Monitoring the geo-temporal progression of COVID in the Bronx

Eric A. Sosa, Albert Einstein College of Medicine, 5th year MD-PhD Candidate

National Medical Fellowships

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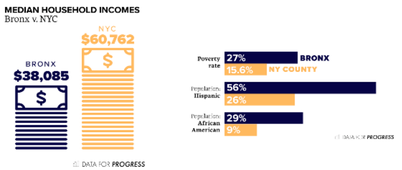
ABSTRACT

- New York City is the epicenter of the coronavirus pandemic in the United States, but not all boroughs within NYC are impacted equally. Of the five boroughs, the Bronx has the most coronavirus infections per capita, including nearly 42,000 cases and 3,247 deaths. It is quite clear that race, inequality, and environmental injustice all intersect in the Bronx, leaving residents particularly vulnerable during this pandemic. The Bronx is one of the most racially diverse boroughs, with a community comprised of 56% Hispanic, 29% Black, and 9% White. It is also the poorest congressional district in the country, where 56 percent of households are rent burdened and over 27% of residents live in poverty.
- The Bronx also has a disproportionate pollution burden. High rates of air pollution and corresponding asthma rates are potential compounding factors that leave residents of the Bronx more vulnerable to coronavirus. While more research is needed, preliminary reports suggest that increased air pollution leads to increased risk of death from COVID. **This project will study the geo-temporal progression of COVID during the pandemic, informing us of additional community risks within the Bronx.** This research underscores the need to address environmental injustice as part of any recovery from the coronavirus pandemic.



Characteristic	Cases		Hospitalizations		Deaths	
	No.	Rate*	No. (row %)	Rate*	No. (row %)	Rate*
Borough of residence						
Bronx	46,085	3,157	12,076 (26.2)	826	3,870 (8.4)	268
Brooklyn	56,548	2,104	15,125 (26.7)	556	5,563 (9.8)	205
Manhattan	25,315	1,369	7,867 (31.1)	408	2,476 (9.8)	123
Queens	62,260	2,507	16,806 (27)	637	5,882 (9.4)	217
Staten Island	13,577	2,701	2,337 (17.2)	423	888 (6.5)	158

BACKGROUND

A Collaborative Effort: Einstein, Montefiore, and Jacobi Medical Center:

- The **Montefiore Health System**:
  - 10 member hospitals
  - 200 outpatient ambulatory care sites
  - Provide coordinated, comprehensive care to patients and their families across the Bronx, Westchester and the Hudson Valley.
- Together, **Montefiore, Einstein, and the Jacobi Medical Center** provide care to ≈ 80% of the Bronx community, providing the majority of COVID data collected in the Bronx. Together, they have developed a task-force to understand community risks via data collection and analysis. The goal of this project is to understand which specific Bronx communities are being targeted in order to enforce preventive measures for future resurgences.
- A large component of the Bronx community is uninsured and of low socioeconomic status. This work is of high relevance as it's impact will directly influence those who have been historically underrepresented in medicine.

EINSTEIN Albert Einstein College of Medicine

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Montefiore

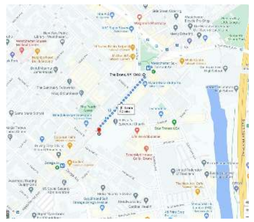
OBJECTIVES

1. **Identify community hotspots and progression of virus spread to model future resurgence.**
2. **Understand the relationship between social determinants of health and COVID spread in the Bronx.**
3. **Investigate how urban planning in the Bronx intertwines with relative risk and mortality.**

METHODOLOGY

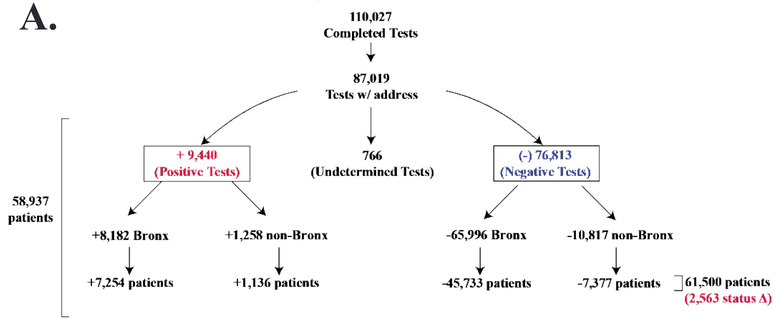
- **Initial Filtering of data:**
  - Positive tests (+)
  - Eliminated duplicate tests (kept earliest +date)
  - March 3rd-October 15th, 2020
  - 7,258 COVID patients in the Bronx
  - Location (Longitude -73.934 to -73.780)
    (Latitude 40.79 to 40.92)

