

# Disparities in Sexually Transmitted Disease Rates Across the “Eight Americas”

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**Background:** The purpose of this study was to examine rates of 3 bacterial sexually transmitted diseases (STDs; syphilis, gonorrhea, and chlamydia) in 8 subpopulations (known as the “eight Americas”) defined by race and a small number of county-level sociodemographic and geographical characteristics. The eight Americas are (1) Asians and Pacific Islanders in specific counties; (2) Northland low-income rural white; (3) Middle America; (4) Low-income whites in Appalachia and Mississippi Valley; (5) Western Native American; (6) Black middle America; (7) Southern low-income rural black; and (8) High-risk urban black.

**Methods:** A list of the counties comprising each of the eight Americas was obtained from the corresponding author of the original eight Americas project, which examined disparities in mortality rates across the eight Americas. Using county-level STD surveillance data, we calculated syphilis, gonorrhea, and chlamydia rates (new cases per 100,000) for each of the eight Americas.

**Results:** Reported STD rates varied substantially across the eight Americas. STD rates were generally lowest in Americas 1 and 2 and highest in Americas 6, 7, and 8.

**Conclusions:** Although disparities in STDs across the eight Americas are generally similar to the well-established disparities in STDs across race/ethnicity, the grouping of counties into the eight Americas does offer additional insight into disparities in STDs in the United States. The high STD rates we found for black Middle America are consistent with the assertion that sexual networks and social factors are important drivers of racial disparities in STDs.

Racial and ethnic disparities in sexually transmitted disease (STD) rates have been well-documented.<sup>1–22</sup> Reported rates of primary and secondary (P&S) syphilis, gonorrhea, and chlamydia in the United States are substantially higher among some minority racial or ethnic groups when compared with rates among whites.<sup>11</sup> Similarly, geographic disparities in STD rates have been well-established.<sup>5–13,17,19–21,23–38</sup> Across the nation, the burden of STDs is notably higher in some regions, states, and counties than in others.<sup>11</sup> These disparities can be explained (at least in part) by studies of sexual networks and the interdependence of health outcomes between persons of a given race/ethnicity group or geographical area.<sup>1–4,6,16,30,35,38–42</sup>

Although racial and geographic disparities in STDs are familiar in the existing literature, relatively few studies have focused on disparities across combinations of race and location. In this study, we examined syphilis, gonorrhea, and chlamydia rates across 8 groups of race-county combinations of the US population. These 8 groups of race-county combinations, developed by Murray et al, are referred to as the “eight Americas.”<sup>43,44</sup> These eight Americas were defined “based on race, location of the county of residence, population density, race-specific county-level per capita income, and cumulative homicide rate.”<sup>44</sup>

Murray et al (2006) found notable disparities in mortality rates and life expectancy across the eight Americas.<sup>44</sup> Although people living in the healthiest of the eight Americas had remarkably high life expectancies, people in the least healthy of the eight Americas had life expectancies on par with middle- and low-income developing countries.<sup>44</sup> These differences in life expectancies across the eight Americas were attributable primarily to markedly different rates of death because of chronic disease and injuries.<sup>44</sup>

The purpose of this study was to examine rates of 3 STDs (syphilis, gonorrhea, and chlamydia) in the eight Americas and to examine whether these STDs showed patterns of disparities similar to the disparities in mortality rates and life expectancy in the eight Americas reported by Murray et al (2006).<sup>44</sup>

## METHODS

The 8 race-county combinations (the eight Americas) we applied are listed in Table 1 and described in more detail later in the text.<sup>44</sup> The corresponding author of the 2006 study of life expectancy and mortality rates across the eight Americas provided for us a list of all of the counties included in each of the eight Americas.<sup>44</sup> We obtained 2008 county-level STD and population data by race from surveillance records maintained by the Centers for Disease Control and Prevention as described in annual STD surveillance reports.<sup>11</sup> In all analyses, we excluded cases where race/ethnicity was not specified. We focused on P&S syphilis, gonorrhea, and chlamydia because these STDs are the 3 most common, nationally reportable bacterial STDs. We did not include HIV owing to the lack of county-level data.

