



HIV MORTALITY DIFFERENCE BETWEEN BLACK AND WHITE WOMEN

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## HIV MORTALITY DIFFERENCE BETWEEN BLACK AND WHITE WOMEN

### Abstract

#### OBJECTIVE

In the United States, human immunodeficiency virus (HIV) continues to be among the top 10 leading causes of mortality for black women between the ages of 20 and 54<sup>1</sup>, but does not rank among the top 10 leading causes of death for white women amongst all age groups<sup>2</sup>. This study describes the HIV mortality difference between black and white women and formulate hypotheses that may reduce or eliminate disparities.

#### METHODS

Information was accessed through public data, the US Census, and the US Compressed Mortality File.

#### RESULTS

In these descriptive data from 1987 through 2015, including reliable HIV mortality rates of both black and white females aged 25 to 64, the HIV mortality difference in black women is 8.2 times greater than that of their white counterparts. The mortality rate of black: white females is 8.7, a number comparable to that of 1997(13.39) a year after the introduction of highly active antiretroviral therapy (HAART). Although the data indicates a decline in the age adjusted mortality rate in HIV among black females, the current rate for black females is at a greater level than that for white female at any point of the epidemic.

#### CONCLUSION

These descriptive data demonstrate a large HIV mortality difference between black and white women. The data also demonstrate a small number of communities with low HIV mortality differences among black/African American women. Their characteristics may provide clinical and public health insights to reduce these higher mortality differences in the black female population of the United States. Analytic epidemiologic studies are necessary to test these hypotheses.

#### Keywords

HIV; Health Disparity; Females; Positive Deviance

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## **HIV Mortality Difference between Black and White Women**

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### **ABSTRACT**

**OBJECTIVE:** In the United States, human immunodeficiency virus (HIV) continues to be among the top 10 leading causes of mortality for black women between the ages of 20 and 54 (Centers for Disease Control and Prevention [CDC], 2014), but does not rank among the top 10 leading causes of death for white women amongst all age groups (CDC, 2016). This study describes the HIV mortality difference between black and white women and formulate hypotheses that may reduce or eliminate disparities.

**METHODS:** Information was accessed through public data, the US Census, and the US Compressed Mortality File.

**RESULTS:** In these descriptive data from 1987 through 2015, including reliable HIV mortality rates of both black and white females aged 25 to 64, the HIV mortality difference in black women is 8.2 times greater than that of their white counterparts. The mortality rate of black: white females is 8.7, a number comparable to that of 1997(13.39) a year after the introduction of highly active antiretroviral therapy (HAART). Although the data indicates a decline in the age adjusted mortality rate in HIV among black females, the current rate for black females is at a greater level than that for white female at any point of the epidemic.

**CONCLUSION:** These descriptive data demonstrate a large HIV mortality difference between black and white women. The data also demonstrate a small number of communities with low HIV mortality differences among black/African American women. Their characteristics may provide clinical and public health insights to reduce these higher mortality differences in the black female population of the United States. Analytic epidemiologic studies are necessary to test these hypotheses.

