

Introduction

- Kidney disease affects more than one in seven U.S. adults
- Disparities in kidney disease-associated mortality are well documented
- However, resources used to explore and visualize these data are limited and may exclude important health determinants
- The NIMHD resource HDPulse combines economic and population health data with the ability to stratify health-related outcomes along several measures of identity

Research Questions:

How are Black-White disparities in kidney disease-associated mortality related to Black-White disparities in poverty? How are other determinants, such as region of residence and insurance coverage, associated with these disparities?

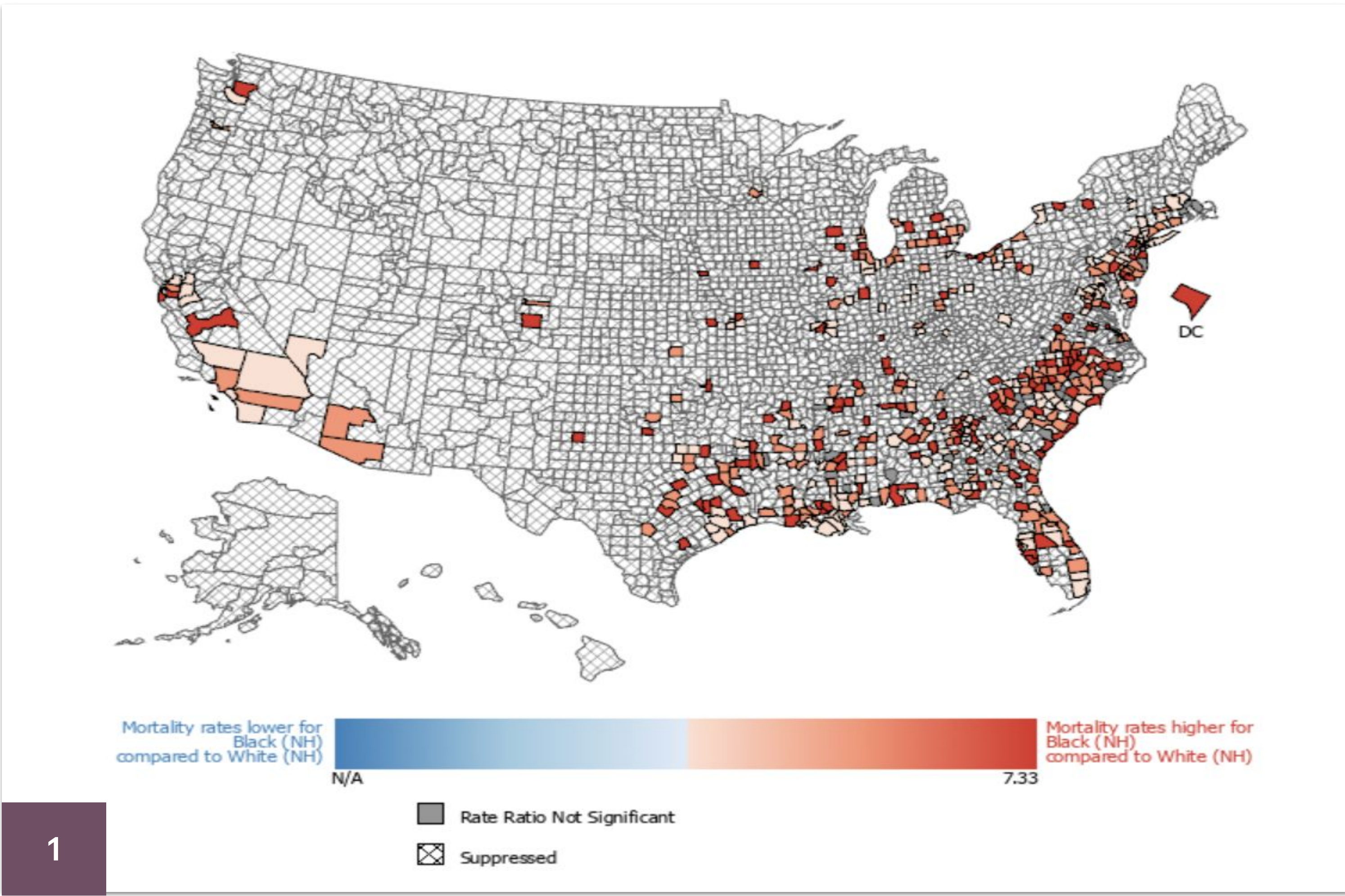


Figure 1:
Age-adjusted annual kidney disease-associated mortality rate ratio as appearing in HDPulse.

