Annals of Internal Medicine | ORIGINAL RESEARCH

Primary and Secondary Syphilis Among Black and Hispanic Men Who Have Sex With Men: Case Report Data From 27 States

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Background: Until 2005, national-level data on the sex of sex partners that describe how primary and secondary syphilis affects men who have sex with men (MSM) of different races or ethnicities were not reported.

Objective: To present data from 27 states comparing trends in primary and secondary syphilis among MSM of different races or ethnicities.

Design: Review of case report data and regression analysis.

Setting: Federal database of case reports in the National Electronic Telecommunications System for Surveillance.

Participants: Men reported to be MSM.

Measurements: Cases of primary and secondary syphilis per 100 000 males of matching race or ethnicity ("rates"), determined by using population data from the National Center for Health Statistics as the denominator to compare age and racial and ethnic differences.

Results: For each year during 2005 to 2008, 27 states from all U.S. census regions reported data on the sex of sex partners for 70% or more of male cases of primary and secondary syphilis. Regression analysis revealed significantly different trends in rates of primary and secondary syphilis: Absolute increases in rates among black MSM and Hispanic MSM were, respectively, 8.0 times and 2.4 times the absolute increase in rate among white MSM. By region, rates among MSM increased 30% in the Midwest, 48% in the South, 73% in the Northeast, and 77% in the West. By age group, the largest absolute increase in rates occurred among MSM aged 20 to 29 years.

Limitation: Results from 27 states may not be generalizable to the United States as a whole.

Conclusion: Rates of primary and secondary syphilis disproportionately increased among black and Hispanic MSM (compared with white MSM) and among young MSM. Care providers should offer counseling about safer sexual practices and screening for syphilis and other sexually transmitted infections when caring for MSM.

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Syphilis is a sexually transmitted disease (STD) caused by the bacterium *Treponema pallidum*. If left untreated, syphilis progresses through distinct initial symptomatic stages (primary and secondary syphilis), an asymptomatic stage that can last for years (latent syphilis), and a late symptomatic stage (late syphilis) (1). Rates of primary and secondary syphilis reached historic lows in the United States in 2000 (2) but began increasing among males in 2001; this increase has continued through the date of this writing (2).

In particular, outbreaks of syphilis among men who have sex with men (MSM) of different races or ethnicities were reported by the early 2000s (3–5). These outbreaks represented a marked shift from the previous epidemiology of primary and secondary syphilis during the 1990s, when syphilis primarily occurred among heterosexual men and women of racial and ethnic minority groups (6, 7). Reports estimated that MSM comprised 62% of cases of primary and secondary syphilis in the United States as early as 2003 (2, 8). However, national-level data on the sex of sex partners were not available at that time. The extent of primary and secondary syphilis among MSM throughout the United States was thus inferred on the basis of diverging rates of primary and secondary syphilis among men and women (8).

Diseases of particular public health interest, including syphilis, are reported to local and state health departments, and case data are transmitted to the Centers for Disease Control and Prevention (9). These data inform efforts to understand the epidemiology of syphilis; this information is then used to refine clinical and programmatic efforts to address syphilis, such as clinical treatment guidelines (10). In part because of increasing cases of primary and secondary syphilis among MSM, the Centers for Disease Control and Prevention began collecting data on the sex of sex partners in 2005. This report describes trends in primary and secondary syphilis among MSM of different races or ethnicities on the basis of data on sex of sex partners from several U.S. states. Historically, nonwhite men have been disproportionately affected by STDs (2). Thus, we sought to determine whether primary and secondary syphilis disproportionately affected MSM of different ages and races or ethnicities; such information could inform efforts to address STDs, including HIV, among MSM of different ages and races or ethnicities (11–13).

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Context

Rates of primary and secondary syphilis in the United States have been steadily increasing since 2001.

Contribution

From 2005 to 2008 in all U.S. census regions, black and Hispanic men who have sex with men (MSM) had significantly greater absolute increases in the rate of primary and secondary syphilis compared with white MSM. The greatest absolute increase in rate by age was seen among MSM in their 20s.

Caution

Data were from 27 states, and it was assumed that the same proportion of men in each racial or ethnic group is MSM.

