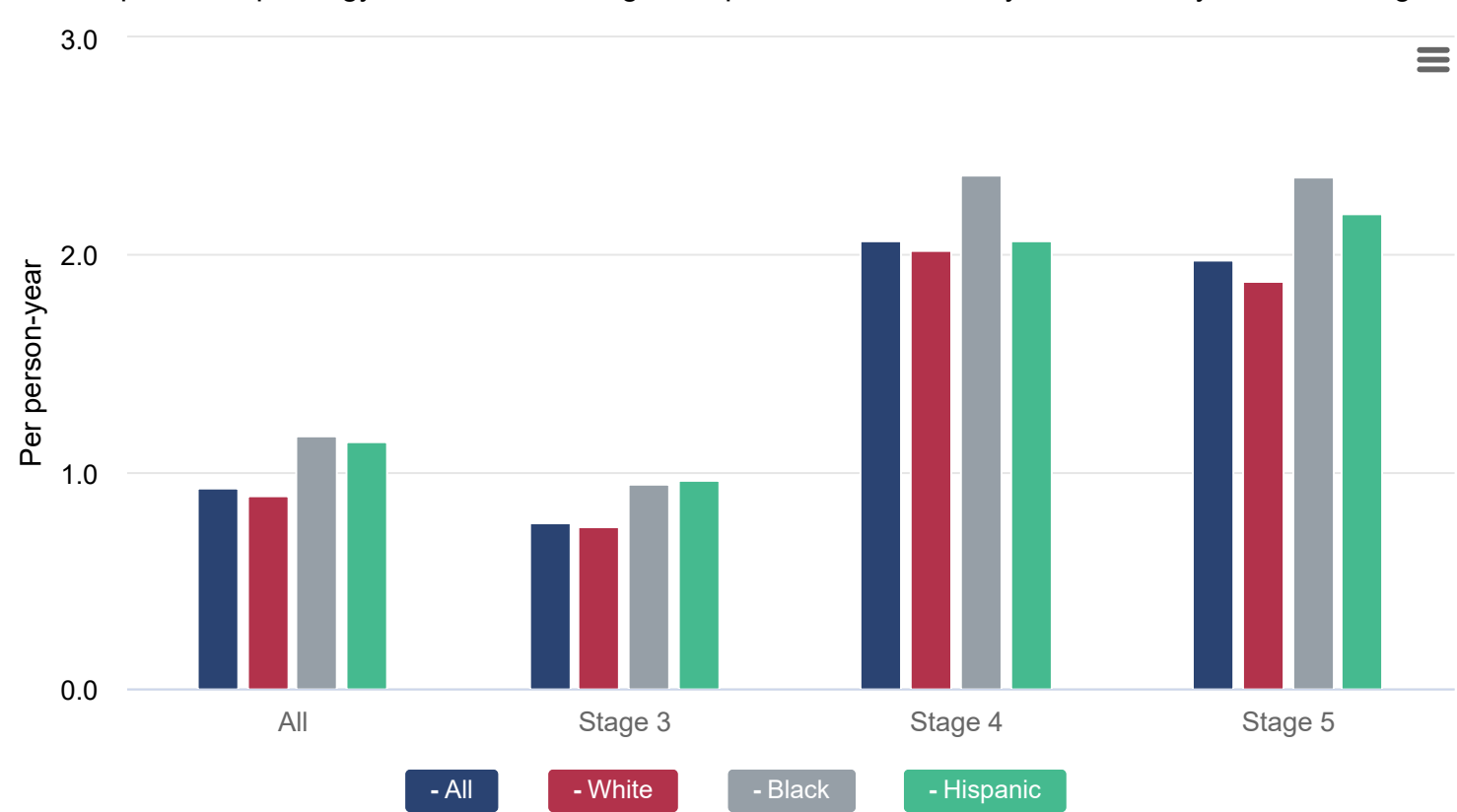
Figure 14.3 Percentage of older patients with CKD receiving key medications, by race/ethnicity and CKD stage, 2019



Data source: Medicare 5% random sample database. December 31, 2019 point prevalent beneficiaries covered by Medicare FFS Parts A, B, and D, aged ≥66 years, with diagnosis of CKD stages 3-5, and of White, Black, or Hispanic race/ethnicity.

Figure 14.3 shows use of key medications among patients with CKD by race/ethnicity. Black and Hispanic patients were not less likely to be prescribed ACEis or ARBs, potassium blockers, phosphorus binders, or SGLT2is than White beneficiaries. Hispanic patients were actually more likely to receive all of these medications. The high percentage of Black (60.8%) and Hispanic (87.1%) patients receiving the Part D Low Income Subsidy (LIS) compared with White patients (26.2%) may account for the lack of racial/ethnic disparities in receipt of these medications (Figure 7.3 in the CKD Volume of this year’s ADR).

Figure 14.4a Rate of outpatient nephrology encounters among older patients with CKD, by race/ethnicity and CKD stage, 2019



Data source: Medicare 5% random sample database. January 1, 2019 point prevalent beneficiaries covered by Medicare FFS Parts A and B, aged ≥66 years, with diagnosis of CKD stages 3-5, and of White, Black, or Hispanic race/ethnicity.

Figure 14.4a shows rates of outpatient nephrology visits by race/ethnicity and CKD stage among Medicare FFS beneficiaries aged ≥66 years. The rates of nephrology visits were 0.7-1.0 per person-year among beneficiaries with stage 3 CKD, 2.0-2.4 per person-year for those with stage 4 CKD, and 1.9-2.4 per person-year for stage 5 CKD. Black beneficiaries with CKD had higher rates of nephrology visits than White beneficiaries at every stage of CKD. Hispanic beneficiaries with stage 3 and stage 5 CKD also had higher rates of nephrology visits than White beneficiaries in the same stages; rates were similar among Hispanic and White beneficiaries with stage 4 CKD.

Figure 14.4b Rate of outpatient nephrology encounters among older patients with CKD, by demographics, Social Deprivation Index, and CKD stage, 2019

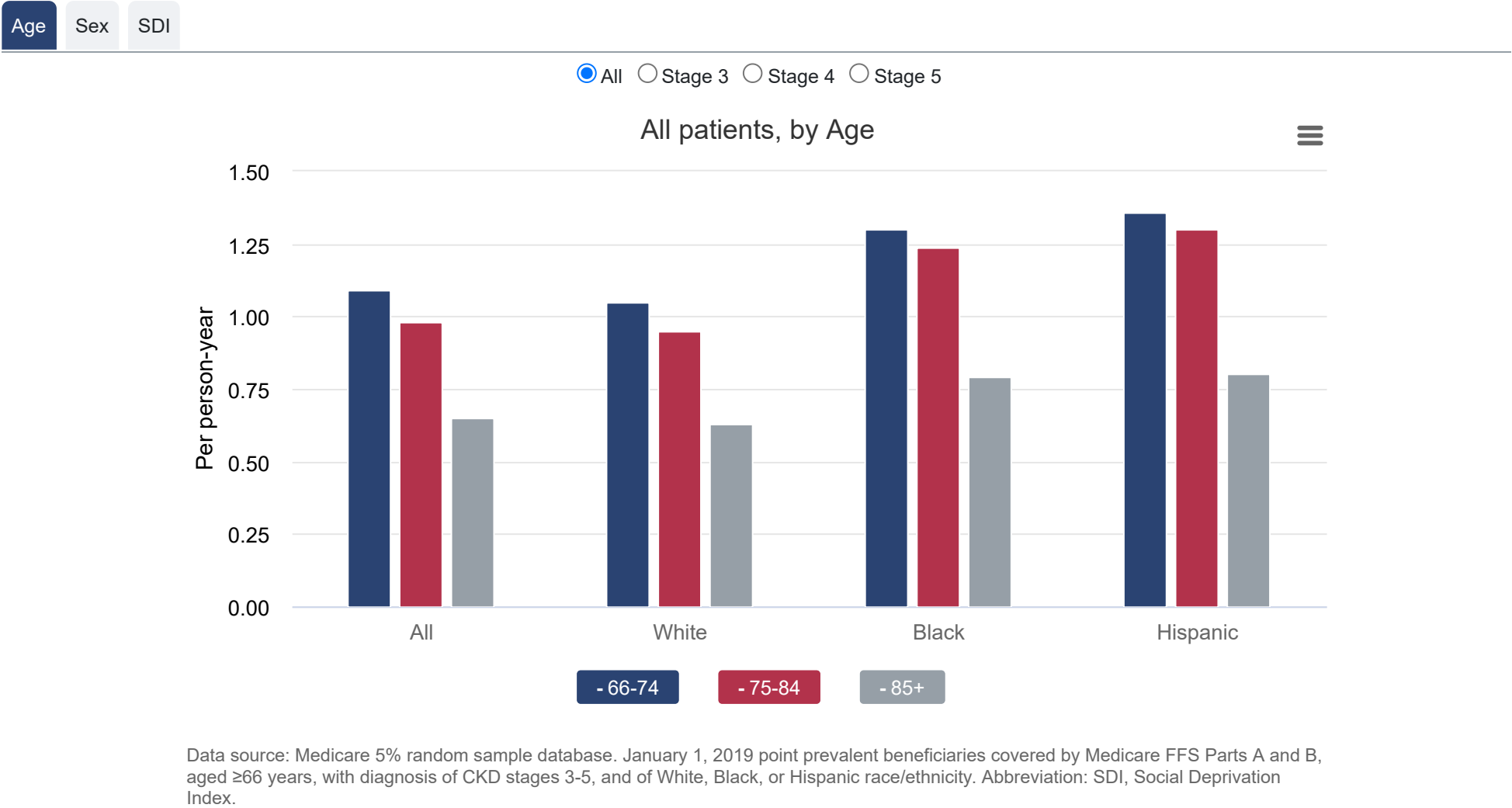
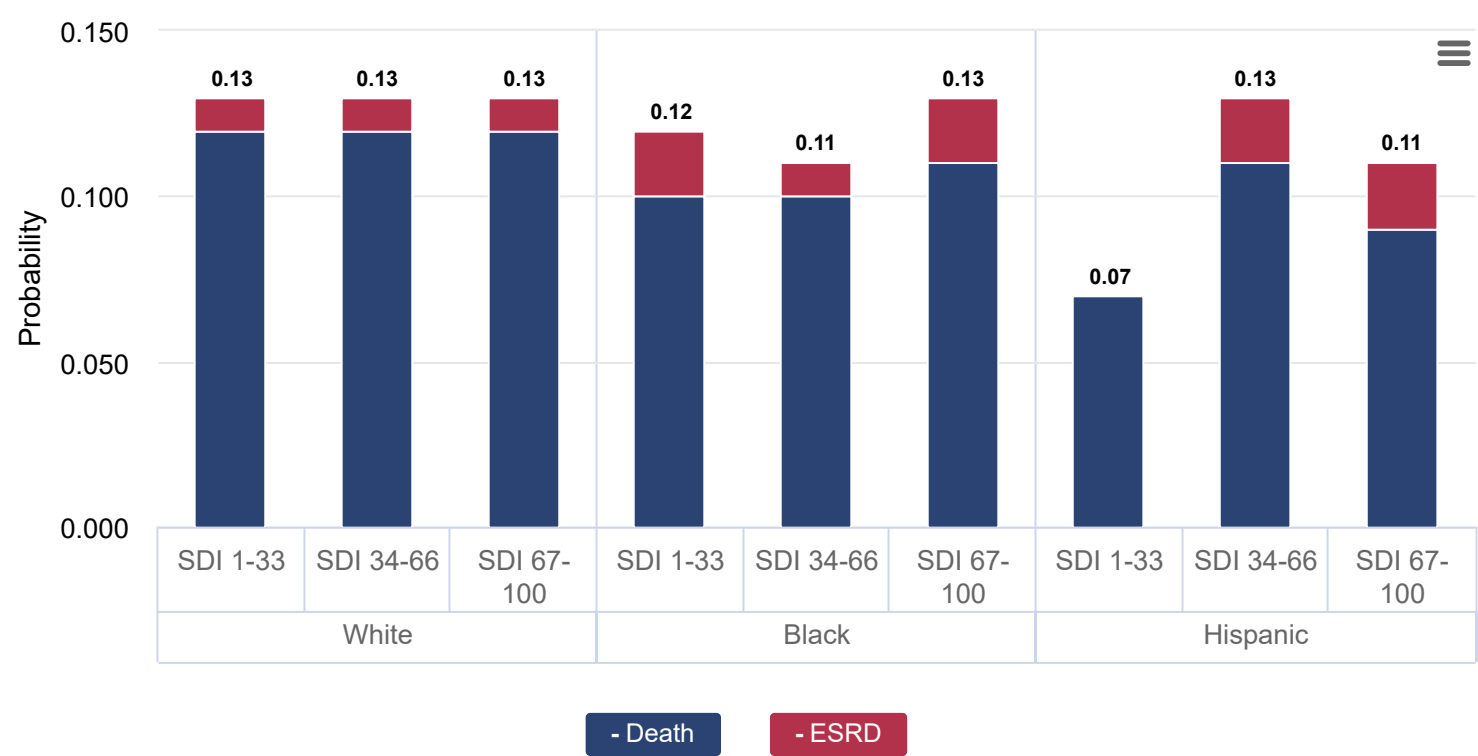


Figure 14.4b shows the rate of nephrology visits by CKD stage stratified by race and by age, sex, and neighborhood SDI within each race/ethnicity group. Among Black and White beneficiaries with stage 3 CKD, the association of neighborhood SDI with visit rate was small and inconsistent. Among Hispanic beneficiaries, those living in neighborhoods with higher SDI scores (more deprivation) actually saw nephrologists more frequently than those living in neighborhoods with lower SDI scores. Among beneficiaries with stages 4 and 5 CKD, the pattern of association between SDI and rate of nephrology visits was not consistent across race/ethnicity groups.