## Description of the Eight Americas

America 1 consists of Asians only (Table 1), though not all Asians live in America 1 (some live in America 3). Americas 2 and 4 consist of whites only, but not all whites live in America 2 or America 4 (some live in America 3). America 5 consists of Native Americans only, but not all Native Americans live in America 5 (some live in America 3). America 3 (Middle America) is the only America that includes more than

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**TABLE 1.** Definitions and Basic Sociodemographic Characteristics of the Eight Americas<sup>44</sup>

America	General Description	Population (Millions)	Average Income per Capita	Percentage Completing High School	Definition	Calculation of STD Rates*
1	Asian	10.4	\$21,566	80	Asians living in counties where Pacific Islanders make up less than 40% of total Asian population	STD cases reported as "Asians and Pacific Islanders" across counties in America 1
2	Northland low-income rural white	3.6	\$17,758	83	Whites in northern plains and Dakotas with 1990 county-level per capita income below \$11,775 and population density less than 100 persons/km <sup>2</sup>	STD cases reported as "Whites, non-Hispanic" and "Hispanics" across counties in America 2
3	Middle America	214.0	\$24,640	84	All other whites not included in Americas 2 and 4, Asians not in America 1, and Native Americans not in America 5	STD cases reported as "Asians and Pacific Islanders," "Whites, Non-Hispanic," "Hispanics," and "American Indians and Alaska Natives," excluding those in America 1, America 2, America 4, and America 5.
4	Low-income whites in Appalachia and the Mississippi Valley	16.6	\$16,390	72	Whites in Appalachia and the Mississippi Valley with 1990 county-level per capita income below \$11,775	STD cases reported as "Whites, non-Hispanic" and "Hispanics" across counties in America 4
5	Western Native American	1.0	\$10,029	69	Native American populations in the mountain and plains areas, predominantly on reservations	STD cases reported as "American Indians and Alaska Natives" across counties in America 5
6	Black Middle America	23.4	\$15,412	75	All other black populations living in counties not included in Americas 7 and 8	STD cases reported as "Blacks, Non-Hispanic" across counties in America 6
7	Southern low-income rural black	5.8	\$10,463	61	Blacks living in counties in the Mississippi Valley and the Deep South with population density below 100 persons/km <sup>2</sup> , 1990 county-level per capita income below \$7,500, and total population size above 1,000 persons (to avoid small numbers)	STD cases reported as "Blacks, Non-Hispanic" across counties in America 7
8	High-risk urban black	7.5	\$14,800	72	Urban populations of more than 150,000 blacks living in counties with cumulative probability of homicide death between 15 and 74 y >1.0%	STD cases reported as "Blacks, Non-Hispanic" across counties in America 8

Table 1 (except final column) was obtained directly from Murray et al. (2006).<sup>44</sup>

\*The final column "Calculation of STD rates" describes how the numerator of the STD rate (number of STD cases) was calculated. The denominator (number of people) was calculated using analogous population estimates.

1 racial category. Middle America includes all Asians not in America 1, all whites not in America 2 or America 4, and all Native Americans not in America 5. Middle America does not include blacks. Americas 6, 7, and 8 include blacks only, and all blacks are in America 6, 7, or 8. America 6 (black Middle America) consists of all blacks not in America 7 or America 8. Murray et al used the term "race-county" because the counties they used to define the eight Americas vary by race. For example, blacks in a given county could be in America 6, whereas Asians in that same county could be in America 1.

## STD Rates in the Eight Americas

For each America, STD rates were calculated per 100,000 population, based on the total number of reported cases of each of 3 STDs (P&S syphilis, gonorrhea, and chlamydia) and the total population. Because the racial and ethnic categories by which STD rates are reported do not precisely match the racial categories applied by Murray et al (2006) shown in Table 1,<sup>44</sup> we used comparable STD categories as described later in the text and in the final column of Table 1.