**Keywords** HIV; Health Disparity; Females; Positive Deviance

### **INTRODUCTION**

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More than 1.2 million people in the US are living with human immunodeficiency virus (HIV). Of that number, more than 284,500(23%) are women (CDC, 2012). In the United States, persons living with HIV who are retained in care and have achieved viral suppression are 94.0% less likely to transmit HIV than HIV-infected undiagnosed persons (Cohen, Van Handel, Branson, et al, 2011). This led the United States Government in 2013 to launch the he HIV Care Continuum Initiative to improve the capacity of all states to systematically identify and re-engage people living with HIV in treatment. It is the belief that the transmission of new HIV infection is a product of risk behavior and the infected person's viral load. Interventions at every stage of the HIV Continuum of Care (diagnosis, retention in medical care, prescription of antiretroviral therapy [ART], and viral suppression) have the potential to decrease transmission (Bradford. 2007; CDC, 2016). The latest published data from 2013 indicated great promise in the struggle against the epidemic for the general population and for women. The HIV Care Continuum established an annual target of 73.9% for the number of people newly diagnosed with HIV that will be linked to HIV medical care and a target of 60% for the number of people newly diagnosed with HIV that are maintained in care (CDC, 2013). In 2013, women exceeded the annual target and did better than the general population for the number of people newly diagnosed with HIV that will be linked to HIV medical care, with 84% of women newly diagnosed with HIV linked to medical care in 1 month compared to 74.5% for the general population. Women fell short of the annual target and was comparable to the general population in 2013 for the number of women newly diagnosed with HIV that are maintained in care, with only 55% of women maintained in care and 56.5% of the general population newly diagnosed with HIV that were maintained in care (CDC, 2012). Nineteen percent of the new HIV infections in the United States in 2015 can be attributed to women (CDC, 2016; Chandra, Billiouz, Copen, Sionean, 2012). In 2015, women comprised one quarter of deaths among people with an HIV diagnosis (CDC, 2016). Black women bear a significant burden of the epidemic and represent the majority of women living with the disease and those newly infected (Chandra, Billiouz, Copen, Sionean, 2012). In 2015, black women accounted for nearly two thirds (61%) of all estimated new HIV infections among women, while only accounting for 13% of the female population; white women accounted for 18% of new infections (Chandra, Billiouz, Copen, Sionean, 2012). HIV is the 4<sup>th</sup> and 6<sup>th</sup> leading cause of mortality for black females aged 35 to 44 and 25 to 34, respectively (CDC, 2014). Recent data indicate that, as with women overall, new HIV infections among black women are also on the decline, decreasing by 24% between 2010 and 2014 (CDC, 2016; Chandra, Billiouz, Copen, Sionean, 2012). Risk behaviors and the likelihood of exposure to HIV are two major factors that contribute to HIV Incidence. Data from the National Survey of Family Growth showed a decrease in HIV-related risk behavior from 11% in 2002 to 8% in 2006 through 2010 (CDC, 2010). During this period of decrease in HIV-related risk behavior there has also been a decline in HIV incidence among women. These changes in risk behavior may have contributed to the decline in HIV incidence among women. In 2010 the annual rate of HIV transmission (per 100 persons living with HIV) decreased to 4.15 from 4.93 in 2007. This decrease in transmission rate, by reducing the likelihood of exposure may have also contributed to the declining HIV incidence among women. These data on changes in risk behavior and likelihood of exposure if sustained are very promising for the continued decrease in HIV incidence among women. Although new HIV infections among black women are on the decline, this population is still disproportionately affected by the epidemic. This brief report identifies and describes the HIV mortality difference between black and white females aged 25 to 64 between 1987 and 2015, and formulates hypotheses that may reduce or eliminate disparities.

