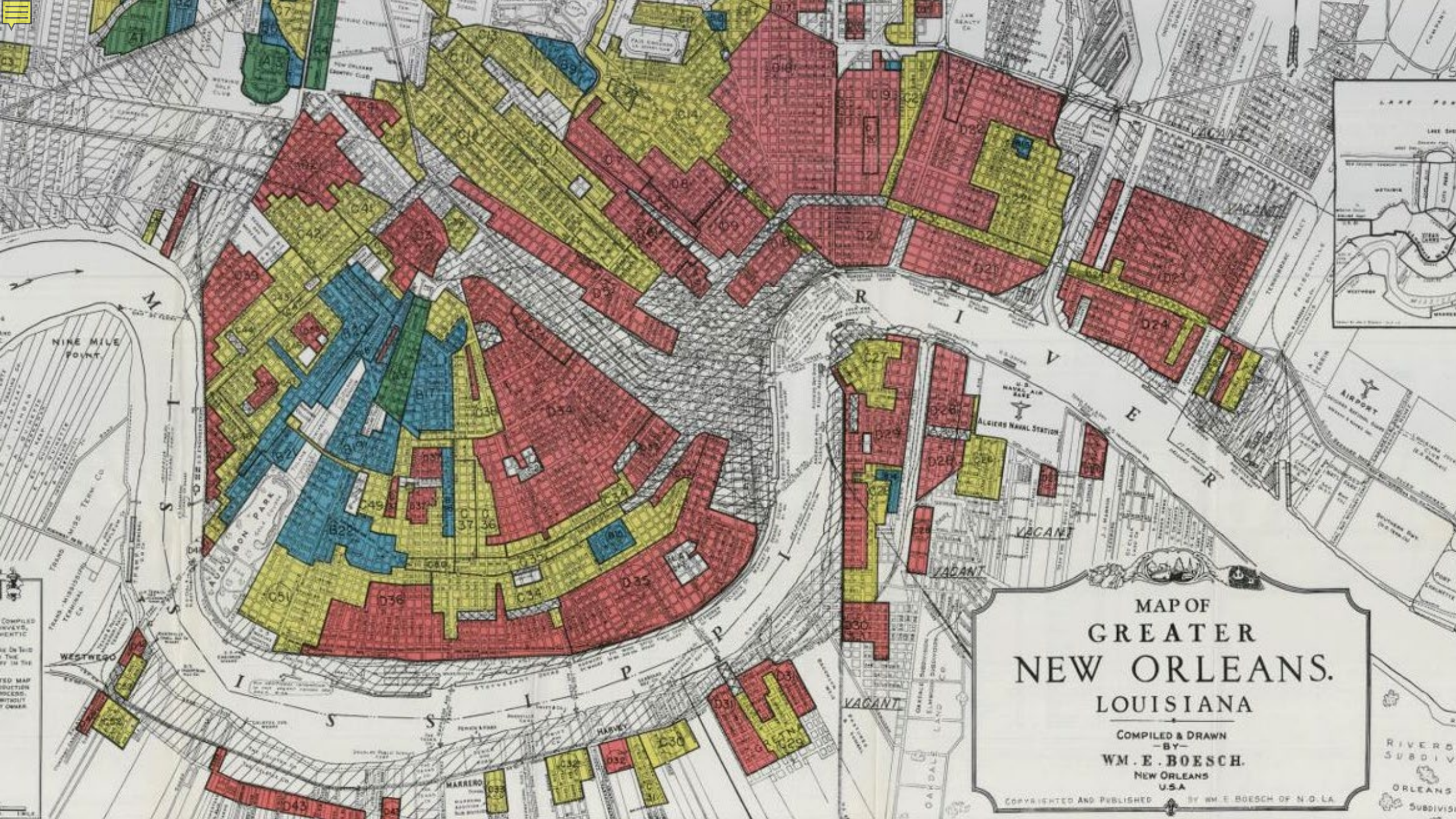
REDLINING AND HIV SUPPRESSION


MAP OF
GREATER
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The lingering impact of “Redlining”

“Redlining is a discriminatory practice in which financial services are withheld from neighborhoods that have significant numbers of racial and ethnic minorities.” (Locke et al, 2021)

Decades of public and private capital disinvestment in redlined communities has had enduring impacts on the health and well-being of the people living in these areas

Cardiovascular health (Mujahid et al, 2021)

“Black adults who lived in historically redlined areas had a 0.82 (95% CI −1.54, −0.10) lower CVH score compared to those residing in grade A (best) neighborhoods”