**TABLE 2.** STD Rates (Number of Reported Cases per 100,000 Population) in the Eight Americas, 2008

America	Primary and Secondary Syphilis			Gonorrhea			Chlamydia		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
1. Asian*	1.4	2.8	0.1	14.5	14.5	14.5	100.6	49.4	148.8
2. Northland low-income rural white	0.3	0.5	0.0	9.2	3.6	14.9	125.5	58.2	192.4
3. Middle America	2.7	4.8	0.5	30.0	24.9	35.0	172.4	83.9	259.1
4. Low-income whites in Appalachia and the Mississippi Valley	1.1	1.5	0.8	23.8	12.2	35.1	139.4	58.1	218.5
5. Western Native American	2.9	3.5	2.3	80.9	55.5	104.9	820.7	344.9	1274.2
6. Black Middle America	14.5	23.3	6.4	475.3	487.2	463.5	1063.6	692.5	1407.3
7. Southern low-income rural black	15.3	19.3	11.6	482.2	448.2	512.4	1109.4	565.3	1610.4
8. High-risk urban black	25.3	46.7	7.4	507.2	546.4	472.9	1155.9	762.3	1482.7

\*As noted in Table 1, our calculation of STD rates in America 1 (defined by Murray and colleagues as "Asian"<sup>44</sup>) includes STD cases reported as "Asians and Pacific Islanders." We excluded cases where race/ethnicity was not specified.

To calculate syphilis rates for America 1, we calculated the number of syphilis cases in America 1 and the number of people in America 1. The number of syphilis cases in America 1 was calculated by summing the number of syphilis cases among the STD category "Asians and Pacific Islanders" across all the counties designated by Murray et al as belonging to America 1. The number of people in America 1 was calculated as the number of Asians and Pacific Islanders living in the counties designated as belonging to America 1. Syphilis rates in America 1 were then calculated as the number of cases in America 1 per 100,000 people in America 1. Chlamydia and gonorrhea rates in America 1 were calculated in an analogous manner.

STD rates in the other 7 Americas were calculated in a manner analogous to that of America 1, using an STD category for race/ethnicity comparable with the race category used to define the eight Americas as described in Table 1. Specifically, to calculate STD rates for America 2 and America 4, we used reported STD cases and population estimates for the categories "whites, non-Hispanic" and "Hispanics." To calculate STD rates for America 5, we used reported STD cases and population estimates for the category "American Indians and Alaska Natives." To calculate STD rates for America 6, America 7, and America 8, we used reported STD cases and population estimates for the category "blacks, Non-Hispanic." For America 3, we used reported STD cases and population estimates for the applicable categories ("Asians and Pacific Islanders," "whites, Non-Hispanic," "Hispanics," and "American Indians and Alaska Natives"), excluding those who were included in America 1, America 2, America 4, and America 5.

### STD Rates Across Racial and Ethnic Groups Nationwide

To facilitate comparison of STD disparities across race counties with STD disparities across race/ethnicity without regard to county location or county-level demographics, we calculated national rates of P&S syphilis, gonorrhea, and chlamydia in 2008 for the following 5 categories of race/ethnicity: Asians and Pacific Islanders; whites, Non-Hispanic; Hispanics; American Indians and Alaska Natives; and blacks, Non-Hispanic.

## RESULTS

### STD Rates in the Eight Americas

Reported STD rates in the eight Americas are presented in Table 2. For all 3 STDs we examined, rates were higher in Americas 6 to 8 (blacks across three Americas) than in Americas 1 to 5 (everyone else). Overall syphilis, gonorrhea, and chlamydia rates were 5.5, 15.8, and 6.2 times higher, respectively, in America 6 (black Middle America) than in America 3 (Middle America). Overall syphilis, gonorrhea, and chlamydia rates were 5.7, 16.1, and 6.4 times higher, respectively, in America 7 (Southern low-income rural black) than in America 3 (Middle America). Overall syphilis, gonorrhea, and chlamydia rates were 9.5, 16.9, and 6.7 times higher, respectively, in America 8 (High-risk urban black) than in America 3 (Middle America).

