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# Using Reported Rates of Sexually Transmitted Diseases to Illustrate Potential Methodological Issues in the Measurement of Racial and Ethnic Disparities

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## Abstract

**Background:** Racial disparities in the burden of sexually transmitted diseases (STDs) have been documented and described for decades. Similarly, methodological issues and limitations in the use of disparity measures to quantify disparities in health have also been well documented. The purpose of this study was to use historic STD surveillance data to illustrate four of the most well-known methodological issues associated with the use of disparity measures.

**Methods:** We manually searched STD surveillance reports to find examples of racial/ethnic distributions of reported STDs that illustrate key methodological issues in the use of disparity measures. The disparity measures we calculated included the black-white rate ratio, the Index of Disparity (weighted and unweighted by subgroup population), and the Gini coefficient.

**Results:** The 4 examples we developed included illustrations of potential differences in relative and absolute disparity measures, potential differences in weighted and nonweighted disparity measures, the importance of the reference point when calculating disparities, and differences in disparity measures in the assessment of trends in disparities over time. For example, the gonorrhea rate increased for all minority groups (relative to whites) from 1992 to 1993, yet the Index of Disparity suggested that racial/ethnic disparities had decreased.

**Conclusions:** Although imperfect, disparity measures can be useful to quantify racial/ethnic disparities in STDs, to assess trends in these disparities, and to inform interventions to reduce these disparities. Our study uses reported STD rates to illustrate potential methodological issues with these disparity measures and highlights key considerations when selecting disparity measures for quantifying disparities in STDs.

Racial and ethnic disparities in the burden of sexually transmitted diseases (STDs) in the United States have been described and documented for decades.[1–7] For example, the annual STD surveillance report provides STD rate ratios by race/ethnicity, in which the rate of reported cases of a given STD (eg, gonorrhea or syphilis) for a given racial or ethnic minority population is divided by the rate of the given STD for whites.[7] Rate ratios by race/

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ethnicity are used specifically to compare STD rates between 2 racial/ethnic groups at a time. To quantify disparity across 3 or more racial/ethnic groups in a population, summary measures of disparity are used, such as the Index of Disparity and the Gini coefficient.[8–10] These disparity measures can be useful to summarize the burden of disparity at a point in time, to assess trends in disparity over time, and to inform the targeting of STD prevention interventions at particular groups to reduce these disparities.

Although measures of disparity are generally useful and informative, potential methodological issues in using these measures have been well documented.[9–14] The existing literature focuses almost entirely on health disparities in general, or on disparities in health outcomes other than STDs. To our knowledge, only 1 study has used multiple disparity measures to assess trends in racial/ethnic disparities in STDs over time.[15] This study reported that although measures of racial/ethnic disparities in STDs are often consistent with one another, these measures from 1 point in time to another can be increasing according to 1 measure and decreasing according to another.[15] The potential for inconsistencies between disparity measures in assessing changes in disparities over time is one of the well-known methodological issue associated with disparity measures.

Because disparity measures differ in their data requirements, how they are calculated, and other factors, the selection of which disparity measure(s) to use requires subjective judgments by the user. Harper and colleagues[11] note that one’s choice of which disparity measure to use depends on subjective value judgments about what is just, fair, and socially acceptable. Moreover, they assert that these value judgments are implicitly embedded in disparity measures.[11]

Numerous scenarios have been described to illustrate how the measurement of health disparities requires subjective value judgments in selecting the most appropriate disparity measure (s) to use.[9–11] Four such scenarios that have been frequently described in the literature are: (1) the difference in relative and absolute disparity measures, (2) the effect of weighting disparity measures according to the population size of the subgroups, (3) the importance of the reference point used to measure disparity, and (4) potential differences in disparity measures in assessing changes in the distribution of health outcomes across subgroups.[9–11]

The use of disparity measures in these 4 scenarios has been examined extensively in the broader health literature, not in the STD-specific literature. The purpose of this article is to provide illustrations of these four scenarios in the context of racial/ethnic disparities in STDs, thereby using a framework geared toward those in the field of STD prevention. By using historic STD surveillance data in these illustrations, we provide specific, real-world examples of key methodological issues in measuring racial/ethnic disparities in STDs. These examples highlight some of the key factors to consider when selecting which disparity measure(s) to use to assess disparities in STDs.