Implication

The recent epidemiology of syphilis in MSM exhibits disparities by race or ethnicity and age. Customized prevention efforts may be useful.

—The Editors

METHODS

Review of Case Report Data

We focused on reported cases of primary and secondary syphilis because they represent recently acquired infection and are therefore more valid indicators of incidence (14). Persons with primary and secondary syphilis (as opposed to latent syphilis) are more likely to be interviewed about risk behaviors. These interviews support public health efforts to find and treat sex partners and involve asking patients about the sex of their recent sex partners (during the past 12 months).

Across the United States, data from these interviews are reported to the Centers for Disease Control and Prevention via the National Electronic Telecommunications System for Surveillance. Some states report new data elements in the year in which they are introduced, whereas other states modify their reporting systems in subsequent years. Some states therefore have limited or no data for a given year, which complicates interpretation of trends.

To reduce the effect of such changes in reporting over time, we reviewed data from the National Electronic Telecommunications System for Surveillance for states in which the sex of sex partners was reported for 70% or more of male cases of primary and secondary syphilis each year during 2005 to 2008 among persons at least 15 years of age; this method represented the best balance between including male cases of primary and secondary syphilis and obtaining the most complete epidemiologic data for these cases. For states that met these criteria, we reviewed the following information for male cases of primary and secondary syphilis: age, race or ethnicity, reporting care setting (type of facility reporting the case), and stage of syphilis (primary or secondary). We described states by using the geographic regions defined by the U.S. Census (2).

Calculating Rates of Primary and Secondary Syphilis

The number of MSM in the United States is unknown (15, 16), making estimates of true rates difficult. However, calculating the true rates of primary and secondary syphilis among MSM was not our objective. To allow comparisons among MSM of different races or ethnicities, including differences among these MSM across regions, we calculated cases per 100 000 males (which we refer to in this report as "rates"). Male cases in a state were used as numerator data, and the male population of matching race or ethnicity was used as the denominator (available from the National Center for Health Statistics, Hyattsville, Maryland) (2). We defined "MSM" as men who reported having sex either with men only or both men and women in the past 12 months. Rates of primary and secondary syphilis among MSM were calculated by U.S. census region and by age group; for the latter calculations, male population data of matching age group and race or ethnicity were used as the denominator. For example, the rate of primary and secondary syphilis among black MSM 15 to 19 years of age was calculated as [(cases of primary and secondary syphilis among 15- to 19-year-old black MSM)/population of 15- to 19-year-old black males] $\times$ 100.

Statistical Analysis

We performed regression analysis by using region, race or ethnicity, age group, and year as independent factors and syphilis rates by each of these categories as the dependent variable. Because syphilis morbidity data were case counts, we assumed that the number of syphilis cases followed a Poisson distribution and that syphilis rates were a multiplicative function of the parameters included in the model. The logarithm of the rates was thus an additive function of these independent factors (17).

To model the data, all factors were categorical variables. We first fit a full saturated model with all independent factors and the interactions among them. Variables with significance levels greater than 0.05 were excluded. We then refitted the data to a reduced model (excluding nonsignificant variables). The maximum likelihood method of estimation was used to obtain asymptotically normally distributed estimates. To check the validity of assuming a Poisson distribution, we compared deviance (a measure of goodness of fit) divided by the degrees of freedom, which provides a measure of the dispersion in the data—a value close to 1.0 would validate the assumption. To check goodness of fit, we compared deviance with the asymptotic chi-square value and plotted residuals from the model against the fitted values to check for any systematic relationship between them. We chose the Akaike Information Criterion (AIC) to compare competing models. A model with the lowest AIC (and thus the fewest predicted errors) was preferred. We then estimated the effects of the age, race or ethnicity, region, and year and calculated their 95%

confidence limits. Estimated rates were adjusted on the basis of the distributions of race or ethnicity, region, and age groups in the underlying population.

Analysis was performed by using the GENMOD procedure in SAS software (SAS, Cary, North Carolina) (18).

Role of the Funding Source

The funding for and design of the study and analysis, interpretation, and presentation of the data were provided by the Centers for Disease Control and Prevention.