Firearm deaths (Benns et al, 2020)

“Relative to green-graded neighborhoods, red-graded neighborhoods had five times as many gunshot victims…(and) remained statistically significant after accounting for differences in demographic, racial, and housing characteristics of the neighborhoods”

Preterm birth (Hollenbach et al, 2021)

“Even when controlling separately for community and patient-level characteristics, patients living in the “Hazardous” region had higher odds of any preterm birth (community-level adjusted OR, 1.46; 95% CI, 1.08-1.97; patient-level adjusted OR, 1.38; 95% CI, 1.25-1.53)”

Time to Viral Suppression (TVS)

Definition, TVS: Time (days) from HIV diagnosis to initial viral load of less than 200 copies per milliliter (copies/mL) of blood

Achieving early and sustained viral suppression following HIV diagnosis is an ongoing focus and national priority

Especially in the Deep South, which experiences a disproportionate HIV burden and where health disparities are exacerbated.

Why investigate the potential association between Redlining and TVS?

How: Data Sources

HOLC Maps and Area Description Files

- Shapefiles that include the graded-neighborhood boundaries

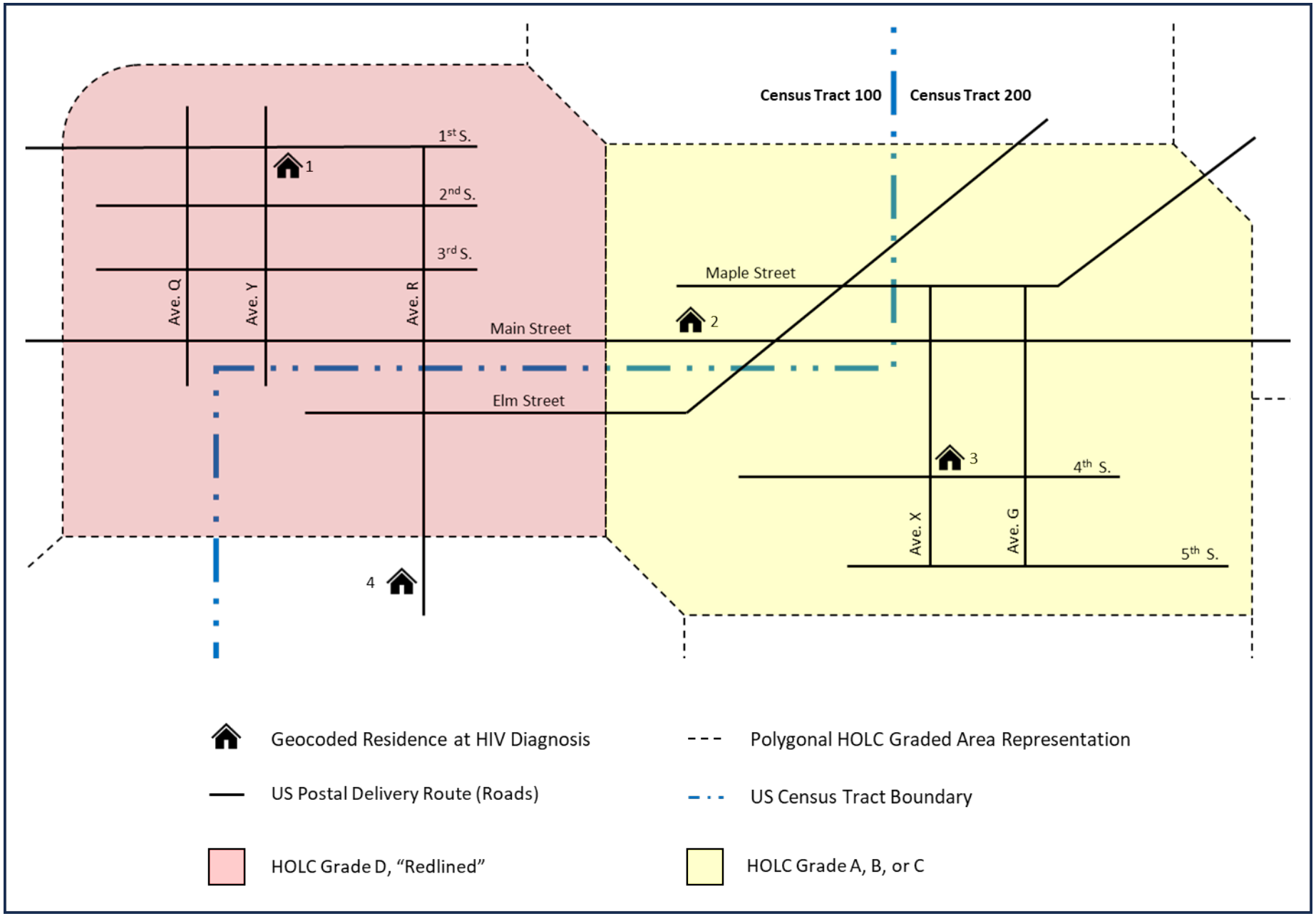
The Enhanced HIV/AIDS Reporting System: eHARS

