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HIV mortality across the 30 largest U.S. cities: assessing overall trends and racial inequities

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ABSTRACT

Background: Despite decreases in overall HIV mortality in the U.S., large racial inequities persist. Most previous analyses of HIV mortality and mortality inequities have utilized national- or state-level data.

Methods: Using vital statistics mortality data and American Community Survey population estimates, we calculated HIV mortality rates and Black:White HIV mortality rate ratios (RR) for the 30 most populous U.S. cities at two time points, 2010–2014 (T1) and 2015–2019 (T2).

Results: Almost all cities (28) had HIV mortality rates higher than the national rate at both time points. At T2, HIV mortality rates ranged from 0.8 per 100,000 (San Jose, CA) to 15.2 per 100,000 (Baltimore, MD). Across cities, Black people were approximately 2–8 times more likely to die from HIV compared to White people at both time points. Over the decade, these racial disparities decreased at the national level (T1: RR = 11.0, T2: RR = 9.8), and in one city (Charlotte, NC).

Discussion: We identified large geographic and racial inequities in HIV mortality in U.S. urban areas. These city-specific data may motivate change in cities and can help guide city leaders and other health advocates as they implement, test, and support policies and programming to decrease HIV mortality.

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Disparity; inequity; HIV; mortality; local data

Introduction

Following the introduction of highly active antiretroviral therapy (HAART) in 1996, HIV mortality rates among the U.S. population have significantly declined (CDC, 2020; National Center for Health Statistics, 2018; Singh et al., 2013). However, biomedical advances in treatment and prevention have not equally benefitted all Americans. Non-Hispanic Black (Black) Americans experience a mortality rate that is much higher than that for Non-Hispanic White (White) Americans. Indeed, after introduction of HAART, the HIV mortality disparity between Black and White populations in the U.S. widened as more White people had access to this life-saving therapy (Allgood et al., 2016; CDC, 2020; NCHS, 2017; Singh et al., 2013). For example, the Black:White national mortality rate ratio (a measure of inequality) grew from 4.3 in 1990–1994 to 11.4 in 2005–2009 (Allgood et al., 2016).

Inequity in HIV outcomes begins with unequal HIV incidence and prevalence among Black and White populations in the U.S. In 2018, the incidence of HIV in the Black population was 39.2/100,000 compared to 4.8/100,000 among the White population (CDC, 2020). The HIV prevalence rate was 1,034/100,000 for the Black population and 154/100,000 for the White population (CDC, 2020). Inequities are further exacerbated by Black:White disparities along the HIV care continuum, encompassing both primary and secondary prevention. These disparities include lower rates of: Pre-Exposure Prophylaxis (PrEP) use, linkage to and retention in HIV care, HAART use, and HIV viral load suppression among Black populations relative to White (Beer et al., 2016; CDC, 2020; Crepaz et al., 2018; Dasgupta et al., 2016; Hall et al., 2012, 2013; Kanny et al., 2019; Lee et al., 2017). Each of these activities is a potential point of intervention for cities looking to improve levels of equity within HIV mortality.

While understanding the inequities in HIV mortality between Black and White populations at the national level is important for identifying trends and setting

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goals, analyses of large geographic areas can mask considerable local variation. Although it is difficult to find HIV mortality rates at the state level, several previous studies have documented striking differences in rates at the county level (El Bcheraoui et al., 2018; McDavid Harrison et al., 2008; Rebeiro et al., 2019). In fact, HIV is the infectious disease with the highest between-county mortality differences in the U.S., ranging from 64.9 per 100,000 in Union County, Florida to 0.15 in Saint Croix County, Wisconsin (El Bcheraoui et al., 2018). Racial inequities in HIV mortality rates also vary widely between counties, though almost all showed higher Black rates than White rates, as well as increasing inequities over time (Levine et al., 2007). This wide geographic variability in HIV mortality rates, and racial inequities within, highlights the local nature of the epidemic, which demands a local response, guided by local data. Thus, data from even smaller geographic units are needed.