Methods

Data Sources & Variables
Data sources: National Vital Health Statistics; American Community Survey
Independent variable: Relative rate of families living at or below the federal poverty level (<\$30,000 for a family of four, 2023); Black residents as compared to White residents by county.
Dependent variable: Relative kidney disease-associated mortality rate among Black residents as compared to White residents by county.
Covariates: Rurality, % uninsured (Black), US Census region

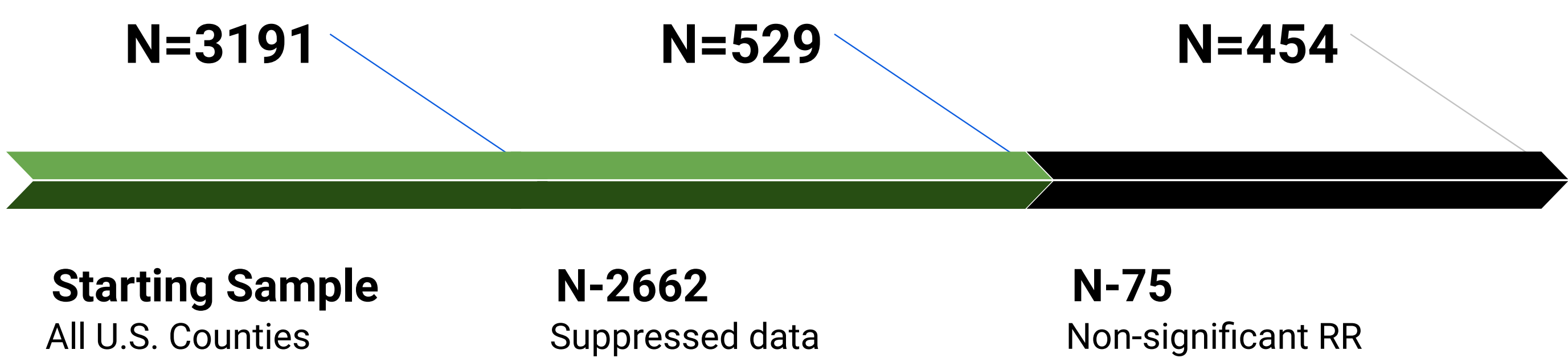
Sample
County-level aggregate data. Exclude any county with:

- Fewer than 3 annual kidney-associated deaths
- No race/ethnicity-specific mortality data or a race/ethnicity-specific proportion of households under the poverty threshold, both comparing Black and White households

Final sample (with 2016-2020 data) = 454 counties.

Analytical Approach

1. Generated a 95% confidence interval for the rate ratio (RR) of kidney disease mortality and poverty (Black v.s. White)
2. Tested relevant county-level covariates with available data in all 454 counties: rurality, region, % uninsured (Black), % with bachelor's degree or higher (Black) using multivariate linear regression
3. Identified three final models after examining collinearity, significance: (1) Model 1: No covariates, (2) Model 2: Adjust for region, (3) Model 3: Adjust for insurance



Validating a Novel Socioeconomic and Health Indicator Visualization Tool to Improve Minority Health