## METHODS

We manually searched STD surveillance reports to find examples of racial/ethnic distributions of reported STDs to illustrate the following 4 topics: (1) differences in relative and absolute measures of disparity, (2) differences in unweighted versus weighted measures of disparity (weighted by population size of the subgroups), (3) the importance of the reference point used to measure disparity, and (4) differences in disparity measures in assessing changes in disparities over time. We selected these 4 topics because they have been extensively documented and described in the health disparities literature.[9–11]

We used the following 5 race/ethnicity categories: non-Hispanic white, non-Hispanic black, Hispanic, Asian/Pacific Islander (A/PI), and American Indian/Alaska Native (AI/AN), consistent with historical STD surveillance reports.[16] Although we obtained STD rates from annual STD surveillance reports from a range of years to develop our illustrations, for clarity and ease of illustration, we used approximate 2014 population estimates for each race/ethnicity category (318 million people overall, with 200 million whites, 40 million blacks, 55 million Hispanics, 20 million A/PI, and 3 million AI/AN) in all calculations of the disparity measures. Because we did not use actual population estimates in the examples for any given year, the case numbers were adjusted manually to correspond to the reported rates for the given year, and therefore do not match the case numbers in the surveillance reports.

For comparing STD rates across 2 racial/ethnic groups, we used rate ratios (such as the black-white rate ratio) as a relative measure of disparity and the rate difference as an absolute measure of disparity. For assessing disparity across the 5 racial/ethnic groups simultaneously, we used 3 common summary measures of disparity: (1) the Gini coefficient, (2) the Index of Disparity, and (3) a weighted version of the Index of Disparity (weighted by population). In an analysis of trends in racial/ethnic disparities in STDs, the Gini coefficient was more highly correlated with the Weighted Index of Disparity than with the Index of Disparity, in part because the Gini coefficient and the Weighted Index of Disparity both account for the population size of the racial/ethnic groups, whereas the Index of Disparity does not.[15] The methods we used to calculate these measures are described briefly here, and discussed in more detail elsewhere.[9–15,17–21]

The black-white rate ratio for a given STD was calculated as the reported rate in non-Hispanic blacks divided by the reported rate in non-Hispanic whites, and the black-white rate difference was calculated as the reported rate in non-Hispanic blacks minus the reported rate in non-Hispanic whites. Rate ratios and rate differences for other racial/ethnic groups were calculated in an analogous manner.

The Gini coefficient ranges from 0 (no inequality) to 1 (maximum inequality).[12] The Index of Disparity can also be as low as 0 (no inequality) and increases as disparity increases, but has no established upper bound.[17] The Gini coefficient was calculated as:

$$\text{Gini} = 1 - \sum_{i=1}^{i=5} \left(Y_i + Y_{i-1}\right)\left(X_i - X_{i-1}\right),$$

where the racial/ethnic groups are ranked from 1 to 5 with 5 being the group with the highest STD rate, $Y_i$ and $X_i$ are the cumulative proportion of STD cases and the population, respectively, accounted for by group 1 through group i, and $X_0$ and $Y_0$ are both 0.[21] The Index of Disparity was calculated as:

$$\text{Index of Disparity } = \frac{100}{5R} \times \sum_{i=1}^{i=5} \left| r_i - R \right|,$$

where $r_i$ is the rate of the STD in racial/ethnic group i and R is the reference rate, which unless otherwise noted was the overall rate of the STD across all racial/ethnic groups.[17] The weighted version of the Index of Disparity was calculated as:

$$\text{Weighted Index of Disparity } = \frac{100}{R} \times \sum_{i=1}^{i=5} \left( \left| r_i - R \right| \right) p_i,$$

where R and $r_i$ are as defined above and $p_i$ is the percentage of the overall population accounted for by racial/ethnic group i.[9,17,22]

## RESULTS

The four examples we developed using historic surveillance data are presented in Tables 1–4.

### Example 1: Illustration of Differences in Relative Disparity Measures and Absolute Disparity Measures

The first example (Table 1) uses reported primary and secondary syphilis rates from 2000 and 2009 for 2 groups: non-Hispanic whites and non-Hispanic blacks.[23,24] In this example, 2 disparity measures are presented: the black-white rate ratio and the black-white rate difference. In this example, the black-white ratio (a relative measure) indicates a decrease in disparity from 2000 to 2009, whereas the black-white rate difference (an absolute measure) indicates an increase in disparity.