- eHARS is a standardized, document-based surveillance database operated by state health departments for the management of all case reports, laboratory results, and other documentation related to PWH
- Patient-level data (labs, demographic information, and address at diagnosis

Census Data

- Additional “neighborhood”-level data, by census tract
- This was used to quantify a measure of gentrification for each census tract

Population, Sample, and Geocoding



How: Variables

HOLC Maps and Area Description Files

- Neighborhood classification: D “Redlined” neighborhood, or A, B, or C-graded neighborhood

The Enhanced HIV/AIDS Reporting System: eHARS

- OUTCOME: TVS
- Patient-level covariates: sex at birth, race/ethnicity, age at HIV diagnosis, mode of HIV transmission, year of diagnosis, and stage 3 (AIDS) at diagnosis

Census Data

- Gentrification, derived from criterion outlined by Freeman (2005)
- Continued…

Gentrification: How and Why

Definition: Gentrifying – if all 5 criteria were met
Potentially Gentrifying – if the first 3 criteria were met, and either 4 or 5 were met
Not Gentrifying – All other combinations

(1) Census tract was within the metropolitan area of New Orleans, based on the 2010 Census

(2) Median income (census tract) less than the 40th percentile for the metropolitan area of New Orleans

(3) Proportion of housing built from 2010 to 2019 that was lower than the proportion found at the 40th percentile the metropolitan area of New Orleans

(4) Percentage increase in educational attainment from 2010 to 2019 greater than the median increase in educational attainment the metropolitan area of New Orleans

(5) Experienced an increase in real housing value from 2010 – 2019 for the metropolitan area of New Orleans

Methods

While it is not the “classical” definition of clustering (i.e. schools or clinical sites), we have created a statistical setting with a clustered time-to-event outcome (by neighborhood, and by census tract)

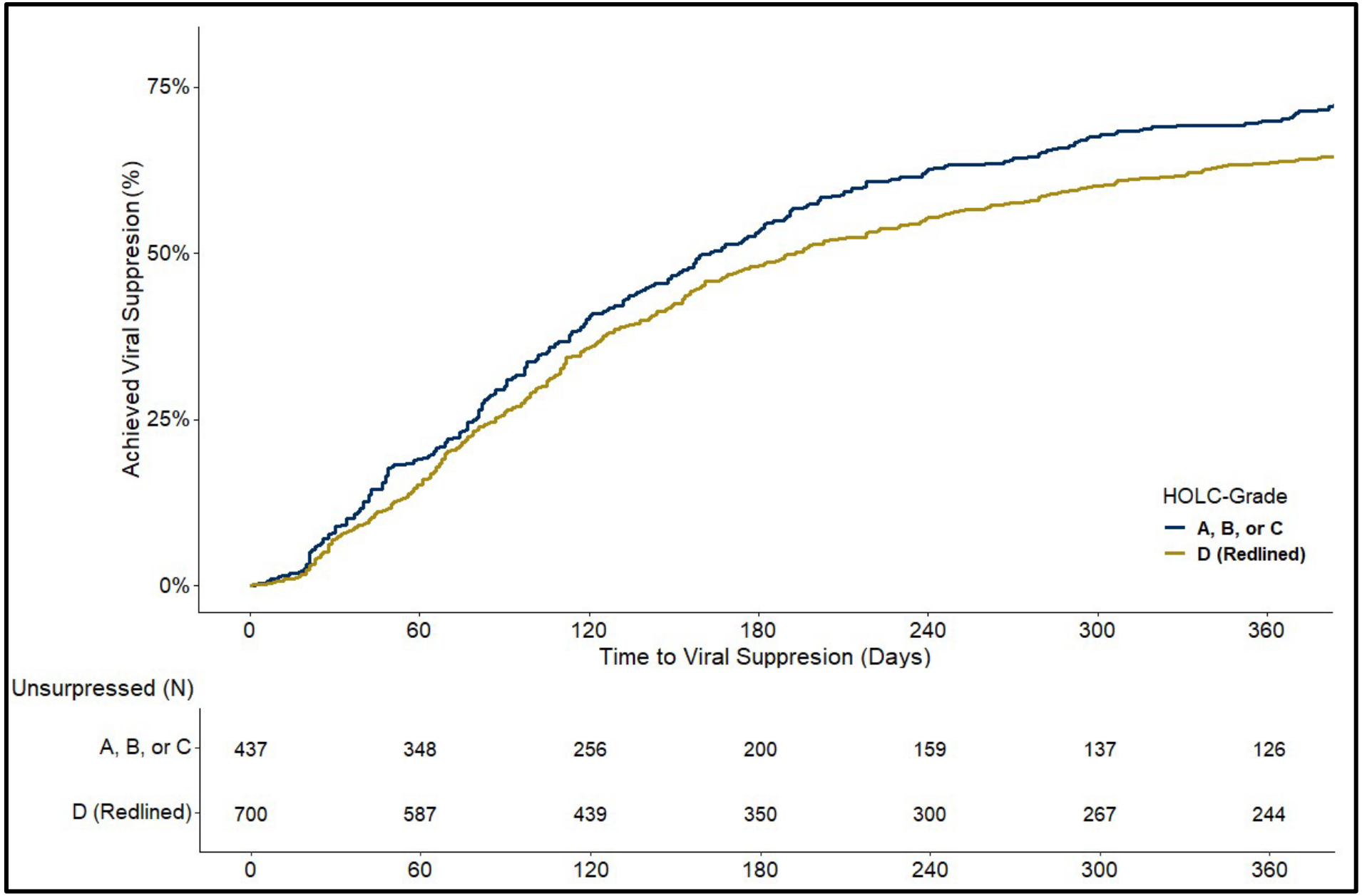
To account for the unobserved environmental factors that PWH in each census tract may share, we have used an extension of the Cox Proportional Hazards model, the shared frailty model