Figure 14.5a Adjusted one year probability of developing ESRD or death in older patients with CKD, by race/ethnicity and Social Deprivation Index, 2019



Data source: Medicare 5% random sample database. January 1, 2019 point prevalent beneficiaries covered by Medicare FFS Parts A and B, aged ≥66 years, with diagnosis of CKD stages 3-5, and of White, Black, or Hispanic race/ethnicity. ESRD and death were treated as competing events for each other. Age, sex, comorbidity, and CKD stage were used in adjusted analyses. Abbreviation: SDI, Social Deprivation Index.

Figure 14.5a shows the 1-year risk of death and ESRD among Medicare FFS beneficiaries aged ≥66 years with CKD by SDI within race/ethnicity groups. The risk of ESRD was higher among Black and Hispanic than among White beneficiaries regardless of SDI, which was not strongly associated with risk of ESRD. The risk of death was slightly higher among Black and White beneficiaries living in neighborhoods with higher SDI scores, but the higher mortality among White beneficiaries was present regardless of neighborhood SDI score.

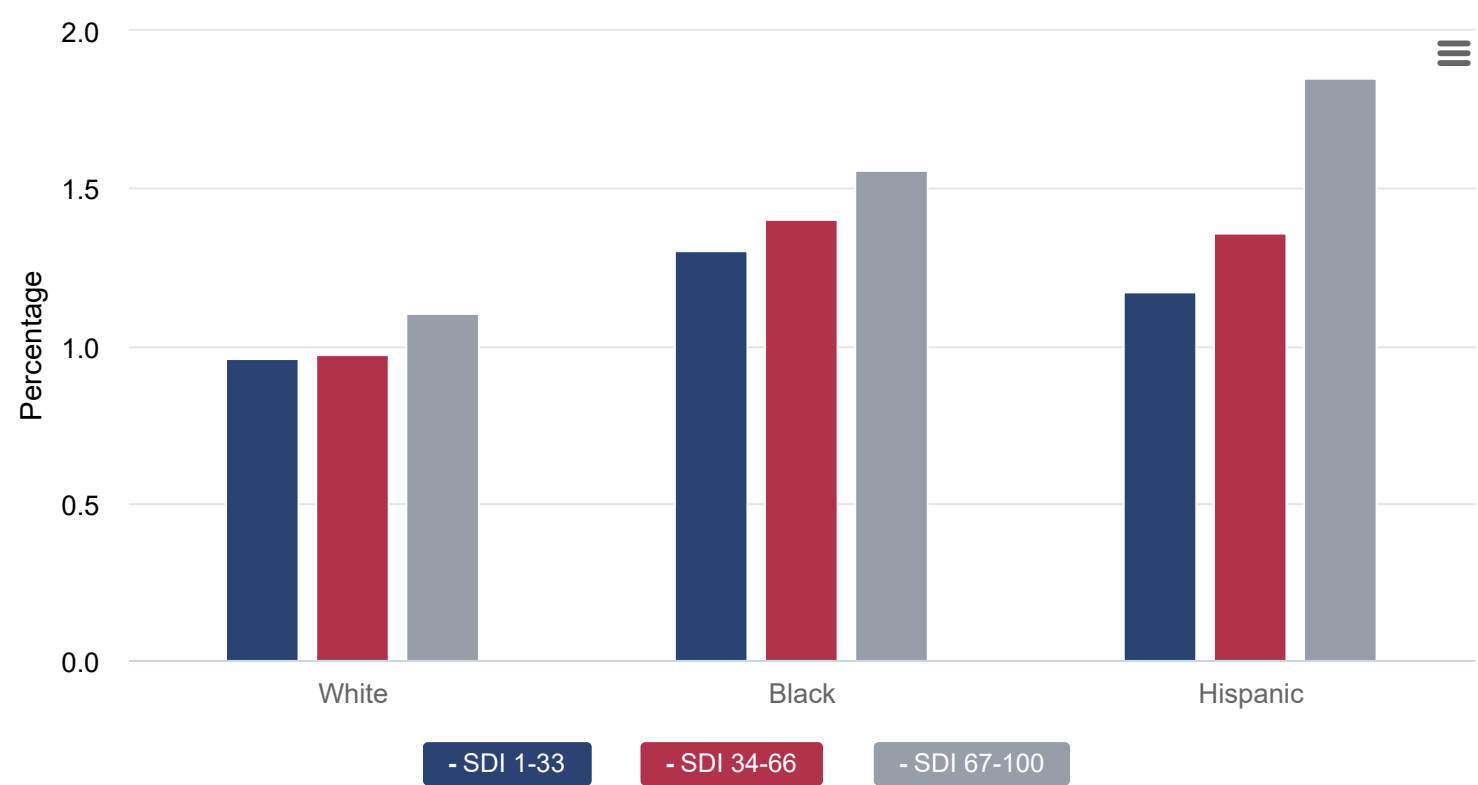
Figure 14.5b One year probability of developing ESRD or death in older patients with CKD, by race/ethnicity and CKD stage, 2019



Data source: Medicare 5% random sample database. January 1, 2019 point prevalent beneficiaries covered by Medicare FFS Parts A and B, aged ≥66 years, with diagnosis of CKD stages 3-5, and of White, Black, or Hispanic race/ethnicity. ESRD and death were treated as competing events for each other. Age, sex, comorbidity, SDI, and Medicare/Medicaid dual eligibility were used in adjusted analyses.

Figure 14.5b shows the 1-year risk of death and ESRD among Medicare FFS beneficiaries aged ≥66 years with CKD by race/ethnicity with and without adjustment for demographic factors, comorbidity, and SDI. Among beneficiaries with stage 3 CKD, the unadjusted risk of death and ESRD were similar among racial/ethnic groups. However, after adjustment, mortality was highest among White and lowest among Hispanic beneficiaries, and risk of ESRD was low for all groups. For those with more advanced CKD, higher mortality among White beneficiaries was evident even in unadjusted analyses and was more prominent after adjustment. The adjusted risk of ESRD was approximately 25-50% higher among Black and Hispanic beneficiaries than among White beneficiaries with stage 4 or 5 CKD.

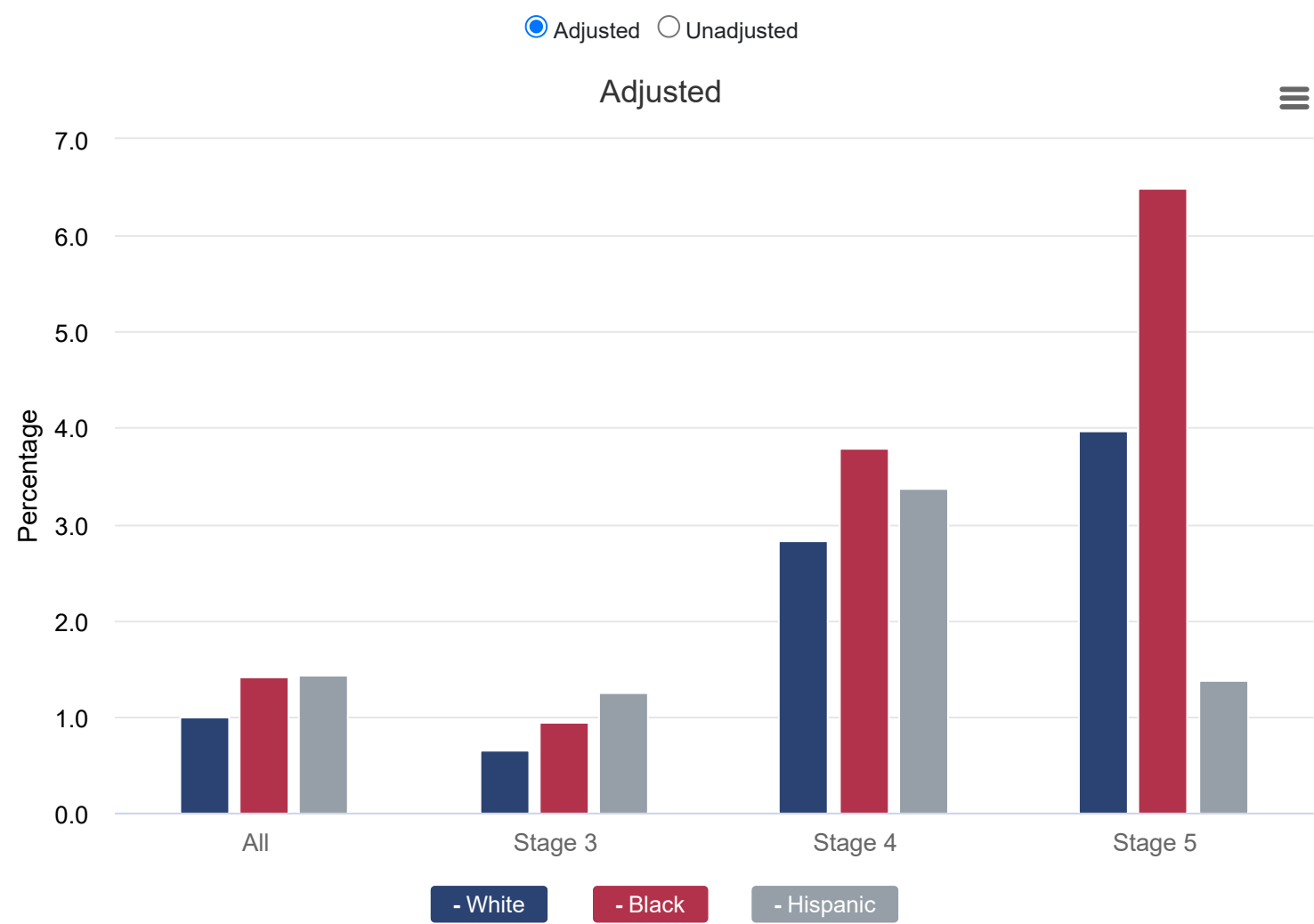
Figure 14.6a Adjusted percentage of AKI hospitalizations requiring dialysis in older patients with CKD, by race/ethnicity and Social Deprivation Index, 2016-2019



Data source: Medicare 5% random sample database. January 1 point prevalent beneficiaries 2016-2019, covered by Medicare FFS Parts A and B, aged ≥66 years, with diagnosis of CKD stages 3-5, and of White, Black, or Hispanic race/ethnicity. Age, sex, comorbidity, and CKD stage were used in adjusted analyses. Abbreviation: SDI, Social Deprivation Index.