## METHODS

We used the US Centers for Disease Control and Prevention's public Wide-ranging Online Data for Epidemiologic Research (WONDER) website (CDC, 2003; Office of Management and Budget [OBM] 2006). The data was examined to evaluate if there is a HIV age adjusted mortality difference between black and white females. We used category codes 042 to 044 of the International Classification of Diseases, Ninth Revision (ICD-9-CM)(CDC, 2016), for HIV diagnoses between 1979 to 1998 and category codes B20 to B24 of the International Classification of Diseases, Tenth Revision (ICD-10-CM) (OBM, 2006) for diagnoses from 1999 to 2015. We examined the data from 1979 to 1998 and 1999 to 2015 independently and identified the age-adjusted mortality rate from HIV for black and white women aged 25 to 64, classified as reliable by the National Center for Health Statistics (i.e., those with at least 20 deaths during the observation period) (CDC, 2003). Statistical comparisons between overall age-adjusted mortality from HIV among black and white females aged 25 to 64 were performed via failure to detect overlap in 95% confidence intervals for these rates as provided by the Centers for Disease Control Wonders (CDC, 2003). The results from both queries were merged, and reliable data from 1987 to 2015 were identified. Because 1979 represented the earliest available CDC WONDER data and 2015 represented the latest available data, we compared the HIV mortality rates of black and white females from those dates ((CDC, 2003; OBM, 2006). The rate ratio (mortality rate of blacks/ mortality rate of whites) and rate difference (mortality rate of blacks - mortality rate of whites) were then calculated. The epidemiological associations were reviewed, which led us to further examine the data to identify those counties in the United States that have reliable HIV mortality data. To identify these counties, the data was examined from 1999 to 2015 for ICD-10 Codes (B20.0- B20.9) for black and white women aged 25 to 64. From among all 3014 US counties we first identified 1235 counties with black or white female HIV age adjusted mortality rates classified as reliable by the National Center for Health Statistics (i.e., those with at least 20 deaths during the observation period) (CDC, 2003). The data for black and white females were merged for all the counties that both groups share in common. Fifty counties were identified. These fifty counties served as the source of the analysis. The rate ratio was then calculated and the counties were stratified from high to low incidence density. Reliable counties were identified from the selected counties. Reliability was based on counties whose rate ratio corresponded to the age-adjusted mortality rate, for example a county with a low rate ratio and low age-adjusted mortality rate was considered to be doing well (table 2).

## RESULTS

The data indicated that from 1987 through 2015, the age-adjusted mortality difference for black females were consistently higher than for white females. The data also indicated the lowest reported difference in HIV mortality among black and white females was 6.8 in 1987 and the highest was 38.5 in 1995. The mortality difference fluctuated from 1987 through 2006 but has decreased consistently from 2006 to 2015 (Table 1). Of the 3014 counties in the United States, 50 counties were identified as having reliable HIV mortality data (Table 2). The CDC indicated that county level data would be suppressed or not reliable if the number of persons living with diagnosed HIV infection is less than 5 at the county-level or the overall county population is less than 100 (CDC, 2003; OBM 2006). From these 50 counties it was identified that in 2015 the HIV death rate per 100,000 women, aged 25 to 64, was 8.7 for black women 17.4 times higher than the