The conditional hazard function for individual *ik*, conditional on the cluster frailty ω_i, is assumed to take the following form:

$$\lambda_{ik}\left(t\middle|Z_{ik,\omega_i}\right) = \omega_i \lambda_0(t) \exp(\beta^T Z_{ik}) \quad i = 1, \dots, n \quad k = 1, \dots, m_i$$

- n independent clusters (census tracts)
- $\omega_i \equiv \omega_i(t), i = 1, \dots, n$ time-dependent frailty variates and $\omega_i \sim Gamma(\theta, \theta)$
- λ_0, the unspecified baseline hazard function
- β a vector of unknown regression coefficients

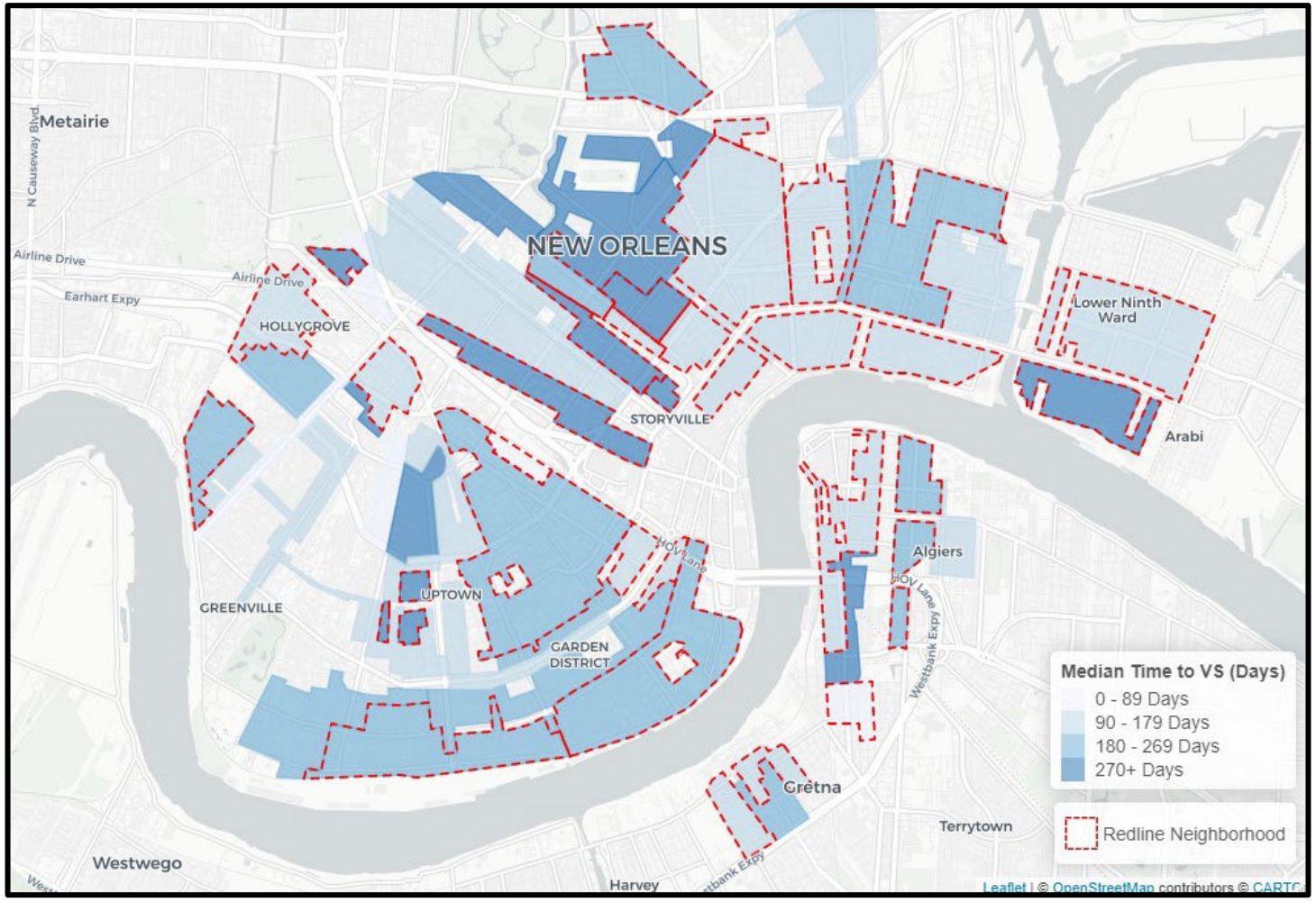
Results: Unadjusted Analysis



Results: Multivariable Analyses

	Total (VS)	Hazard Ratio (95% CI)
Multivariate Analysis: Cox PH, Time to Viral Suppression by HOLC Grade		**0.0204[a]**
"Redlined" HOLC Grade D	700 (602)	**0.86 (0.75-0.98)**
HOLC Grade A, B, or C	437 (390)	Reference
Multivariate Analysis: Cox-Gamma Frailty, Time to Viral Suppression by HOLC Grade and Gentrification Status [d]		**0.0368[b]**
"Redlined" HOLC Grade D		
Not Gentrifying	421 (363)	**0.61 (0.43, 0.88)**
Potentially Gentrifying	164 (144)	**0.59 (0.40, 0.87)**
Gentrifying	101 (83)	**0.53 (0.35, 0.80)**
HOLC Grade A, B, or C		