Figure 14.6a shows the percentage of point prevalent beneficiaries with stages 3-5 CKD on January 1 of each year from 2016-2019 who were hospitalized with AKI requiring dialysis in the year by race/ethnicity and SDI. White beneficiaries were less likely to develop dialysis-requiring AKI than Black or Hispanic beneficiaries. Those with a higher neighborhood SDI score (more deprivation) were more likely to experience AKI than those living in neighborhoods with less deprivation. The association with SDI is more apparent among Black and Hispanic than among White individuals. For example, Hispanic beneficiaries with the highest SDI scores were 1.5 times as likely to have an AKI hospitalization than those with the lowest scores.

Figure 14.6b Percentage of AKI hospitalizations requiring dialysis in older patients with CKDs, by race/ethnicity and CKD stage, 2016-2019



Data source: Medicare 5% random sample database. January 1 point prevalent beneficiaries 2016-2019, covered by Medicare FFS Parts A and B, aged ≥66 years, with diagnosis of CKD stages 3-5, and of White, Black, or Hispanic race/ethnicity. Age, sex, comorbidity, SDI, and Medicare/Medicaid dual eligibility were used in adjusted analyses.

Figure 14.6b shows that Black individuals aged ≥66 years with CKD were consistently more likely to experience hospitalization with AKI requiring dialysis within 1 year than White beneficiaries even after adjusting for SDI. Hispanic beneficiaries with CKD stage 3 and stage 4 were also more likely to experience hospitalization with AKI requiring dialysis than White beneficiaries, but this was not true for those with stage 5 CKD.

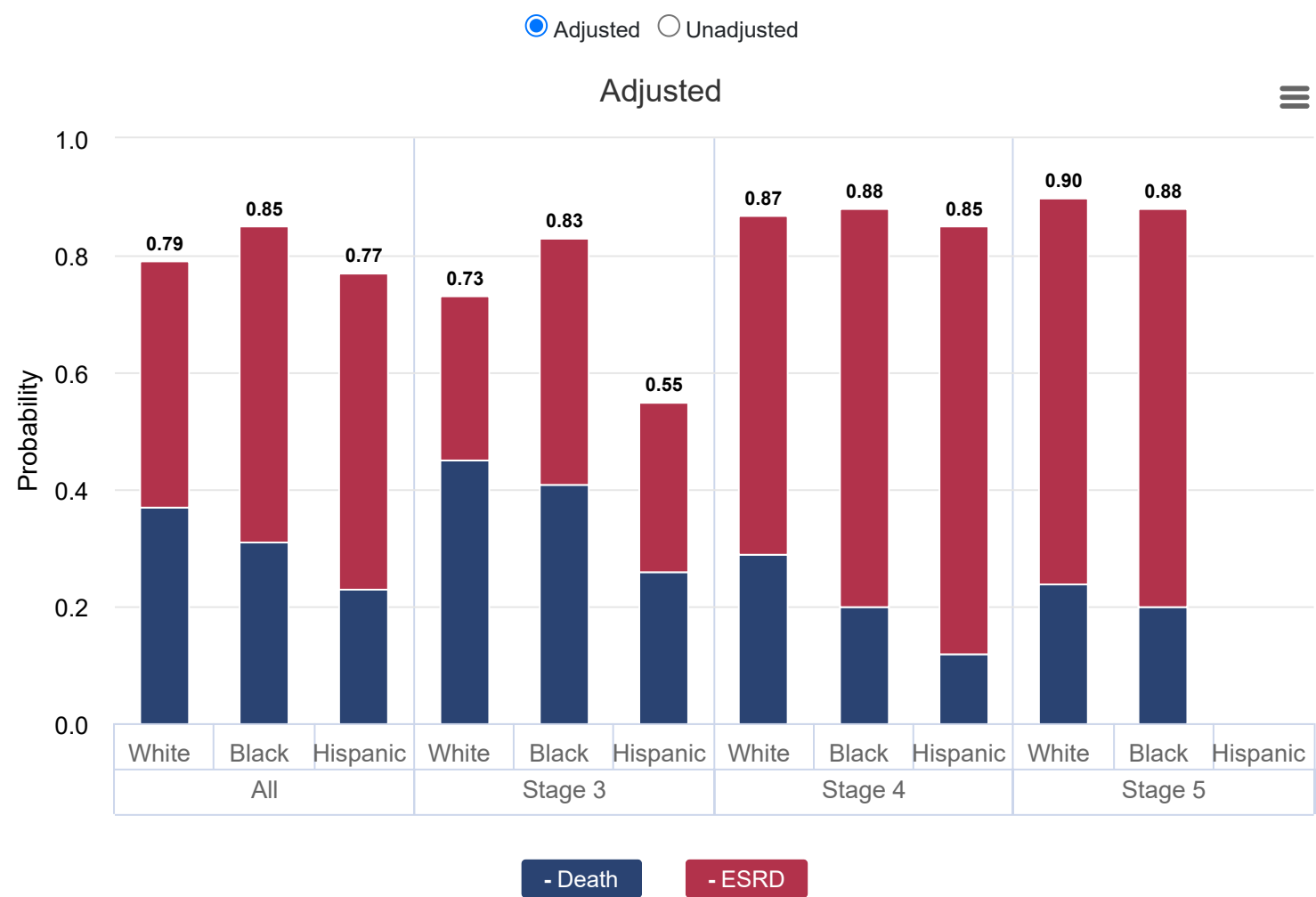
Figure 14.7a Adjusted six-month probability of developing ESRD or death after AKI hospitalization requiring dialysis in older patients with CKD, by race/ethnicity and Social Deprivation Index, 2016-2019



Data source: Medicare 5% random sample database. January 1 point prevalent beneficiaries 2016-2019, covered by Medicare FFS Parts A and B, aged ≥66 years with diagnosis of CKD stages 3-5 who had an AKI hospitalization requiring dialysis and were of White, Black, or Hispanic race/ethnicity. ESRD and death were treated as competing events for each other. Age, sex, comorbidity, and CKD stage were used in adjusted analyses. Abbreviation: SDI, Social Deprivation Index.

The overall probability of death or ESRD within 6 months after a hospitalization with AKI requiring dialysis was very high for all race/ethnicity groups and varied little by SDI score. However, the risk of death within 6 months differed by race/ethnicity and neighborhood SDI. The probability of death was higher among White than among Black or Hispanic individuals. There was little difference in the risk of death across categories of SDI score among White beneficiaries, whereas the risk of mortality was higher among Black and Hispanic beneficiaries living in neighborhoods with higher SDI scores. Conversely, and likely because of the competing risk of death, Black and Hispanic individuals from neighborhoods with lower SDI scores (less deprivation) were more likely to reach ESRD within 6 months than those living in areas with higher SDI scores.

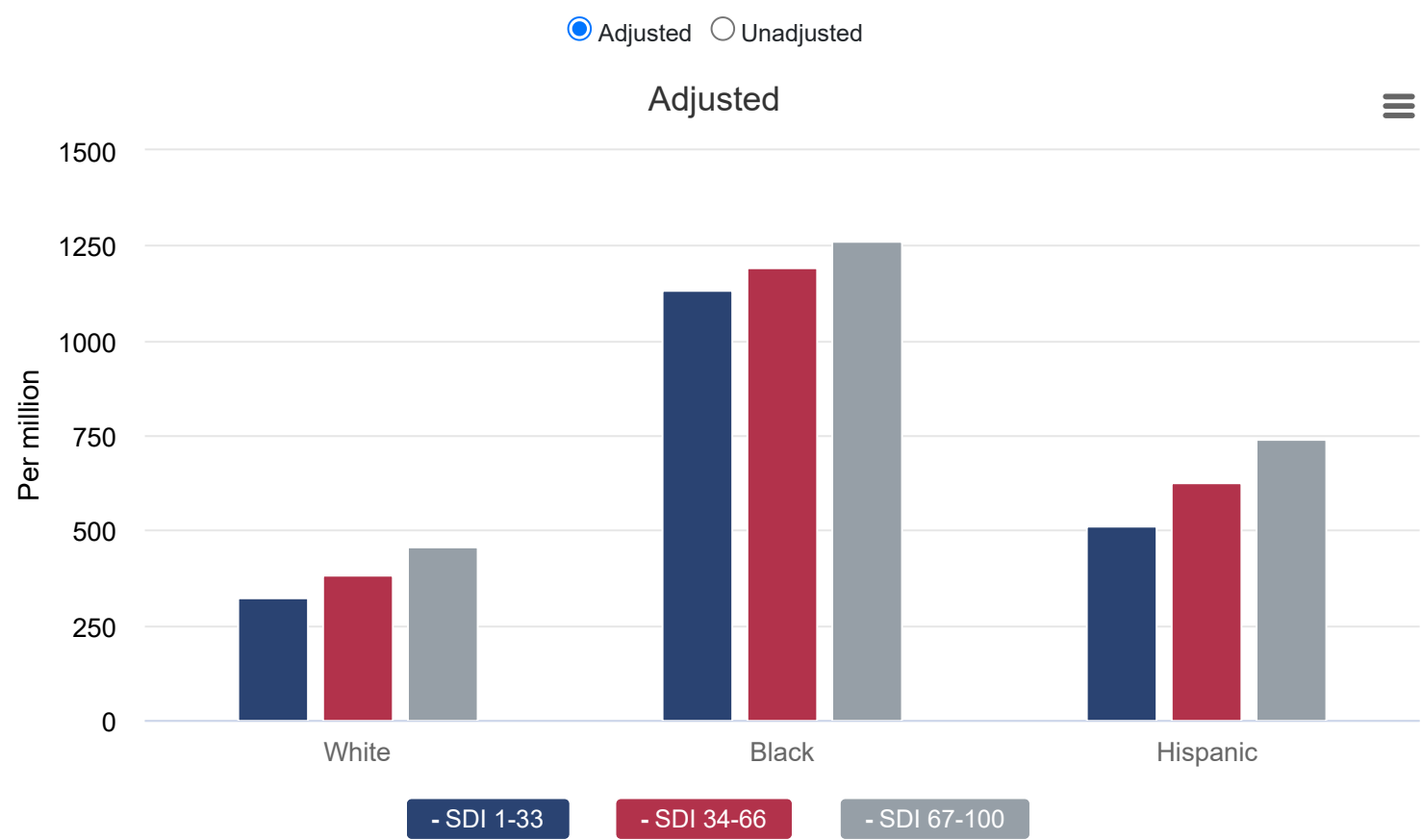
Figure 14.7b Six-month probability of developing ESRD or death after AKI hospitalization requiring dialysis in older patients with CKD, by race/ethnicity and CKD stage, 2016-2019



Data source: Medicare 5% random sample database. January 1 point prevalent beneficiaries 2016-2019, covered by Medicare FFS Parts A and B, aged ≥66 years, with diagnosis of CKD stages 3-5 who had an AKI hospitalization requiring dialysis and were of White, Black, or Hispanic race/ethnicity. ESRD and death were treated as competing events for each other. Age, sex, comorbidity, SDI, and Medicare/Medicaid dual eligibility were used in adjusted analyses.

Figure 14.7b shows that White beneficiaries had a higher risk of death and lower risk of ESRD within 6 months following a hospitalization with AKI requiring dialysis than Black beneficiaries even after adjusting for demographic characteristics, comorbidity, and SDI.