More specifically, city officials, public health professionals, funders, and other organizations need city-level data to enable them to make evidence-based decisions as it relates to the prevention of, and screening for, sexually transmitted infections like HIV (Cuffe et al., 2017; DeSalvo et al., 2017; Leichliter et al., 2016). This is particularly true for HIV mortality information, as over 95% of HIV positive individuals live in urban areas (CDC, 2020). It is the local departments of public health, and other city agencies and offices, who develop and enforce many health and social policies, provide related services, and allocate funding for these initiatives. Yet, while there are studies that examine HIV mortality *within* individual cities, or even neighborhoods, we only found one study that examined HIV mortality rates across US cities as part of a study investigating life expectancy in the 25 largest U.S. cities (Fenelon & Boudreaux, 2019). However, this study did not assess Black:White HIV mortality inequities (Fenelon & Boudreaux, 2019). The present study fills this critical gap in the literature by: (1) examining HIV mortality rates for the 30 largest U.S. cities; (2) assessing racial inequities in HIV mortality in these cities; and (3) comparing city-level trends in HIV mortality rates (and inequities within) over the past decade. Reducing overall HIV mortality and racial inequities in mortality are national priorities set forth by the *Healthy People 2020* campaign, the National HIV/AIDS strategy, and the President's *Ending the HIV Epidemic: A Plan for America* (HHS, 2015, 2019; HRSA, 2019). City-level data on HIV mortality and mortality inequities can help guide the design of public health initiatives to achieve these ambitious public health goals.

Methods

Study population

We identified the 30 most populous cities by using 2013 U.S. Census Bureau data (as part of a larger project) (Benjamins & De Maio, 2021). For the few cases in which the city and county governments have consolidated (i.e., Louisville/Jefferson County, KY, Nashville/Davidson County, TN, and Indianapolis/Marion County, IN), we used county data. Selected city characteristics are shown in Supplemental Table 1.

Data sources

Mortality data

We obtained 2010–2019 mortality data from the Multiple Cause of Death data files from the National Vital Statistics System (NVSS) and extracted total and race/ethnicity-specific deaths by age group (0–34, 35–44, 45–54, 55–64, 65–74, 75–84, and over 85 years) and place of residence. Note that this study examines HIV-related deaths among the whole population (not just among people living with HIV). In addition, the total city outcomes include all race/ethnic groups (not just non-Hispanic Black and non-Hispanic white). Race and ethnicity data in death records are filled out by proxy (Arias et al., 2016).

Case definition

As is standard, we included deaths coded as B20–B24 using the International Classification of Diseases (ICD)-10 (World Health Organization, 2016). These codes correspond to malignancy, infections, diseases, and other medical conditions secondary to HIV infection.

Population data

For each city, we obtained total and race- and age-specific population-based denominators using U.S. Census Bureau data. Denominator data for the total and non-Hispanic (nH) white populations come from the American Community Survey (ACS). The ACS 5-year estimates for 2010 were used for 2010–2014 (T1) and 5-year estimates for 2015 were used for 2015–2019 (T2). Non-Hispanic Black population estimates are not available in the ACS but they are available in the Decennial Census. Therefore, we estimated the non-Hispanic Black population denominators for the US and each city by calculating the proportion of the Black population that was non-Hispanic in the 2010 Decennial Census and applying these proportions to the total Black population estimates from the ACS 5-year estimates for 2010 (T1) and 2015 (T2) using the following formula, where n is age group, *NHB Pop* is non-Hispanic Black Population, *Black Pop* is Total (Hispanic + non-Hispanic) Black Population, *U.S. Census* refers to the 2010 Decennial Census, and *ACS* refers to the 2010 or 2015 American Community Survey, for T1 and T2, respectively (U.S. Census Bureau, 2019a, 2019b).

$$NHB\ Pop.\ Estimate = \sum_{n=1}^{10}\left\{\left[\frac{NHB\ Pop_{U.S.\ Census}}{Black\ Pop_{U.S.\ Census}}\right] \times [Black\ Pop_{ACS}]\right\}$$

We assumed a constant population size to estimate the population over each five-year period of mortality data used.

Mortality rates

Age-adjusted total and race-specific HIV mortality rates were calculated for all 30 cities and the U.S. as a whole. If cities had fewer than 20 cause-specific deaths for any race group, they were excluded, in accordance with research on the reliability of mortality rates (Hoyert et al., 2006). To have enough deaths for the majority of cities, we calculated age-adjusted mortality rates across a five-year period. We adjusted mortality rates by age using the year 2000 standard U.S. population (Klein & Schoenborn, 2001). Age-adjustment makes the different groups comparable by standardizing the age distribution for each city to match that of the overall general US population. Mortality data for Las Vegas were removed from the results due to the potential misclassification on death certificate data of some individuals who resided in unincorporated areas but who may have been counted as Las Vegas deaths. All rates presented are per 100,000 people.