### Example 2: Illustration of Differences in Weighted and Nonweighted Disparity Measures

The second example (Table 2) uses reported gonorrhea rates from 2007 and 2010 for all 5 of the racial/ethnic groups we included in this study.[25] In this example, 3 disparity measures are presented: the Index of Disparity, the Weighted Index of Disparity, and the Gini coefficient. Gonorrhea rates declined from 2007 to 2010 for all racial/ethnic groups except AI/AN, the group with the smallest population. The unweighted measure (Index of Disparity), which does not directly account for the population size of the racial/ethnic groups, indicates an increase in disparity from 2007 to 2010. In contrast, the weighted version of the measure (Weighted Index of Disparity), which does account for the population size of the subgroups and thereby places less weight on the AI/AN group than on the other, more highly populated groups, indicates a decrease in disparity from 2007 to 2010. The Gini coefficient, which like the Weighted Index of Disparity accounts for population size of the racial/ethnic groups, also indicates a decrease in disparity from 2007 to 2010.

### Example 3: Illustration of the Importance of Reference Point for Calculation of Disparities

The third example (Table 3) uses reported gonorrhea rates from 2003 and 2006 for five racial/ethnic groups.[26] In this example, 5 disparity measures are presented: 2 versions of the Index of Disparity, 2 versions of the Weighted Index of Disparity, and the Gini coefficient. The 2 versions of the Index of Disparity were calculated by using 2 different reference points. One version was calculated as in Example 2 using the overall gonorrhea rate as the reference point, and one version was calculated using the lowest gonorrhea rate (the rate among A/PI) as the reference point.

This example shows how the Index of Disparity and the Weighted Index of Disparity both indicate a decrease in disparity from 2003 to 2006 when using the overall rate as the reference point, but indicate an increase in disparity when using the lowest subgroup rate (ie, the rate for A/PI) as the reference point. These differences arise in part because the overall gonorrhea rate increased from 2003 to 2006 (from 116.6 to 121.8), whereas the gonorrhea rate among the lowest subgroup (A/PI) decreased from 2003 to 2006 (from 22.1 to 21.1). The Gini coefficient, for which no reference point needs to be specified, is shown for comparison purposes.

### Example 4: Illustration of a Decrease in the Index of Disparity Over the Same Period in Which the Rate Ratio Increases for Each Minority Group (Relative to non-Hispanic Whites)

The fourth example (Table 4) uses reported gonorrhea rates from 1992 and 1993 for all 5 of the racial/ethnic groups.[27] In this example, 7 disparity measures are presented: 4 rate ratios (one for each of the four minority populations, relative to non-Hispanic whites), the Index of Disparity, the Weighted Index of Disparity, and the Gini coefficient. In this example, the rate ratio increases for each minority population (vs non-Hispanic whites) from 1992 to 1993, whereas the Index of Disparity and the Weighted Index of Disparity both indicate a decrease in disparity. The Gini coefficient indicates a slight increase in disparity.

## DISCUSSION

Methodological issues and limitations in the assessment of disparities in health have been well-documented in the literature. The purpose of this study was to use historic STD surveillance data to illustrate four of the most well known of these methodological issues, in the context of assessing racial/ethnic disparities in STDs. We developed 4 specific examples of scenarios in which disparity measures can yield conflicting assessments of the degree of racial/ethnic disparity in STD rates. All of the disparity measures we applied in these examples can be useful in quantifying racial/ethnic disparities in STDs. However, these disparity measures differ in how they are calculated, and the decision to use a given disparity measure over another requires consideration of these differences. Such consideration often requires subjective judgment about key issues.

Over time, disparity might be worsening in relative terms but improving in absolute terms, or vice versa (Table 1). One's choice of which of these measures to use will depend in part on subjective assessments as to whether it is better to reduce relative disparities or absolute disparities. Disparity measures can differ depending on whether or not the population size of the racial/ethnic groups is taken into account (Table 2). One's choice of whether or not to use population weights depends in part on subjective assessments as to whether each racial/ethnic group should be treated equally (regardless of population size), or whether the individuals that make up these groups should be treated equally. One's choice of which reference point to use can also influence how disparities are quantified (Table 3). The importance of the reference point is also illustrated in the fourth example (Table 4), in which the gonorrhea rate increases for all minority groups (relative to non-Hispanic whites) from 1 year to the next, yet the Index of Disparity and the Weighted Index of Disparity both suggest a decrease in disparity. This discrepancy in the assessments of the disparity measures arises because the Index of Disparity measures were calculated using the overall rate as the reference point, whereas the rate ratios were calculated using the non-Hispanic white rate as the reference point. If the Index of Disparity measures had instead used the rate in non-Hispanic whites as the reference point, these measures would have indicated an increase in disparity, consistent with the results of the rate ratios for each minority group.