America 5 (Western Native American) had higher overall STD rates than Americas 1 to 4, and America 3 (Middle America) had higher overall STD rates than Americas 1, 2, and 4. Within the three black Americas (Americas 6–8), overall STD rates were highest in America 8 (High-risk urban black); however, there were some differences between males and females. In males, all 3 STD rates were highest in America 8; conversely, in females, rates were highest in America 7 (Southern low-income rural black).

America 1 (Asian) had the lowest chlamydia rates (total, male, and female) and the lowest female gonorrhea rates. America 2 (Northland, rural low-income whites) had the lowest syphilis rates (total, male, and female) and the lowest total gonorrhea rates and male gonorrhea rates.

### STD Rates Across Racial and Ethnic Groups Nationwide

National STD rates for 5 categories of race/ethnicity (without regard to county of residence or any other characteristic) are presented in Table 3. When focusing on total (male and female) rates of each of the 3 STDs, the categories "Asians and Pacific Islanders" and "whites, Non-Hispanic" had the lowest and second-lowest rates, respectively. The category "blacks, Non-Hispanic" had the highest rates. Total (male and female) rates for the categories "Hispanics" and "American Indians and Alaska Natives" were higher than those for "whites, Non-Hispanic" and lower than those for "blacks, Non-Hispanic."

**TABLE 3.** National STD Rates (Number of Reported Cases per 100,000 Population) by Race/Ethnicity, 2008

Race/Ethnicity	Primary and Secondary Syphilis			Gonorrhea			Chlamydia		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Asians and Pacific Islanders	1.4	2.9	0.1	15.4	14.9	15.7	112.9	55.4	166.6
Whites, non-Hispanic	2.1	3.8	0.5	24.1	18.0	30.0	125.0	59.3	188.1
Hispanics	4.4	7.6	0.9	50.9	47.0	54.9	356.4	172.3	552.4
American Indians and Alaska Natives	2.2	3.0	1.4	83.9	58.1	108.8	563.4	239.4	875.8
Blacks, non-Hispanic	16.6	26.7	7.4	489.0	497.7	480.1	1100.6	693.7	1469.8

We excluded cases where race/ethnicity was not specified, thus the rates shown here are lower than reported in the 2008 STD surveillance report, in which cases with missing race/ethnicity information were prorated according to the distribution of cases for which this information was not missing.<sup>11</sup>

## DISCUSSION

The disparities in reported STD rates we observed across the eight Americas were akin to the disparities in mortality rates and life expectancy described by the authors of the original eight Americas study.<sup>44</sup> That is, STD rates were generally lower in Americas 1 to 4 than in Americas 5 to 8, just as life expectancy and mortality rates were more favorable in Americas 1 to 4 than in Americas 5 to 8. However, the disparity in STD rates between America 1 and America 8 is even more pronounced than the disparity in mortality. Whereas those in America 8 were about 4 to 5 times more likely to die before the age of 45 years than those in America 1,<sup>44</sup> STD rates in America 8 were 10 to 70 times higher than in America 1.

Disparities in reported STD rates across the eight Americas (Table 2) are generally similar to the disparities in reported STD rates across the 5 race/ethnicity groups (Table 3). For example, STD rates in America 1 (Asians in certain counties) are among the lowest of the eight Americas, just as STD rates are typically lower among Asians and Pacific Islanders than among other race/ethnicity groups. Similarly, STD rates in America 6 (black Middle America), America 7 (Southern low-income rural black), and America 8 (High-risk urban black) are notably higher than that of the other Americas, just as STD rates in the race/ethnic category "blacks, Non-Hispanic" are notably higher than that of any other race/ethnicity category.