Equity measures

All equity measures were calculated using the age-adjusted, 5-year average mortality rates for T1 and T2 as described above. Relative inequities were assessed by calculating Black:White rate ratios (RR). These provide the proportional disparity in Black and White deaths. Absolute inequities were calculated using the risk difference (RD) in rates. Specifically, we subtracted the White mortality rate from the Black rate.

Statistical analysis

We calculated total and race-specific average HIV mortality rates for T1 and T2, multiple measures of racial inequities, and rankings, at the city-level. For rates, RR and RDs, we calculated standard errors and corresponding 95% confidence intervals (CI) using a Taylor series expansion technique (Kleinbaum et al., 1982). Because HIV mortality has been declining consistently since 1995, we tested for significant declines in race-specific mortality rates from T1 to T2 using a one-sided z-score (Allgood et al., 2016; Murphy et al., 2021). If the z-score was greater than 1.645, we considered the race-specific mortality rate in T2 to be significantly lower than the rate in T1 (at the $p < 0.05$ level) (Keppel et al., 2004).

To assess the significance of changes in the disparity over time, we calculated the percent difference between Black and White mortality rates at each time period using the following formula: $(\text{Rate}_{\text{Black}} - \text{Rate}_{\text{White}})/\text{Rate}_{\text{White}} \times 100$. We then calculated a two-sided z-score that compared the percent difference at T1 to the percent difference at T2, using the technique developed by Keppel et al. (2004). If the absolute value of the z-score was greater than 1.96, we considered there to be a statistically significant change in the relative percent difference over time (using a 95% CI) (Keppel et al., 2004).

This study was reviewed by the Mount Sinai Institutional Review Board (MSH #18–40) and did not require full review because it used publicly available, de-identified data.

Results

Total mortality

In T1, the national HIV mortality rate was 2.3, decreasing significantly to 1.7 in T2 (Table 1). HIV mortality rates in the largest cities tended to be higher than the national rate. In T1, all but one of the 29 cities had HIV mortality rates higher than the national rate; only San Jose had a lower rate. In T2, both Austin and San Jose had mortality rates lower than the national rate. At both time points, the city with the highest overall HIV mortality rate was Baltimore (20.0 in T1 and 12.3 in T2). San Jose experienced the lowest overall HIV mortality, with less than one death per 100,000 population during both time periods.

Although HIV mortality decreased among all cities except Oklahoma City (and significantly so in 24 out of the 29 cities), the magnitude of the improvement varied. Figure 1 shows the trends over time, with the cities with the highest (or lowest) 2010–2014 rates highlighted. Baltimore had the largest decline in HIV mortality between T1 and T2 (but still had the highest mortality rate in T2). Of the other cities with significant decreases, Washington, DC, Philadelphia, Memphis, and New York had the next largest absolute decreases.

Table 1. HIV mortality rates and racial disparities in rates for the U.S. and the 30 biggest cities at two time points.