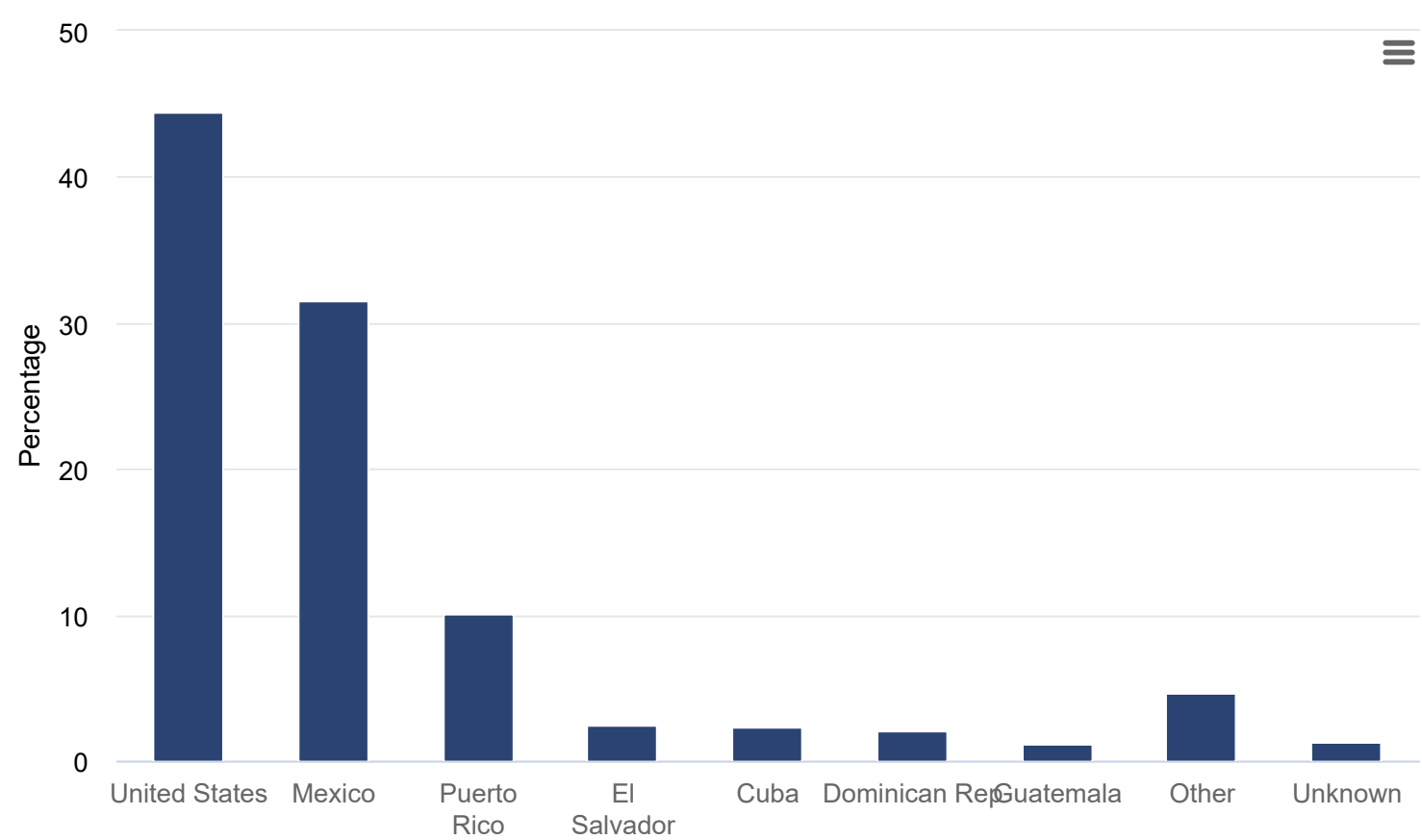
Figure 14.8 ESRD rate by race/ethnicity and Social Deprivation Index, 2019



Data source: USRDS ESRD database. 2019 incident ESRD patients and 2019 US population, aged ≥18 years, and of White, Black, or Hispanic race/ethnicity. Age and sex were used for adjusted analysis. Abbreviation: SDI, Social Deprivation Index.

Figure 14.8 shows the rate of ESRD by race/ethnicity and by SDI score. For all race/ethnicity groups, the rate of ESRD was higher among individuals living in areas with worse SDI scores. However, racial/ethnic differences in the rate of ESRD persisted within SDI categories. The rate of ESRD among Black individuals in the lowest SDI category was 3.5 times as high as among White individuals in the lowest SDI category and was more than twice as high as Hispanic individuals in this category.

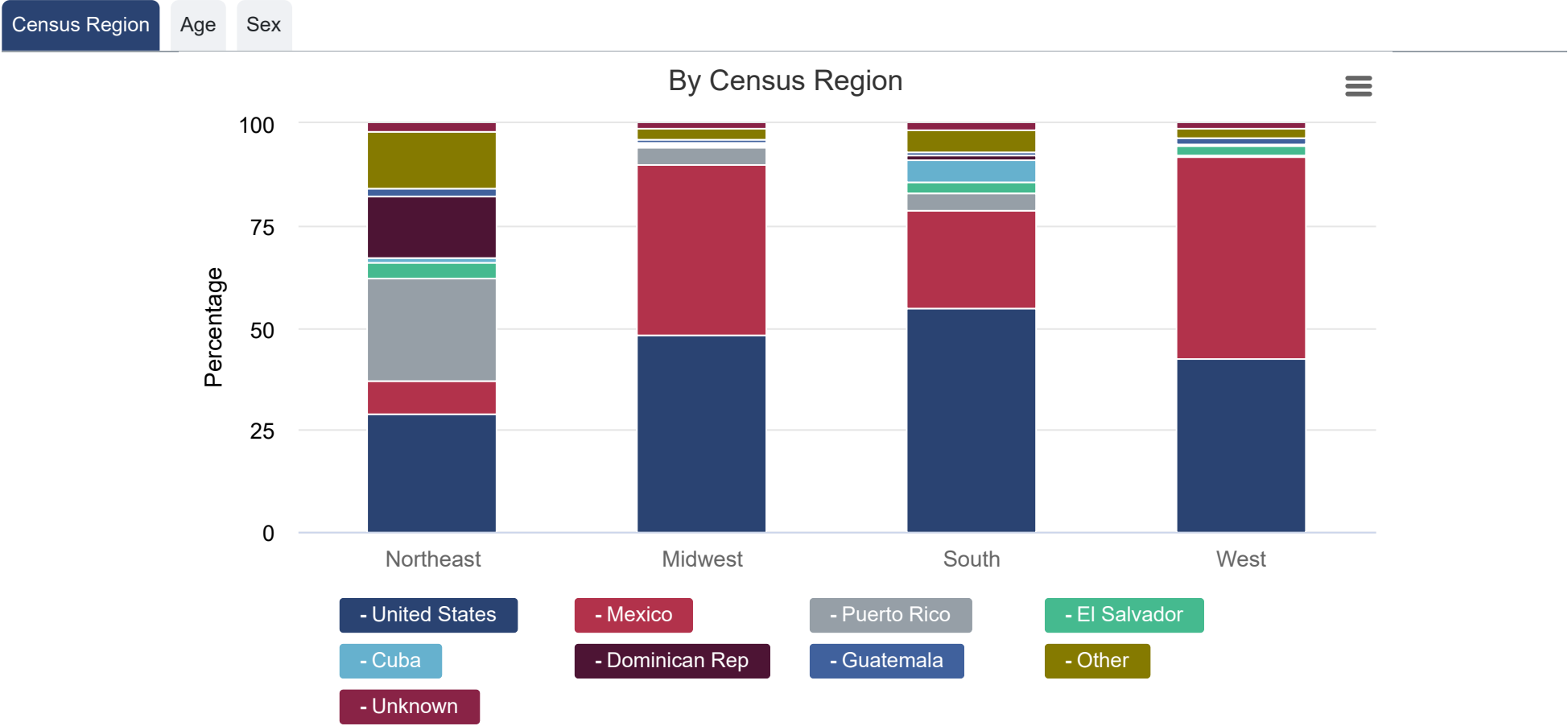
Figure 14.9a Country or area of origin of Hispanic incident ESRD patients, 2016-2019



Data source: USRDS ESRD database. 2016-2019 Hispanic incident ESRD patients, aged ≥18 years.

Figure 14.9a shows the country or area of origin among incident ESRD patients of Hispanic ethnicity. Forty-four percent were from the (mainland) U.S. (i.e., not immigrants). Among those who were immigrants, the most common country of origin was Mexico. Ten percent indicated that they were from or were living in Puerto Rico.

Figure 14.9b Country or area of origin of Hispanic incident ESRD patients, by census region and demographic characteristics, 2016-2019



Data source: USRDS ESRD database. 2016-2019 Hispanic incident ESRD patients, aged ≥18 years.

Figure 14.9b shows the distribution of country or area of origin of Hispanic individuals initiating treatment for ESRD by census region, age, and sex. The percentage from mainland U.S. and the largest non-mainland U.S. point of origin differed substantially by census region. In the South, more than half of Hispanic individuals were from mainland U.S., whereas that percentage was only 28.9% in the Northeast. The largest non-mainland U.S. point of origin was Mexico in the Midwest, South, and West, with approximately half of all Hispanic patients in the West from Mexico. However, in the Northeast, a relatively small percentage of Hispanic patients was from Mexico, and one quarter was from Puerto Rico.

Figure 14.10 Percentage of patients initiating dialysis in the hospital, by race/ethnicity and Social Deprivation Index, stratified by age, 2019