A key theme across all 4 of our examples is that different disparity measures can provide divergent assessments of trends in disparities in STDs from one point in time to another, consistent with previous research. Chesson and colleagues[15] used 5 disparity measures to examine trends in racial/ethnic disparities in gonorrhea and syphilis. Although the 5 measures were generally consistent with one another, these measures sometimes provided different assessments of changes in disparities in STDs. For example, all 5 measures agreed on the direction of change in racial/ethnic disparity in gonorrhea from 1 year to the next about 60% of the time.[15]

Numerous other studies have examined trends in disparities in outcomes other than STDs. For example, Harper and colleagues[13] used 7 measures of disparity (4 relative, 3 absolute) to examine trends in socioeconomic and racial disparities in lung cancer. They found that one's assessment of the magnitude and direction of change in these disparities can depend on one's choice of summary measure, and thus suggested the use of a collection of measures rather than a single measure.[11–13] Similarly, Rossen and Schoendorf[14] found that the use of different disparity measures could lead to different conclusions about trends in racial/ethnic and socioeconomic disparities in obesity rates in the United States.

Our illustration of potential issues associated with measuring racial/ethnic disparities was limited to four examples and was therefore not exhaustive. Numerous other potential limitations of disparity measures have been described and documented in the literature. For example, Wagstaff and colleagues[12] note that a key limitation of using the Gini coefficient to assess health disparities across social classes is that this measure does not account for the impact of socioeconomic factors on inequalities in health. Similarly, the Gini coefficient and the Index of Disparity do not distinguish between a scenario in which all disease occurs among the richest 10% of the population and a scenario in which all disease occurs in the poorest 10% of the population. An analogous limitation applies to the use of these disparity measures to assess racial disparities in STD rates, as these measures do not account for the racial/ethnic disparities in factors that contribute to STD risk, such as residential segregation, poverty, and lack of access to health care.[28] For example, if all racial/ethnic groups were of the same population size, the Gini coefficient would be the same in the scenario in which all STDs occurred in the most "disadvantaged" racial/ethnic group as in the scenario in which all STDs occurred in the most "advantaged" racial/ethnic group, without regard to how one defines "disadvantaged" and "advantaged."

Our examination of summary measures of racial disparities in STDs is illustrative in nature and is subject to limitations. The 4 specific examples we presented were selected at our discretion; others might have chosen different scenarios to illustrate potential inconsistencies in disparity measures. Our examples used STD rates by race/ethnicity across all ages. Racial/ethnic disparities in STDs, particularly absolute disparities such as differences in rates, are typically more pronounced for age groups at high risk for STDs, such as ages 15 to 29 years. For ease of presentation, we focused on a limited number of disparity measures. Future analyses could examine a broader selection of such measures.

Finally, we note that our examples were selected to illustrate how disparity measures can differ in their assessment of whether disparity increases or decreases from one scenario to the next, without regard to issues related to the estimated magnitude or statistical significance of the change in disparity. In many of our examples, the absolute change in the disparity measure was limited, such as the change in the Gini coefficient from 0.619 to 0.608 in Table 2. Thus, we note that one should consider not only the direction of change in a disparity measure over time, but also the magnitude and meaningfulness of this change.

## CONCLUSIONS

Although imperfect, disparity measures can be useful to quantify racial/ethnic disparities in STDs, to assess trends in these disparities, and to inform interventions to reduce these disparities. However, methodological issues in the assessment of disparities have been extensively documented in the literature. The contribution of our study was to use STD surveillance data to illustrate some of these potential issues and to highlight key considerations when using disparity measures to quantify racial/ethnic disparities in STDs.