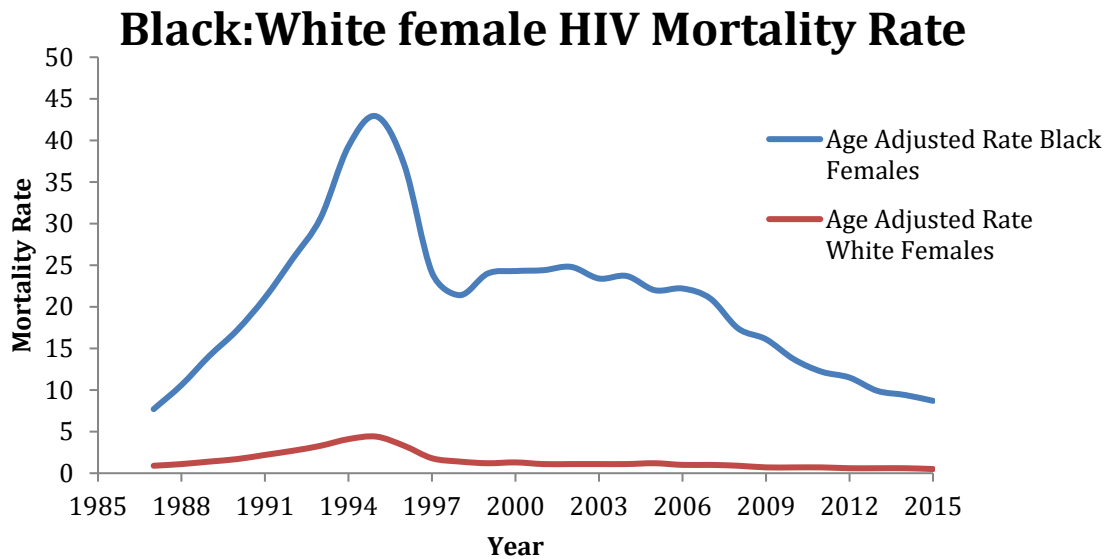
rate for white women (Table 1). Further examination of the data demonstrated a decrease in HIV age adjusted mortality rate for black females from 37.1 in 1996 to 8.7 in 2015, some 4.26 decreases. This decline coincides with the introduction of highly active antiretroviral therapy (HAART) in 1996. However, the black to white mortality rate difference has not seen the same improvement. Instead, the rate has fluctuated and stands today at a value that exceeds that of 1996 (Figure 1). In 1996, black women were dying from HIV at a rate of 11.2, and in 2015 the rate stood at 17.4, with the highest rate of 23.9 in 2009. The difference in mortality from HIV among black and white women in 2015 was 8.2. For every white female death from HIV, approximately eight black females succumbed to the disease. Further analyses of the data indicates that from amongst 50 counties in the United States that have reliable mortality rates for black and white females, 7 counties (Maricopa, AZ, Los Angeles, CA, San Bernardino, CA, San Diego, CA, Middlesex, MA, Wayne, MI, King, WA) have low mortality difference (less than 5) with both low age adjusted mortality rate for both Black and White women. These counties are prototypes of counties throughout the country that are succeeding in terms of the mortality difference between black and white women. All seven counties were within large central metropolitan areas. As defined by the US Office of Management and Budget, large central metropolitan areas are counties in a metropolitan statistical area of 1 million or more population that fulfill 1 of the 3 following criteria: that contain the entire population of the largest principal city of the metropolitan statistical area, whose entire population re- sides in the largest principal city of the metropolitan statistical area, or that contain at least 250,000 of the population of any principal city in the metropolitan statistical area(United States Department of Agriculture Economic Research Service [USDOA- ERS] 2016). These seven counties vary in regards to the percent of the population in 2015 living in poverty, unemployment rate in 2016, percent of individuals who have completed college as of 2016 (Bradford, 2007)(Table 3).

**TABLE 1:** Standardized mortality ratios and incident density (rate ratio and rate difference) for HIV-infected black and white women from 1987–2015 (standardized to CDC Compressed Mortality File for US female)

<b>Year</b>	<b>Age Rate Females</b>	<b>Adjusted Black Age Adjusted Rate White Females</b>	<b>Rate Ratio</b>	<b>Rate Difference</b>
1987	7.7	0.9	8.6	6.8
1988	10.6	1.1	9.6	9.5
1989	14.1	1.4	10.1	12.7
1990	17.2	1.7	10.1	15.5
1991	21.1	2.2	9.6	18.9
1992	25.8	2.7	9.6	23.1
1993	30.7	3.3	9.3	27.4
1994	39.3	4.1	9.6	35.2
1995	42.9	4.4	9.8	38.5
1996	37.1	3.3	11.2	33.8
1997	24.1	1.8	13.4	22.3
1998	21.4	1.4	15.3	20.0
1999	24	1.2	20.0	22.8
2000	24.3	1.3	18.7	23.0
2001	24.4	1.1	22.2	23.3
2002	24.8	1.1	22.5	23.7
2003	23.4	1.1	21.3	22.3
2004	23.7	1.1	21.5	22.6
2005	22.0	1.2	18.3	20.8
2006	22.2	1.0	22.2	21.2
2007	21.0	1.0	21.0	20.0
2008	17.4	0.9	19.3	16.5
2009	16.1	0.7	23.0	15.4
2010	13.7	0.7	19.6	13.0
2011	12.2	0.7	17.4	11.5
2012	11.5	0.6	19.2	10.9
2013	9.9	0.6	16.5	9.3
2014	9.4	0.6	15.7	8.8
2015	8.7	0.5	17.4	8.2

**FIGURE 1:** Mortality ratios for HIV-infected black and white women, 1987–2015





**TABLE 2:** County in the US with reliable mortality ratios and incident density (rate ratio and rate difference) for HIV-infected black and white women, 1987–2015