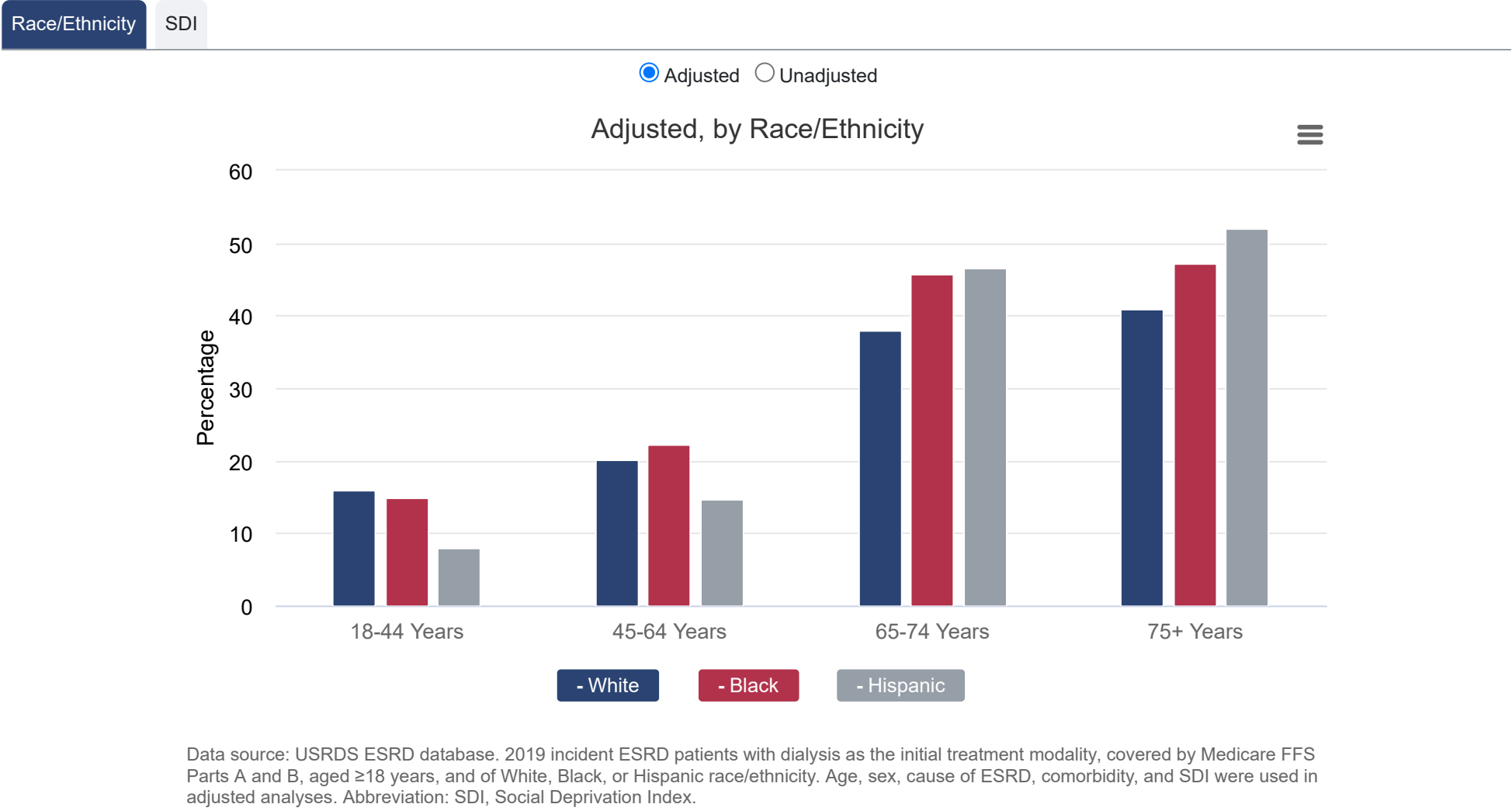
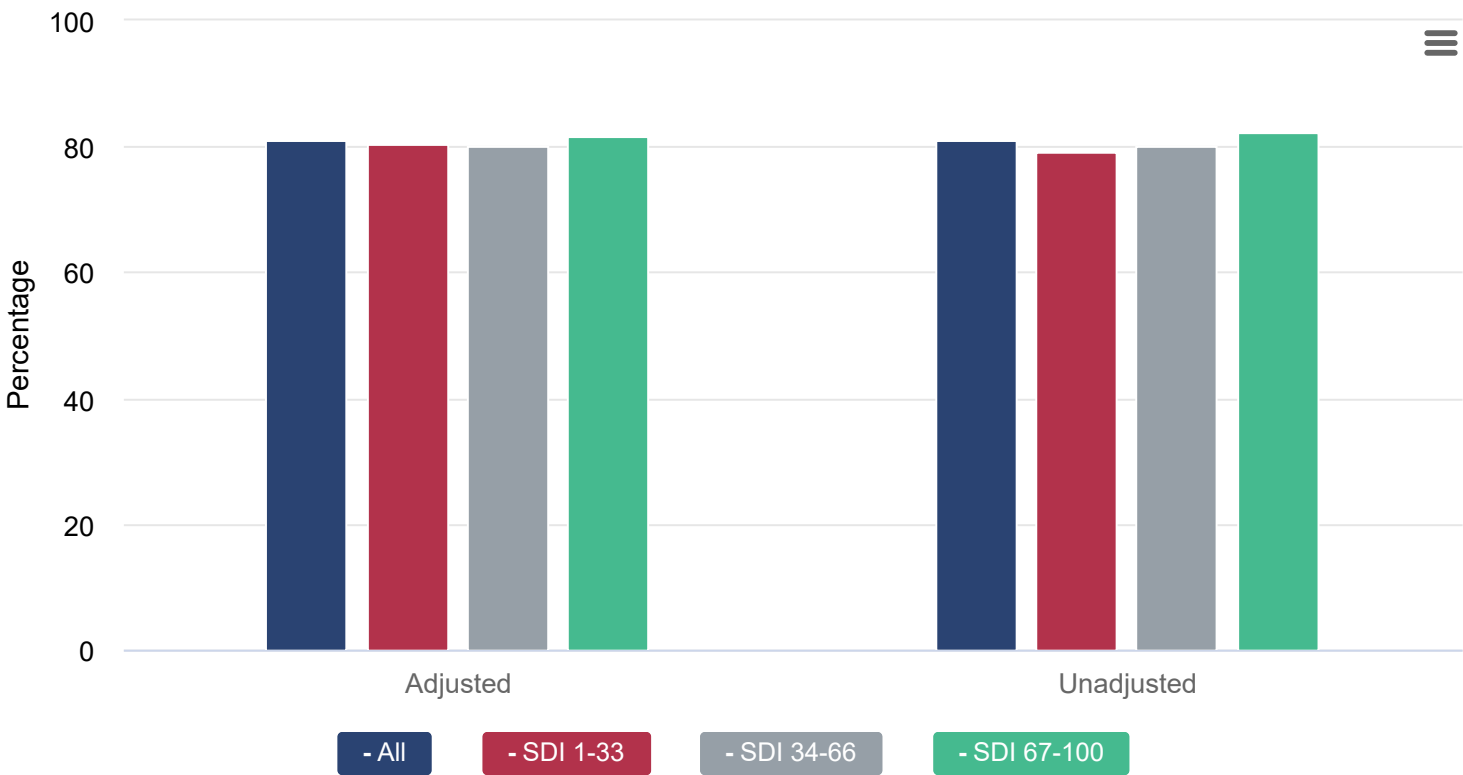


Figure 14.10 shows the percentage of patients initiating dialysis in the hospital in 2019. Older patients were more likely to initiate dialysis in the hospital than younger ones. Differences by race/ethnicity were smaller than differences across age groups, and the pattern varied by age. Younger Hispanic patients were less likely than White or Black patients to initiate dialysis in the hospital, but older Hispanic patients were more likely than their White or Black counterparts to do so. Across all age groups, patients living in neighborhoods with higher SDI scores were more likely to initiate dialysis in the hospital than those living in neighborhoods with lower scores.

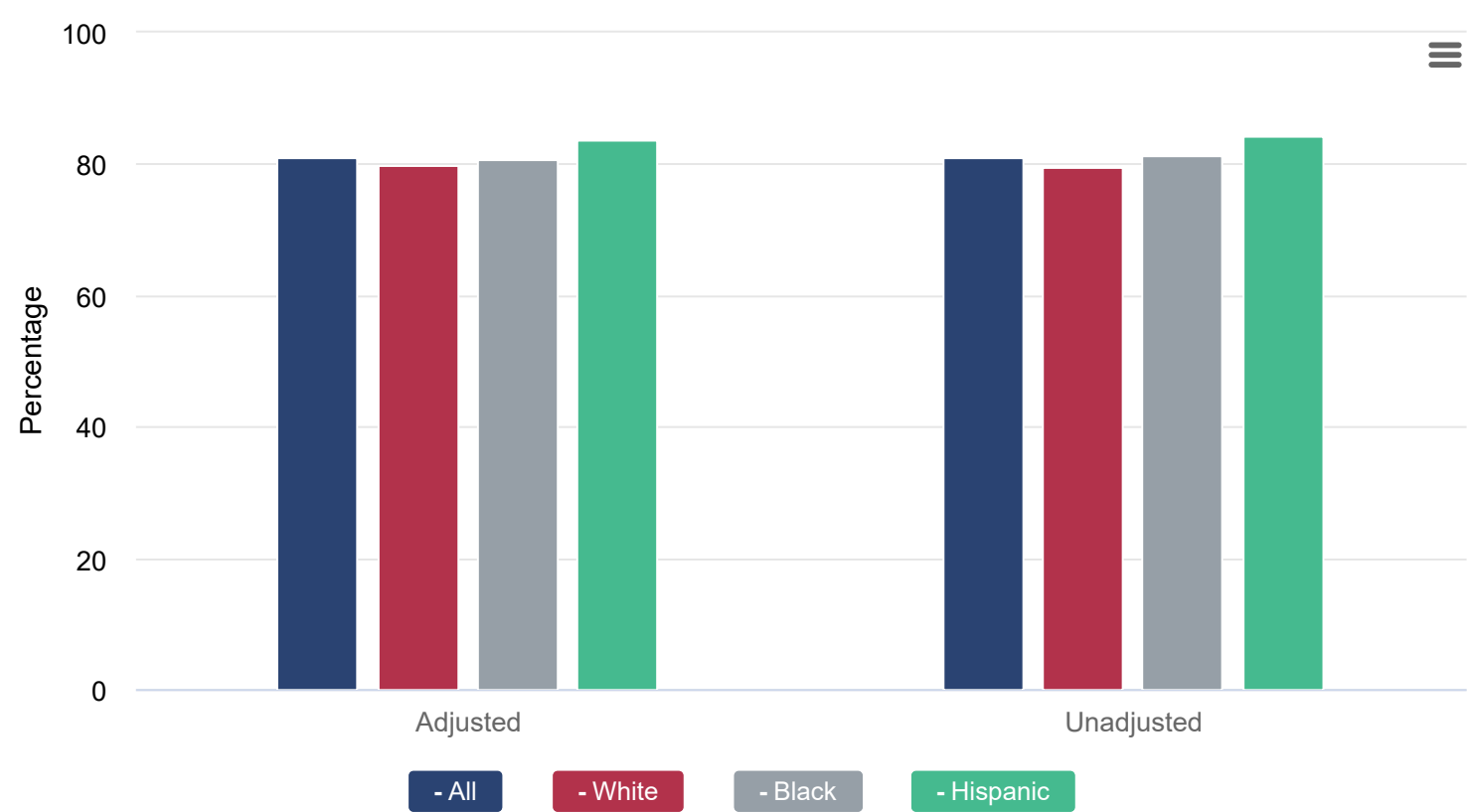
Figure 14.11a Percentage of patients initiating hemodialysis with a catheter, by Social Deprivation Index, 2019



Data source: USRDS ESRD database. 2019 incident ESRD patients with HD as the initial treatment modality, aged ≥18 years, and of White , Black, or Hispanic race/ethnicity. Age, sex, cause of ESRD, comorbidity, and race/ethnicity were used in adjusted analyses. Abbreviation: SDI, Social Deprivation Index.

Patients’ neighborhood SDI score was not associated with the likelihood of initiating HD with a catheter. Catheter use was high for all groups.

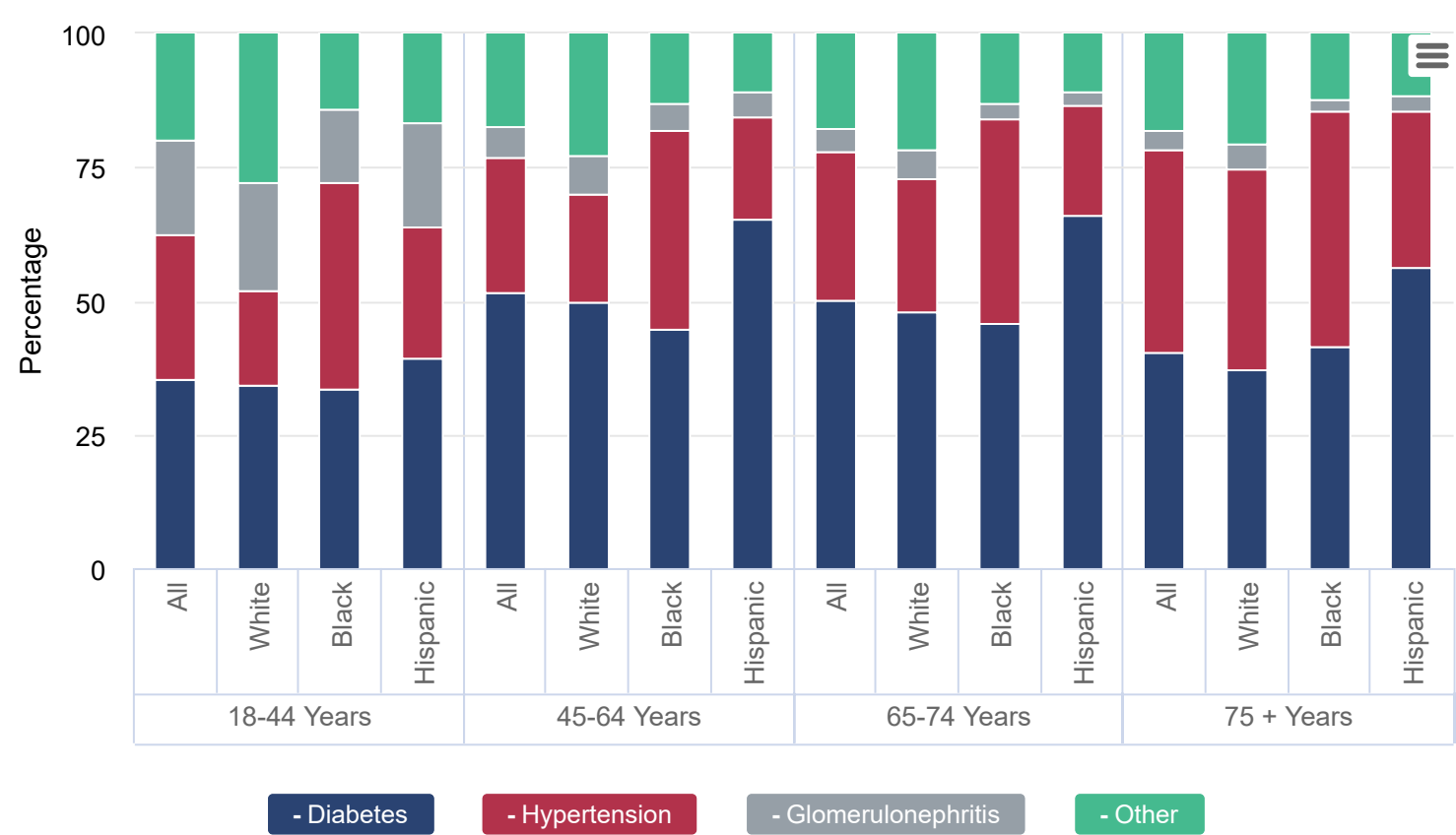
Figure 14.11b Percentage of patients initiating hemodialysis with a catheter, by race/ethnicity, 2019



Data source: USRDS ESRD database. 2019 incident ESRD patients with HD as the initial treatment modality, aged ≥18 years, and of White, Black, or Hispanic race/ethnicity. Age, sex, cause of ESRD, comorbidity, and SDI were used in adjusted analyses.