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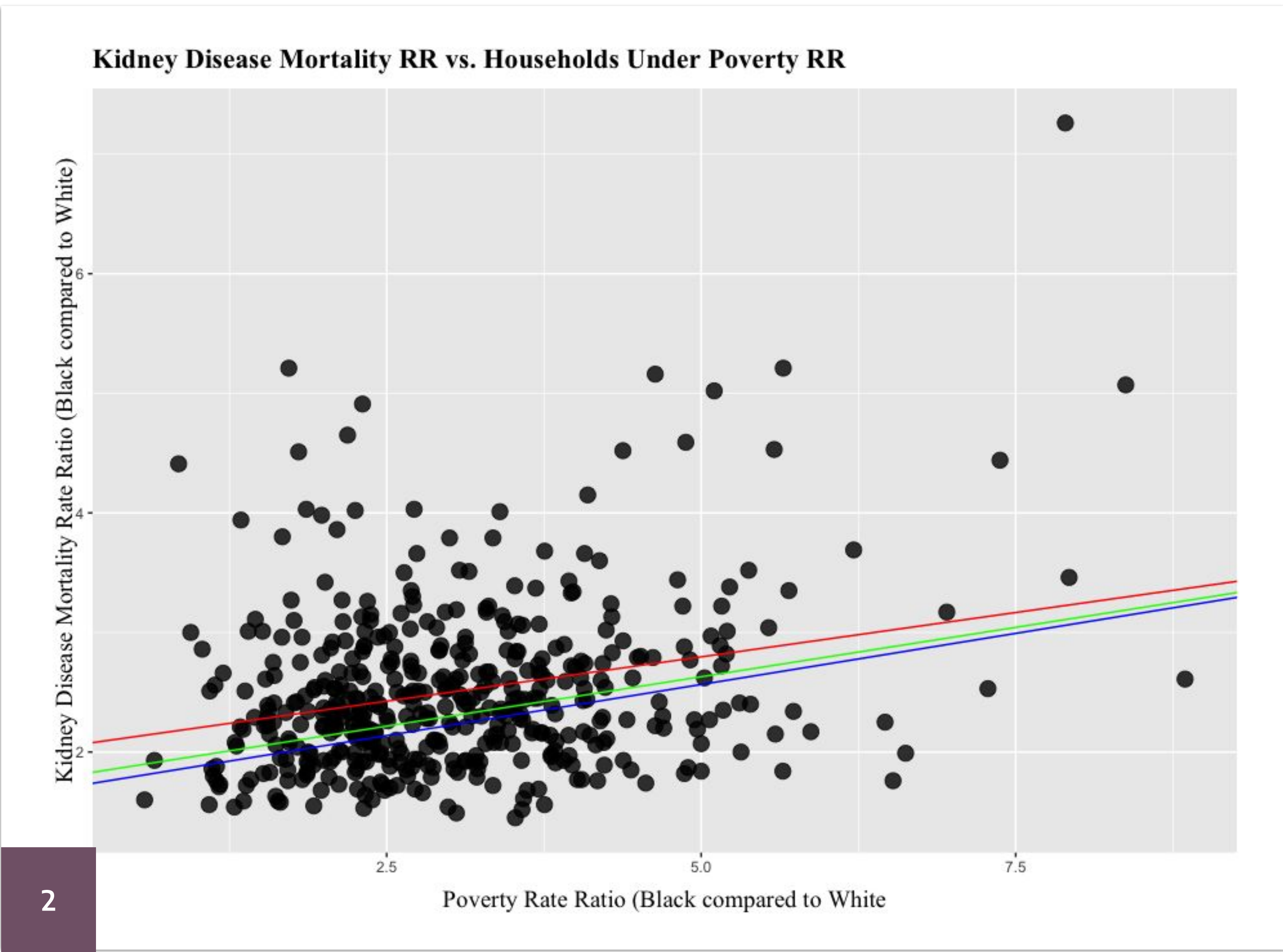
Results

County Characteristics (N=454)

3	Midwest (N=66)	Northeast (N=53)	South (N=311)	West (N=24)	Overall (N=454)
Kidney disease mortality RR (Black compared to White)					
Mean (SD)	2.46 (0.531)	2.27 (0.513)	2.58 (0.761)	2.26 (0.496)	2.51 (0.702)
Median [Min, Max]	2.42 [1.45, 3.94]	2.16 [1.52, 3.86]	2.41 [1.49, 7.26]	2.28 [1.60, 3.35]	2.38 [1.45, 7.26]
Households under poverty RR (Black compared to White)					
Mean (SD)	3.83 (1.18)	3.09 (1.26)	2.91 (1.24)	2.59 (1.18)	3.05 (1.27)
Median [Min, Max]	3.77 [1.31, 8.85]	3.02 [0.654, 5.65]	2.64 [0.576, 8.38]	2.29 [1.11, 5.70]	2.82 [0.576, 8.85]
Rurality					
Rural (Non-metro)	1 (1.5%)	0 (0%)	85 (27.3%)	0 (0%)	86 (18.9%)
Urban (Metro)	65 (98.5%)	53 (100%)	226 (72.7%)	24 (100%)	368 (81.1%)
Percent Black uninsured residents					
Mean (SD)	9.43 (2.41)	8.07 (3.34)	16.0 (4.65)	10.0 (3.07)	13.8 (5.30)
Median [Min, Max]	9.05 [5.30, 19.9]	6.90 [3.30, 18.2]	15.8 [4.60, 28.6]	9.80 [5.10, 16.2]	13.4 [3.30, 28.6]
Percent Black residents with at least bachelor's degree					
Mean (SD)	19.0 (7.06)	24.5 (7.68)	19.0 (9.80)	26.5 (5.34)	20.0 (9.30)
Median [Min, Max]	17.1 [8.90, 43.5]	23.5 [9.70, 41.0]	16.7 [4.10, 54.9]	27.5 [15.4, 36.4]	18.1 [4.10, 54.9]