County	Age Adjusted Rate Black Women	Age Adjusted Rate White Women	Rate Ratio	Rate Difference
Maricopa County, AZ	2.6	0.2	13	2.4
Alameda County, CA	6.1	0.6	10.17	5.5
Los Angeles County, CA	4.5	0.6	7.5	3.9
Sacramento County, CA	5.3	0.8	6.63	4.5
San Bernardino County, CA	2.6	0.7	3.71	1.9
San Diego County, CA	3.7	0.5	7.4	3.2
San Francisco County, CA	25.2	2.4	10.5	22.8
Fairfield County, CT	6.3	0.6	10.5	5.7
Hartford County, CT	9.7	1	9.7	8.7
New Haven County, CT	13.5	0.9	15	12.6
Broward County, FL	15.8	1.3	12.15	14.5
Duval County, FL	13.4	1.4	9.57	12
Hillsborough County, FL	15.4	0.8	19.25	14.6
Miami-Dade County, FL	28.2	2.9	9.72	25.3
Orange County, FL	11.2	1.2	9.33	10
Palm Beach County, FL	21.5	1.1	19.55	20.4



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Pinellas County, FL	9	0.8	11.25	8.2
Polk County, FL	14.2	0.9	15.78	13.3
Volusia County, FL	7.6	0.9	8.44	6.7
Fulton County, GA	16.6	1.7	9.76	14.9
Cook County, IL	6.5	0.5	13	6
Baltimore County, MD	7.3	1.1	6.64	6.2
Baltimore city, MD	34.4	5.7	6.04	28.7
Hampden County, MA	8.1	1.1	7.36	7
Middlesex County, MA	4.7	0.6	7.83	4.1
Suffolk County, MA	7.4	1.9	3.89	5.5
Wayne County, MI	4	0.5	8	3.5
Clark County, NV	5.8	0.5	11.6	5.3
Atlantic County, NJ	11.6	1.7	6.82	9.9
Essex County, NJ	28.9	2.6	11.12	26.3
Hudson County, NJ	24.1	4.9	4.92	19.2
Middlesex County, NJ	8.8	1.1	8	7.7
Monmouth County, NJ	15.8	0.8	19.75	15
Bronx County, NY	23.6	17.7	1.33	5.9
Kings County, NY	14.4	2	7.2	12.4
Nassau County, NY	6.8	0.3	22.67	6.5
New York County, NY	33	2.5	13.2	30.5
Queens County, NY	8.4	1.9	4.42	6.5
Richmond County, NY	14.5	1.2	12.08	13.3
Suffolk County, NY	7.9	0.4	19.75	7.5
Westchester County, NY	9.8	0.7	14	9.1
Mecklenburg County, NC	9	0.6	15	8.4
Philadelphia County, PA	8.4	1.8	4.67	6.6
Providence County, RI	13.4	1	13.4	12.4
Davidson County, TN	6.2	2	3.1	4.2
Dallas County, TX	5.4	0.7	7.71	4.7
Harris County, TX	13.1	1.1	11.91	12
Tarrant County, TX	5.8	0.5	11.6	5.3
Travis County, TX	14.1	0.6	23.5	13.5
King County, WA	4.1	0.3	13.67	3.8

FIGURE 2: County in the US with lower mortality ratios and incident density for HIV-infected black women compared to white women, 1987–2015

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## Select Counties with low Black HIV Mortality Difference in Women

