COMPLETENESS OF COVID-19 OUTCOMES AMONG PEOPLE WITH HIV RECEIVING CARE IN NEW YORK CITY IN 2020

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BACKGROUND

Many early COVID-19 outcome studies were based exclusively on electronic health record (EHR) data from single health systems

- However, in many urban U.S. areas most affected by the COVID-19 pandemic in 2020, people who would have ordinarily received care in their usual health system may have experienced outcomes at other hospitals or at home due to the public health emergency, which would not be captured in the EHR
- New York City is home to over 10 separate health systems alone

We assessed completeness of COVID-19 outcomes among people with HIV (PWH) receiving HIV care in 3 large New York City health systems

- Compared outcomes from EHR data alone to public health surveillance data
- Follow-up : From 3/2020 (when the New York City COVID-19 emergency began) to 12/2020 (before COVID-19 vaccines were widely available)

METHODS

Study population and inclusion criteria

Adult (18+) PWH with at least one ART prescription between 1/1/2019-3/1/2020 in the Mount Sinai, Montefiore, and Northwell Health systems

Outcome ascertainment from EHR data

We obtained data on lab-confirmed **COVID-19 infections**, **COVID-19 hospitalizations**, **COVID-19 ICU admissions** and **deaths due to any cause** from **health system EHRs** between 3/1/2020 and 12/31/2020

Linkage and outcome ascertainment from public health surveillance

Patient data from the 3 New York City health systems and the **New York City Department of Health and Mental Hygiene (NYC DOHMH)'s COVID-19 Surveillance Registry** were linked with the **NYC DOHMH HIV Registry** using a published automated deterministic matching algorithm, based on personal identifiers.

We obtained surveillance data on the same outcomes as above, based on city-wide surveillance via legally mandated reporting of all HIV and COVID-19 diagnostic tests, CD4 counts, HIV viral loads, and deaths, as well as chart reviews. These data served as the gold standard for completeness.

Statistical analysis

After linkage, we compared numbers of outcomes between data sources

To assess potential bias when limiting analyses of COVID-19 outcomes to EHR data alone, we compared associations of selected characteristics with COVID-19 outcomes by source in the linked dataset

EHR data in urban U.S. areas may have severely underestimated the frequency of key COVID outcomes among PWH in care, potentially biasing risk factor associations

RESULTS

Eligible PWH from 3 New York City health systems (N=19,833)

	N	%
Sex at birth		
Male	14,527	73
Female	5,306	27
Race/ethnicity		
Black (non-Hispanic)	8,320	42
Hispanic	7,764	39
White (non-Hispanic)	3,196	16
Asian/Pacific Islander	388	2
Other/unknown/missing	165	0.8
Age, years (median, IQR)	53	40, 60
18-29	1,187	6
30-39	3,664	18
40-49	3,394	17
50-59	6,171	31
60-69	4,231	21
70+	1,186	6

	N	%
HIV transmission category		
MSM	7,483	38
IDU history	1,144	6
Heterosexual	5,964	30
Other	1,747	9
Unknown	3,495	18
HIV viral suppression (<200 copies/mL)*		
Yes	15,277	77
No	3,145	16
Unknown	1,411	7
Site		
Mount Sinai	12,407	63
Montefiore	5,907	30
Northwell	1,519	8

IDU = injection drug use, IQR = interquartile range, MSM = men who have sex with men
*Closest in time on or before 3/1/2020, up to 14 months (i.e., pre-COVID)

CONCLUSIONS

In our high HIV prevalence city that was overwhelmed by the COVID-19 pandemic in 2020, analyses of COVID-19 among PWH in care that were limited to single-site EHR data severely underestimated COVID-19 and death outcomes

Interpretation of estimates from EHR-based studies during public health emergencies should require careful consideration of ascertainment bias

RESULTS

COVID-19 outcomes by source, after linkage (N=19,833)

	EHR only		Surveillance (gold standard)		Either source after linkage		Ratio of either source to EHR only
	N	%	N	%	N	%	
COVID-19 infections	422	2.1	1233	6.2	1372	6.9	**3.3**
COVID-19 hospitalizations	128	0.6	421	2.1	435	2.2	**3.4**
COVID-19 ICU admissions	21	0.1	62	0.3	70	0.3	**3.3**
Deaths, any cause	94	0.5	455	2.3	460	2.3	**4.9**

Using outcomes from EHR data alone resulted in a ***3-fold under-estimation*** of COVID-19 infections, hospitalizations and ICU admissions and a ***5-fold underestimation*** of deaths due to any cause

Among those who died, younger PWH were more likely to be missing from EHR after adjusting for site, race/ethnicity, sex, HIV transmission category and HIV viral suppression (data not shown)

Potential bias in associations with all-cause mortality by using EHR data alone

	EHR only	Surveillance (gold standard)	Either source after linkage
	adjOR (95% CI)	adjOR (95% CI)	adjOR (95% CI)
HIV viral suppression (<200 copies/mL) (ref.=Yes)			
No	**1.62 (0.96, 2.70)**	**2.20 (1.76, 2.75)**	2.21 (1.77, 2.75)
Unknown	0.26 (0.04, 1.91)	0.58 (0.33, 1.02)	0.62 (0.36, 1.07)
Race/ethnicity (ref.=White non-Hispanic)			
Black (non-Hispanic)	0.86 (0.42, 1.76)	1.26 (0.92, 1.71)	1.22 (0.90, 1.66)
Hispanic	0.76 (0.36, 1.59)	1.10 (0.80, 1.51)	1.08 (0.79, 1.47)
Other/unknown/missing	0.67 (0.08, 5.38)	0.52 (0.19, 1.45)	0.50 (0.18, 1.39)

adjOR = adjusted odds ratio, also controlling for sex, HIV transmission category, site, age, and age^2, CI = confidence interval

The adjusted odds ratio for pre-COVID HIV viremia (200+ copies/mL) in relation to all-cause mortality was **1.62 (95% CI 0.96-1.70)** using EHR data only and **2.20 (95% CI 1.76-2.75)** using surveillance data

Associations of race/ethnicity with mortality also differed by source

Differences also observed for other COVID-19 outcomes (data not shown)

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