The race-county groupings that we used (the eight Americas) were initially developed by Murray et al (2005, 2006) to examine disparities in life expectancy and mortality rates.<sup>43,44</sup> As the developers of the eight Americas concept noted, the county groupings they developed are not the only such grouping that would facilitate the examination of disparities in health across race and counties in the United States.<sup>44</sup> However, the eight Americas grouping does offer the ability to examine STD rates for eight distinct subgroups, identified by only race and a few county-level characteristics, such as location, per-capita income, population density, and homicide rates.<sup>44</sup> Because the eight Americas are defined by several characteristics, examining disparities in STD rates across the eight Americas offers a different perspective than analyses of disparities in STD rates across race/ethnicity or across geographic regions. Perhaps the most striking example is the high rate of STDs in black Middle America (America 6) compared with Americas 1 through 5. About two-thirds of blacks live in black Middle America, which consists of all blacks except those in America 7 (Southern low-income rural blacks) and America 8 (High-risk urban black, which includes blacks in 13 urban counties with high homicide mortality rates). So, even

when excluding about one-third of the black population in high-risk counties (America 7 and America 8), rates among the remaining blacks (those in America 6) are still markedly higher than in Americas 1 to 5.

Racial disparities in STD rates cannot be explained by differences in sexual behavior.<sup>1,2,4,12,16,18,22,45-48</sup> STD rates among blacks have been shown to be higher than among whites even after controlling for sexual behaviors, such as number of sex partners and condom usage.<sup>1,2,18,22,46,47</sup> Sexual networks and social determinants of health have been suggested as more important factors for risk of acquiring an STD than individual-level sexual behaviors.<sup>1-4,6,13,14,16,30,35,37-42,49-52</sup> Examples of social determinants of racial disparities in STDs include racial disparities in educational and economic opportunities, disparities in access to health care, residential segregation by race, and high incarceration rates among blacks.<sup>4,11,13,53,54</sup> As for examples of racial differences in sexual networks, evidence suggests that blacks are more likely to have partners of the same race than are other partners, and partners of "low-risk" blacks are much more likely to be "core group" members than are partners of "low-risk" whites, where "core group" was defined to include those with 4 or more sex partners in the past year.<sup>2</sup> These 2 differences in sexual network structure could be a main determinant of racial disparities in STD rates.<sup>2</sup> A higher prevalence of concurrent sex partnerships (often defined as partnerships that overlap in time) among blacks has also been suggested as a possible explanation for racial disparities in STD rates.<sup>55-59</sup>

Our approach allowed us to quantify STD rates across the eight Americas but did not allow us to examine potential reasons for these disparities. Our findings of disparities in STD rates across the eight Americas does not establish a causal link between any of the characteristics that define the eight Americas (income, homicide rates, race/ethnicity, etc.) and a higher risk for acquiring STDs, either at the county level or individual level. However, the high STD rates we found for black Middle America are at least consistent with the assertion that sexual networks and social determinants of health are important drivers of racial disparities in STDs. Our findings are also concordant with those of nationally representative surveys in which self-reported STD rates were generally higher among black respondents than white respondents, after controlling for factors such as socioeconomic status and differences in sexual behavior and health care access.<sup>18,60-62</sup> The relatively high STD rates we found for black Middle America are also consistent with the observations of Farley (2006), who pointed out that high rates of gonorrhea and syphilis at the state level were

common across the United States and were not confined to certain geographic regions (such as the South).<sup>12</sup>