City, State	2010–2014 (T1) Total rate	Black rate	White rate	Rate ratio	Rate ratio CI	Rate difference	Rate difference CI	2015–2019 (T2) Total rate	Black rate	White rate	Rate ratio	Rate ratio CI	Rate difference	Rate difference CI	Change in total rate (T1-T2)[a]	Change in Disparity (T1-T2)[b]
United States	2.3	10.6	1.0	10.7	10.4, 10.9	9.6	9.5, 9.8	1.7	7.3	0.8	9.53	9.3, 9.8	6.6	6.5, 6.7	**<.001**	**<.001**
Austin, TX	2.6	13.3	1.5	8.65	5.4, 13.9	11.8	7.6, 16	1.6	–	1.5	–	–	–	–	**.001**	–
Baltimore, MD	20.0	28.0	6.3	4.41	3.3, 5.8	21.6	18.8, 24.5	12.3	17.4	3.6	4.85	3.4, 7	13.8	11.6, 16	**<.001**	.63
Boston, MA	3.5	7.8	2.2	3.53	2.2, 5.6	5.6	3.4, 7.8	2.6	5.4	1.6	3.35	2, 5.6	3.8	2.1, 5.6	**.03**	.86
Charlotte, NC	5.4	13.7	1.3	10.26	6.7, 15.7	12.4	10.1, 14.6	3.5	8.0	1.5	5.29	3.5, 8	6.5	4.9, 8	**<.001**	**.03**
Chicago, IL	4.9	10.5	2.3	4.50	3.6, 5.6	8.2	7.1, 9.2	3.3	7.7	1.3	5.97	4.5, 7.8	6.4	5.5, 7.3	**<.001**	.08
Columbus, OH	2.6	5.3	1.7	3.07	2, 4.6	3.6	2, 5.1	1.7	3.0	1.3	2.30	1.4, 3.7	1.7	0.6, 2.8	**.003**	.31
Dallas, TX	6.6	13.6	5.3	2.6	2, 3.3	8.4	6.2, 10.5	5.2	11.7	4.2	2.79	2.2, 3.6	7.5	5.6, 9.4	**.002**	.62
Denver, CO	3.3	7.0	3.0	2.33	1.4, 3.9	4.0	0.9, 7.1	2.7	–	2.7	–	–	–	–	.07	–
Detroit, MI	6.8	7.7	–	–	–	–	–	3.8	4.5	–	–	–	–	–	**<.001**	–
El Paso, TX	2.3	–	–	–	–	–	–	2.1	–	–	–	–	–	–	.36	–
Fort Worth, TX	3.7	9.4	2.6	3.53	2.4, 5.2	6.7	4.2, 9.2	2.5	6.6	1.8	3.71	2.4, 5.8	4.9	2.9, 6.8	**.002**	.85
Houston, TX	8.7	23.4	4.2	5.63	4.6, 6.8	19.2	17.1, 21.3	6.7	18.2	3.9	4.65	3.8, 5.7	14.3	12.5, 16.1	**<.001**	.12
Indianapolis, IN	3.1	6.3	2.0	3.15	2.2, 4.5	4.3	2.7, 5.9	2.1	4.1	1.4	2.83	1.9, 4.3	2.6	1.4, 3.8	**.003**	.65
Jacksonville, FL	7.7	21.5	2.2	9.70	7.3, 12.9	19.3	16.5, 22	5.4	14.7	1.8	8.03	5.8, 11.1	12.8	10.6, 15.1	**<.001**	.34
Los Angeles, CA	3.4	11.1	2.8	3.99	3.3, 4.9	8.3	6.7, 9.9	2.9	9.7	2.5	3.87	3.1, 4.8	7.2	5.7, 8.7	**.002**	.82
Louisville, KY	2.7	8.8	1.3	6.78	4.5, 10.2	7.5	5.3, 9.7	2.2	6.8	1.2	5.56	3.6, 8.6	5.6	3.7, 7.6	.09	.48
Memphis, TN	10.9	16.6	2.1	7.77	4.8, 12.4	14.5	12.4, 16.6	7.4	10.7	–	–	–	–	–	**<.001**	–
Nashville, TN	4.8	11.0	3.0	3.72	2.7, 5.2	8.1	5.6, 10.6	2.5	5.5	1.7	3.24	2.1, 5	3.8	2.2, 5.4	**<.001**	.56
New York, NY	7.5	17.3	2.3	7.47	6.6, 8.4	14.9	14.1, 15.8	4.1	9.8	1.3	7.70	6.6, 9	8.5	7.9, 9.2	**<.001**	.73
Oklahoma City, OK	2.9	5.6	2.1	2.6	1.6, 4.5	3.5	1, 5.9	2.9	–	2.9	–	–	–	–	.48	–
Philadelphia, PA	7.3	12.7	2.5	5.13	4, 6.6	10.2	8.8, 11.6	3.5	6.1	1.2	5.12	3.6, 7.4	4.9	3.9, 5.8	**<.001**	.99
Phoenix, AZ	2.9	10.7	2.4	4.54	3.2, 6.5	8.4	5.2, 11.6	1.8	5.0	1.7	2.90	1.8, 4.6	3.3	1.3, 5.3	**<.001**	.10
Portland, OR	2.7	–	2.6	–	–	–	–	2.1	–	2.0	–	–	–	–	.08	–
San Antonio, TX	4.0	10.1	2.6	3.91	2.6, 5.9	7.5	4.4, 10.7	3.2	7.9	2.9	2.74	1.8, 4.2	5.0	2.3, 7.7	**.007**	.20
San Diego, CA	2.8	9.4	2.9	3.28	2.2, 4.8	6.6	3.5, 9.6	2.0	4.5	2.2	2.08	1.3, 3.4	2.3	0.3, 4.4	**.001**	.12
San Francisco, CA	7.2	23.6	9.8	2.40	1.8, 3.2	13.8	7.8, 19.8	4.6	18.5	5.6	3.31	2.4, 4.6	12.9	7.7, 18.1	**<.001**	.14
San Jose, CA	0.9	–	–	–	–	–	–	0.6	–	–	–	–	–	–	**.02**	–
Seattle, WA	3.2	–	3.1	–	–	–	–	2.0	–	1.6	–	–	–	–	**.003**	–
Washington, DC	15.3	26.9	2.2	11.98	7.6, 18.9	24.6	21.8, 27.4	10.0	18.3	–	–	–	–	–	**<.001**	–

