



THE UNIVERSITY OF CHICAGO  
M E D I C A L C E N T E R

# Racial and Socioeconomic Disparities in CKD

Milda Saunders, MD, MPH  
Section of General Internal Medicine and  
MacLean Center for Clinical Medical Ethics  
Living Donor Advocate Physician, Transplant Institute  
University of Chicago Medicine



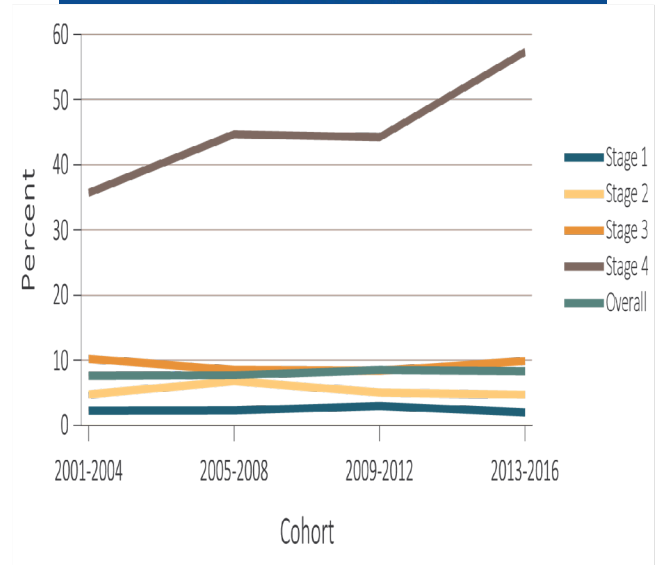
# Overview

- Chronic Kidney Disease and ESRD Epidemiology in the US
- Variation by race/ethnicity, SES and neighborhood
- Impact of Health Care
- Now What?



# Chronic Kidney Disease in the US

- 14.8% US population with kidney disease
- \$79 billion in Medicare spending (12.5% of total)
- In early stage CKD, AA and Whites have similar prevalence (approx 15%)
- Awareness of CKD is low (3% overall, Stage 4 55%)



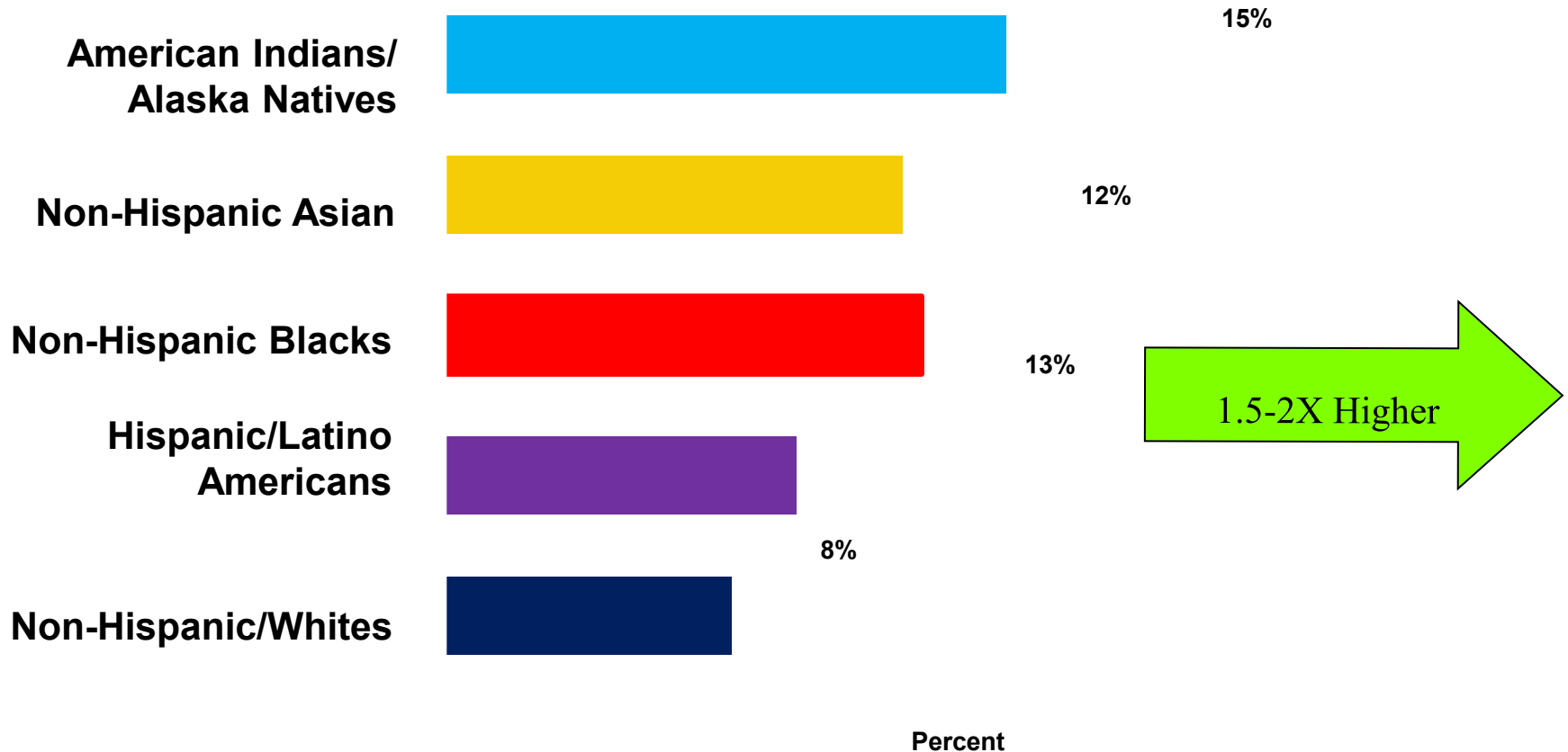


# At each stage in the continuum, there are racial/ethnic disparities

- Risk Factors
- CKD Progression
- RRT
  - Dialysis Outcomes
  - Transplantation



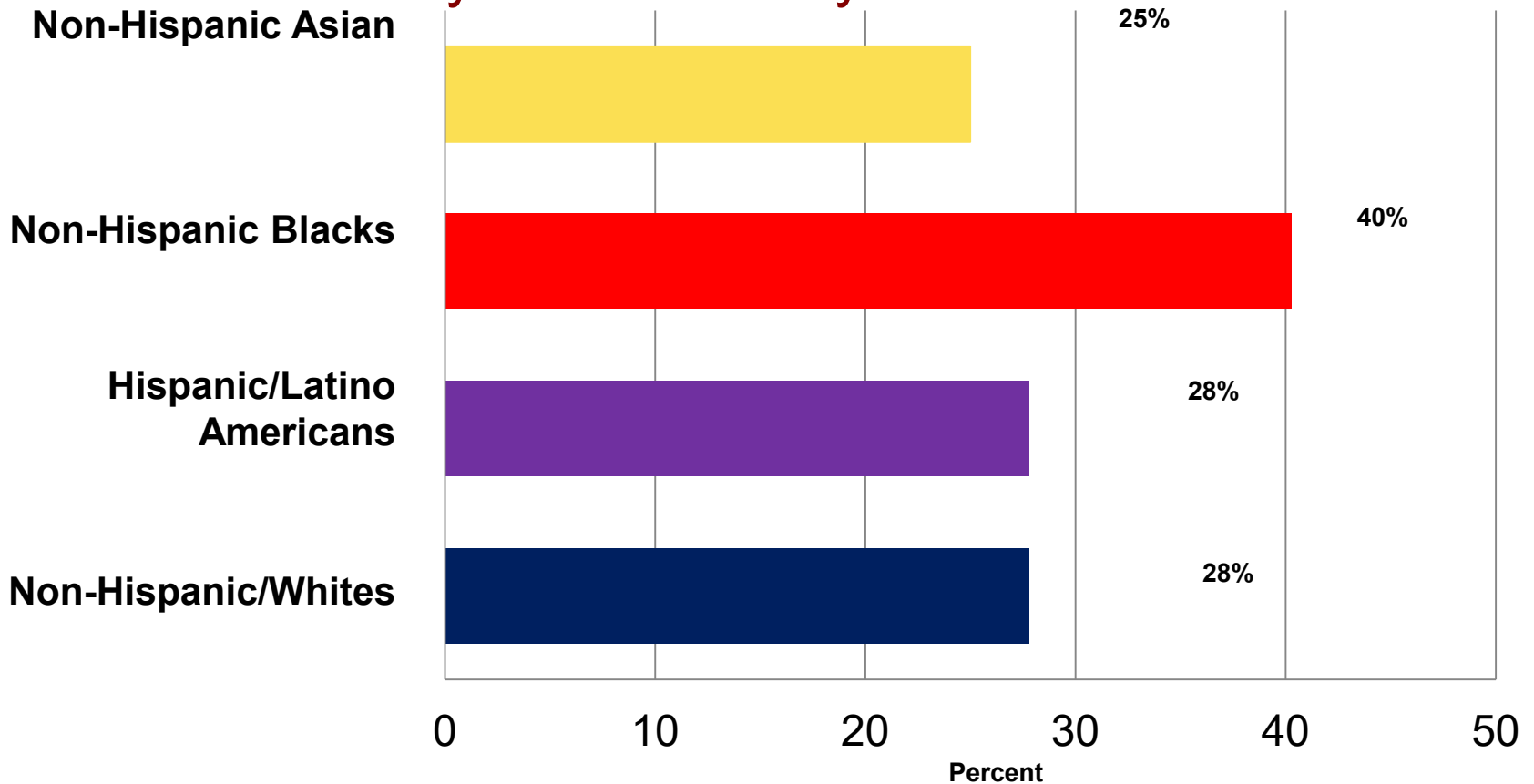
## Age-Adjusted Prevalence of Diabetes\* by Race/Ethnicity in the US



\* In people 18+ years old.



## Age-Adjusted Prevalence of Hypertension\* by Race/Ethnicity in the US

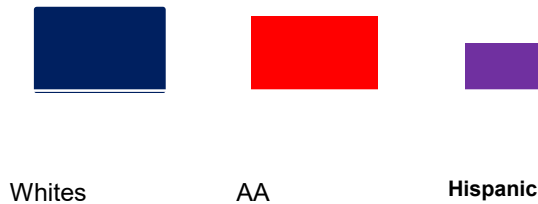


\* In people 18+ years old.

