

Using Heat Vulnerability Index (HVI) To Analyze Low Birth Weight For Babies Due To Higher Temperatures Caused By Environmental Racism In Bronx County, Kings County, New York County, and Queens County

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Introduction

- Heat exposure in pregnant people has been associated with negative and unexpected health outcomes in labor and delivery. One of these outcomes is low birth weight for babies which can be detrimental to their health.
- In New York, some boroughs experience higher temperatures due to the concentration of concrete, vehicle emissions, and lack of green space due to the consequences of environmental racism. This phenomenon is known as the urban heat island effect. These problems disproportionately affect low income communities of color, which creates a disparity in birth weight outcomes for this specific population of babies.
- This project examined the association between heat vulnerability index (HVI) and low birth weight percentages in New York City zip codes.
- I hypothesized that higher HVI scores would be correlated with higher low birth weight percentages and that certain counties effected by lack of green space and low income neighborhoods would have higher HVI scores and higher rates of low birth weights.

Research Question

Do the higher temperatures caused by the urban heat island effect impact birth weight for babies in zip codes across Bronx County, Kings County, New York County, and Queens County?

Results

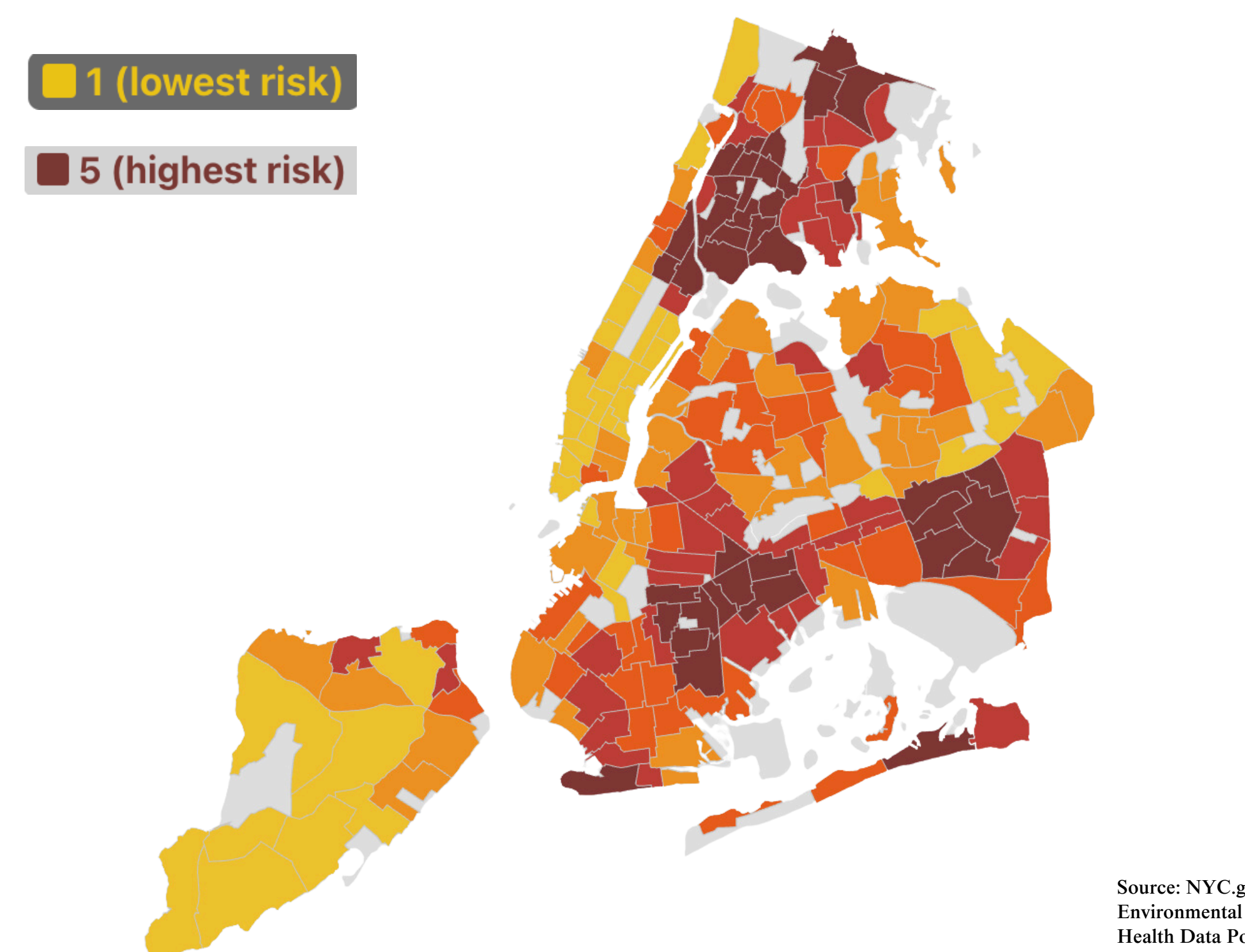


Table 1. County Characteristics

County (n=163)	Mean HVI (Standard Deviation)	Mean Green Space % (Standard Deviation)	Median Income (IQR)	Mean Low Birth Weight Rate per 1,000 live births (Standard Deviation)
Bronx County (n=25)	4.3360000 (0.8353393)	25.5% (0.0707)	\$40,976.00 (\$30,821.00)	10.74 (1.9386593)
Kings County (n=37)	3.4532432 (0.9459565)	22.1% (0.0421)	\$62,096.00 (\$18,045.00)	8.21(2.1369128)
New York County (n=42)	2.0771429 (1.2506570)	21.1% (0.0739)	\$121,480.00 (\$86,740.00)	7.95 (1.7771227)
Queens County (n=59)	2.9618644 (1.0223241)	31.4% (0.0961)	\$76,444.00 (\$16,293.00)	9.16 (2.5627143)

Table 2. Unadjusted Linear Regression

Variable	Regression Parameter Estimate	P-Value	Confidence Interval
Mean HVI	1.158	0.001	0.930-1.386