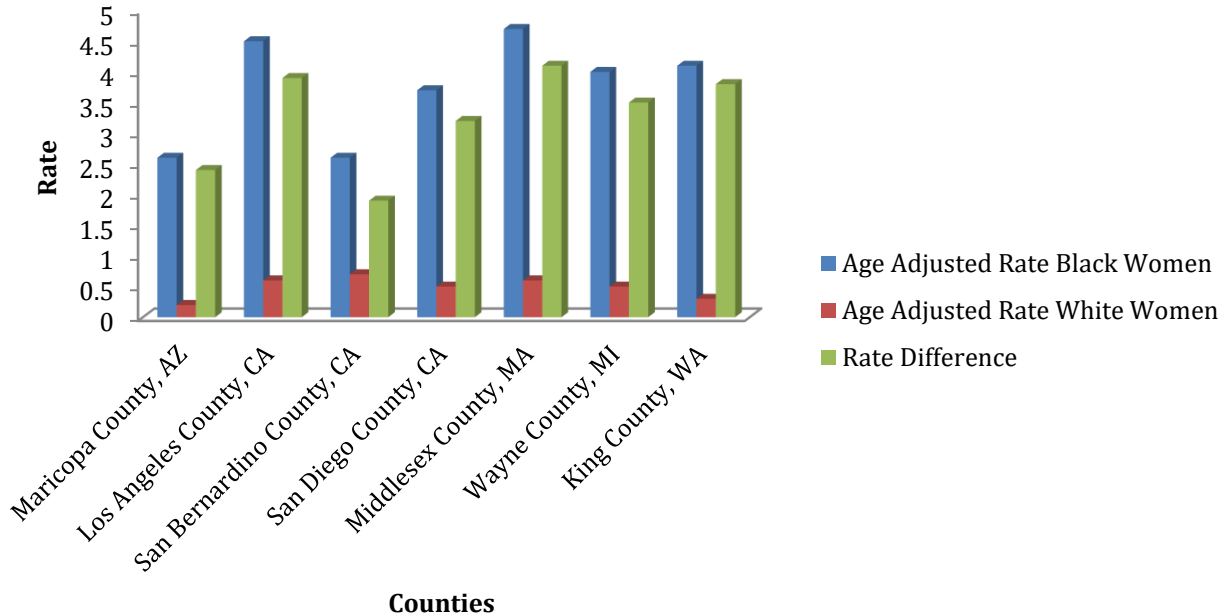


TABLE 3: Selected county level data for the 7 counties in the US with lower mortality ratios and incident density for HIV-infected black women compared to white women, 1987–2015

Counties	% Poverty (2015)	Unemployment (2016)	Rate	% Completing College (2016)
United States	13.5	4.4		29.8
Maricopa County, AZ	16.3	4.5		30.4
Los Angeles County, CA	16.7	5.2		30.3
San Bernardino County, CA	18.9	5.7		19.0
San Diego County, CA	13.9	4.7		35.7
Middlesex County, MA	7.6	3.0		52.0
Wayne County, MI	24.8	6.4		22.0
King County, WA	9.8	3.9		47.9

### DISCUSSION

In these descriptive data from 1987 through 2015 with reliable HIV mortality rates of black and white females aged 25 to 64, the most recently reported difference in HIV mortality among

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black and white females is 8.2: 1, and the mortality rate of black/white females is 17.4, a number higher than that found in 1997(13.4), a year after the introduction of highly active antiretroviral therapy (HAART). Although the data indicates a decline in the age adjusted mortality rate in HIV among black females, the current rate for black females is at a level that is greater than that for white female at any point of the epidemic. These data are startling and although the scientific community is well aware of the social and structural factors, stressors, everyday discrimination and other varied factors that are associated with these disparities; the challenge of closing the disparity gap still remains a reality. The CDC has summarized current knowledge by emphasizing that factors such as stigma, discrimination, income, education and geographic region and the social context in which risk-behavior takes place are social and structural factors that influence HIV transmission, the disease progression and subsequently help to explain why disparity exists between HIV/AIDS mortality<sup>4</sup>. Widespread implementation of evidence-based interventions that promote and improve linkage to and retention in care is needed to sustain and strengthen the current decline in the incidence of HIV among women (CDC, 2017). Many ecological factors may also be postulated to contribute to the higher level of mortality in black females as compared to their white counterparts. As with people with HIV overall, most women with HIV are not in regular care and only a quarter are virally suppressed (Positive Deviance Initiative, 2016). Women with HIV and of risk of contracting it face several challenges to getting the services and information they need, including socio-economic and structural barriers, such as poverty, cultural inequities, and sexual violence, and women may place the needs of their families above their own. All these factors cited above are more common barriers in the African American community and other minority communities, which place them at a disproportionate disadvantage as compared to their White counterparts.