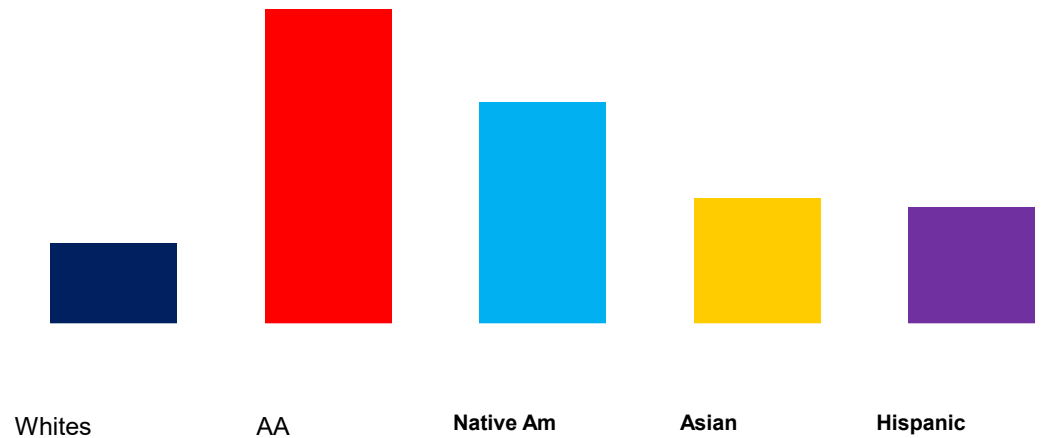


# Despite a Lower Relative Prevalence of CKD there is a Higher Prevalence of ESRD in Minorities

Relative prevalence of stage 1 - 3 CKD (MDRD GFR)



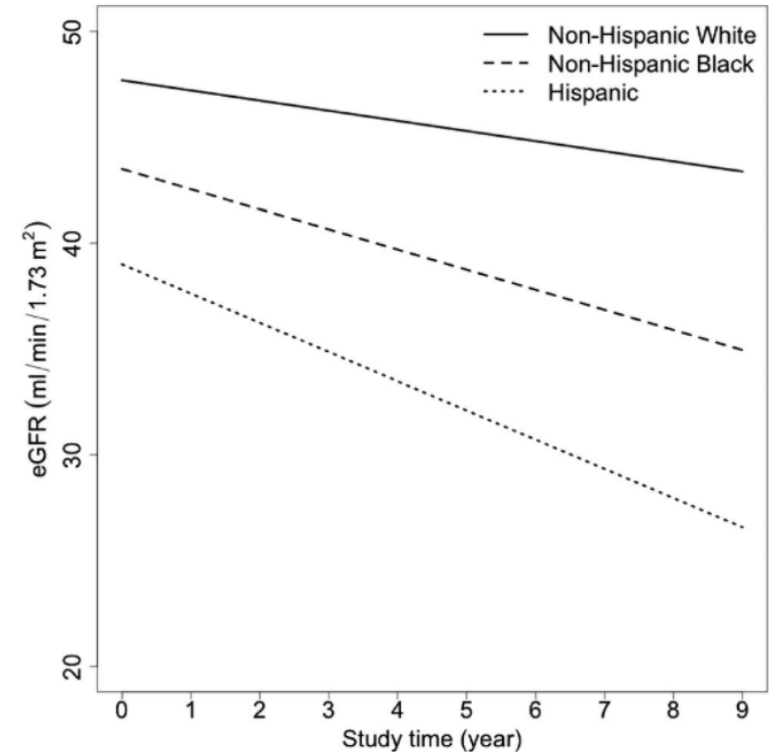
Relative prevalence of ESRD





## CKD Progression by Race

- Using CRIC data, Hispanics have a greater rate of CKD progression compared to NHB and NHW
- Persisted in adjustment for demographic and clinical factors (except proteinuria)
- Prior work showed risk of kidney failure  
NHB>Hispanic>Whites>Asian



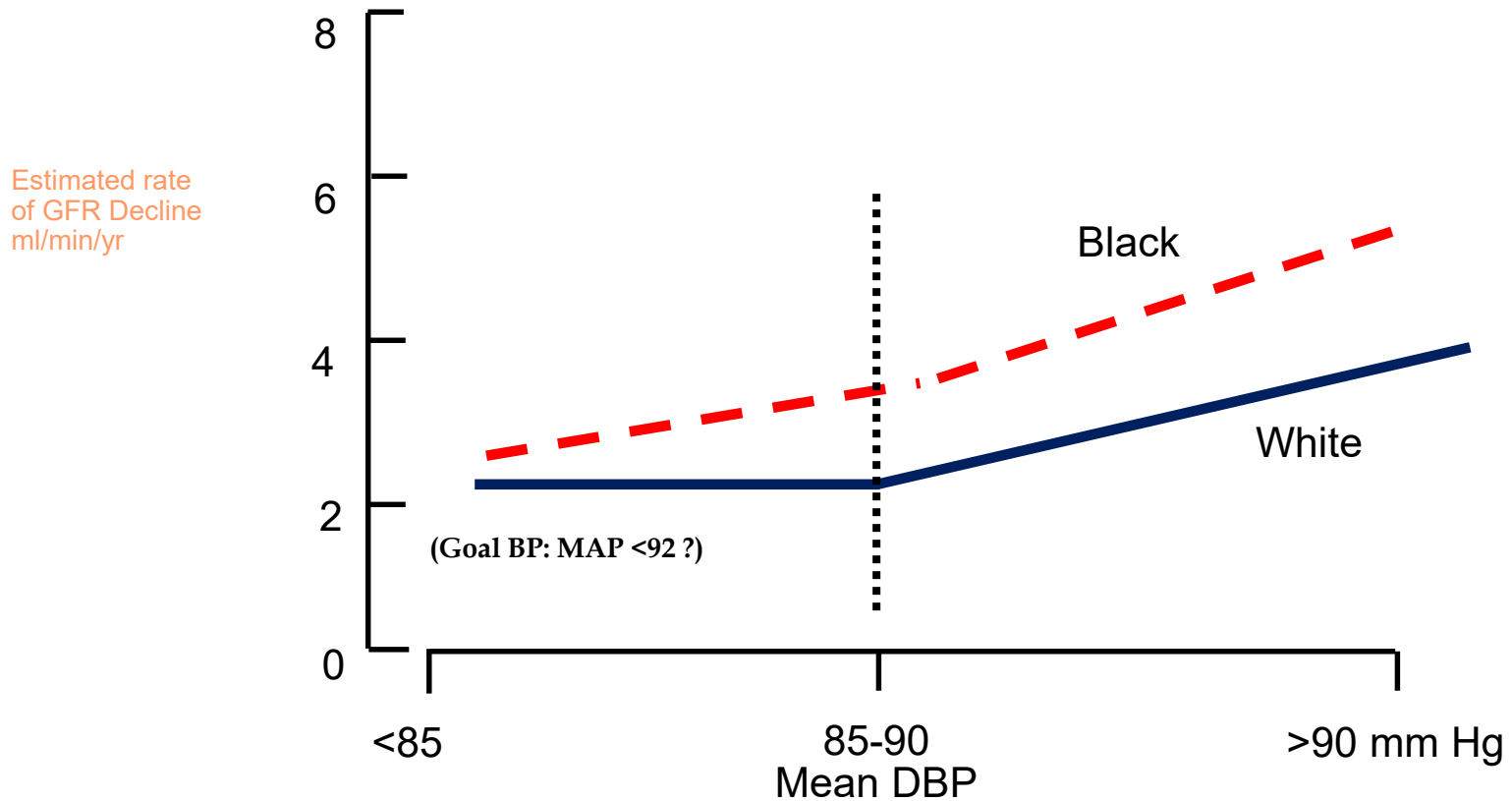
Race-Ethnicity	N	eGFR slope (ml/min/1.73m <sup>2</sup> /yr) (SE) <sup>†</sup>	p-value <sup>†</sup>
Non-Hispanic White	1638	-0.48 (0.03)	<0.0001
Non-Hispanic Black	1650	-0.95 (0.04)	<0.0001
Hispanic	497	-1.38 (0.09)	

<sup>†</sup> Mean changes in eGFR per year are adjusted for 5 study design features (i.e., age, gender, baseline eGFR, diabetes,





# Racial Differences in Estimated GFR Decline by BP Level





# Biologic Differences

- APOL1 high risk allele has been associated with CKD progression in AA
- Patients with 2 copies of a risk allele were twice as likely to reach ESRD (as those with 1 or none)

Multivariable Analyses of Differences in the eGFR Slope and Risk of the  $\hat{\Delta}$ -Composite Renal Outcome in the CRIC Study

Multivariate Model and Comparison Group	Difference in eGFR Slope				Risk of Composite Renal Outcome				
	With Diabetes		Without Diabetes		With Diabetes		Without Diabetes		
	ml/min/1.73 m <sup>2</sup> /yr	P value	ml/min/1.73 m <sup>2</sup> /yr	P value	hazard ratio	P value	hazard ratio	P value	
	(95% CI)		(95% CI)		(95% CI)		(95% CI)		
<b>Model 3</b>									
All black patients vs. all white patients	-0.48 (-0.88 to -0.09)	0.02	-0.17 (-0.48 to 0.13)	0.27	1.49 (1.18 to 1.88)	<0.001	1.80 (1.31 to 2.49)	<0.001	
Black patients with APOLI high risk vs. all white patients	-1.32 (-2.02 to -0.63)	<0.001	-1.05 (-1.54 to -0.56)	<0.001	1.95 (1.39 to 2.73)	<0.001	2.68 (1.78 to 4.05)	<0.001	
Black patients with APOLI low risk vs. all white patients	-0.35 (-0.75 to 0.06)	0.09	0.08 (-0.25 to -0.40)	0.65	1.40 (1.10 to 1.78)	0.006	1.57 (1.11 to 2.21)	0.01	



# But not just..Biologic Differences

- APOL1 high risk allele has been associated with CKD progression in AA
- Patients with 2 copies of a risk allele were twice as likely to reach ESRD (as those with 1 or none)
- Notably, among blacks in the low-risk group compared with all whites, there remained a 40-57% greater risk of the composite renal outcome.