Notes: [a]Significant based on one-sided *z*-scores for decline in total mortality rate between time periods.
[b]Significant based on two-sided *z*-scores for change in relative percent difference between time periods.

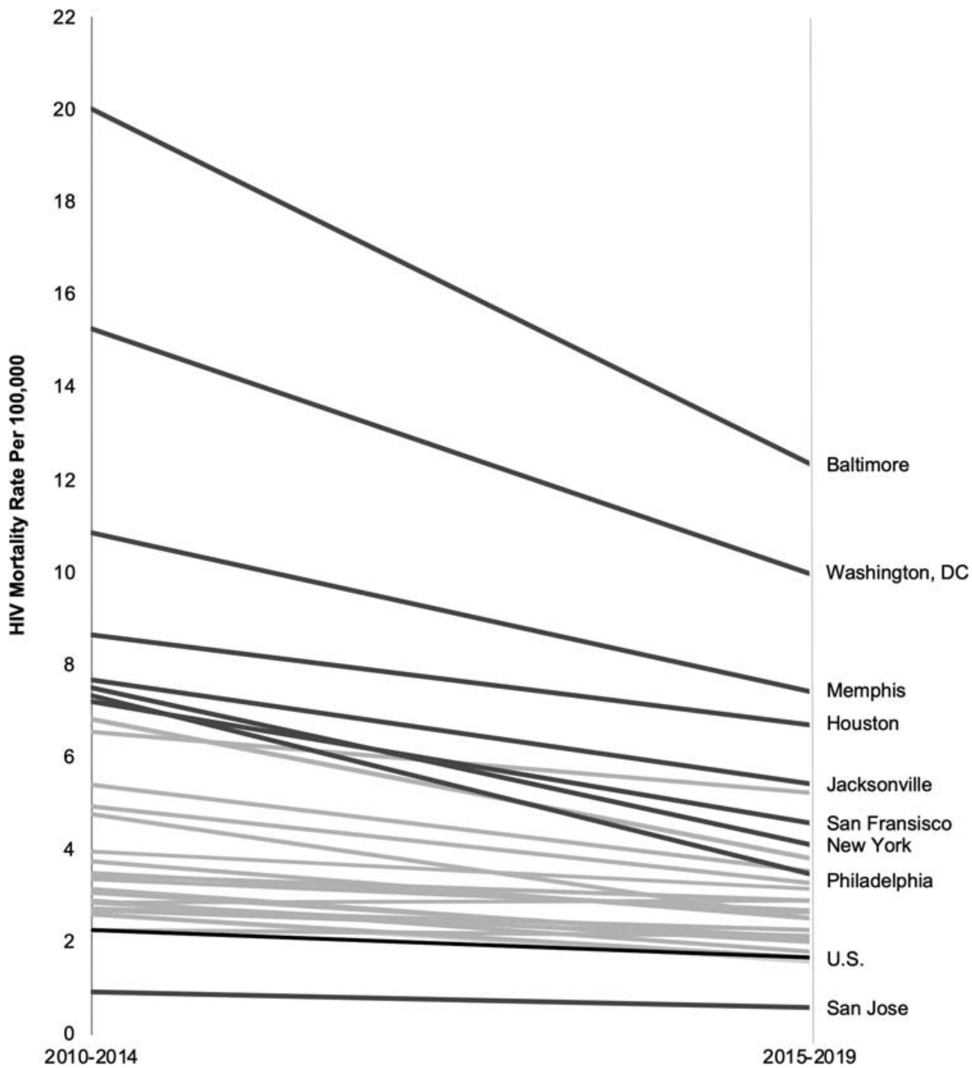

Figure 1. HIV mortality rates at two time points for selected cities and the U.S.
Note: Selected cities represent the eight highest rates at T1, as well as city with the lowest T1 rate (San Jose).