As far as offering guidance on which disparity measures are best suited for the field of STD prevention, we note that experts in the field of quantifying disparities have typically avoided the promotion of a single disparity measure as the "best" measure to use.[9–11] We agree with this approach, as well as with the following key guidelines that have emerged in the literature: (1) the use of multiple measures of disparity rather than relying on any single measure, (2) the consideration of absolute differences in disparity in addition to relative differences, (3) examining changes in incidence rates along with changes in summary disparity measures, and (4) understanding and describing the implications of choosing one disparity measure over another.[9–15]

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**Table 1.**

Example 1: Illustration of Differences in Relative Disparity Measures and Absolute Disparity Measures, Based on Reported Primary and Secondary Syphilis Rates in 2000 (Scenario A) and 2009 (Scenario B)

| | | Scenario A (2000) | | Scenario B (2009) | |
|---|---|---|---|---|---|
| **Racial/Ethnic Group** | **Population** | **No. Cases** | **Rate (per 100,000)** | **No. Cases** | **Rate (per 100,000)** |
| White, non-Hispanic | 200,000,000 | 1,200 | 0.6 | 4200 | 2.1 |
| Black, non-Hispanic | 40,000,000 | 5,100 | 12.8 | 7680 | 19.2 |
| Disparity measure | | | | | |
| Black-white rate ratio (relative measure) | | 21.3 | | 9.1 | |
| Black-white rate difference (absolute measure) | | 12.2 | | 17.1 | |

In this example, the black-white ratio (a relative measure) indicates a decrease in disparity from 2000 to 2009, whereas the black-white rate difference (an absolute measure) indicates an increase in disparity.

The rates in scenarios A and B correspond to reported syphilis rates in 2000 and 2009, respectively.[23,24] For ease of display and comparison, the populations used in all examples reflect rounded approximations of 2014 estimates. Because we did not use actual population estimates for any given year, the case numbers were adjusted manually to correspond to the reported rates for the given year, and therefore do not match the case numbers in the surveillance reports.

**Table 2.**

Example 2: Illustration of Differences in Weighted and Nonweighted Disparity Measures, Based on Reported Gonorrhea Rates From 2007 (Scenario C) and 2010 (Scenario D)

| | | Scenario C (2007) | | Scenario D (2010) | |
|---|---|---|---|---|---|
| **Racial/Ethnic Group** | **Population** | **No. Cases** | **Rate (per 100,000)** | **No. Cases** | **Rate (per 100,000)** |
| White, non-Hispanic | 200,000,000 | 54,000 | 27.0 | 46,800 | 23.4 |
| Black, non-Hispanic | 40,000,000 | 206,080 | 515.2 | 170,480 | 426.2 |
| Hispanic | 55,000,000 | 29,100 | 52.9 | 26,350 | 47.9 |
| A/PI | 20,000,000 | 2,900 | 14.5 | 2,880 | 14.4 |
| AI/AN | 3,000,000 | 2,485 | 82.8 | 3,222 | 107.4 |
| Overall | 318,000,000 | 294,565 | 92.6 | 249,732 | 78.5 |
| **Disparity Measure** | | | | | |
| Index of Disparity | | 133.0 | | 134.1 | |
| Weighted Index of Disparity | | 114.8 | | 112.1 | |
| Gini coefficient | | 0.619 | | 0.608 | |

In this example, the unweighted measure (Index of Disparity) indicates an increase in disparity from 2007 to 2010, whereas the weighted version of the measure (Weighted Index of Disparity) indicates a decrease in disparity. The Gini coefficient, which like the Weighted Index of Disparity accounts for population size of the racial/ethnic groups, also indicates a decrease in disparity from 2007 to 2010.

The rates in scenarios C and D correspond to reported gonorrhea rates in 2007 and 2010, respectively.[25] For ease of display and comparison, the populations used in all examples reflect rounded approximations of 2014 estimates. Because we did not use actual population estimates for any given year, the case numbers were adjusted manually to correspond to the reported rates for the given year, and therefore do not match the case numbers in the surveillance reports. Similarly, the overall rate was calculated from the adjusted number of cases for each subgroup and therefore does not match the overall rate in the surveillance reports.

