Associations Between Historical Redlining and Birth Outcomes In Virginia: A 2016-2020 study.

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Outline

- Background
- Research Question and Hypothesis
- Methods
- Results
- Discussion
- Future Research

Background

- Adverse birth outcomes persist across racial and ethnic lines in the US

- Adverse birth outcomes seem to be triggered by multiple, interacting biological and environmental factors. However, sociodemographic factors do not fully explain rates.

- Shift of epi focus from individual factors to societal aspects

Background Cont.

- Redlining is neighborhood grading practice implemented by Homeowners' Loan Corporation (HOLC)
- Neighborhoods identified as hazardous in 1933 still suffer
- Historic redlining is related to current neighborhood characteristics

Research Question & Hypothesis

- Is there an association between historical redlining and adverse birth outcomes in mothers residing in area of high risk, as outlined by HOLC at the time of birth, as opposed those not residing in those areas?

- Areas with available redlining maps: Richmond, Newport News-Norfolk-Virginia Beach, Lynchburg, and Roanoke.

- 3 outcomes of interest:

   1. preterm birth (PTB)

   2. low birth weight (LBW)

   3. small for gestational age (SGA)

Methods

- Dataset: Virginia Birth Certificate data

- Analytic sample: all live births born to resident women during 2016-2020 period in Virginia and who had complete information on both exposure and outcome of interest

- Primary Exposure: HOLC grading within one of the 5 areas of interest

- Outcome: low birthweight, preterm delivery, and small-for-gestational age

- Main analysis: residential addresses at the time of birth as listed on birth certificate data linked to HOLC Security Maps. Logistic regression was used to model the association between HOLC grading and adverse birth outcomes.

Results: demographics

Characteristic	Total	Preterm Birth		Low Birth Weight		SGA	
		YES	**NO**	**YES**	**NO**	**YES**	**NO**
Age		3,350	29,736	3,208	29,960	4,410	28,722
Younger than 20	2,047	215 (6.4%)	1,783 (6.0%)	256 (8.0%)	1,746 (5.8%)	392 (8.9%)	1,605 (5.6%)
20-24	8,415	800 (23.8%)	7,301 (24.5%)	844 (26.3%)	7,270 (24.3%)	1,269 (28.8%)	6,830 (23.8%)
25-29	10,314	986 (29.4%)	8,939 (30.0%)	929 (29.0%)	9,002 (30.0%)	1,326 (30.0%)	8,594 (29.9%)
30-34	8,991	833 (24.8%)	7,758 (26.1%)	756 (23.5%)	7,842 (26.2%)	927 (21.0%)	7,663 (26.7%)
35-39	3,985	426 (12.7%)	3,381 (11.4%)	351 (10.9%)	3,456 (11.5%)	422 (9.6%)	3,384 (11.8%)
40+	749	96 (2.87%)	624 (2.1%)	77 (2.4%)	644 (2.2%)	74 (1.7%)	645 (2.3%)
Race/Ethnicity							
Non-Hispanic White	14.131	965 (28.8%)	12,718 (42.8%)	781 (24.4%)	12,910 (43.2%)	1,160 (26.3%)	12,519 (43.7%)
Non-Hispanic Black	17,201	2,133 (63.7%)	14,253 (48.0%)	2,214 (69.0%)	14,192 (47.5%)	2,905 (66.0%)	13,475 (47.0%)
Asian/PI	751	65 (1.9%)	668 (2.3%)	58 (1.8%)	675 (2.3%)	99 (2.3%)	634 (2.2%)
AI/AN	61	7 (0.2%)	52 (0.2%)	5 (0.2%)	54 (0.2%)	11 (0.2%)	48 (0.2%)
Hispanic	2,290	181 (534%)	2,036 (6.9%)	150 (4.7%)	2,070 (7.0%)	230 (5.2%)	1,987 (6.9%)

Descriptive Statistics

Results Cont.

