IMPACT OF REDLINING ON TIME TO VIRAL SUPPRESSION AMONG PERSONS DIAGNOSED WITH HIV

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Background

Developed in the 1930s by the US government, Home Owners' Loan Corporation (HOLC) Security Maps classified residential neighborhoods with ≥40000 populations into grades based on alleged investment risk of resident borrowers. Grades ranged from A (mapped as green areas considered "Best") to D (red areas that were poorer and predominantly Black considered "Hazardous"), the latter colloquially referred to as "Redlined".

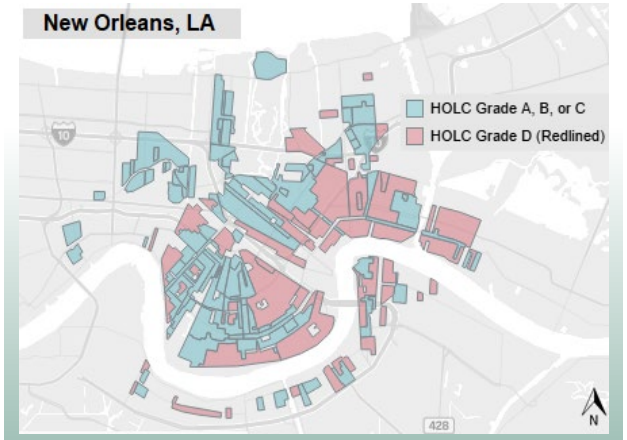
We seek to assess the association of structural racism through redlining policies on current time to viral suppression (VS) among people newly diagnosed with HIV.

Methods

City boundaries were defined by 2020 US Census Bureau ZIP Code Tabulation Areas (ZCTA) ad spatially joined with HOLC-graded neighborhoods. Using the Louisiana HIV surveillance database, people newly diagnosed with HIV between 2011-2019 were grouped into two HOLC-graded categories based on residence at time of diagnosis, Grade D, or Other (A,B, C, or ungraded). Survival analysis of time to VS by redline status were calculated using Kaplan-Meier and Cox proportional hazard models, adjusted for age, race/ethnicity, sex at birth, mode of HIV transmission, and AIDS status at diagnosis.

Results

Of the 3227 PWH analyzed, 929 (28.8%) lived in a redlined neighborhood, 606 (19%) lived in A, B or C HOLC neighborhoods, and 1692 (52%) lived within the city but not in a HOLC graded area. In redlined areas, 74% of PWH were Black as compared to 64% in A, B, and C grade areas, and 78% in non-graded areas. The adjusted median time to VS among PWH in redlined areas was 262 days (95% CI: 219-294), compared to 195 days (95% CI: 182-207) among PWH in non-redlined areas. Additionally, PWH in redlined areas were 0.88 (95% CI: 0.81-0.95) times as likely to achieve VS as PWH in non-redlined areas. Final analysis included the application of a Cox-Gamma Frailty model incorporating median household income (from US Census, by ZCTA) using ZCTA as the frailty term. In agreement with the previous analyses, PWH in redlined areas were 0.87 (95% CI: 0.78-0.96) times as likely to achieve VS as PWH in non-redlined areas.



Demographics by Redline Status in New Orleans and Shreveport, LA

	"Redlined" HOLC Grade D (N = 929)	HOLC Grade A, B, or C (N = 606)	No HOLC Grade (N = 1692)	Total (N = 3227)
Residence at HIV Diagnosis				
New Orleans, LA	848 (91.3%)	443 (73.1%)	1287 (76.1%)	2578 (79.9%)
Shreveport, LA	81 (8.7%)	163 (26.9%)	405 (23.9%)	649 (20.1%)
Sex at Birth (Male)	734 (79.0%)	458 (75.6%)	1266 (74.8%)	2458 (76.2%)
Race/Ethnicity				
Hispanic/Latino	50 (5.4%)	47 (7.8%)	103 (6.1%)	200 (6.2%)
Black	688 (74.1%)	385 (63.5%)	1324 (78.3%)	2397 (74.3%)
White	177 (19.1%)	160 (26.4%)	233 (13.8%)	570 (17.7%)
Other races	14 (1.5%)	14 (2.3%)	32 (1.9%)	60 (1.9%)
Method of Transmission				
MSM or MSM & IDU	487 (52.4%)	341 (56.3%)	890 (52.6%)	1718 (53.2%)
IDU Only	64 (6.9%)	22 (3.6%)	70 (4.1%)	156 (4.8%)
Heterosexual Contact	261 (28.1%)	166 (27.4%)	497 (29.4%)	924 (28.6%)
Unknown or Other	117 (12.6%)	77 (12.7%)	235 (13.9%)	429 (13.3%)

Abbreviations: MSM – Men Who Have Sex with Men; IDU - Injecting Drug Users

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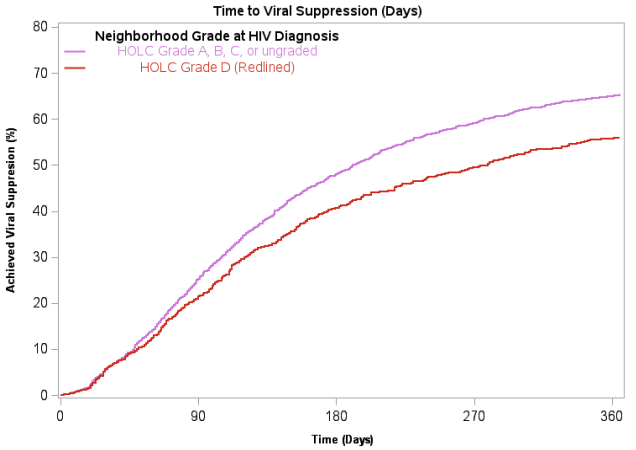
Survival Analysis of Time to Viral Suppression (VS) by Redline Status

	Total (VS)	Hazard Ratio (95% CI) [Cox]
Adjusted survival, HIV Diagnosis within Redlined District		
HOLC Grade D (Redlined)	929 (777)	**0.88 (0.81 - 0.95)**
HOLC Grade A, B, C, or ungraded	2298 (1982)	Reference
Adjusted survival, HIV Diagnosis within Redlined District (HOLC graded only)		
HOLC Grade D (Redlined)	929 (777)	**0.89 (0.79 - 0.99)**
HOLC Grade A, B, or C	606 (523)	Reference
Cox-Gamma Frailty survival, HIV Diagnosis within a Redlined District [¥]		
HOLC Grade D (Redlined)	929 (777)	**0.87 (0.78 - 0.96)**
HOLC Grade A, B, C, or ungraded	2298 (1982)	Reference

[Cox] Cox Proportional Hazard model

[¥] ZCTA used as Frailty term, and median household income is included as a covariate

Model covariates (All models): Year of HIV Diagnosis, Sex at Birth, Race/Ethnicity, Age at Diagnosis, Method of Transmission, Stage 3 at Diagnosis



Conclusion

Generational inequities and structural racism continue to impact present-day health outcomes. Time to VS was significantly longer for PWH in redlined vs non-redlined communities. Our analysis quantifies the importance of the physical environment on health outcomes in Louisiana, and these findings can inform local EHE strategies and beyond.

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