Multivariable Analyses of Differences in the eGFR Slope and Risk of the  $\Delta$ -Composite Renal Outcome in the CRIC Study

Multivariate Model and Comparison Group	Difference in eGFR Slope				Risk of Composite Renal Outcome			
	With Diabetes		Without Diabetes		With Diabetes		Without Diabetes	
	ml/min/1.73 m <sup>2</sup> /yr	P value	ml/min/1.73 m <sup>2</sup> /yr	P value	hazard ratio (95% CI)	P value	hazard ratio (95% CI)	P value
<b>Model 3</b>								
All black patients vs. all white patients	-0.48 (-0.88 to -0.09)	0.02	-0.17 (-0.48 to 0.13)	0.27	1.49 (1.18 to 1.88)	<0.001	1.80 (1.31 to 2.49)	<0.001
Black patients with APOLI high risk vs. all white patients	-1.32 (-2.02 to -0.63)	<0.001	-1.05 (-1.54 to -0.56)	<0.001	1.95 (1.39 to 2.73)	<0.001	2.68 (1.78 to 4.05)	<0.001
Black patients with APOLI low risk vs. all white patients	-0.35 (-0.75 to 0.06)	0.09	0.08 (-0.25 to -0.40)	0.65	1.40 (1.10 to 1.78)	0.006	1.57 (1.11 to 2.21)	0.01



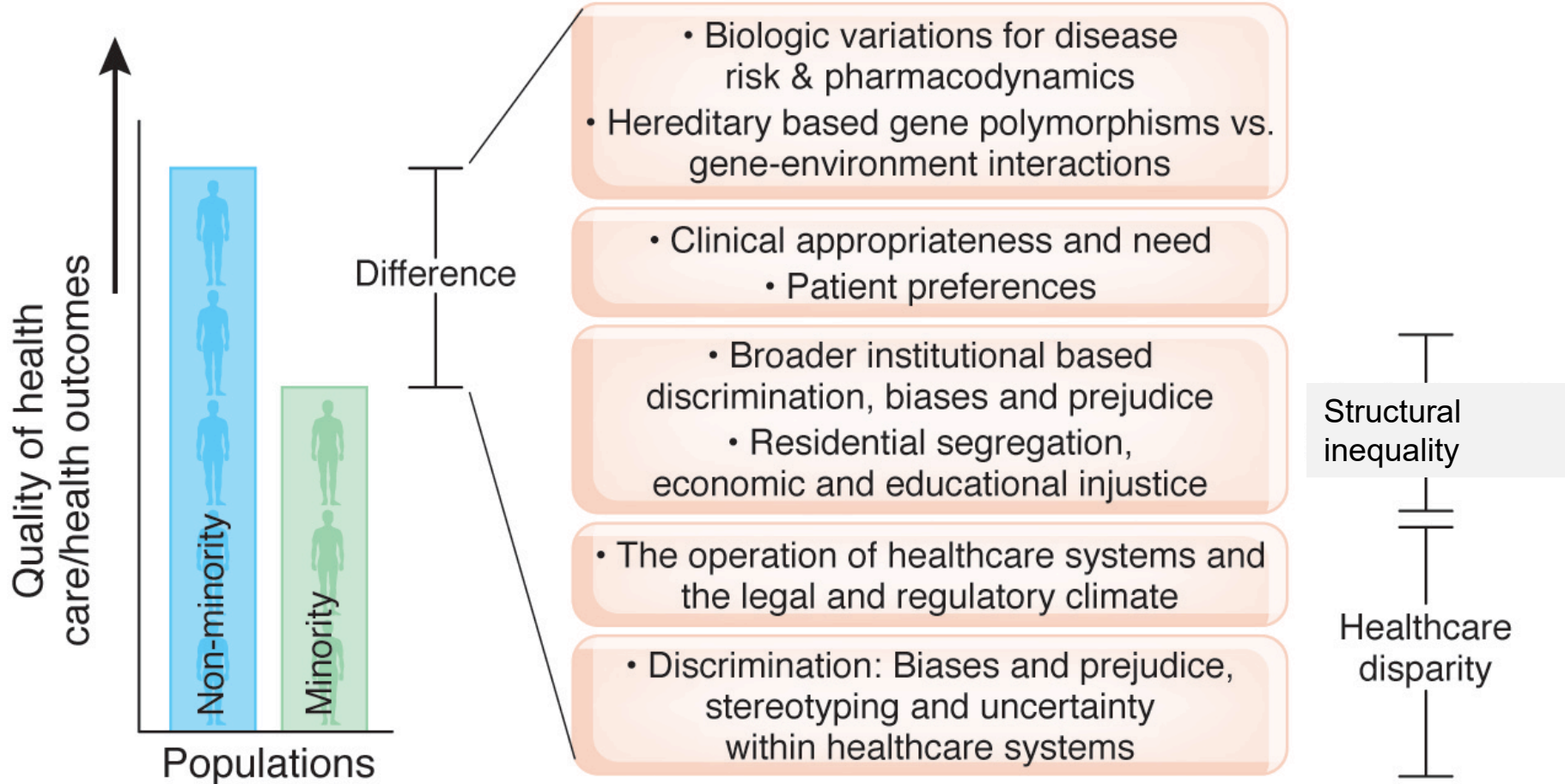
## Race Matters....

- Increased rates of hypertension and diabetes
- Accelerated vascular damage (typically characterized by excess rates of albuminuria) due to increased rates of stress, nutritional deficiencies, toxin exposures, and other
- Racial/ethnic variations in select enzyme activity, gene expressions, receptor densities and/or polymorphisms, for an array of signaling and metabolic pathways that may affect ESRD progression (eg, increased TGF- $\beta$ , ApoL1, dysregulation of intrarenal renin-angiotensin system).

...**but does not fully account for excess burden**



## What do we mean by Health Disparities?





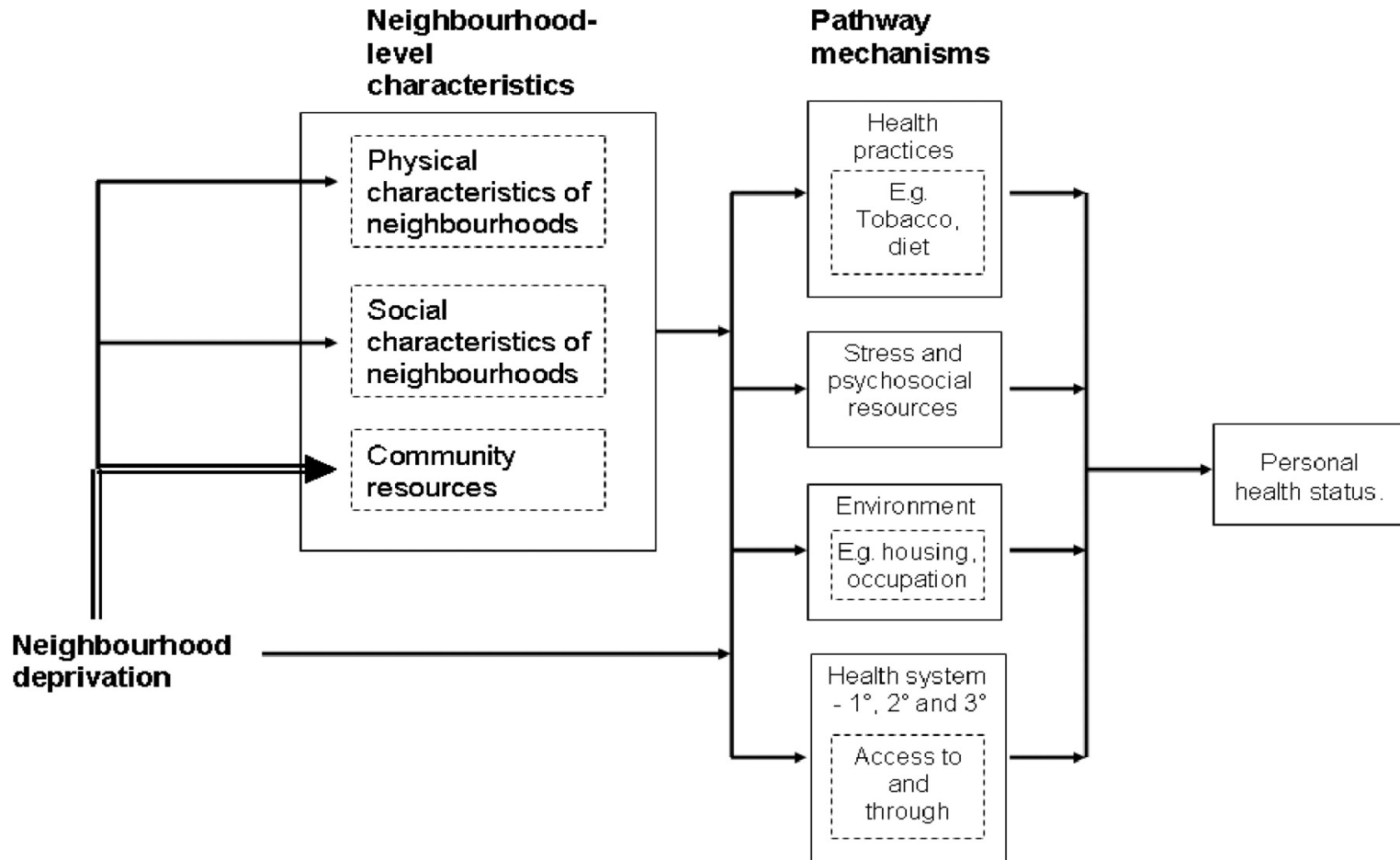
# Neighborhood Effects

- Neighborhood plays a role in:
  - education, employment & income outcomes
- Studies on health outcomes:
  - Mortality
  - CV health
  - Obesity
  - Birth outcomes
  - Diabetes



