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Ecologic Study of Influenza Vaccination Uptake and COVID-19 Death Rate in New York City

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Introduction

- February 29-December 2, 2020: over 360,000 COVID-19 cases and 24,000 deaths in New York City
- Distribution of COVID-19 vaccines could take months for many Americans
- Other measures of mitigation are necessary
- Influenza vaccination has been hypothesized to mitigate COVID-19 severity in elderly populations
- Socioeconomic confounders associated with influenza vaccination uptake and COVID-19 severity have not been considered

Study Aim

- **Assess the area-level relationship between cumulative death rate for COVID-19 and historic influenza vaccination uptake in New York City, adjusted for possible confounders of COVID-19 severity, as defined by the Centers for Disease Control and Prevention (CDC)**

Methods

- Modified zip code tabulation area (MODZCTA) level cumulative COVID-19 death rates February 29, 2020-December 2, 2020 from the NYC Department of Health (DOH) Coronavirus repository

- United Hospital Fund (UHF) level age-adjusted prevalence (%) of self-reported flu vaccination, diabetes, asthma, BMI $\geq$ 30 kg/m^2 , and hypertension from the 2017 Community Health Survey (CHS) via the Department of Health and Mental Hygiene's EpiQuery tool

- Percent of residents who were white, Hispanic, and ≥65 years old in each ZCTA from the American Community Survey (ACS) 2018 5-year estimates

- Data for CHS and ACS indicators were converted to MODZCTA using crosswalks provided by NYC DOH

- Multilinear analysis to assess the association of COVID-19 death by MODZCTA by prevalence of flu vaccination in 2017

Results

Multiple Linear Relationship between COVID-19 Death Rate and Flu Vaccination Prevalence in New York City Residents

	COVID-19 Cumulative Death Rate per 100,000 residents[#]						
Variable (%)	Median (IQR)	Q1	Q3	Coefficients	p	95% Confidence	
				B		Lower	Upper
Flu Vaccination Prevalence^	44 (7.2)	40.7	47.9	-5.17	<0.0001	-7.4	-2.93
Diabetes Prevalence^	11.2 (6.0)	9	15	3.86	0.1736	-1.72	9.44
Asthma Prevalence^	13.4 (7.2)	10	17.2	1.28	0.4169	-1.82	4.38
BMI ≥ 30 kg/m^2 Prevalence^	23.3 (11.3)	19.1	30.4	0.89	0.6007	-2.45	4.22
Hypertension Prevalence^	28.2 (9.0)	23.5	32.5	-2.05	0.3635	-6.5	2 .39
Proportion White Residents*	46.4 (45.2)	22.62	67.87	-1.71	<0.0001	-2.42	-1
Proportion Hispanic Residents*	18.9 (26.2)	10.91	37.12	1.58	0.0002	0.76	2.4
Proportion Residents ≥65 Years *	13.6 (6.0)	11.11	17.07	11.98	<0.0001	9.1	14.86

[#] New York City Department of Health. NYC Coronavirus disease 2019 (COVID-19) data. https://github.com/nychealth/coronavirus-data. Accessed December 2, 2020

^ Department of Health and Mental Hygiene NYCDoHaMH EpiQuery. https://nyc.gov/health/epiquery. Accessed November 12, 2020

* Bureau USC. American Community Survey. 2018 American Community Survey 5-Year estimates. https://data.census.gov/cedsci/. Accessed April 28, 2020

Results

- In NYC in 2017, 44% of residents reported receiving a flu vaccine, 13% having asthma, 25% a BMI $\geq$ 30 kg/m^2, and 28% hypertension. The population was 43% white, 29% Hispanic, and 15% >65 years.