Initiation of HD using a catheter occurred in a similarly high percentage of White, Black, and Hispanic patients with and without adjustment for demographic characteristics, comorbidity, and SDI.

Figure 14.12 Primary cause of ESRD, by age and race/ethnicity, 2019 incident ESRD patients



Data source: USRDS ESRD database. 2019 incident ESRD patients, aged ≥18 years, and of White, Black, or Hispanic race/ethnicity.

Figure 14.12 shows the primary cause of ESRD by age and race/ethnicity. Hispanic individuals in all age groups were more likely to have ESRD caused by DM than White or Black individuals. Black individuals in all age groups were more likely to have ESRD caused by hypertension than White or Hispanic individuals. Glomerulonephritis was more likely to be the cause of ESRD among younger individuals than older ones. Patterns across race/ethnicity groups were not consistent across age groups.

Figure 14.13a Percentage of patients on home dialysis in the first year of ESRD, by race/ethnicity and Social Deprivation Index, 2018

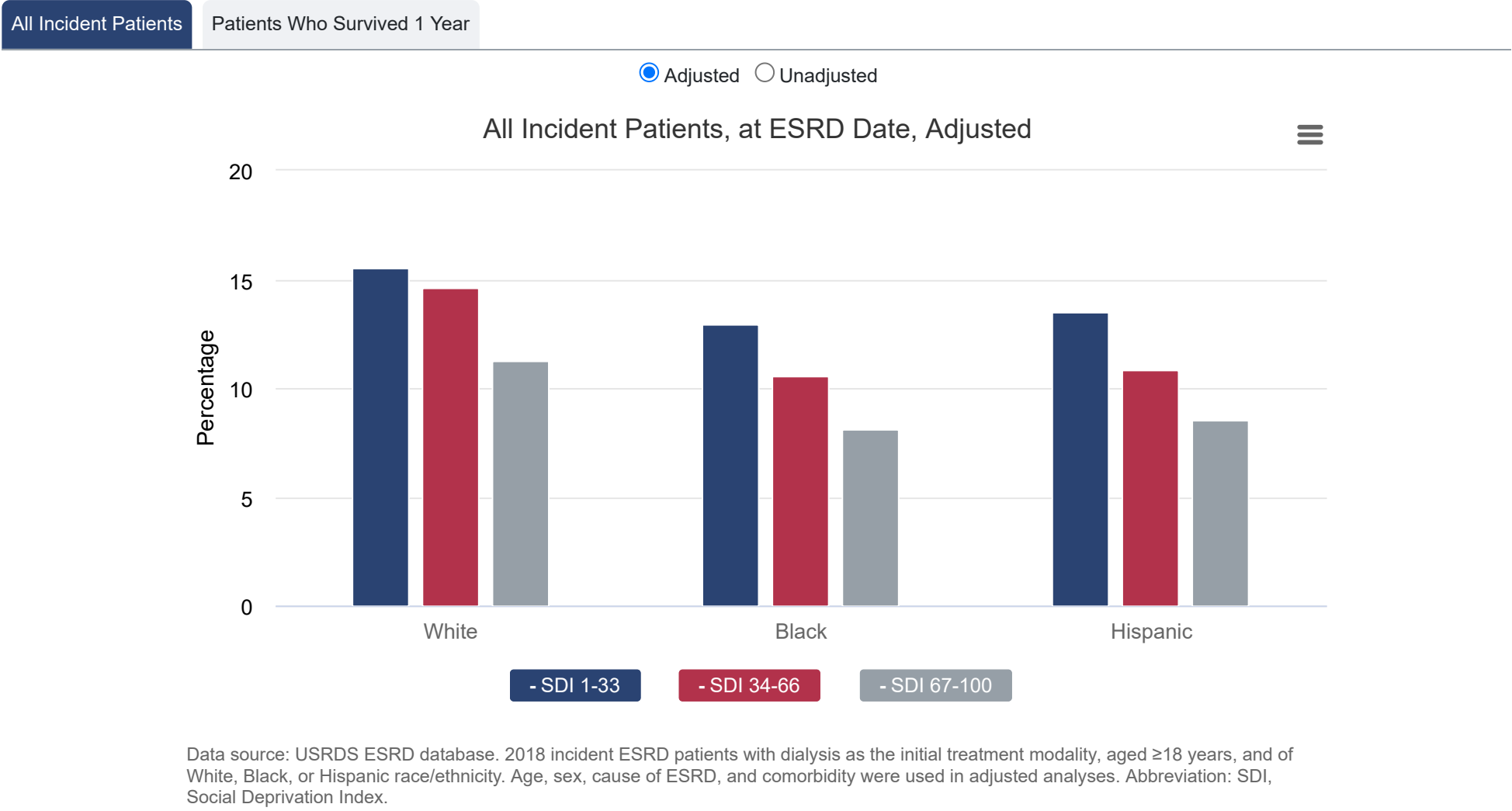


Figure 14.13a shows the percentage of incident dialysis patients starting dialysis at home and receiving dialysis at home after 1 year by race and SDI. Patients in all race/ethnicity groups living in neighborhoods with higher SDI were less likely to dialyze at home initially and after 1 year. Although White patients were more likely to be dialyzing at home than Black or Hispanic patients within each stratum of neighborhood SDI, differences across levels of SDI were larger than differences among race groups within SDI categories.

Figure 14.13b Percentage of patients receiving home dialysis in the first year of ESRD, 2018

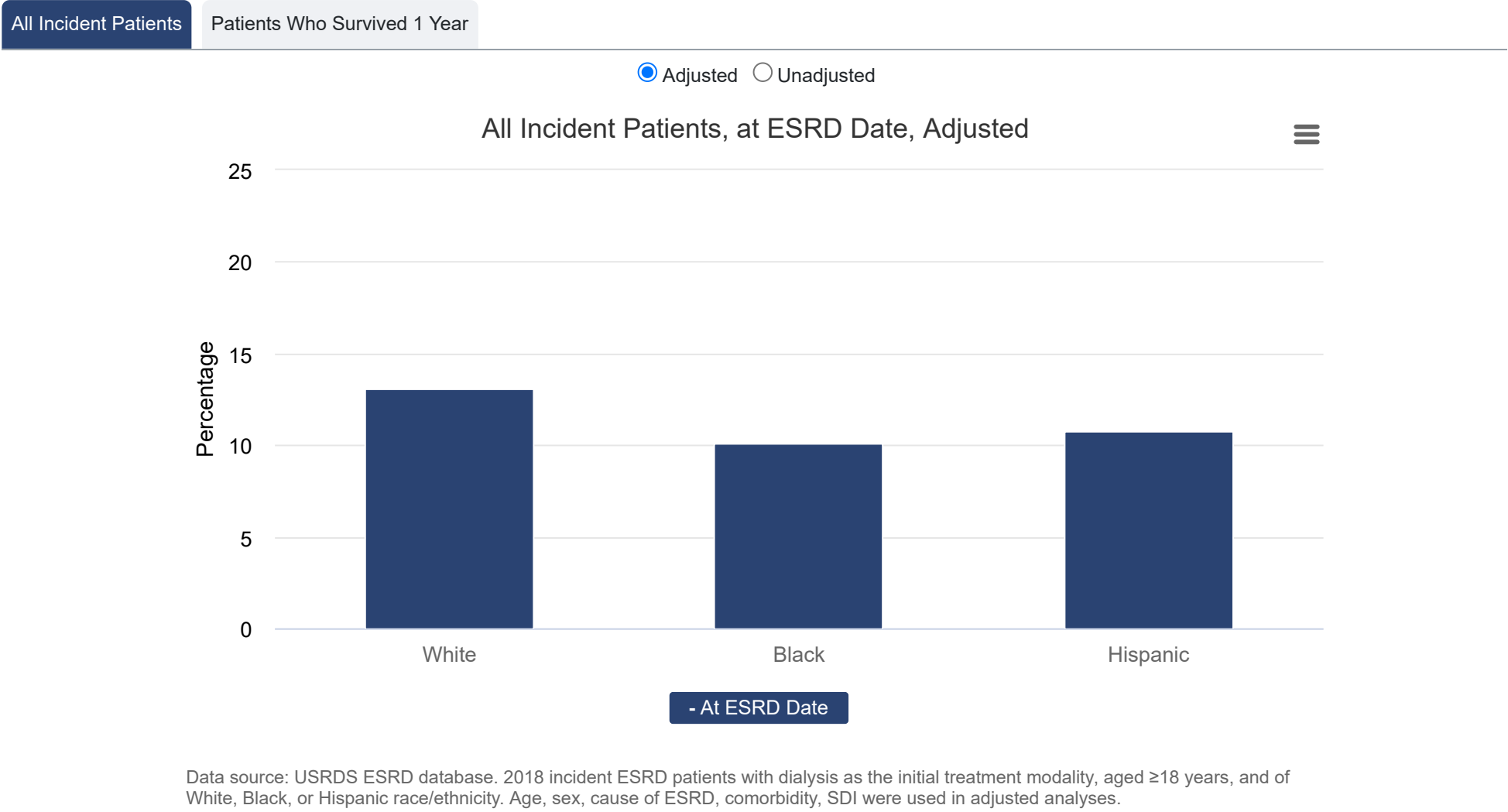


Figure 14.13b shows that a higher percentage of White beneficiaries initiated home dialysis treatment and dialyzed at home after 1 year compared with Black or Hispanic beneficiaries, even after adjustment for demographic characteristics, comorbidity, and neighborhood-level variables including the percentage of the population living in crowded housing units.