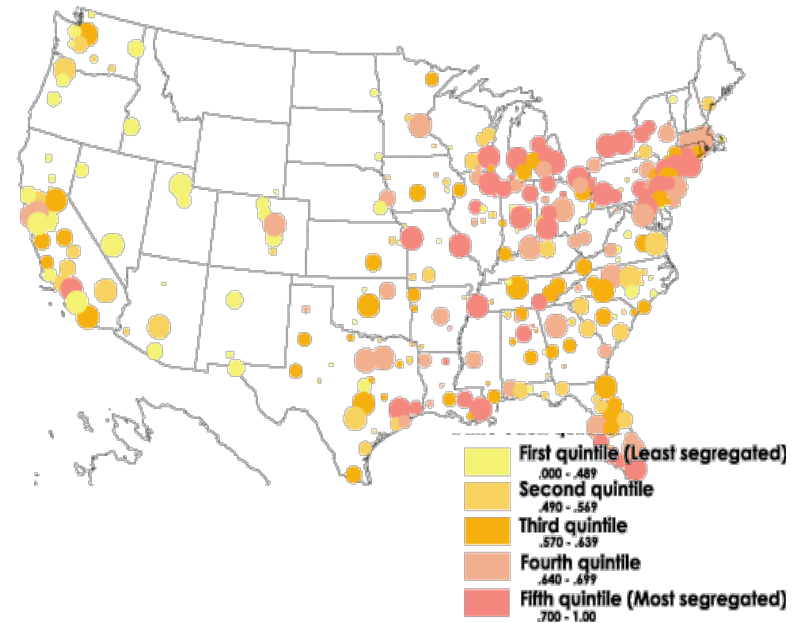
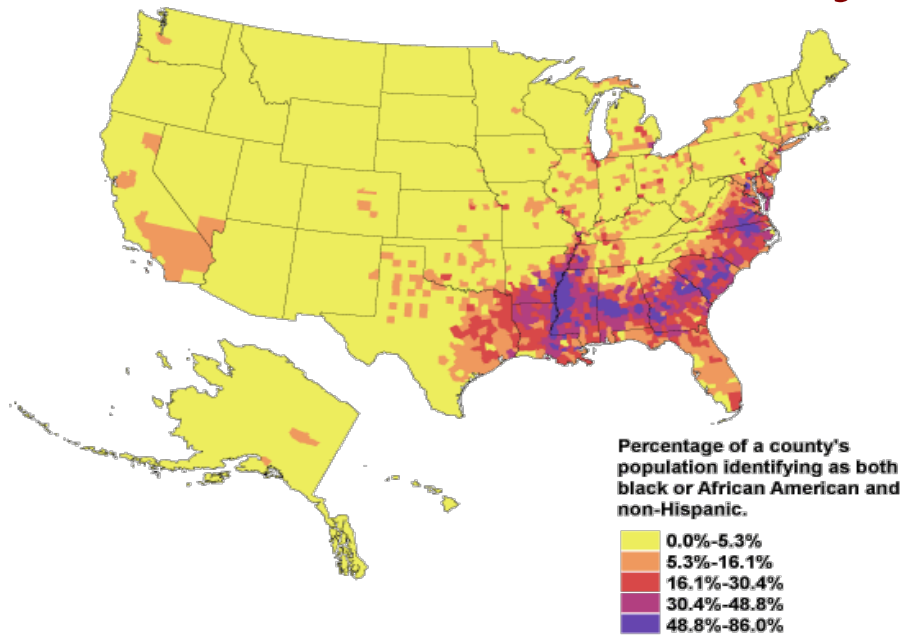


# Conceptual Model of Neighborhood Effects





# Location is socially mediated



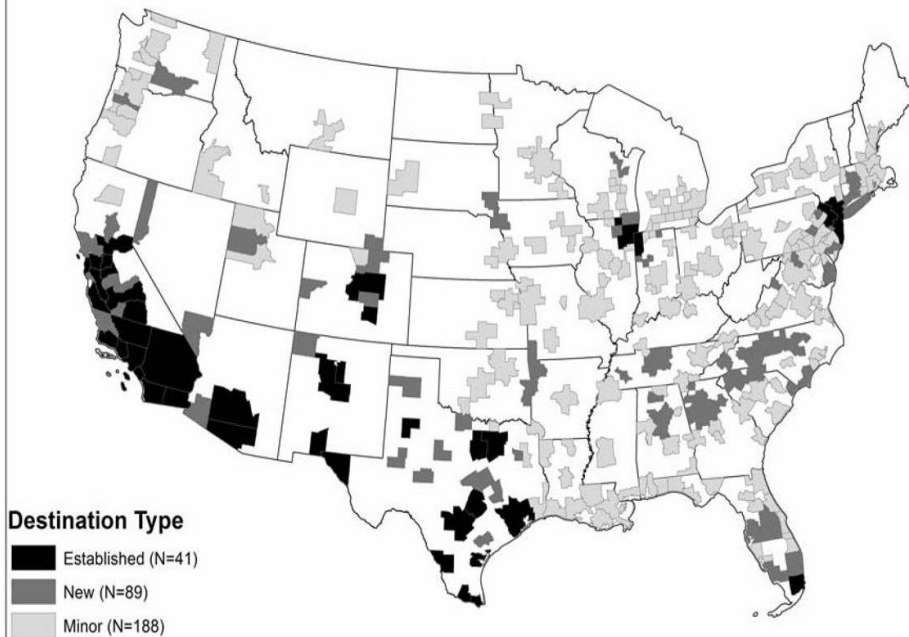
- African Americans are concentrated largely in urban areas and in the South
- Even within these communities, African Americans and Whites live separately





# Location is socially mediated

- Hispanics in US



- In 1990, 39% of all Latinos in the US and 46% of all poor Latinos lived in neighborhoods where at least 50% of the population was Latino



# Location is socially mediated

- Policy

- By law, discrimination by race in housing has been illegal since 1968
- FHA had a discriminatory practice of “red-lining” which excluded mortgages (and people) not in White middle class areas
- HUD has played a role in perpetuating segregation through its location of public housing and distribution of rental vouchers as late as 1990s



# Location is socially mediated

- Practice
  - Realtors tend to steer minority clients to minority areas, regardless of stated preference
  - Similarly, Whites are steered toward away from minority areas
  - African Americans and Hispanics who responded to newspaper advertisements to either rent or purchase a home experienced discrimination roughly 50% of the time.



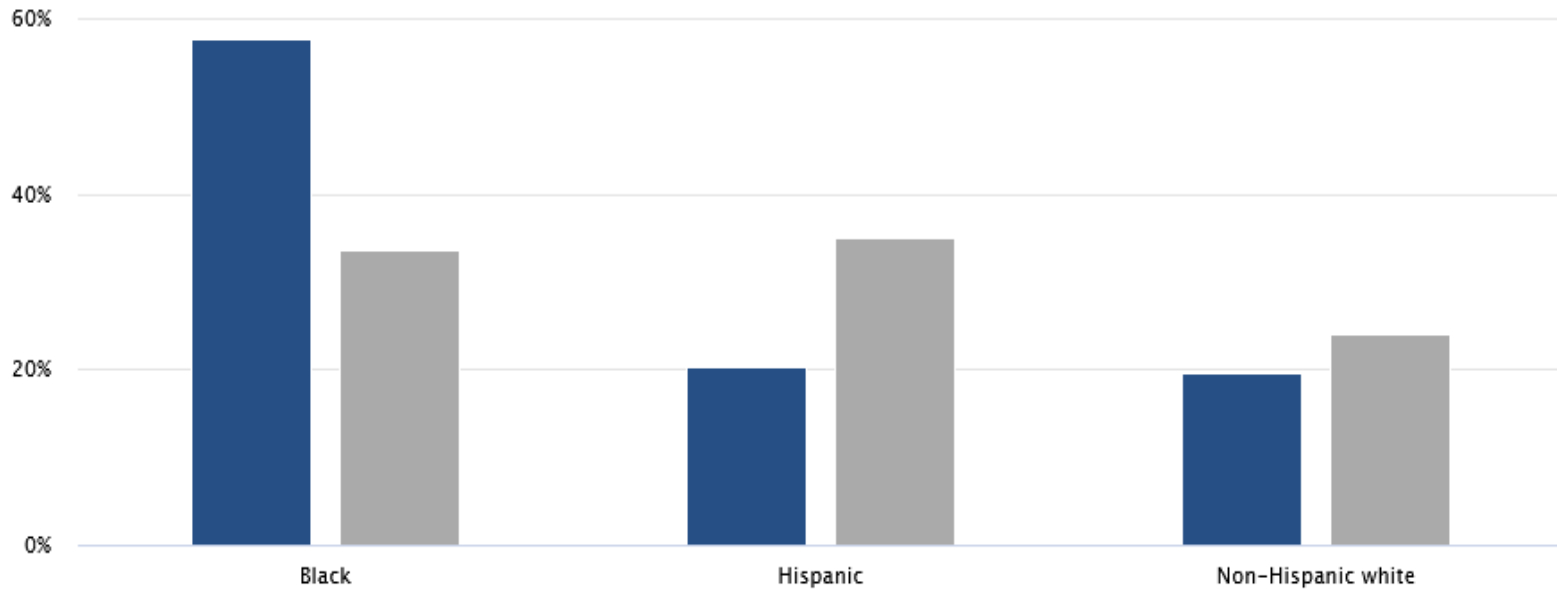
# Location is socially mediated

- Choice
  - African Americans would prefer to live in neighborhoods that are 20-50%AA
  - AA chose mixed, then AA then White neighborhoods—all other things equal
  - However, the “tipping point” for Whites, is 20-60%
  - Whites chose White, then mixed then AA neighborhoods—all other things equal
  - Racial composition sometimes serves as a “proxy” for structural strength e.g. crime rates, property values, school quality that determine the desirability of a given neighborhood.



# Differences in economic opportunity

Racial composition of high-poverty neighborhoods  
1980 and 2018, U.S. metro areas



Source: EIG Analysis of U.S. Census Bureau data and American Community Survey, 5-Year estimates



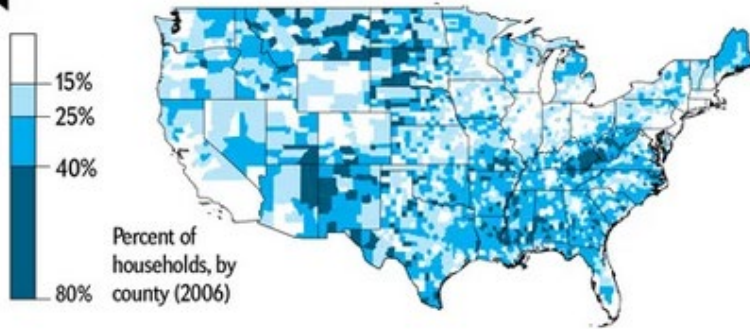
## Consequences

- AA non-poor children are significantly more likely to live in poor neighborhoods than White poor children
- AA and Hispanics need a higher income than NHW to live in a non-poor neighborhood
- Consequences:
  - Decreased wealth
  - Increased exposure to violence and disorder
  - Decreased access to resources, including health-promoting resources

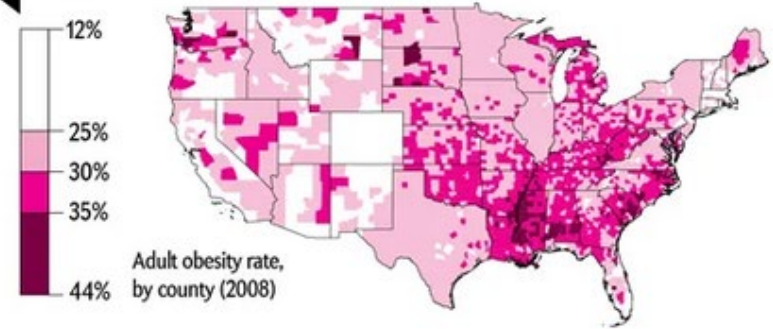


# Important Implications for Health Outcomes

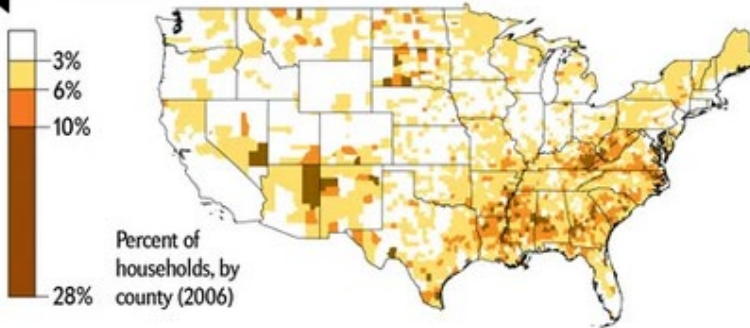
Low-Income Households (more than 1 mile from a grocery)