Not Gentrifying	365 (323)	**0.68 (0.47, 0.98)**
Potentially Gentrifying	14 (14)	0.74 (0.39, 1.40)
Gentrifying	36 (34)	Reference

a: Overall test of significance, Wald χ^2_1 test, p-value; **b:** Overall test of significance, Wald χ^2_5 test with adjusted degrees of freedom, p-value



https://jbassler.shinyapps.io/NOLA-TVS-Redlining/

Conclusions

Racism is a public health crisis, and for people of color diagnosed with HIV in historically redlined neighborhoods of New Orleans, their experience in the ongoing HIV epidemic is shown to be measurably more difficult due, in part, to the concentrated disadvantage shaped by discriminatory housing policies.

For which this work would not be possible…

Aadia Rana MD
UAB Division of Infectious Diseases

Scott Batey PhD
TU School of Social Work

Emily Levitan ScD
UAB Department of Epidemiology

Lauren Ostrenga MPH
LDH

A Department full of Distinguished New Researchers

Mary Appah

Satpal Chandel

Bella Capio

Yumo Xue

Leslie Simms

Chia Ying Chiu

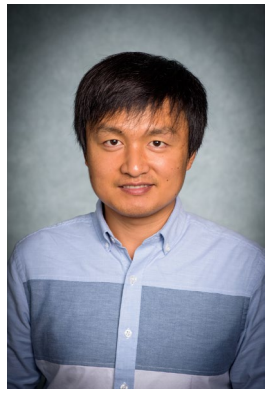
Kevin Owuor

Rachel Stuckwisch

Tina Boateng

Lingling Wang

Mokshad Gaonkar



Zhenying Ding

Jinhong Cui

Thank you! Questions?