- **Maintaining patient confidentiality via residence randomization:**
  - Longitude & Latitude Adjustment (+/-0.002)
  - Test date Adjustment (+/- 2-4 days)
  - Eliminate duplicates



- **COVID Data Collection and Analysis:**

A.



A. Montefiore, Einstein, and Jacobi Medical Center collected data from over 100,000 COVID tests between March and October of 2020. The distribution of these test results is represented above.

RESULTS

A.

Montefiore Data*	(+) cases	(-) cases	total cases	prevalence	NNH	% of total data
Bronx	7,258	41,981	49,239	0.147	6.42	80
NY non-Bronx	1,129	11,124	12,253	0.092	11.86	20
Total	8,387	53,105	61,492	0.136	7.35	100

* Duplicate test results were removed

B.

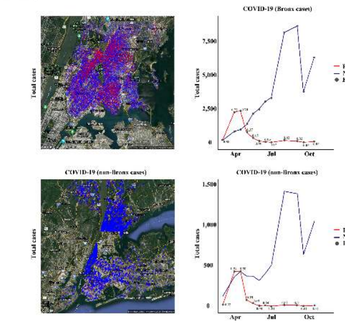
Bronx residence	COVID (+)	COVID (-)
(+)	7,258	41,981
(-)	1,129	11,124

$= \frac{0.1474}{0.092}$ RR = 1.6

A. Summary of COVID data representing over 100,000 reported tests in the Montefiore system. **B.** The relative risk (RR) for COVID infection when treating Bronx residence as a predisposing condition is 1.6. Thus, Bronx residents are nearly twice as likely to contract COVID compared to non-Bronx NY residents.

RESULTS

A.



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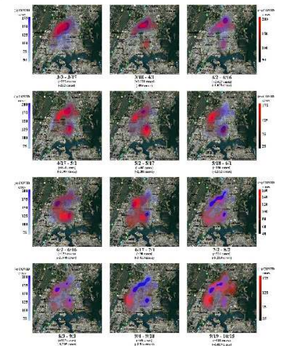
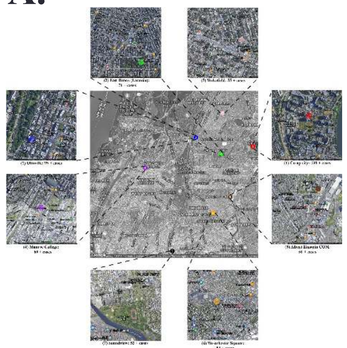
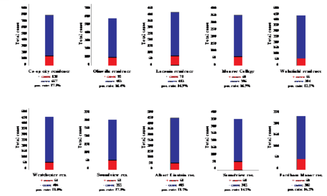


A. The prevalence of COVID in the Bronx was ≈ 20% higher during the initial spike. **B.** Distribution of COVID results in the Bronx as a function of time.

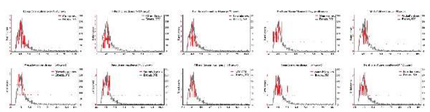
A.



B.



C.



A. These 8 residencies account for 557 COVID cases and represent the buildings in the Bronx with the highest COVID/household ratio. They reported nearly 70 cases per residence, a number far above the average. These locations were noted to be near medical centers, transited highways, and academic institutions. **B.** Positivity rates in these locations is not due to number of residents. Some of these buildings have positivity rates near 18% while neighboring ones are near 4%. **C.** Positive cases in these locations remained high despite declining rates in neighboring boroughs.

CONCLUSIONS

- **76 unique addresses account for 1,457 cases (20%). Many unique residencies displayed upwards of 50 COVID patients at a given time.**
- **Several high-prevalence locations have identical buildings nearby with far lower positivity rates.**
- **Many of these high prevalence buildings are not necessarily low income/deprived.**
- **Future studies require epidemiological expertise for informative and responsible conclusions to be reached.**