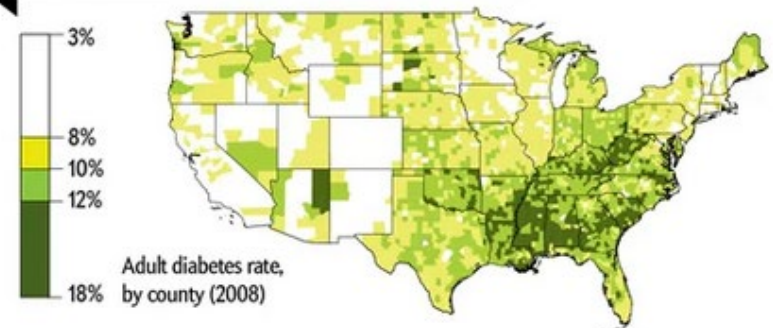
Health Indicator: Obesity



Car-Free Households (more than 1 mile from a grocery)



Health Indicator: Diabetes





# CKD Risk Factors: Diabetes Risk by Neighborhood Resources

Table 3. Incidence of Type 2 Diabetes<sup>a</sup> by Tertiles of Neighborhood Scores<sup>b</sup>

Neighborhood Resources	Incidence per 1000 Person-Years (95% Confidence Interval)		
	Tertile 1, Worst	Tertile 2, Intermediate	Tertile 3, Best
Physical activity	28.7 (23.1-35.6)	27.0 (21.8-33.4)	16.3 (12.5-21.4)
Healthy foods	31.4 (25.7-38.4)	26.8 (21.6-33.2)	15.5 (11.8-20.4)





# CKD Progression is Associated with Area SES

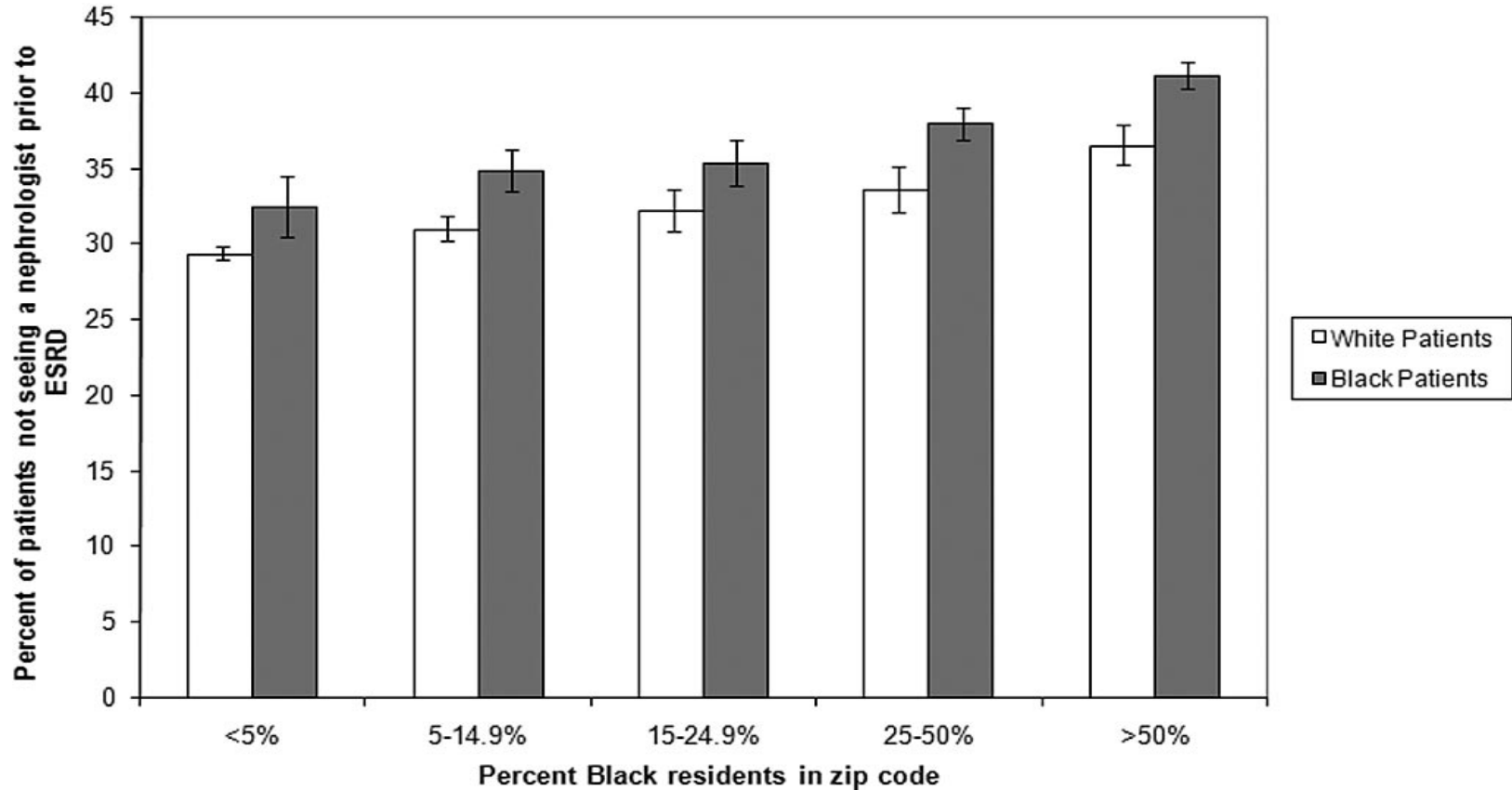
Area-SES score <sup>b</sup>	Basic	+ income and education	+ lifestyle factors	+ diabetes and hypertension
1 (low)	1.6 (1.2-2.2)	1.5 (1.1-1.9)	1.5 (1.0-2.0)	1.4 (1.0-1.7)
2	1.7 (1.3-2.3)	1.6 (1.2-2.1)	1.6 (1.2-2.1)	1.6 (1.2-2.0)
3	1.1 (0.8-1.5)	1.1 (0.8-2.2)	1.0 (0.8-1.4)	1.1 (0.8-2.1)
4 (high-reference)	Reference	Reference	Reference	Reference
p-trend	0.0001	0.002	0.004	0.01

- CKD progression (>0.4g/dL) associated with area SES even after controlling for individual SES

- Living in the lowest SES area was associated with a 40% increased risk in pCKD even after controlling for individual SES, DM, and HTN



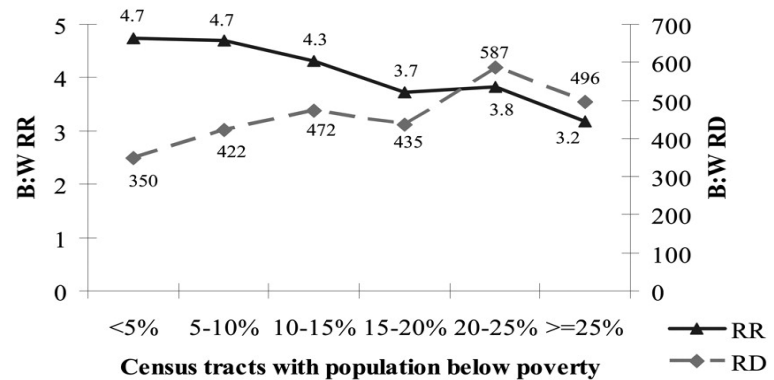
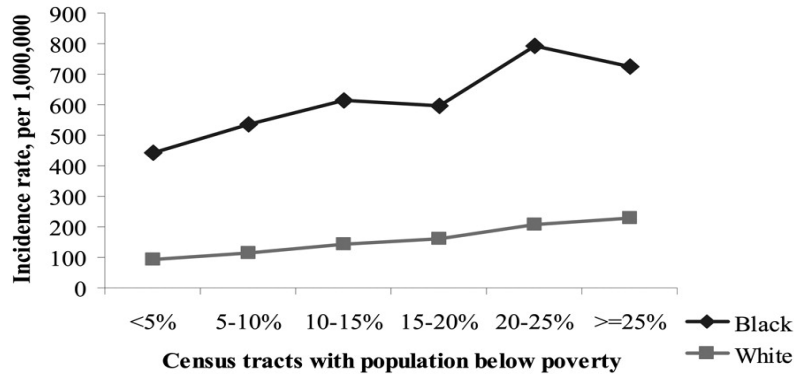
# Likelihood of Receiving Pre-ESRD Care Varies by Neighborhood



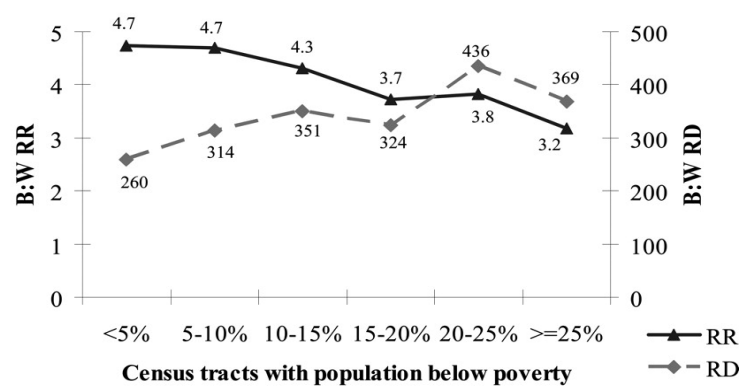
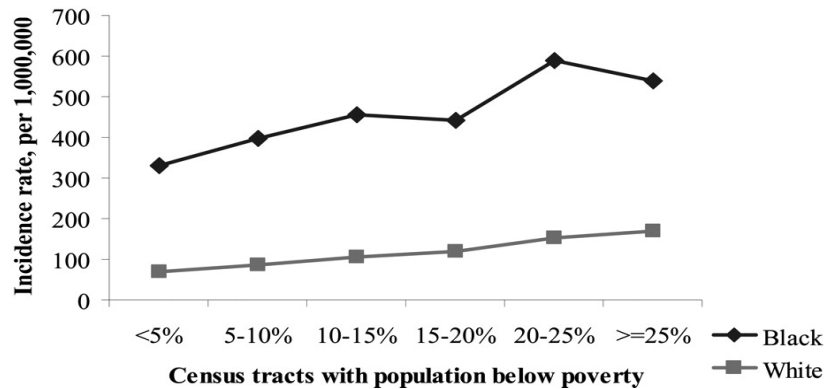