RESULTS

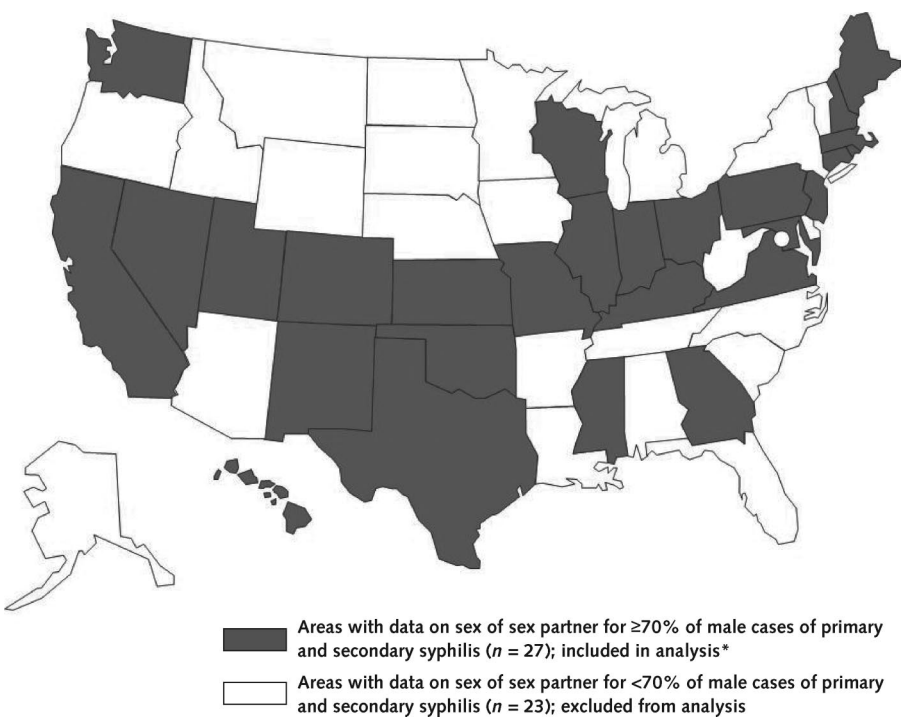
We identified 27 states with sex of sex partner data for 70% or more of male cases of primary or secondary syphilis for each year during 2005 to 2008 (**Figure 1**). During this period, reporting of data on the sex of sex partners in these states increased from an average of 88.9% of male cases to 91.1% of male cases (a 2.5% relative increase). These states accounted for 62% to 67% of cases of primary and secondary syphilis among males and 60% to 65% of all cases of primary and secondary syphilis in the United States during 2005 to 2008.

Table 1 shows characteristics of all patients reported to have primary or secondary syphilis during 2008 in the 27 included states. Most cases of primary and secondary syphilis (>80%) occurred among persons 15 to 44 years of age. Most patients (94%) were black, Hispanic, or white: data analysis thus focused on MSM of these 3 races or ethnicities. Compared with cases reported from the 23 excluded states in 2008, a greater proportion of cases from the 27 included states were in white persons and a greater proportion were reported from the Midwest (17% vs. 7%) and West (33% vs. 7%) (**Appendix Table 1**, available at www.annals.org).

By region, observed rates of primary and secondary syphilis increased among MSM of all races or ethnicities during 2005 to 2008 (relative increases of 33% to 110% among black MSM, 31% to 112% among Hispanic MSM, and 1% to 34% among white MSM, depending on region) (**Appendix Table 2**, available at www.annals.org). Depending on region, rates of primary and secondary syphilis among black MSM were 1.3 to 8.6 times the rate for white MSM, and rates among Hispanic MSM were 0.9 to 3.1 times the rate for white MSM. The highest rates in any region during 2005 to 2008 were observed among black MSM.

During 2005 to 2008, the greatest relative increase in observed rates occurred among MSM 15 to 19 years of age, whereas the greatest absolute increase in observed rates occurred among MSM 20 to 24 years of age and 25 to 29 years of age (**Appendix Table 3**, available at annals.org). The greatest absolute increase in rates among black MSM (29.0 cases per 100 000 black males) and Hispanic MSM

Figure 1. **States reporting sex of sex partner data for 70% or more of male cases of primary and secondary syphilis during 2005 to 2008.**



* These 27 states accounted for 62.4% to 66.5% of male cases of primary and secondary syphilis and 60% to 64.9% of all cases of primary and secondary syphilis in the United States during 2005 to 2008.