For example, Washington, DC declined from a rate of 15.3–10.0. When looking at relative percent change (not shown), the four cities with the greatest reductions (ranging from 44% to 53%) were Philadelphia, Nashville, New York, and Detroit. Only five cities (Portland, Denver, Louisville, El Paso, and Oklahoma City) did not see significant improvements over this period.

Inequities in HIV mortality

The national Black mortality rate was 10.6 in T1 and 7.3 in T2. At the city level, the Black HIV mortality rate decreased significantly from T1 to T2 in 17 of the 22 cities with a sufficient number of Black deaths. The highest Black mortality rate was in Baltimore at T1 (28.0) and San Francisco at T2 (18.5), while the lowest rate among cities with sufficient data was in Columbus at both time points (5.3 at T1, 3.0 at T2). The national White mortality rate was 1.0 in T1 and 0.8 in T2. At the city level, the White HIV mortality rate decreased significantly between T1 and T2 in 10 of the 24 cities with a sufficient number of White deaths. The city with the highest White mortality rate in T1 was San Francisco (9.8) and the lowest rate was Louisville (1.3). San Francisco continued to have the highest White mortality rate in T2 (5.6), while the city with the lowest White mortality rate in the most recent time period was Philadelphia (1.2).

The Black:White mortality rate ratios (RR) indicate that the Black HIV mortality rate in the U.S. was over ten times the White rate in T1 (RR = 10.7, 95%CI [10.4–10.9]) and over nine times the White rate in T2 (RR = 9.5, 95%CI[9.3–9.8]) (Table 1). At the city level, all cities with sufficient data to calculate race-specific rates had statistically significant Black:White rate ratios at both time points.

The magnitude of the racial disparity was generally larger at the national level compared to the city level (Table 1). More specifically, in T1, only 1 of the 24 cities with sufficient data (Washington, DC) had mortality RRs that were higher than the national RR. In T2, all cities with sufficient data had RRs lower than the national RR. The largest disparity between Black and White HIV mortality rates in T1 was found in Washington, DC (RR = 12.0, 95%CI[7.6–18.9]). The lowest RR in T1 was seen in Denver (RR = 2.3, 95%CI[1.4–3.9]). In T2, the largest disparity was seen in Jacksonville (RR = 8.0, 95%CI[5.8–11.1]) and the smallest was found in San Diego (RR = 2.1, 95%CI[1.3–3.4]).

The size of the racial disparities significantly decreased between T1 and T2 for the U.S. as a whole (z-score for relative percent difference = 6.51, $p < .001$). At the city level, the change in the relative percent difference between Black and White mortality rates was only statistically significant for Charlotte (z-score for relative percent difference = 2.19, $p = .029$).

Best and worst performing cities

Figure 2 provides an integrated comparison of mortality rates and racial equity in rates between cities at T2. We used the median mortality rate (3.2 deaths per 100,000) and median Black:White rate ratio (3.7) from the 19 cities with sufficient T2 data to separate the cities into quadrants. The best performing cities were those with both relatively low overall mortality and low inequity in mortality (as measured by the mortality rate ratio). This quadrant included the following seven cities: San Diego, Columbus, San Antonio, Nashville, Indianapolis, Phoenix, and Boston.

The worst performing cities were those with relatively high levels of overall mortality and high levels of inequity as measured by the Black:White mortality rate ratio (Figure 2). This quadrant included the following seven cities: Jacksonville, New York, Baltimore, Chicago, Houston Charlotte, and Philadelphia. The remaining cities performed well in terms of *either* mortality or equity. Some cities had overall high mortality rates but a low degree of inequity, such as Dallas. Others had low overall mortality but high inequity, such as Louisville.

Discussion

Our analyses showed huge variability in HIV mortality and inequities within the most populous cities in the U.S. The positive news is that the vast majority of big cities saw significant improvements in HIV mortality between the first and second half of the previous decade. However, some big cities do not fare as well as others, with the highest HIV mortality rate (Baltimore) being almost 20 times higher than the lowest city rate (San Jose). The second critical finding concerns racial inequities in HIV mortality. In all of the cities in this analysis, Black individuals were approximately two to eight times more likely to die from HIV compared to White individuals in the most recent time period. Importantly, only one city (Charlotte) was able to statistically significantly reduce the racial inequity over time.

Multiple cities (such as San Diego, Indianapolis, Columbus, and Phoenix) experienced low total HIV mortality as well as relatively low racial inequities in HIV mortality at T2. However, we also found cities with both high total HIV mortality *and* a large racial inequity, including Jacksonville, New York, and Baltimore. Other cities either performed better than average for overall HIV mortality *or* inequities within.