# ESRD Incidence Varies by Neighborhood

## A. Males 50-60 years old

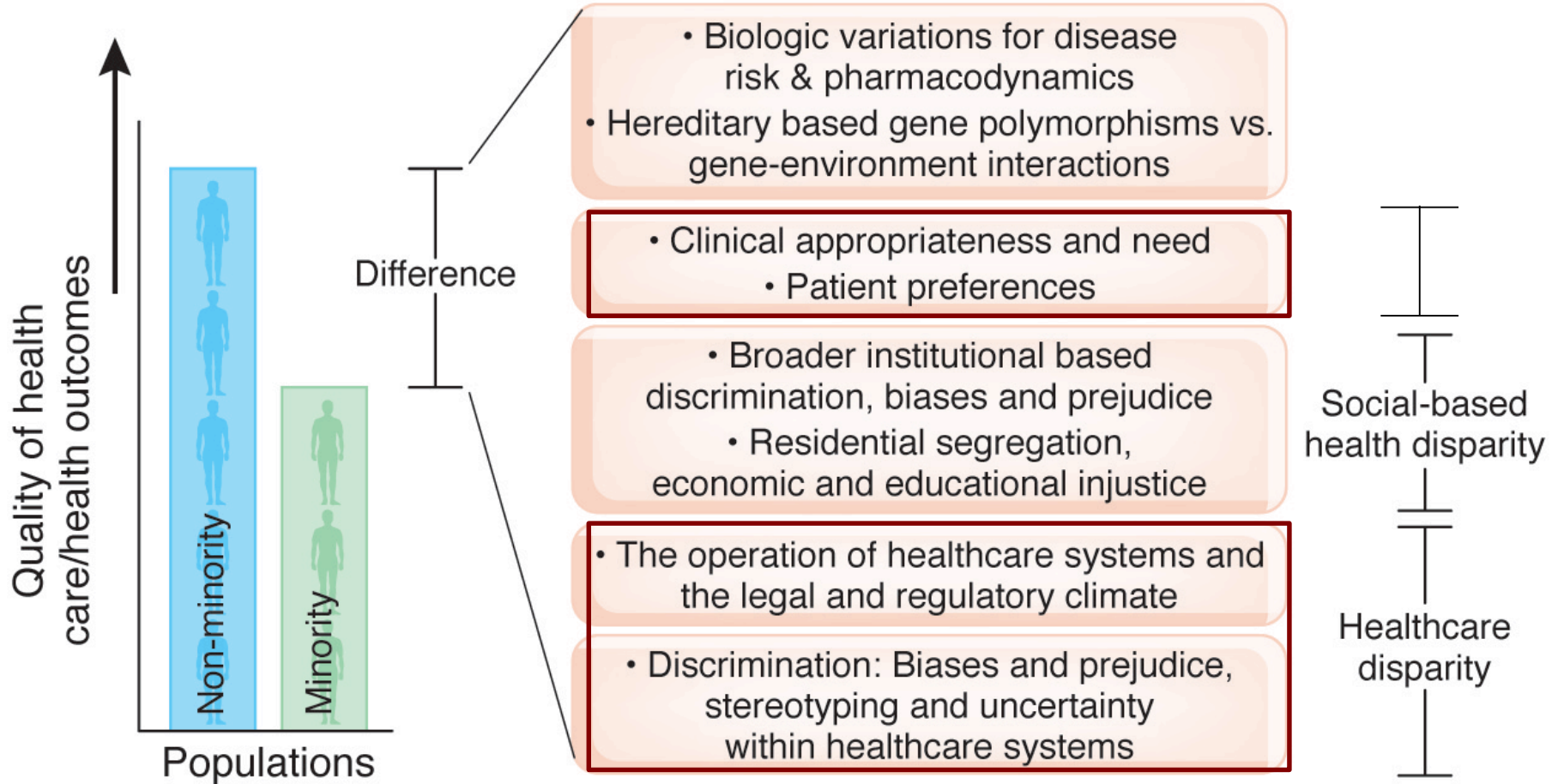


## B. Females 50-60 years old





# What do we mean by Health Care Disparities?



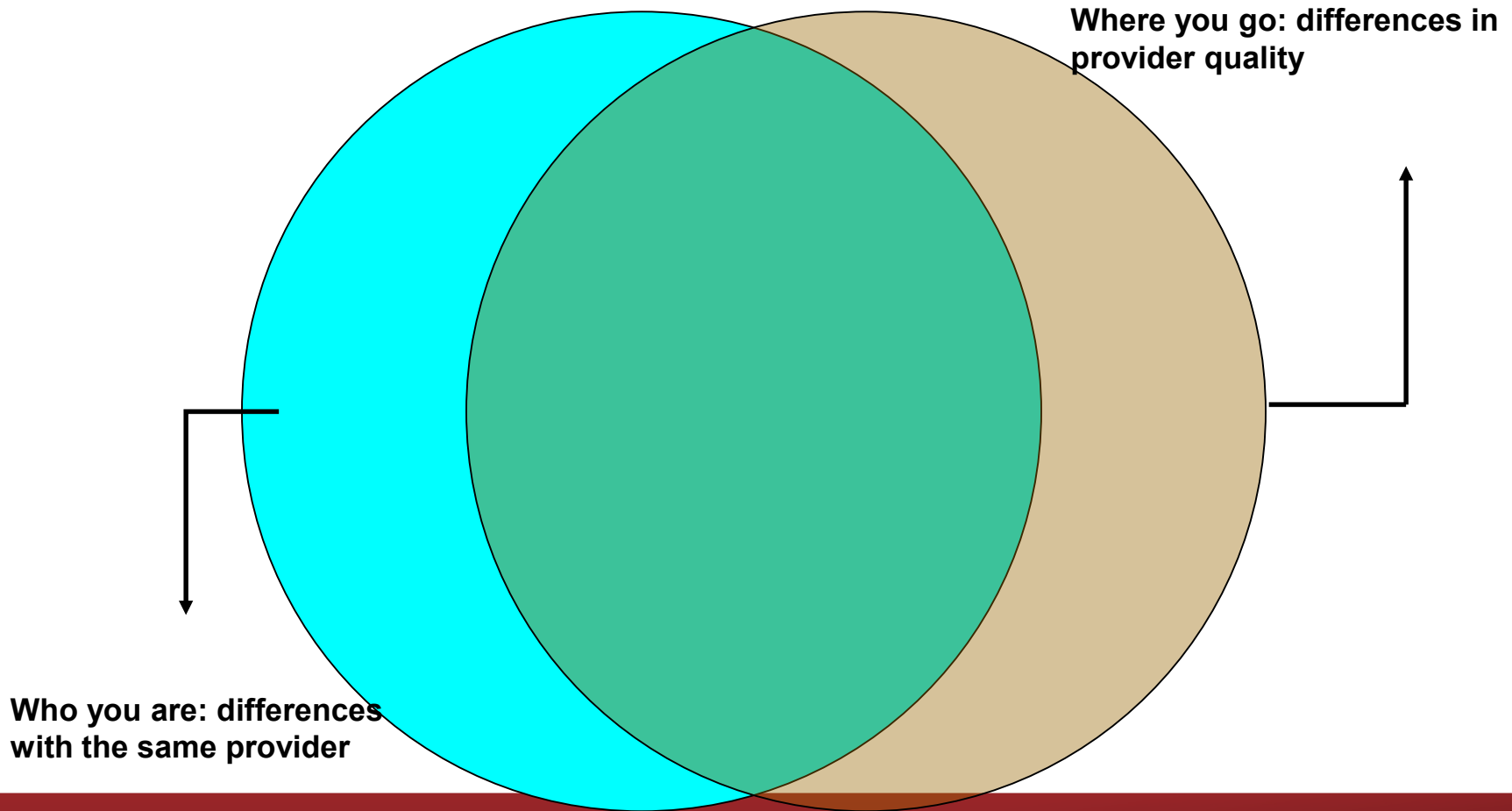


# Population-Based Determinants of Health

- Some believe that medical care accounts for only 10% of the variance in health (Adler, McGinnis)
- BUT... medical care may have a greater impact on the health of vulnerable racial and low SES groups than on their counterparts (Williams and Collins, p. 373)



# Differences in health care quality

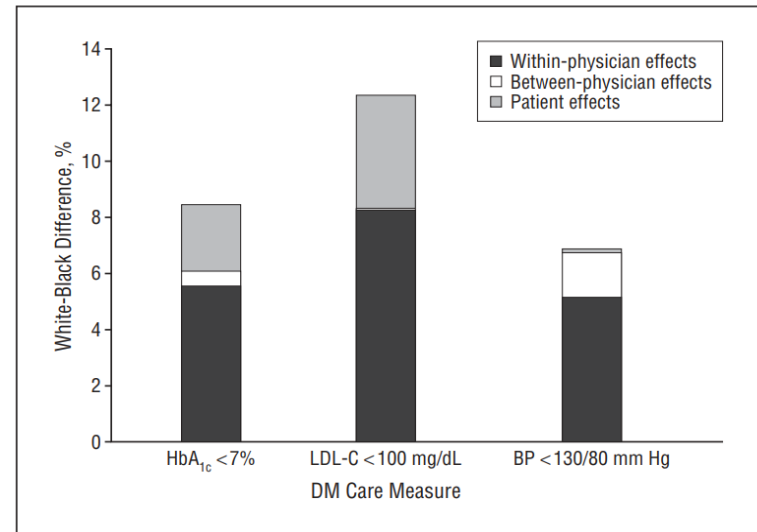




# Disparities in Quality of Care

**Table 2. Impact of Patient Characteristics and Physicians on Racial Disparities in DM Care**

Characteristic	Difference for Black vs White Patients According to Type of Model, %			
	Unadjusted Model <sup>a</sup>	Sociodemo- graphic Model <sup>b</sup>	Clinical Model <sup>c</sup>	Physician Model <sup>d</sup>
HbA <sub>1c</sub> control				
<7.0	-8.5	-5.3	-6.1	-5.6
<8.0	-7.8	-3.9	-4.8	-4.4
LDL-C control, mg/dL				
<100	-12.2	-8.1	-8.2	-8.3
<130	-6.4	-2.9	-3.6	-3.7
BP control, mm Hg				
<130/80	-6.9	-6.0	-6.8	-5.2
<140/90	-6.0	-5.4	-6.5	-5.9