Table 1. **Characteristics of 8151 Patients With Primary and Secondary Syphilis in 27 States in 2008***

Characteristic	Patients, *n* (%)
Age	
15–19 y	512 (6.3)
20–24 y	1445 (17.7)
25–29 y	1382 (17.0)
30–34 y	1090 (13.4)
35–39 y	1086 (13.3)
40–44 y	1091 (13.4)
≥45 y	1545 (14.9)
Sex	
Male	7049 (86.5)
MSM	4740 (58.2)
Men having sex with women only	1436 (17.6)
Missing sex of sex partner data	873 (10.7)
Female	1100 (13.5)
Missing sex	2 (0.0)
Race or ethnicity	
American Indian/Alaskan Native	33 (0.4)
Asian/Pacific Islander	171 (2.1)
Black, non-Hispanic	3433 (42.1)
Hispanic	1420 (17.4)
White, non-Hispanic	2819 (34.6)
Other	70 (0.9)
Unknown or not specified	205 (2.5)
Reporting care setting	
HIV counseling and testing site	412 (5.1)
Other health department clinic	704 (8.6)
Private physician or HMO	2491 (30.6)
STD clinic	2359 (28.9)
Other care providers	2185 (26.8)
Stage of syphilis	
Primary	2237 (27.4)
Secondary	5914 (72.6)
U.S. region	
Midwest	1361 (16.7)
Northeast	794 (9.7)
South	3311 (40.6)
West	2685 (32.9)

MSM = men who have sex with men; STD = sexually transmitted disease.
* States with data on sex of sex partners for ≥70% of male cases of primary and secondary syphilis.

(5.8 cases per 100 000 Hispanic males) occurred among MSM 20 to 24 years of age, whereas the greatest absolute increases among white MSM (2.2 cases per 100 000 white males) occurred among MSM 25 to 29 years of age. The absolute increase in rates among black MSM 15 to 19 years of age (9.5 cases per 100 000 black males) exceeded the absolute increase in rates among Hispanic or white MSM of any age group. By 2008, observed rates of primary and secondary syphilis among black MSM and Hispanic MSM were 4.7 times and 1.8 times, respectively, the rate among white MSM (**Appendix Table 3**).

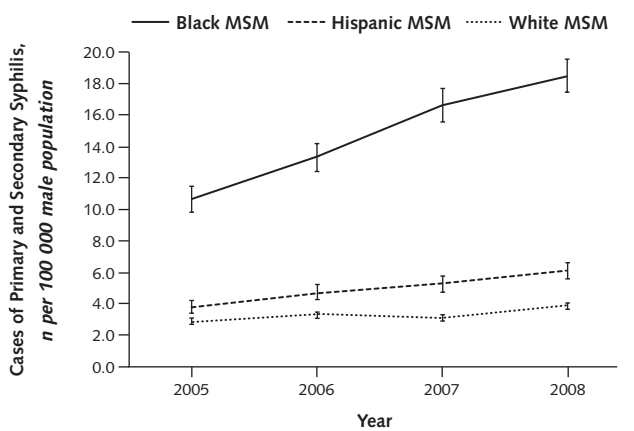
Many types of care settings reported cases of primary and secondary syphilis. In 2008, STD clinics reported more cases among black MSM than did other care settings: 48% of 1137 total cases compared with 34% among private care settings. Private care settings reported more cases among white MSM than other care settings: 49% of 1593 total cases, compared with 29% among STD clinics. Among Hispanic MSM, STD clinics and private care settings reported 37% and 36%, respectively, of 739 total cases.

The best regression analysis model included all main variables (age group, race or ethnicity, region, and year), all 2-way interactions among these variables, and one 3-way interaction (among age, race or ethnicity, and region). None of the 3-way interactions among age, race or ethnicity, and region with year was significant.