Figure 3
County-level characteristics of predictor, outcome and potential covariates stratified by region. 454 U.S. counties included in analysis after exclusion. All data derived from HDPulse.

Regression Models



Model	Term	Estimate	P Value	R-sq
Model 1	Intercept	2.055	<0.0001	0.0703
	Poverty RR	0.148	<0.0001	
Model 2	Intercept	1.803	<0.0001	0.1048
	Poverty RR	0.165	<0.0001	
Model 3	Intercept	1.711	<0.0001	0.0894
	Poverty RR	0.171	<0.0001	
	Uninsured percent	0.020	<0.0001	

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Regression Models:

- Model 1: No covariates; R² = 7.03%
- Model 2: Adjusted for region; R² = 10.48%
- Model 3: Adjusted for insurance; R² = 8.94%

Figure 2:
Scatterplot of Kidney Disease Mortality Rate Ratio (Black as compared to White) and Poverty Rate Ratio (Black as compared to White) using HDPulse county-level data and key regression models.

Figure 4

All predictors were tested for covariance during feature selection. Predictors were separated when necessary to reduce collinearity. Regression model for Model 1 (no covariates), Model 2 (adjusted for binarized region as South/non-South) and Model 3 (percent Black uninsured residents in county) are displayed with intercepts, predictor coefficients, p-values and R-squared statistics.



Discussion/Conclusions

- Black-White disparities in poverty were positively associated with Black-White disparities in kidney disease mortality such that poverty explained 7% of the variability in kidney disease mortality
- The positive significant relationship between poverty and mortality remained stable in all models
- When accounting for region (Southern versus non-Southern), 10% of the variability in kidney disease mortality was explained
- When accounting for insurance status, almost 9% of the variability was explained
- HDPulse validation: Having multiple data topics and sources (e.g. socioeconomic indicators and various health outcomes) within the same resource provides a “one-stop shop” that allows a range of users to identify disparities and prioritize intervention

Limitations & Future Studies

- Analyses are restricted to only those variables available in HDPulse and may exclude other important determinants
- Suppression of county-level data due to limited observations led to exclusion of many US counties from analysis
- This analysis excluded inter-county differences when data were unavailable
- Future studies might include additional data sources to conduct more robust analyses that account for multiple levels of determinants (individual, structural) and expand to other racial or ethnic groups

Selected References

Chu, C. D., Powe, N. R., McCulloch, C. E., Crews, D. C., Han, Y., Bragg-Gresham, J. L., Saran, R., Koyama, A., Burrows, N. R., Tuot, D. S., & Centers for Disease Control and Prevention Chronic Kidney Disease Surveillance Team. (2021). Trends in Chronic Kidney Disease Care in the US by Race and Ethnicity, 2012-2019. JAMA Network Open, 4(9), e2127014. <https://doi.org/10.1001/jamanetworkopen.2021.27014>

Kawachi, I., & Kennedy, B. P. (1997). The relationship of income inequality to mortality: Does the choice of indicator matter? Social Science & Medicine, 45(7), 1121-1127. [https://doi.org/10.1016/S0277-9536\(97\)00044-0](https://doi.org/10.1016/S0277-9536(97)00044-0)

Kidney Disease Statistics for the United States - NIDDK. (n.d.). National Institute of Diabetes and Digestive and Kidney Diseases. Retrieved March 27, 2023, from <https://www.niddk.nih.gov/health-information/health-statistics/kidney-disease>

Nicholas, S. B., Kalantar-Zadeh, K., & Norris, K. C. (2015). Socioeconomic Disparities in Chronic Kidney Disease. Advances in Chronic Kidney Disease, 22(1), 6-15. <https://doi.org/10.1053/j.ackd.2014.07.002>