- For every 1 point that the HVI mean goes up in a zip code, the percentage of babies that are born with low birth weight increases by 1.158 percent (P= 0.001, 95% CI: 0.930-1.386).
- There is significant evidence that HVI and low birth weight are significantly associated.

Table 3. Adjusted Linear Regression

Variable	Regression Parameter Estimate	P-Value	Confidence Interval
Mean HVI	1.713	0.001	1.392-2.035

- Adjusting for green space and median income, for every 1 point that the HVI mean goes up in a zip code, the percentage of babies that are born with low birth weight increases by 1.713 percent (P= 0.001, 95% CI: 1.392-2.035).

Methodology

- Heat Vulnerability Index (HVI), which is a measurement that uses social and environmental factors to estimate risk of heat associated deaths in New York City neighborhoods was used to collect heat data.
- Low birth weight and demographic data were extracted from The New York State Health Department website. Heat vulnerability index, green space, and neighborhood income data were extracted from NYC.gov's Environment & Health data portal.
- Each zip code contains between 1 and 6 neighborhoods. Within these, the HVI's of each neighborhood were averaged to create an average HVI for the zip code overall.
- A linear regression model was used because the outcome (low birth weight percentages) were approximately normally distributed and is linearly associated with the exposure (HVI).
- All analyses were conducted in SPSS Statistics.

Key Takeaways & Discussion

- Overall, the hypothesis that higher HVI scores would be correlated with higher low birth weight percentages was statistically significant.
- When adjusting for confounders, the statistical significance was even stronger.
- Due to the fact that each zip code had varying numbers of neighborhoods, this may have slightly affected the HVI averages because some zip codes had sums that were divided by a greater total of neighborhoods.
- The HVI averages do not account for the fact that some neighborhoods take up more space within particular area code compared to other neighborhoods within the same zip code.
- Next steps could include analyzing how race influences the following:
 - Low birth weight
 - HVI
 - Income
 - Green space percentage

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References