It is vital for each city to know which of these outcomes (i.e., mortality rates or equity in rates) needs the most attention because public health interventions aimed at improving overall health outcomes in a population differ from those needed to improve disparities in that outcome. For example, increasing the use of HAART can effectively lower viral load among individuals with HIV (thus, potentially reducing mortality); however, Black individuals are less likely to receive this type of treatment, potentially exacerbating racial inequities (Levine et al., 2007). Cities performing poorly in overall HIV mortality or equity (or both) can also look to cities that have lowered their mortality rates or achieved equity. Discussions with public health officials, health care providers, and HIV advocates in those model cities may reveal useful insight and guidance.

City health departments play a pivotal role in prevention of sexually transmitted infections such as HIV, especially those departments that are considered the safety-net systems of their jurisdiction (Cramer et al., 2014; Cuffe et al., 2017; Leichliter et al., 2016). City health departments are better able to tailor services to the needs of local populations at risk for HIV, compared to state health departments (Cuffe et al., 2017; Leichliter et al., 2016). Examples of this include efforts to improve HIV testing rates in Washington, DC, Houston, and the Bronx, and a targeted initiative to improve access to testing, diagnosis, and linkage to HIV care among transgender women of color that was implemented in nine U.S. cities, and CDC grants to the cities of San Francisco, Philadelphia, Baltimore, and Washington, DC to scale up HIV prevention services (Branson et al., 2018; Castel et al., 2012; Hallmark et al., 2014; Myers et al., 2012; Rebchook et al., 2017; Zigman, 2020).

Similar programs are needed to strategically target HIV mortality at the city level. An important first step