- In a private health care system, no Black-White difference in screening (processes) but different outcomes
- Patient factors explained 13% to 38% of the racial differences in these measures, within-physician effects accounted for 66% to 75%



# Disparities in Quality of Care

**Table 1. Sociodemographic and Clinical Characteristics of Study Patients**

Characteristic	Patients, No. (%)		P Value
	White (n=4556)	Black (n=2258)	
Age, mean (SD), y	64.7 (13)	58.7 (12)	<.001
Male	2477 (54)	938 (42)	<.001
Median household income, \$	57 580	42 859	<.001
Insurance			
Commercial	2360 (52)	1552 (69)	] <.001
Medicare	1966 (43)	495 (22)	
Medicaid	106 (2)	130 (6)	
Uninsured	124 (3)	81 (4)	
BMI, mean (SD)	32.3 (7)	32.7 (7)	.01
Cardiovascular disease	483 (10)	164 (7)	<.001
GFR, mean (SD), mL/min/1.73 m <sup>2</sup>	71.8 (23)	83.0 (26)	<.001
Annual HbA <sub>1c</sub> test	4081 (90)	2012 (89)	.55
Annual LDL-C test	3802 (83)	1879 (83)	.81
Statin prescription	2945 (65)	1218 (54)	<.001
HbA <sub>1c</sub> control			
<7.0	2146 (47)	872 (39)	<.001
<8.0	3223 (71)	1421 (63)	<.001
LDL-C control, mg/dL			
<100	2619 (57)	1022 (45)	<.001
<130	3416 (75)	1549 (69)	<.001
BP control, mm Hg			
<130/80	1385 (30)	531 (24)	<.001
<140/90	2855 (63)	1279 (57)	<.001

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); BP, blood pressure; GFR, glomerular filtration rate; HbA<sub>1c</sub>, hemoglobin A<sub>1c</sub>; LDL-C, low-density lipoprotein cholesterol.

SI conversion factors: To convert HbA<sub>1c</sub> to a proportion of 1.0, multiply by 0.01; to convert LDL-C to millimoles per liter, multiply by 0.0259.

- In a VA system, there was no disparity in processes of care or outcomes for individuals with Stage 3 and 4 CKD (except for LDL measurement)
- Overall low adherence to CKD process of care and outcomes





# Lower Access to Pre-dialysis Nephrology Care

Table 3. Temporal Trends in Racial/Ethnic Disparities in Receipt of at Least 12 Months of Predialysis Nephrology Care

Cohort year	Crude OR (95% CI)				Adjusted OR (95% CI) <sup>a</sup>			
	White	Black	Hispanic	Asian	White	Black	Hispanic	Asian
2005-2007	1 [Reference]	0.74 (0.72-0.75)	0.61 (0.59-0.63)	0.81 (0.77-0.85)	1 [Reference]	0.82 (0.80-0.84)	0.67 (0.65-0.69)	0.84 (0.80-0.89)
2008-2010	1 [Reference]	0.71 (0.69-0.72)	0.58 (0.57-0.60)	0.81 (0.78-0.85)	1 [Reference]	0.77 (0.76-0.79)	0.63 (0.61-0.65)	0.84 (0.81-0.88)
2011-2013	1 [Reference]	0.72 (0.71-0.73)	0.57 (0.56-0.59)	0.83 (0.80-0.86)	1 [Reference]	0.78 (0.76-0.79)	0.61 (0.59-0.62)	0.85 (0.81-0.88)
2014-2015	1 [Reference]	0.71 (0.70-0.73)	0.60 (0.58-0.61)	0.90 (0.86-0.94)	1 [Reference]	0.76 (0.74-0.78)	0.61 (0.60-0.63)	0.90 (0.86-0.95)

Abbreviation: OR, odds ratio.

<sup>a</sup> Adjusted for differences in age (continuous), sex (male or female), body mass index (calculated as weight in kilograms divided by height in meters squared;  $\leq 30.0$  or

$>30.0$ ), and end-stage kidney disease etiology (diabetes, hypertension, glomerular diseases, or other).

- Black and Hispanic patients are consistent less likely to receive nephrology care at least 1 year prior to ESKD
- Overall low rates—Whites 39.5-Hispanic 28.3



## Racial Disparities in Access to Transplant

- Waitlisting reflects processes rather than organ availability which varies by region and ABO
- Post KAS data
- In addition, while the proportion of living donor recipients is increasing among Whites and Asians, it has decreased among AA and Hispanics

### Hazard of Waitlisting Among Patients 2015-2017

	Unadjusted	Adjusted
White	Reference	Reference
Black	1.00 (0.97-1.03)	0.88 (0.85-0.90)
Hispanic	1.17 (1.13-1.21)	1.08 (1.04-1.12)
Asian	1.55 (1.48-1.63)	1.23 (1.17-1.30)



# Re-assessing Kidney Function

## A Unifying Approach for GFR Estimation: Recommendations of the NKF-ASN Task Force on Reassessing the Inclusion of Race in Diagnosing Kidney Disease



**Recommend immediate implementation of the CKD-EPI creatinine equation refit without the race variable in all laboratories in the U.S.**

*The equation refit excludes race in the calculation and reporting, includes diversity in its development, is immediately available to all labs in the U.S., and has acceptable performance characteristics and potential consequences that do not disproportionately affect any one group of individuals.*



**Recommend national efforts to facilitate increased, routine, and timely use of cystatin C, especially to confirm eGFR in clinical decision-making**



**Encourage and fund research on GFR estimation with new endogenous filtration markers and on interventions to eliminate racial and ethnic disparities**



**The Task Force gathered input from diverse stakeholders and carefully reviewed the evidence to create these recommendations**

Cynthia Delgado, Mukta Baweja, Deidra C. Crews, et al. *A Unifying Approach for GFR Estimation: Recommendations of the NKF-ASN Task Force on Reassessing the Inclusion of Race in Diagnosing Kidney Disease.* *AJKD* DOI: 10.1053/j.ajkd.2021.08.003, *JASN* DOI: 10.1681/ASN.2021070988

Visual Graphic by Edgar Lerma, MD, FASN





# Racial Disparities in CKD

## Protective Factors

- Continuous access to health care
- Low BMI
- Controlled BP
- Healthy diet

- Continuous access to health care
- Controlled BP
- Social support
- Nephrologist referral
- Communication and trust with provider

- Continuous access to health care
- High SES
- Health literacy
- Education
- Complete-workup

- Continuous access to health care
- Education
- Non-minority
- Social networks
- Social capital
- Young age

- Continuous access to health care
- Controlled BP
- Healthy diet
- Physical activity
- Self-care
- Social support
- Living donation
- High SES

CKD

ESRD

Waiting List

Transplantation

Post-Transplant Outcomes

- Poor access to health care
- Minority status
- Diabetes
- Elevated serum creatinine at diagnosis
- Obesity
- Hypertension

- Poor access to health care
- Minority status
- Low SES
- Cultural beliefs
- Exposure to toxins
- Geography
- Delayed referral
- Use of synthetic grafts
- Longer hospital stay

- Poor access to health care
- Minority status
- Low SES
- Female gender
- Cultural beliefs
- Housing status
- Age
- Disability
- Literacy
- Immigration status
- Lack of commitment to surgery

- Poor access to health care
- Minority status
- Low SES
- Physician bias
- Low social support
- Low social capital
- Incomplete work-up
- Immunological factors

- Deceased donor kidney
- Low SES
- Unemployment
- Compliance
- Pharmacologic response
- Immunological factors

## Risk Factors



THE UNIVERSITY OF CHICAGO  
M E D I C A L C E N T E R

# PROMISING PROGRAMS

---



## Five Plus Nuts and Beans” Randomized Trial

- African American low income participants randomized to the active intervention group (Dietary Approaches to Stop Hypertension [DASH]–Plus) v. control (n=123)
  - **Intervention received coach-directed dietary** advice and assistance with weekly online ordering and purchasing of high-potassium foods (\$30/week) delivered by a community supermarket to a neighborhood library; Control received a printed [DASH diet](#) brochure along with a debit account of equivalent value to that of the DASH-Plus group.
- Compared with the control group, the DASH-Plus group:
  - increased self-reported consumption of fruits and vegetables (mean=1.4, 95% CI=0.7, 2.1 servings/day)
  - Increased intake of potassium (mean=0.4, 95% CI=0.1, 0.7 grams/day); and urine [potassium excretion](#) (mean=19%, 95% CI=1%, 38%)
  - No significant effect on blood pressure



# Smartphone Medication Adherence Stops Hypertension (SMASH) program

- **SMASH program**

- Patient-centered, theory-guided, iterative design process
- Electronic medication trays provided reminder signals, and Short Message Service [SMS] messaging reminded subjects to monitor BP with Bluetooth-enabled monitors.
- Motivational and reinforcement text messages were sent to participants based upon levels of adherence
- 38 participants (18 AAs; 20 Hispanics) with uncontrolled HTN

- **Significant BP reduction in SMASH group**

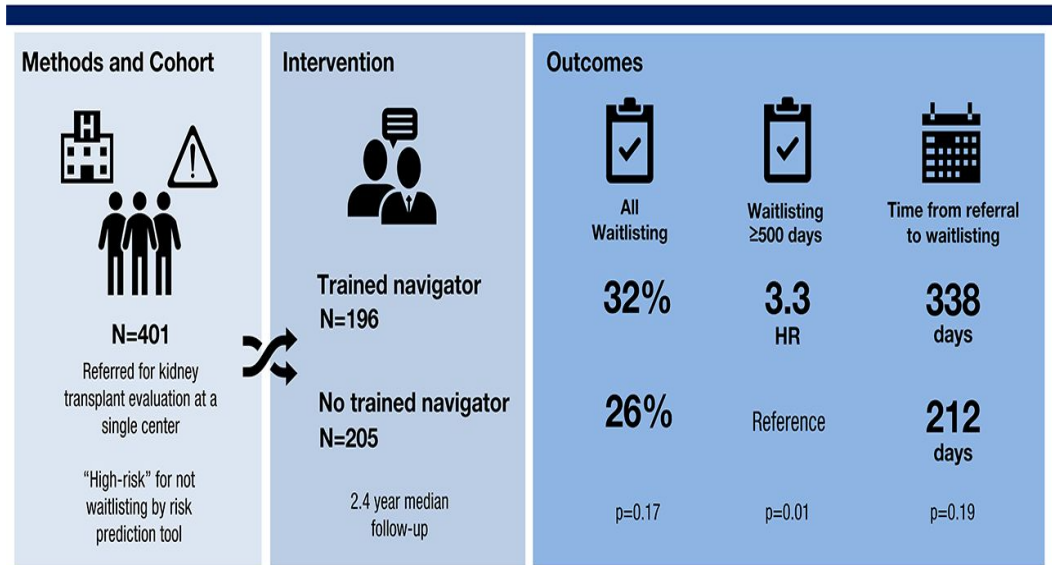
- Significant reductions in SBP and DBP for the SMASH group vs. the standard care (SC) control group across all time points.
- At month 6, 94.4% of the SMASH vs. 41.2% of the SC group exhibited controlled BP ( $p < 0.003$ ).