To our knowledge, this is the first study to examine disparities in STD rates in “race-counties” across the nation. However, this is not the first study to examine racial disparities in STDs across geographic region. For example, previous studies have focused on racial disparities across states or regions in the United States,<sup>5,9,12,19</sup> across counties nationwide or within a given state or region,<sup>10,13,15,17,24,42</sup> and across census block groups or census tracts in a given city or state.<sup>23,29</sup> Several key conclusions emerged from these studies of the joint impact of race and location on STD rates. First, just as STD rates vary across geographic regions, the degree of racial disparity in STD rates varies across geographic regions as well. Second, for a given geographic unit (state, county, etc), the percentage of the population who are black is typically correlated with higher STD rates, although this correlation tends to diminish when controlling for other sociodemographic factors (such as income, income disparities, education, etc.).<sup>9,10,12,13,15,17,19,23,24,29,42,63</sup> These geographic-based studies offer findings consistent with individual-level studies, in which racial disparities in STD rates often diminish when controlling for other factors. For example, in a recent report examining the protective role of education against STD acquisition, educational status was correlated with STI prevalence among both black and white adolescent females, but the racial disparity in STIs remained even after controlling for educational status.<sup>53</sup> Third, although focusing prevention efforts on racial minorities may help to reduce racial disparities in STD rates, population-level approaches are needed to address the root causes of racial disparities in health outcomes.<sup>9,12,24,42,64</sup> Examples of population-level interventions that have been suggested to reduce racial disparities in health include public policies that encourage participation in society,<sup>54,65</sup> social programs to ensure that children and adolescents have a safe, favorable environment,<sup>54,65</sup> provision of high-quality educational opportunities to all,<sup>54</sup> economic policies to reduce income disparities and residential segregation by race,<sup>12,13</sup> policies that encourage long-term monogamous relationships,<sup>12,49</sup> and policies to reduce the disproportionate incarceration rates among blacks.<sup>12,14</sup>

We excluded STD cases where race/ethnicity was not specified. In 2008, values for race/ethnicity were unknown, missing, or invalid in 3.2% of reported P&S syphilis cases, 20.3% of reported gonorrhea cases, and 26.4% of reported chlamydia cases. As a result, the STD rates we report by race/ethnicity (Table 3) are lower than presented in the 2008 STD surveillance report in which cases with missing race/ethnicity information are prorated according to the distribution of cases for which this information was not missing.<sup>11</sup>

Our analysis is subject to limitations. First, and perhaps most important, are the usual limitations associated with surveillance data, such as incomplete reporting of cases.<sup>11</sup> Differences in the degree of underreporting across racial groups could bias our results. For example, the degree to which the STD burden in Americas 6 to 8 exceeds the STD burden in the other Americas would be overstated if STD cases among blacks are more likely to be reported than STD cases among other racial groups.<sup>8</sup> Because we excluded STD cases in which race/ethnicity information was not available, biases in comparing STD rates across counties can arise due to differences across counties in the percent of reported STD cases that have missing race/ethnicity information. Further, reported chlamydial infections might be more of a reflection of the amount of testing being done rather than the degree of prevalence or incidence of

new infection.<sup>11</sup> Second, as noted earlier, the race-county groupings we used are arbitrary and are not the only possible such groupings to use. Third, to use the same race-county groupings as in the original “eight Americas” studies, the groupings we used were those based on county characteristics (per-capita income, homicide rates, etc) as of 1990,<sup>43,44</sup> whereas the STD rates we examined were from 2008. Fourth, our approach allowed us to quantify STD rates across the eight Americas, but did not allow us to examine potential reasons for these disparities.

Despite these limitations, our analysis offers a new look at disparities in STD rates across the US by focusing on “race-counties.” Although we did not examine causes for racial disparities in STD rates, our findings are consistent with the idea that social factors and sexual network dynamics are important contributors to these disparities.<sup>1,2,4,12,16,18,22,45</sup> Given the important role of population-level factors as determinants of STD rates, structural interventions and population-level approaches may have more potential impact in reducing disparities in STDs (and reducing STD rates overall) than individual-level interventions.<sup>1,2,6,9,12,23,24,40,49</sup>

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