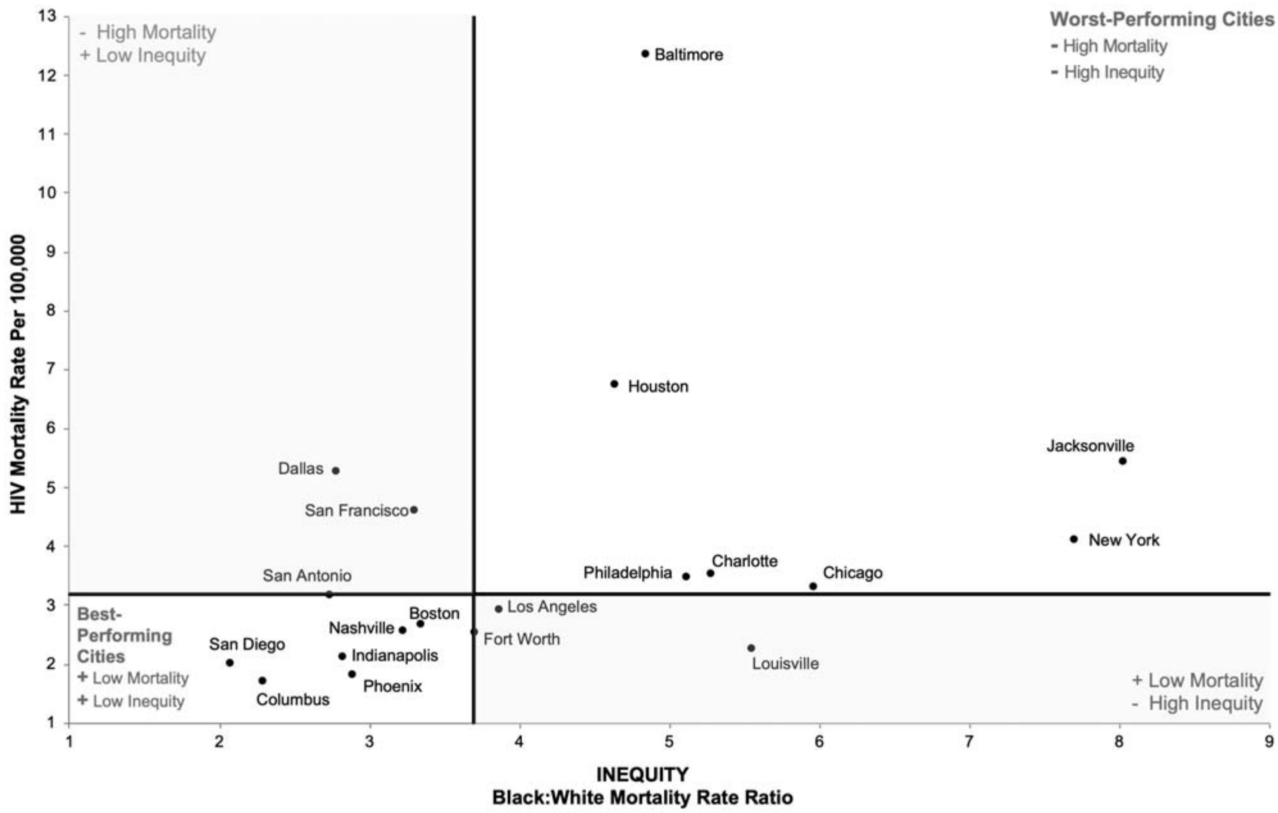

Figure 2. HIV mortality rates and racial inequity in rates (2015–2019).
* Note: Vertical and horizontal lines represent the median result across the 19 cities with sufficient data to calculate the Black:White rate ratio.

in this process is the implementation of routine screening in healthcare settings, particularly emergency departments (ED). For many underserved populations, an ED visit may provide the only opportunity to learn one's HIV status. This critical juncture then provides another important opportunity – provision of linkage to care services. Patient navigation has been shown to be an effective model for engaging and retaining in care persons living with HIV, ultimately leading to viral suppression, the key to long-term health among this population (Cunningham et al., 2018; Mizuno et al., 2018). The data provided in this paper can help to identify where these critical resources are needed. In addition, the city-level mortality disparities presented here help to fill the knowledge gap left by previous investigations of local inequities across the HIV prevention and care continuums (Kay et al., 2016; Parsons et al., 2017).

Strengths and limitations

To the best of our knowledge, no previous work has systematically investigated city-level HIV mortality rates and inequities at this scale. To begin, over one-quarter of all HIV-related deaths in the U.S. occurred within these big cities (in 2014–2019). Moreover, understanding HIV mortality inequities at the city level is important, as policies and interventions to address disparate outcomes require targeted interventions aligned with community needs (Panagiotoglou et al., 2018). Data from larger jurisdictions, such as counties or states, may overlook disparities only evident at a more local level, as shown by a recent study of county versus city health outcomes (Spoer et al., 2020). At the other extreme, data from census tracts or zip codes are not aligned with governance structures and are less likely to motivate action from stakeholder groups.

Despite these strengths, there are also several limitations that should be considered when interpreting the results of this study. To begin, the number of cities with enough HIV-related deaths to calculate city-level mortality rates (and race-specific rates) is limited. In addition, there is a potential under-ascertainment of HIV as an underlying cause of death. One study that used HIV surveillance data and death certificate data found that death certificate data missed 9% of probable HIV-related deaths (Trepka et al., 2016). Evidence as to whether or not under-ascertainment differs by race/ethnicity is mixed (Scheer et al., 2001; Trepka et al., 2016). Thus, it is possible that HIV mortality rates are generally higher than reported here, but it is unclear how under-ascertainment would impact our findings with regard to the assessment of racial inequities.

Another possible limitation of the study is that we have restricted our analyses to Black:White disparities. We selected this comparison because poorer health outcomes for Black populations remain a major challenge in this country and because the relatively smaller number of deaths in other racial/ethnic groups preclude a full analysis. However, we recognize that disparities likely exist among several other racial and ethnic groups for this outcome, such as the Latinx population (Harrison et al., 2010; McGinnis et al., 2003). Finally, HIV could potentially also increase the risk of death from other causes, such as other chronic conditions. We attempted to cast a broad net by including a wide range of ICD-10 codes related to HIV-associated diagnoses; however, it is possible not all deaths associated with HIV were coded as such.

Public health implications

Our analyses document huge variation in HIV mortality rates between the 30 largest cities in the U.S. and between Black and White populations in these cities. Importantly, we showed that while racial disparities existed across all cities and both time points, the degree of inequity differed substantially between cities. The city-specific data provided here can help motivate stakeholders, empower communities, and guide decisions related to funding, programs, and policies. Health advocates need this type of actionable data to achieve the national HIV priorities set forth by the *Healthy People* initiative, the National HIV/AIDS strategy, and *Ending the HIV Epidemic: A Plan for America* (HHS, 2015, 2019; HRSA, 2019). In countries like the U.S., HIV is a manageable chronic condition that should no longer be a substantial contributor to mortality. This has been largely realized within the White population and it is time to make this a reality for everyone living in the U.S.

Disclosure statement

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