# Patient Navigation for Transplant Access

- Over 400 patients (81% African American)
- No significant difference in number of waitlisted patients or time to waitlisting
- There was a significant difference in likelihood of being waitlisted >500 days (75% versus 25%; hazard ratio, 3.31; 95% confidence interval, 1.20 to 9.12).
- Suggests navigation may be successful for most challenging patients

## Can a Transplant Center Patient Navigator Improve Access to Transplantation in High-Risk Patients?



**Conclusions** A transplant center-based navigator targeting disadvantaged patients improved waitlisting but not until after 500 days of follow-up. However, the absolute effect was relatively small.

Mohua Basu, Lisa Petgrave-Nelson, Kayla D Smith, Jennie Perryman, Kevin Clark, Stephen Pastan, Thomas Pearson, Christian Larsen, Sudeshna Paul, and Rachel Patzer. **Transplant Center Patient Navigator and Access to Transplantation among High-Risk Population.** doi: 10.2215/CJIN.08600817





*To get to a point where race won't make a difference,  
we have to wrestle, first, with the difference that race  
makes.*

*--Michael Eric Dyson*

# **A WAY FORWARD**



# Anti-racist Practices in Clinical Care

## **1. Embed an equity and antiracist/antibiased lens into clinical care processes**

- Reconsider and dismantle potential sources of bias in kidney transplant candidacy evaluation (ie, restrictive policies around social support, reconsideration of factors leading to “poor adherence,” including awareness of effects of structural racism).

## **2. Invest in structural interventions at the health system level to address social drivers of inequity**

- Apply an equity lens to the consideration of existing and proposed policies (eg, dialysis payment, transplantation reimbursement), recognizing potential and disproportionate harms caused by existing financial structures/schemes.

## **3. Ensure clinical care environments are inclusive and equity-focused**

- Educate providers and staff with a common language to create inclusive environments (eg, inclusive communication strategies, intake forms).



## Anti-racist Practices in Clinical Care

### **4. Embed unbiased clinical practice alerts into care systems**

- Develop electronic health tools that bypass potential provider biases (eg, trigger to consider discussions regarding SGLT2i, transplant referral).

### **5. Incorporate equity evaluations into interval outcome/quality assessments**

- Analyze data regarding outcomes, referrals using an equity lens across race, ethnicity, and other social domains.

### **6. Resist a deficit mindset and reframe disparities within the context of structural inequity**

- Use a strengths-based approach to counteract narratives regarding individual or community “deficits” as a cause of health problems; rather, contextualizing behaviors (ie, nonadherence) within lived experiences and structural barriers.



## Conclusions

- CKD associated with increased morbidity and mortality; ESRD is a high cost, high morbidity disease
- Prevalence and outcomes vary by race/ethnicity and neighborhood
- Can't change individuals' race/ethnicity or neighborhoods, can reduce their impact
- Patient education and high quality medical care can slow progression and improve outcomes
- We can identify, educate and refer patients with CKD across all phases of care

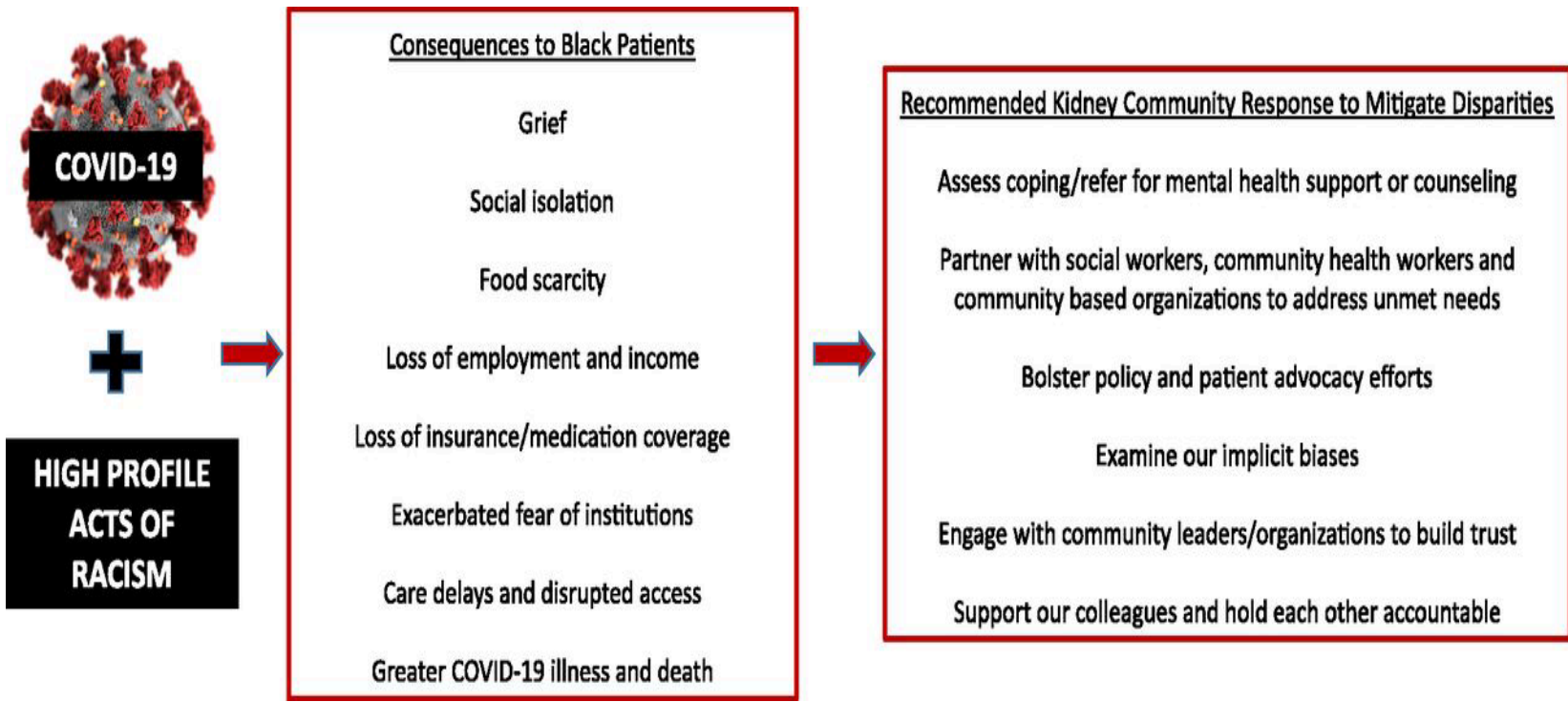


# Questions???

[msaunders@uchicago.edu](mailto:msaunders@uchicago.edu)

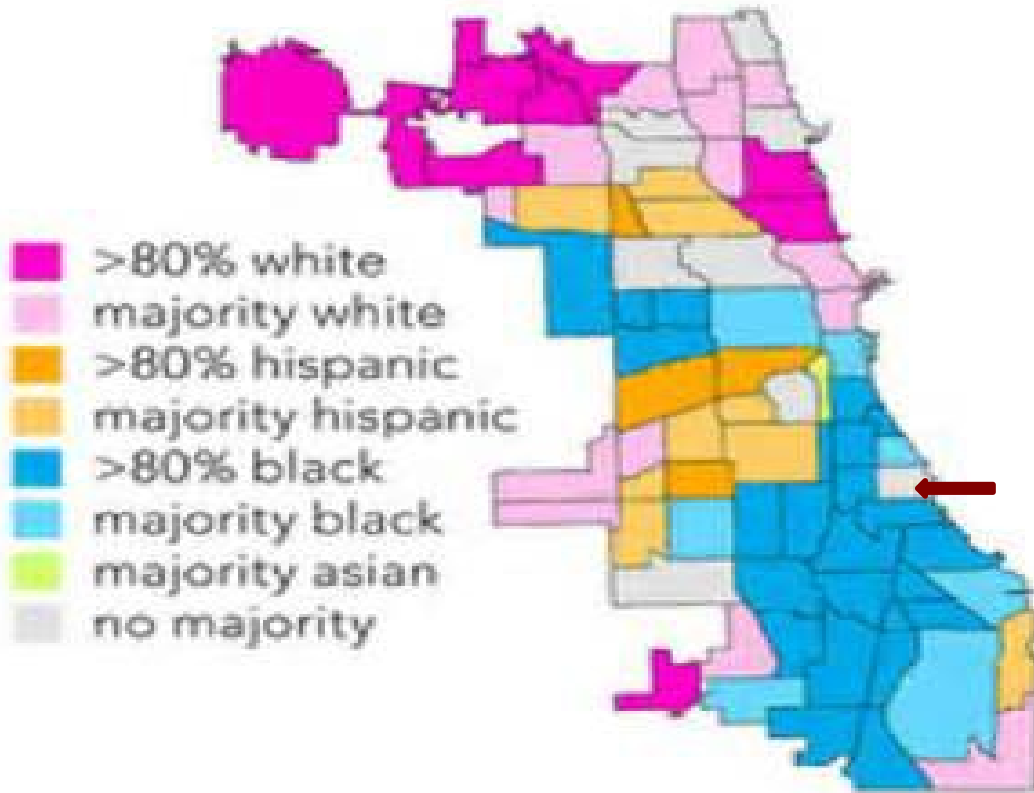


# There are numerous potential consequences to patients with kidney disease stemming from the COVID-19 and racism crises.

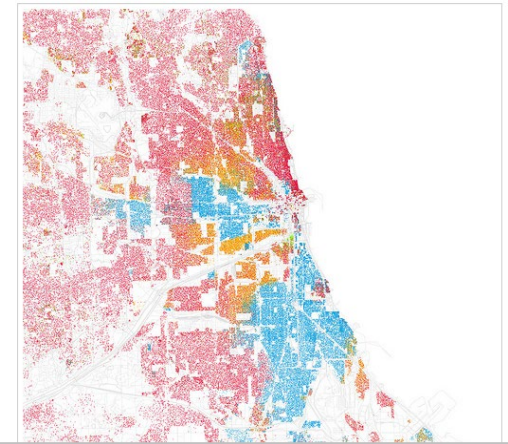




# So what does this mean for us?



Chicago Is Still America's Most Segregated City





THE UNIVERSITY OF CHICAGO  
M E D I C A L   C E N T E R







# Why Neighborhood?