Further analysis of the data revealed seven counties across the country with low mortality differences in HIV among black females as compared to their white counterparts, indicating that there are communities across the country in which black females are achieving better HIV mortality outcomes (Figure 2). cursory analyses of these seven counties did not yield any obvious similarities in terms of demographics and socioeconomic status. The factors that differentiate these seven counties are issues that need to be review in depth. However, they are beyond the scope of this brief paper. Further studies need to done on these issues. The authors are in the process of doing such an analyses. It may be beneficial to go into these communities with better outcomes and ascertain what factor or factors are driving the difference using the positive deviance theory. The positive deviance theory is an underused principle to improve outcome in healthcare. The positive deviance approach is a problem solving, asset- based approach rooted in the fact that communities have assets or resources they have not accessed or not utilizing appropriately (Hennekens, Buring, 1987). Positive deviance approach allows communities to harness or improve uncommon behaviors or strategies that are discovered or utilized by community members that are least likely to succeed (positive deviants), develop strategies or initiatives based on these findings and measured outcomes. In brief, the positive deviance approach is able to bring about sustainable behavioral and social change by identifying solutions that already exist in the system. This approach has been used worldwide to combat such intractable problems as childhood malnutrition, sex trafficking of girls, and poor infant health. This theory could be used to find possible solutions to the disproportionately high HIV mortality rate difference in black women. In depth analyses of the factors or initiatives that have proved successful in these seven identified counties that are very diverse from each other could be the framework for understanding and

creating behavioral and social change in the disparity of HIV mortality among black and white females. The use of the positive defiance approach could prove more beneficial than merely postulating what factors are important in reducing HIV mortality from HIV amongst black females, a better solution is to go to the communities with low mortality difference and ascertain what they have done to achieve success and examine those interventions for their possible applications in other communities or universally. The same is true for communities that do not have great outcomes with regard to HIV mortality. Factors that are driving the high mortality can be obtained and implementation of strategies from the other communities with better outcomes can be used to eradicate these disparities. Knowledge of what works and what do not work can be the best tool to implement change and obtain results.

These data have several potential limitations. First, the findings are subject to limitations of mortality data (HRSA, 2012), including the fact that exposure information is based on populations rather than individuals. Second, in these analyses we focus on communities with sufficient numbers of death from HIV to produce reliable rates. Therefore these results may not be reliable for smaller and rural communities. Third, the analyses utilized two different coding systems: the ICD-9-CM and ICD-10. There are nearly 19 times as many procedure codes in ICD-10 than ICD-9 and nearly 5 times as many diagnosis codes in ICD-10 than in ICD-9. ICD-10 also has alphanumeric categories instead of numeric ones.

## CONCLUSIONS

Despite these limitations, we believe the most plausible interpretation of these descriptive data to be that they demonstrate that black women are dying from HIV seventeen times more frequently than their white counterparts. The many hypothesis formulated from these descriptive data are needed to be tested by analytic epidemiologic studies with the potential and priority to do so. For example, using positive deviance approach, the seven counties that were identified from the data as having low mortality difference between black and white women can be selected as a point of study. Such study would include obtaining data from these counties on how they have and are addressing the HIV epidemic in women, especially black women. Obtaining data, such as details about the programs that these counties employ in getting black women tested, linked to and retained in care. Information may also be obtained on the economic status of these counties and of the demographics of the black women of the counties and what measured were employed to close to socio-economic gap and allow success. Further, the information from these counties may provide clinical and public health insights to reduce these higher HIV mortality rates among black women in the US population.

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