Characteristic	Total	Preterm Birth		Low Birth Weight		SGA	
		YES	NO	YES	NO	YES	NO
Insurance Type							
Medicaid	16,270	1,918 (57.2%)	13,619 (45.8%)	1,965 (61.2%)	13,591 (45.4%)	2,641 (60.0%)	12,891 (45.0%)
Selfpay	1,701	214 (6.4%)	1,442 (4.9%)	204 (6.4%)	1,462 (4.9%)	231 (5.3%)	1,423 (5.0%)
Other	2,556	212 (6.3%)	2,248 (7.6%)	155 (4.8%)	2,304 (7.7%)	209 (4.8%)	2,250 (7.9%)
Private	13,976	1,007 (30.1%)	12,429 (41.8%)	886 (27.6%)	12,552 (42.0%)	1,323 (30.0%)	12,112 (42.2%)
WIC participation	11,596	1,247 ((38.1%)	9,816 (33.6%)	1,312 (42.1%)	9,753 (33.2%)	1,847 (43.0%)	9,215 (32.7%)
no WIC	22,250	2,027 (61.9%)	19,363 (66.4%)	1,802 (57.9%)	19,613 (66.8%)	2,450 (57.0%)	18,931 (67.3%)

Descriptive Statistics

Results Cont.

| Characteristic		Preterm Birth		Low Birth Weight		SGA	
		YES	NO	YES	NO	YES	NO
Smoking Prior to Pregnancy	3,493	459 (13.7%)	2,882 (9.8%)	484 (15.1%)	2,864 (9.6%)	630 (14.3%)	2,710 (9.5%)
Pre-pregnancy Hypertension	1,274	275 (8.2%)	928 (3.1%)	248 (7.7%)	957 (3.2%)	204 (4.6%)	999 (3.5%)
Pre-pregnancy Diabetes	486	35 (4.0%)	324 (1.0%)	74 (2.3%)	385 (1.3%)	44 (1.0%)	415 (1.5%)
Gestational Hypertension	2,334	352 (10.5%)	1,839 (3.2%)	342 (10.7%)	1,851 (6.2%)	320 (7.3%)	1,871 6.5%)
Gestational Diabetes	1,444	175 (5.2%)	1,213 (4.1%)	120 (3.7%)	1,269 (4.2%)	131 (3.0%)	1,257 (4.4%)
HOLC Grading							
Grade A	2339	135 (4.0%)	2204 (7.4%)	129 (4.0%)	2209 (7.4%)	222 (5.0%)	2116 (7.4%)
Grade B	3708	277 (8.2%)	3431 (11.5%)	240 (7.5%)	3469 (11.6%)	360 (8.2%)	3348 (11.7%)
Grade C	12216	1218 (36.2%)	10998 (36.9%)	1181 (36.7%)	11050 (36.85%)	1616 (36.6%)	10597 (36.9%)
Grade D	14908	1731 (51.5%)	13177 (44.2%)	1667 (51.8%)	13257 (44.2%)	2214 (50.2%)	12688 (44.1%)

Results Cont.

| Adjusted Odds Ratio (95% CI) of Women living in redlined areas and adverse birth outcomes			
	Preterm Birth	**Low Birthweight**	**Small for Gestational Age**
Grade A	Reference	Reference	Reference
Grade B	1.25 (1.00, 1.56)	1.09 (0.96, 1.37)	0.97 (0.81, 1.17)
Grade C	1.35 (1.11, 1.64)	1.23 (1.01, 1.51)	1.06 (0.90, 1.24)
Grade D	1.36 (1.12, 1.66)	1.20 (0.98, 1.47)	1.01 (0.86, 1.19)

- **Preterm Birth:** Women living in Grade D ('hazardous') were 1.36 times more likely to have a preterm birth than women living in Grade A ('best') neighborhoods.

- **Low Birth Weight:** Women living in Grade D ('hazardous') were 1.20 times more likely to have an infant born low birthweight than women living in Grade A ('best') neighborhoods, though non-significant.

- **Small-for-Gestational Age:** Other confounding factors seemed to explain much of the association between residing in a redlined neighborhood and small-for-gestational age.