Figure 14.14a Percentage of preemptive wait listing or transplantation in incident ESRD patients, by race/ethnicity and Social Deprivation Index, 2019

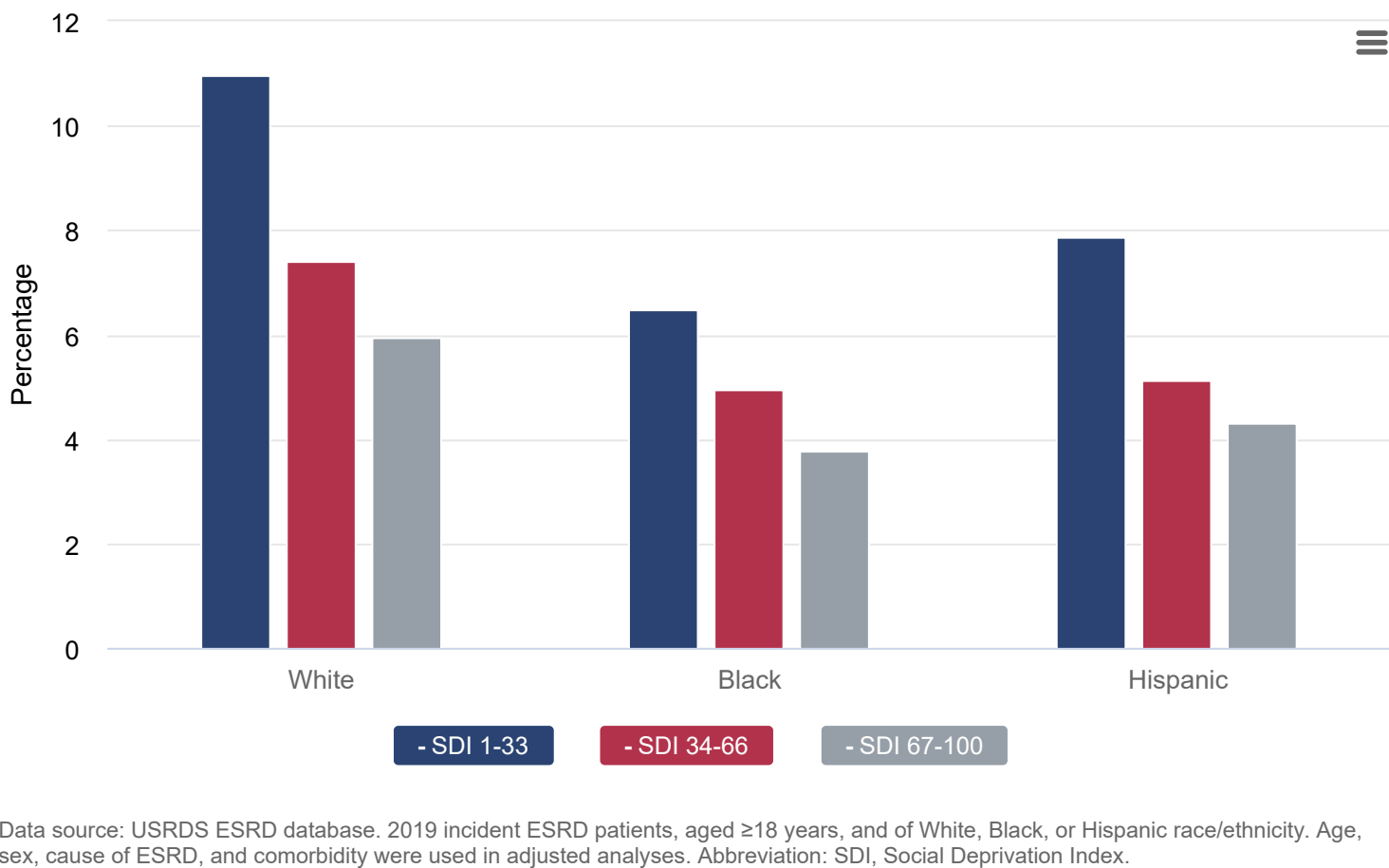
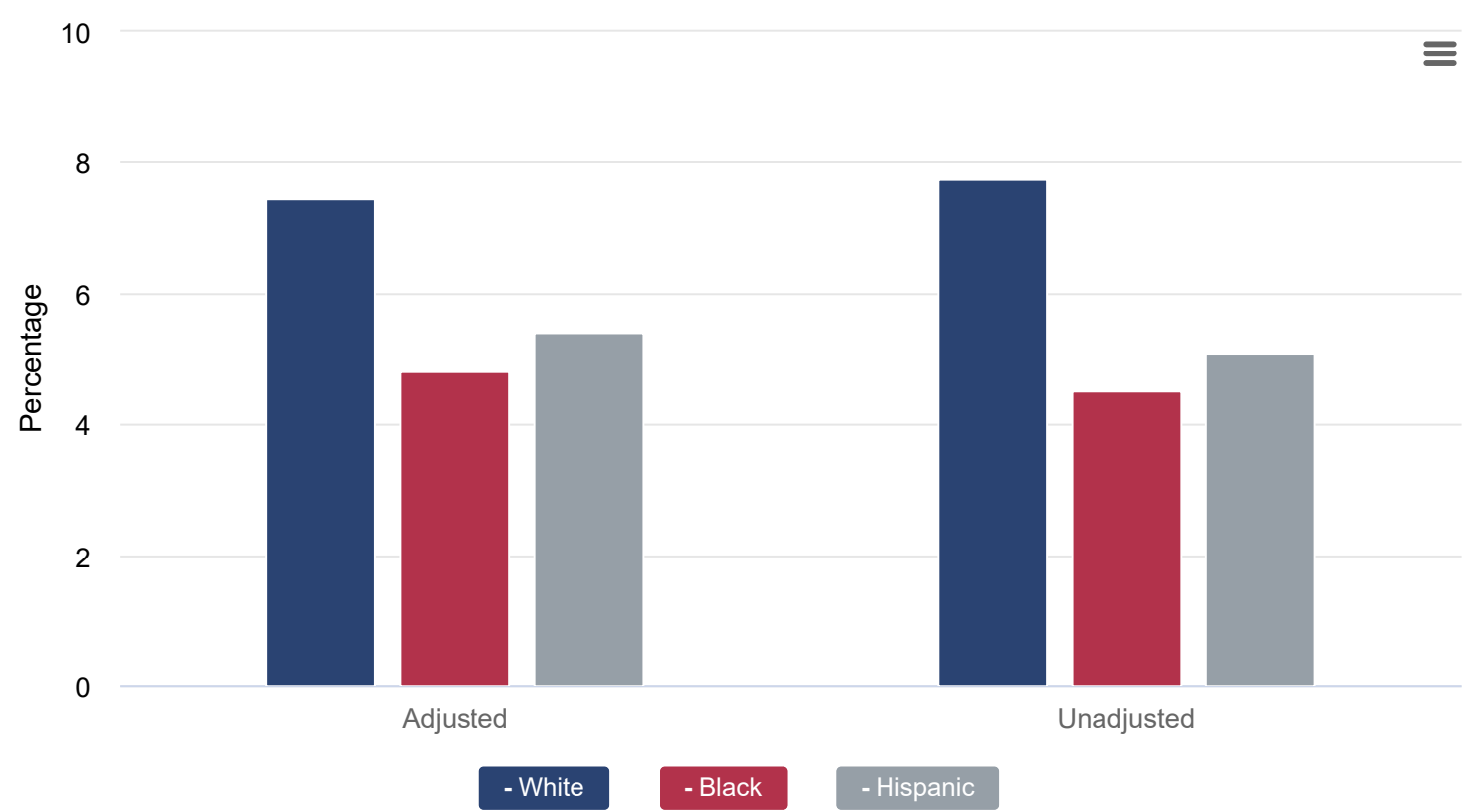


Figure 14.14a shows the percentage of incident dialysis patients who had been placed on the waitlist for a kidney transplant prior to dialysis initiation (i.e., preemptively waitlisted) by race/ethnicity and by SDI. Among all race/ethnicity groups, those living in neighborhoods with higher SDI scores (higher deprivation) were substantially less likely to have been preemptively waitlisted for a kidney transplant. Nevertheless, White patients were more likely to be waitlisted than Black or Hispanic patients from neighborhoods with SDI scores in the same range.

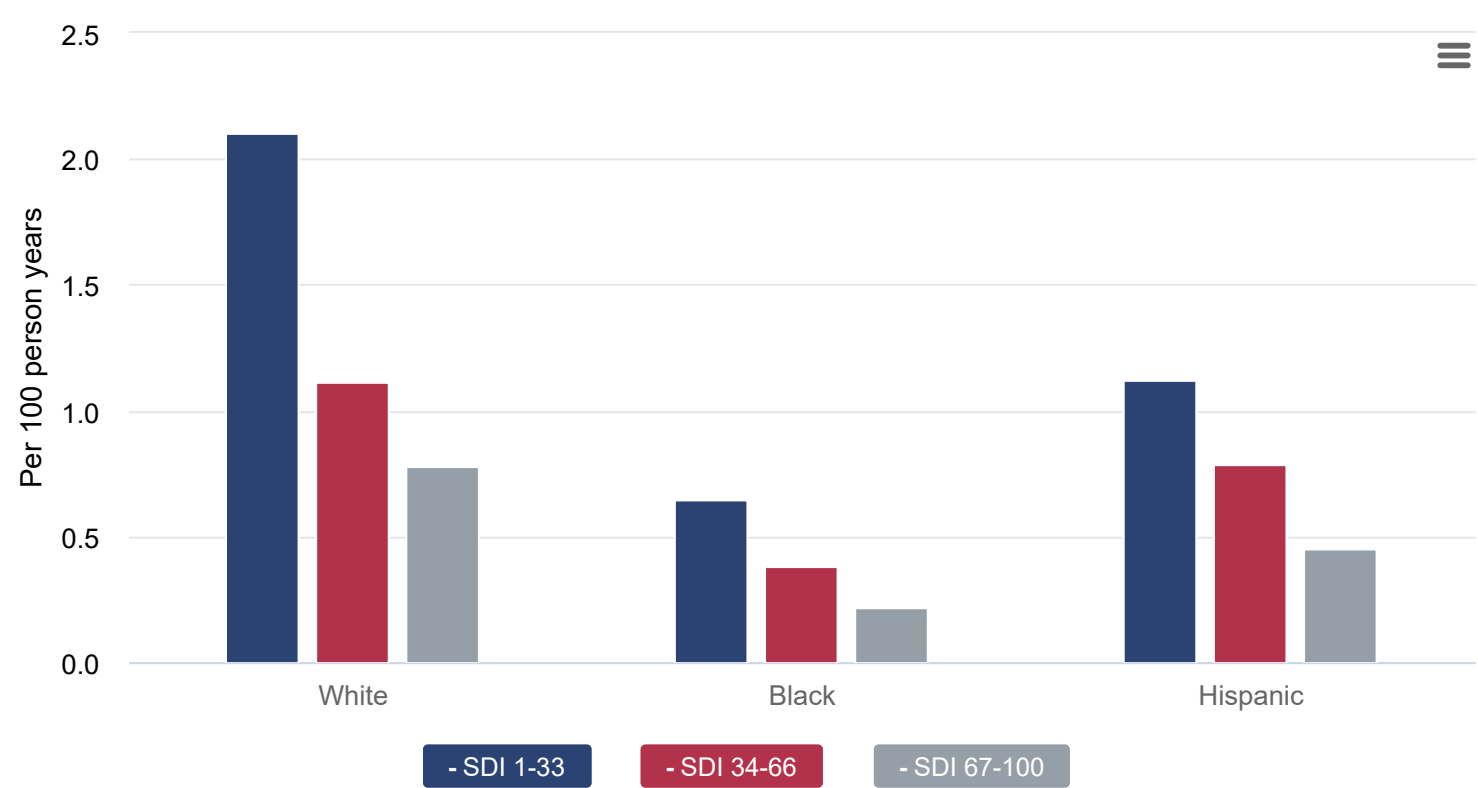
Figure 14.14b Preemptive wait listing or transplantation by race/ethnicity in incident ESRD patients, 2019



Data source: USRDS ESRD database. 2019 incident ESRD patients, aged ≥18 years, and of White, Black, or Hispanic race/ethnicity. Age, sex, cause of ESRD, comorbidity, and SDI were used in adjusted analyses.

Figure 14.14b shows that White patients remain substantially more likely to be placed on the waitlist for a kidney transplant prior to starting dialysis than Black or Hispanic patients even after adjusting for demographic characteristics, comorbidity, and SDI.