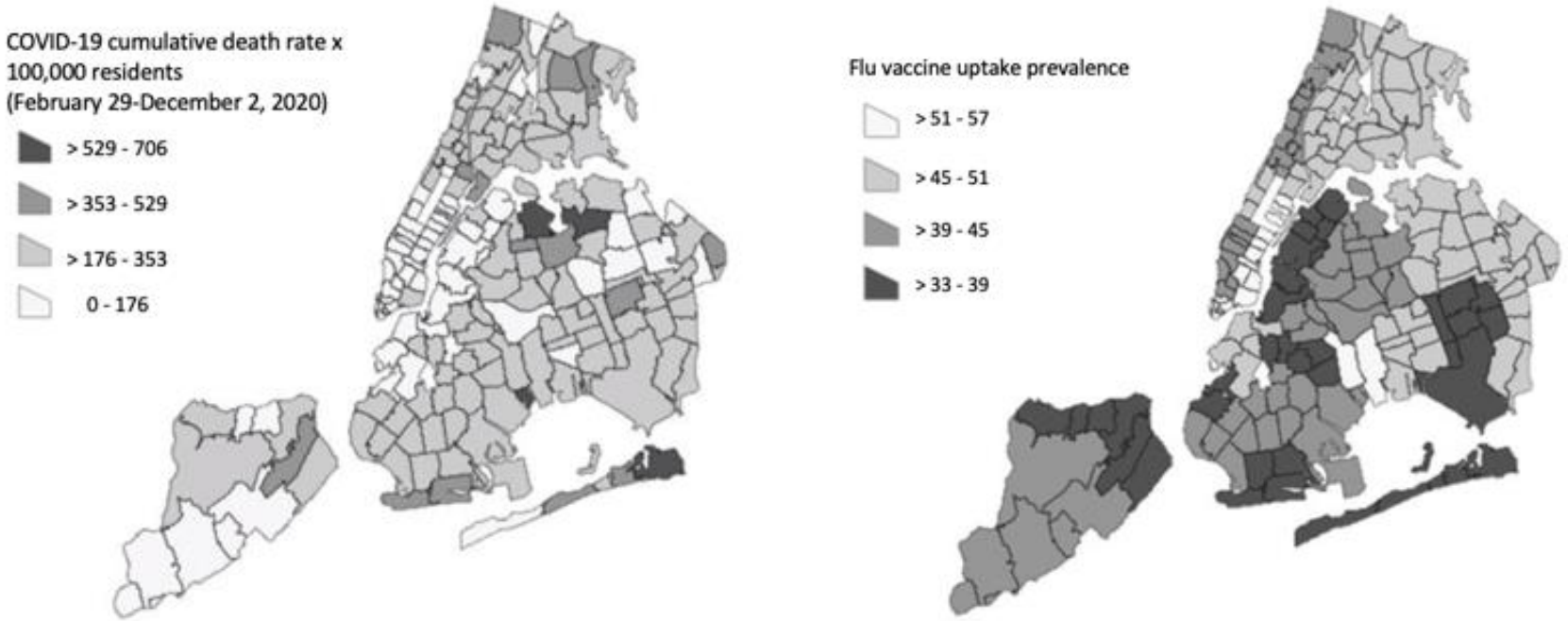
- After adjusting for potential confounders, predictors accounted for 49% of the variability in the COVID-19 death rate ($p < 0.0001$).

- For every one-unit increase in flu vaccination uptake for each zip code area, the rate of COVID-19 deaths decreased by 5.17 per 100,000 residents ($p < 0.0001$).

- The proportion of white residents ($B_{adj} = -1.710$, $p < 0.0001$) was significantly inversely associated with mortality.

- Older age ($B_{adj} = 11.980$, $p < 0.0001$) and the proportion of Hispanic residents were positively associated with COVID-19 mortality ($B_{adj} = 1.580$, $p = 0.0002$).

Distribution of COVID-19 Mortality Rates and of Flu Vaccination Uptake Prevalence in NYC



Distribution of the COVID-19 cumulative death rate per 100,000 residents Feb. 29-Dec. 2, 2020 (left) and age-adjusted prevalence (%) of self-reported flu vaccination (right) from UHF 2017 CHS NYC Modified Zip Code Tabulation Areas.

Discussion

- Neighborhoods with a higher prevalence of influenza vaccination had lower rates of COVID-19 mortality, even after adjustment for racial and ethnic makeup, and distribution of age and health risk factors for severe COVID-19.

- This analysis is the first to consider these confounders in a US based database.

- These findings suggest that influenza vaccination may contribute to lower COVID-19 mortality, and could be an effective population-wide prevention and mitigation measure, with special emphasis on vaccinating seniors.

Conclusions

- Influenza vaccination should be actively promoted, as it could be an additional effective public health measure.

- Future research should explore the relationship between influenza vaccination uptake and COVID-19 mortality at the individual level.

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