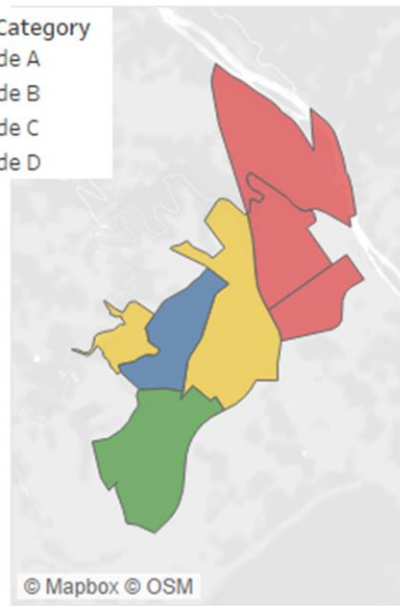VDH VIRGINIA DEPARTMENT OF HEALTH

Results

The figure depicts the HOLC maps of the 4 major geographic areas in the top row and the distribution of preterm birth in the same areas in the bottom row.
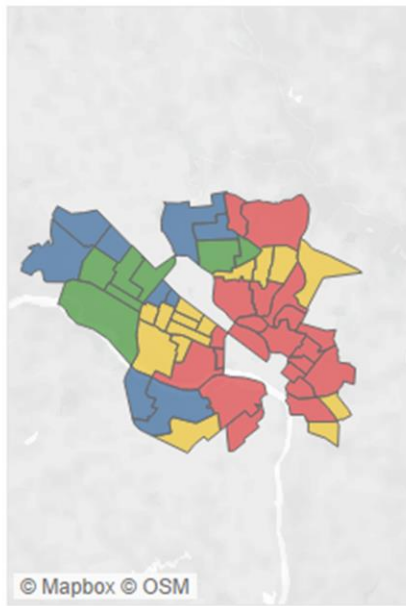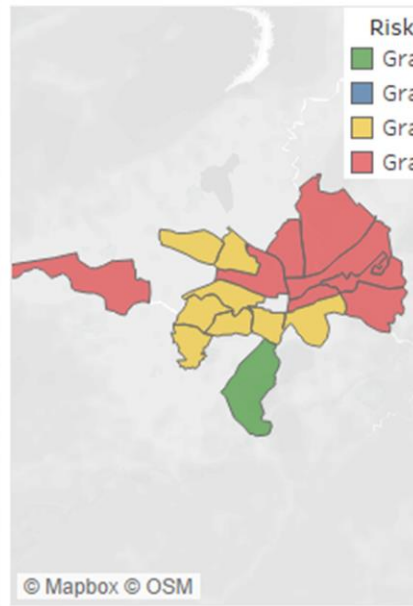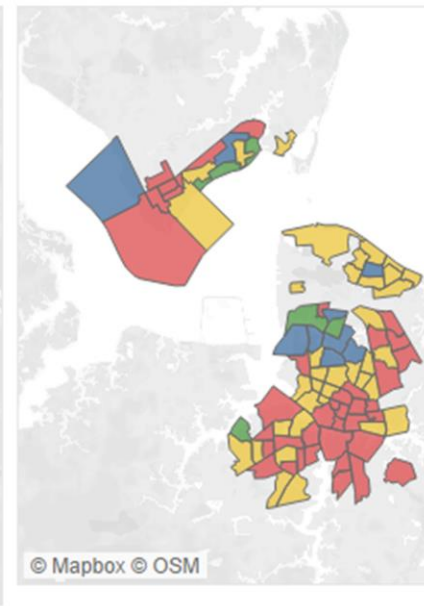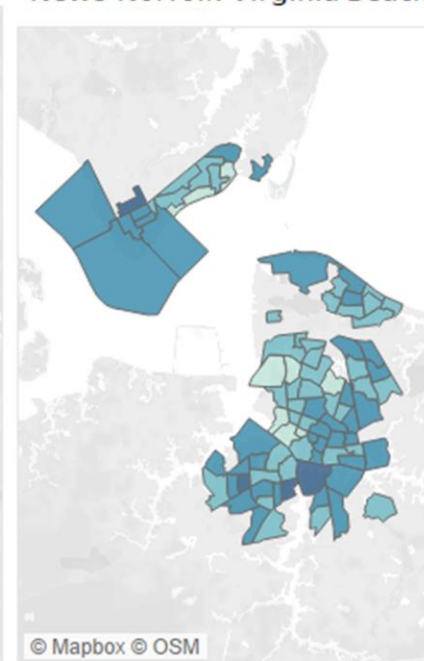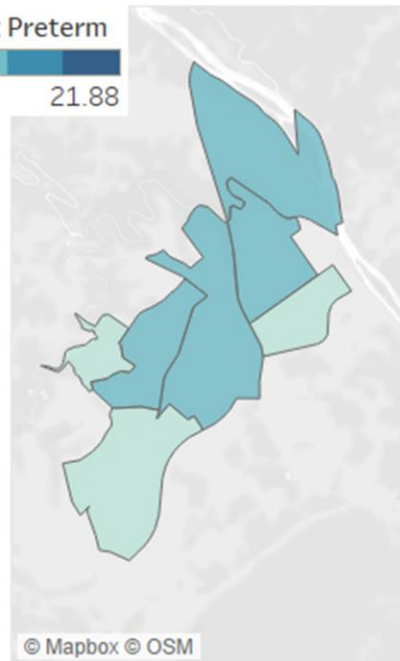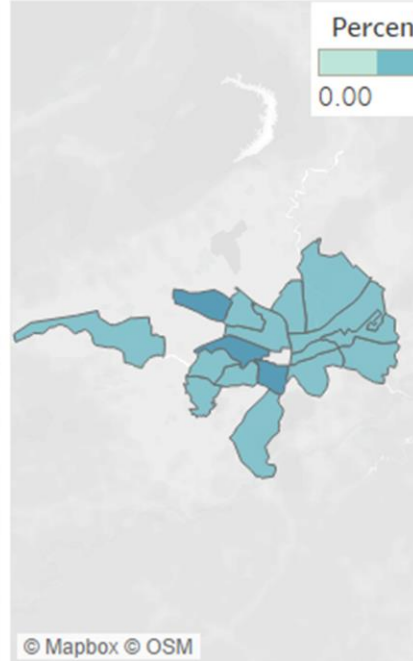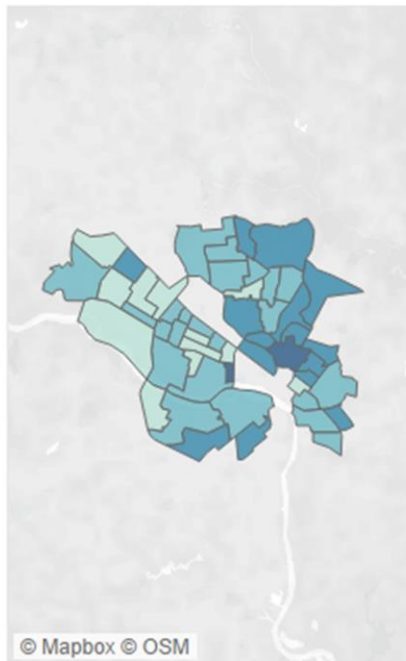
Discussion

- Worsening HOLC grade was associated with adverse birth outcomes, specifically preterm birth.

- Policies for fair housing, economic development, and health equity.

- Redlining also calls for a potential exploration as a social determinant of health.

Discussion

- <u>Limitations:</u>
  1. Limited coverage of HOLC maps
  2. Length of address at the time of birth
  3. Unable to ascertain the longevity of exposure

- <u>Strengths:</u>
  1. First to examine relationships between historical redlining and current patterns of adverse birth outcomes in Virginia.
  2. Accounts for several confounding factors.
  3. Generalizable to the population in those communities.

Future Research

- Residential redlining as a form institutional racism and neighborhood characteristics may be important for understanding racial disparities in pregnancy and preterm birth.

- Whether historical redlining continues to be associated with present-day health inequities is largely unexplored.

Contact Information

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