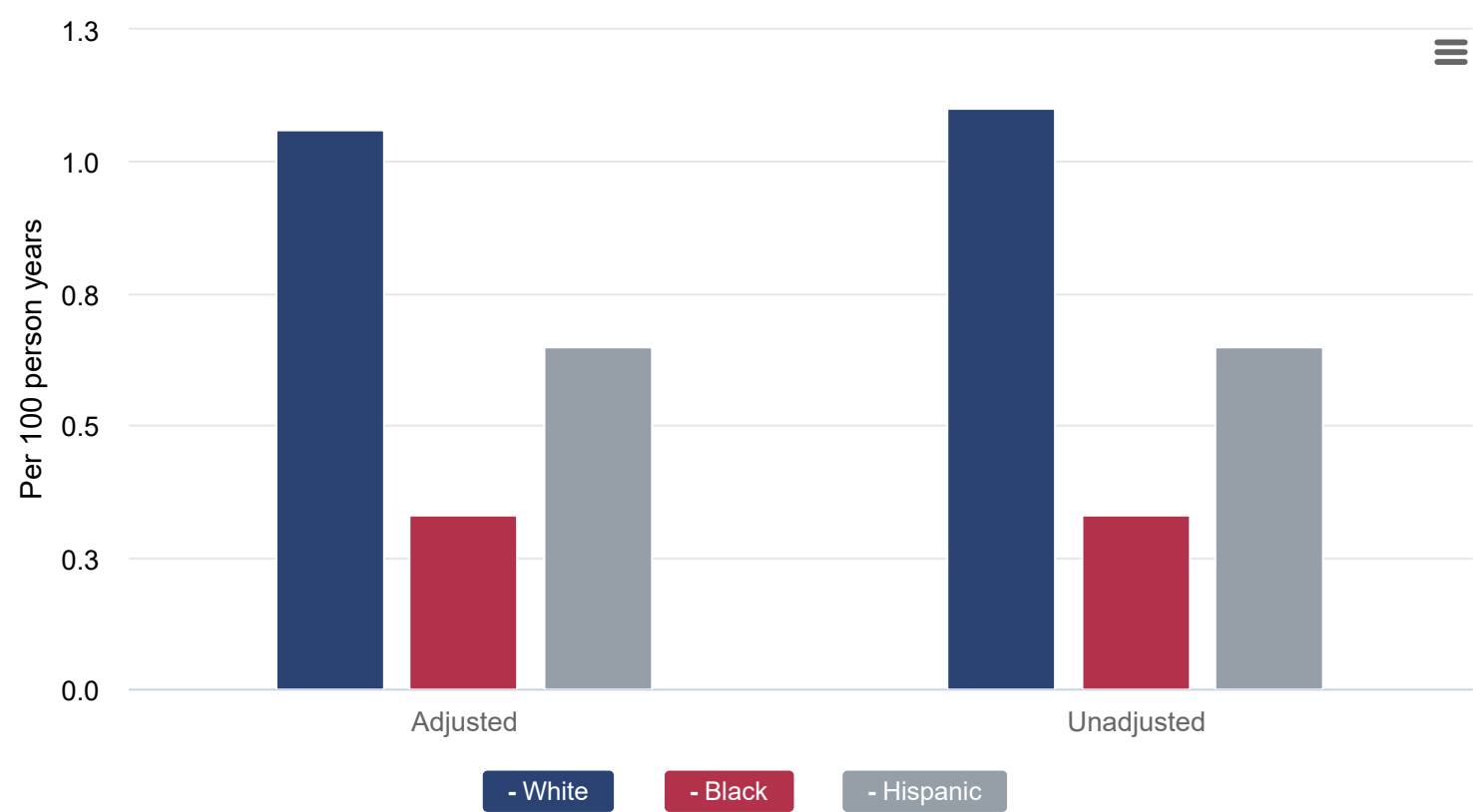
Figure 14.15a Rate of receipt of a living donor kidney transplant in dialysis patients, by race/ethnicity and Social Deprivation Index, 2019



Data source: USRDS ESRD database. 2019 point prevalent ESRD patients with dialysis as treatment modality, aged ≥18 years, and of White, Black, or Hispanic race/ethnicity. Age, sex, cause of ESRD, and comorbidity were used in adjusted analyses. Abbreviation: SDI, Social Deprivation Index.

Figure 14.15a shows the rate of receipt of a living donor kidney transplant by race/ethnicity and by SDI among patients on dialysis. Within all race/ethnicity groups, patients living in neighborhoods with high SDI scores (more deprivation) had much lower rates of receipt of a living donor kidney transplant. However, large disparities by race/ethnicity persisted within and across strata of neighborhood SDI. For example, Black patients living in neighborhoods in the lowest SDI category (least deprivation) had lower rates of receipt of a living donor kidney transplant than White patients living in neighborhoods with the highest SDI scores.

Figure 14.15b Rate of receipt of a living donor kidney transplant in dialysis patients, by race/ethnicity, 2019



Data source: USRDS ESRD database. 2019 point prevalent ESRD patients with dialysis as treatment modality, aged ≥18 years or older, and of White, Black, or Hispanic race/ethnicity. Age, sex, cause of ESRD, comorbidity, and SDI were used in adjusted analyses.

Figure 14.15b shows the rate of receipt of a living donor kidney transplant by race/ethnicity among patients receiving dialysis with and without adjustment for demographic characteristics, comorbidity, and SDI. Despite the large differences in rate of receipt of a living donor kidney transplant across categories of neighborhood SDI (Figure 14.15a), adjustment for SDI made little difference in the degree of disparity across race/ethnicity groups.

Summary

The aims of this chapter were to examine racial/ethnic disparities in outcomes across the spectrum of CKD and ESRD in more detail than in other parts of the ADR. We focused initially on the disconnect between the large differences in ESRD incidence between race/ethnicity groups and the lack of difference in rates of early stages of CKD in the overall U.S. population. We examined the possibility that the current method of estimation of GFR may underestimate the rate of early CKD among Black individuals; that Black and Hispanic individuals have less access to care for CKD or higher rates of AKI; and that social determinants of health may play a role. We also examined the potential role of social determinants of health in access to home dialysis and kidney transplantation among patients with ESRD.

Potential impact of the new eGFR equation on estimates of CKD

Although the biological rationale for including coefficients for characteristics associated with non-GFR determinants of serum creatinine concentration (e.g., age, sex, body weight) seems apparent, the reasons for including race are more questionable. It may be problematic to rely on a correction factor without completely understanding what information is being captured. Specifically, there is an underappreciation of the ancestral and social diversity within the Black community in the U.S. (which is also true for other racial and ethnic groups). Furthermore, as a growing number of individuals in the U.S. identify as being of mixed racial background, the complexity of using race in the practice of medicine is increasing. Race is increasingly being recognized as a social construct rather than a biological one, making its inclusion in GFR estimation increasingly problematic. For these reasons, the joint NKF-ASN taskforce recently recommended adoption of a new eGFR equation that does not include an adjustment for Black race (Delgado et al., 2021; Inker et al., 2021).

We used data from the NHANES to examine the distribution of eGFR among Black, White, and Hispanic individuals using the CKD-EPI equation currently employed by most healthcare systems (Levey et al., 2009) and using the newly derived equation that is based on serum creatinine that does not include a coefficient for Black race (Inker et al., 2021). Use of the new equation systematically lowered the estimated prevalence of CKD among White and Hispanic individuals and increased the estimated prevalence among Black individuals. Thus, although there appeared to be little difference in the prevalence of CKD between Black and White individuals using the older equation (7.7% of White and 6.4% of Black individuals with eGFR <60 ml/min/1.73m² based on NHANES participants from 2015-2018), Black individuals have a higher prevalence of CKD according to the new estimating equation (9.3% vs. 5.8% of White individuals). In other words, Black individuals are estimated to have a 60% higher rate of stage 3-5 CKD than White individuals using the new equation. Use of an estimating equation that leads to a higher eGFR among Black patients may be masking disparities in CKD prevalence earlier in the course of disease.

Access to care during CKD

We did not observe disparities in rates of outpatient nephrology visits or receipt of medications to treat CKD or its complications, including ACEi/ARBs, potassium or phosphorus binders, or SGLT2i, by race/ethnicity. Rates of nephrology visits also differed little by level of neighborhood deprivation. These results suggest that Medicare coverage, including Part D and the LIS, appear to provide comparable access to care for CKD across race/ethnicity groups and across levels of neighborhood deprivation. However, it is important to note that these analyses were limited to individuals aged ≥ 66 years with Medicare FFS coverage. An important contributor to the disparity in ESRD incidence among Black and Hispanic individuals appears to be related to higher rates of hypertension and DM (as evidenced by the causes of ESRD in Figure 14.12), which often begin at a younger age among Black and Hispanic than among White individuals. Barriers to access to care prior to Medicare eligibility likely contribute to the higher rates and earlier onset of DM and hypertension among Black and Hispanic individuals as well as to the higher risk of subsequent CKD and ESRD. The likelihood that disparities are much greater before Medicare eligibility is supported by a recent study published in *JAMA Internal Medicine*, which reported that racial and ethnic healthcare disparities in the general population decreased substantially after the age of Medicare eligibility, even in the era after implementation of the Affordable Care Act (Wallace et al., 2021).

Social determinants of health

Race may serve as a proxy measure for social, environmental, and structural factors that have important effects on health. ICD-10-CM includes SDOH-related encounter reason codes (Z55-Z65) that can be used to document SDOH data (Centers for Medicare & Medicaid Services, 2021). These codes were created to identify individuals' social risk factors and unmet needs to inform healthcare delivery and services and ultimately to improve quality of care, care coordination, and experience of care. Collecting data on SDOH and the associations among SDOH and receipt of healthcare and services and health outcomes could help identify opportunities to address barriers to high quality of care. However, SDOH-related Z codes are rarely documented among Medicare beneficiaries with (or without) CKD (Mathew et al., 2020), limiting our ability to study the role of SDOH in racial and ethnic disparities in this population.

Because Z-codes were coded so infrequently, we turned to the U.S. Social Deprivation Index, developed by the Robert Graham Center, the policy institute affiliated with the American Academy of Family Physicians (Phillips et al., 2016; Robert Graham Center, 2021), at the ZIP code Tabulation Area (ZCTA) level (United States Census Bureau, 2020). Although we found little association between SDI and receipt of medical care (medications and nephrology visits) among patients with CKD, there were strong associations between patients' neighborhood SDI and access to home dialysis and kidney transplantation. Patients living in neighborhoods with high SDI scores were much less likely to dialyze at home, to be waitlisted for a kidney transplant prior to initiating dialysis, or to receive a living donor kidney transplant. Addressing barriers related to SDOH may be critical to successfully increasing utilization of home dialysis

Considering kidney transplantation, implementation of the new Kidney Allocation System in December 2014 essentially eliminated disparities in access to deceased donor transplantation among Black patients with ESRD (see Figure 7.11 in the ESRD Volume of this year's ADR). Thus, lower rates of preemptive transplantation and living donor kidney transplantation are now the key drivers of the ongoing overall disparity in access to transplantation among Black patients. These disparities are particularly significant because outcomes are superior for preemptive and living donor kidney transplants compared with deceased donor kidney transplants after ESRD onset.

It is important to note some limitations of these analyses. First, SDI is a measure at the ZCTA level and does not represent an individual's SDOH. Although there is overlap, patient-level and community-level approaches for assessing patient social risks are not equivalent (Cottrell et al., 2020). Second, we examined associations of SDI with outcomes using the lower, middle, and upper thirds of the total range of scores as has been done in other analyses of associations with health outcomes. These groups each include a fairly wide range of SDI scores, and it is likely that scores with these subgroups vary by race/ethnicity (i.e., that the mean neighborhood SDI among White individuals with SDI 1-33 is lower than the mean among Black individuals with SDI 1-33). Both of these approximations have the potential to introduce "noise" into analyses of the associations between SDOH and outcomes and would be expected to lessen the extent to which SDOH are associated with outcomes and the extent to which SDOH may account for racial disparities. Therefore, although it appears as though addressing SDOH would not eliminate racial and ethnic disparities in access to preemptive and living transplantation or barriers to home dialysis, it is likely that these barriers are more important than our analyses suggest. Efforts to mitigate barriers posed by SDOH should be a high priority.

Conversely, we should not ignore the large disparities that remain unexplained after accounting for demographic characteristics, comorbidity, and SDI. Although rates of nephrology visits and receipt of some key medications used in treatment of patients with CKD did not differ meaningfully by race/ethnicity, there are many aspects of access to and processes of care that cannot be examined through claims data. Therefore, the nephrology community must critically examine healthcare delivery using other data sources to look for evidence of potential racism in the delivery of healthcare and be willing to address any racism that is discovered.

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