## Table 3.

Example 3: Illustration of the Importance of Reference Point for Calculation of Disparities, Based on Reported Gonorrhea Rates From 2003 (Scenario E) and 2006 (Scenario F)

| | | Scenario E (2003) | | Scenario F (2006) | |
|---|---|---|---|---|---|
| **Racial/Ethnic Group** | **Population** | **No. Cases** | **Rate (per 100,000)** | **No. Cases** | **Rate (per 100,000)** |
| White, non-Hispanic | 200,000,000 | 65,200 | 32.6 | 73,000 | 36.5 |
| Black, non-Hispanic | 40,000,000 | 259,720 | 649.3 | 263,360 | 658.4 |
| Hispanic | 55,000,000 | 38,335 | 69.7 | 42,570 | 77.4 |
| A/PI | 20,000,000 | 4,420 | 22.1 | 4,220 | 21.1 |
| AI/AN | 3,000,000 | 3,075 | 102.5 | 4,150 | 138.3 |
| Overall | 318,000,000 | 370,750 | 116.6 | 387,300 | 121.8 |
| Disparity measure | | | | | |
| Index of Disparity (reference: overall rate) | | 132.5 | | 128.7 | |
| Index of Disparity (reference: lowest rate) | | 692.9 | | 783.2 | |
| Weighted Index of Disparity (reference: overall rate) | | 114.9 | | 111.1 | |
| Weighted Index of Disparity (reference: lowest rate) | | 427.5 | | 477.2 | |
| Gini coefficient | | 0.622 | | 0.607 | |

This example shows how the Index of Disparity and the Weighted Index of Disparity both indicate a decrease in disparity from 2003 to 2006 when using the overall rate as the reference point, but indicate an increase in disparity when using the lowest subgroup rate (ie, the rate for A/PIs) as the reference point. The Gini coefficient is shown for comparison purposes.

The rates in scenarios E and F correspond to reported gonorrhea rates in 2003 and 2006, respectively.[26] For ease of display and comparison, the populations used in all examples reflect rounded approximations of 2014 estimates. Because we did not use actual population estimates for any given year, the case numbers were adjusted manually to correspond to the reported rates for the given year, and therefore do not match the case numbers in the surveillance reports. Similarly, the overall rate was calculated from the adjusted number of cases for each subgroup, and therefore does not match the overall rate in the surveillance reports.

## Table 4.

Example 4: Illustration of a Decrease in the Index of Disparity Over the Same Period in which the Rate Ratio Increases for Each Minority Group (Relative to Whites), Based on Reported Gonorrhea Rates From 1992 (Scenario G) and 1993 (Scenario H)

| | | Scenario G (1992) | | Scenario H (1993) | |
|---|---|---|---|---|---|
| **Racial/Ethnic Group** | **Population** | **No. Cases** | **Rate (per 100,000)** | **No. Cases** | **Rate (per 100,000)** |
| White, non-Hispanic | 200,000,000 | 70,800 | 35.4 | 56,600 | 28.3 |
| Black, non-Hispanic | 40,000,000 | 563,240 | 1408.1 | 482,300 | 1205.8 |
| Hispanic | 55,000,000 | 52,360 | 95.2 | 49,200 | 89.5 |
| A/PI | 20,000,000 | 4,480 | 22.4 | 4,200 | 21.0 |
| AI/AN | 3,000,000 | 2,820 | 94.0 | 2,880 | 96.0 |
| Overall | 318,000,000 | 693,700 | 218.1 | 595,180 | 187.2 |
| Disparity measure | | | | | |
| Black-white rate ratio | | 39.8 | | 42.6 | |
| Hispanic-white rate ratio | | 2.7 | | 3.2 | |
| A/PI—white rate ratio | | 0.6 | | 0.7 | |
| AI/AN—white rate ratio | | 2.7 | | 3.4 | |
| Index of Disparity | | 166.5 | | 163.8 | |
| Weighted Index of Disparity | | 137.2 | | 136.9 | |
| Gini coefficient | | 0.724 | | 0.728 | |

In this example, the rate ratio increases for each minority population (when using the rate in whites as the comparator) from 1992 to 1993, whereas the Index of Disparity and the Weighted Index of Disparity both indicate a decrease in disparity.

The rates in scenarios G and H correspond to reported gonorrhea rates in 1992 and 1993, respectively[27] For ease of display and comparison, the populations used in all examples reflect rounded approximations of 2014 estimates. Because we did not use actual population estimates for any given year, the case numbers were adjusted manually to correspond to the reported rates for the given year, and therefore do not match the case numbers in the surveillance reports. Similarly, the overall rate was calculated from the adjusted number of cases for each subgroup, and therefore does not match the overall rate in the surveillance reports.