Regression analysis showed significant differences in trends over time for rates among black, Hispanic, and white MSM during 2005 to 2008 ($P < 0.001$ for interaction of year and race or ethnicity) (**Figure 2**). Rates of primary and secondary syphilis that were adjusted for region and age group increased 74% among black MSM, 61% among Hispanic MSM, and 34% among white MSM. The greatest absolute increase in rate occurred among black MSM (7.9 cases per 100 000 black males); this was 3.4 and 8.0 times, respectively, the absolute increase among Hispanic MSM and white MSM during this period. The greatest absolute increase in rate among Hispanic MSM (2.3 cases per 100 000 Hispanic males) was 2.4 times the absolute increase among white MSM.

Regression analysis also showed significant differences in trends over time in rates of primary and secondary syphilis among MSM across U.S. regions during 2005 to 2008, after adjustment for race or ethnicity and age group ($P = 0.009$ for interaction between year and region) (**Figure 3**). Rates of primary and secondary syphilis increased 30% in the Midwest, 48% in the South, 73% in the Northeast, and 77% in the West. Both the highest rate (11.4 cases per

Figure 2. **Rates of primary and secondary syphilis among MSM, by race or ethnicity, in 27 states in 2005 to 2008.***

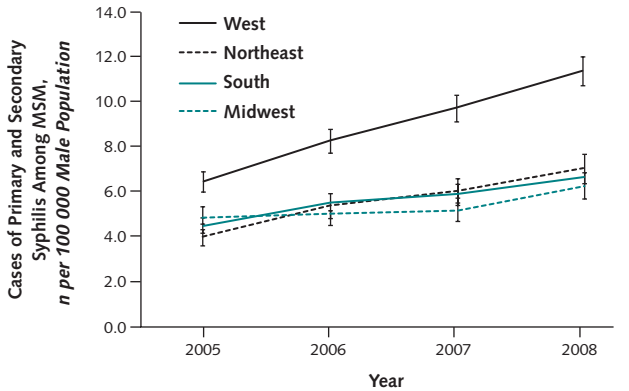


MSM = men who have sex with men.
* Adjusted estimates are from the final Poisson model based on the distributions of age group and region in the population.

100 000 persons in 2008) and greatest absolute increase in rate (5.0 cases per 100 000 males) occurred in the West.

After adjustment for race or ethnicity and region, trends for rates of primary and secondary syphilis differed significantly over time among age groups ($P < 0.001$ for interaction between year and age group) (**Table 2**). Relative increases in rates were highest among MSM 15 to 19 years of age (160%), MSM 20 to 24 years of age (117%), and MSM 25 to 29 years of age (69%). The greatest absolute increases in rates occurred among MSM 20 to 24 years of age and 25 to 29 years of age. Among black MSM, rates were highest among younger age groups (20 to 29 years), whereas among white MSM, rates were highest among older age groups (35 to 44 years). Rates among Hispanic MSM were lower in the youngest and oldest age groups but were otherwise similar across age groups.

Figure 3. **Rates of primary and secondary syphilis among MSM, by region, in 27 states in 2005 to 2008.***



MSM = men who have sex with men.
* Adjusted estimates are from the final Poisson model based on distributions of race or ethnicity and age group in the population.

DISCUSSION

We believe that our report is the first description of trends in incidence of primary and secondary syphilis among MSM across multiple states that are based on reported data on the sex of sex partners. Our observations suggest a marked shift in the epidemiology of primary and secondary syphilis in the United States in recent years, specifically with regard to MSM: In the early 2000s, reports described outbreaks of primary and secondary syphilis mostly among MSM in their 30s (4, 19). Our data suggest that primary and secondary syphilis is now increasingly affecting younger MSM (for example, those 15 to 29 years of age) as well as black and Hispanic MSM. These MSM might be increasingly at risk for other sexually transmitted infections, such as HIV (19, 20).

Particularly concerning is the great possibility of co-infection with both syphilis and HIV that young MSM, black MSM, and Hispanic MSM face. The observed increase in rates of primary and secondary syphilis among black MSM 15 to 29 years of age during 2005 to 2008 parallels a reported increase in diagnoses of HIV among black MSM 13 to 24 years of age during 2001 to 2006 (21). These observations might reflect previous reports that some young MSM are increasingly engaging in risk behaviors that transmit both diseases, including unprotected anal intercourse, sex with multiple partners, and using the Internet to recruit sex partners (4, 19, 22). Recent reports indicate that in the southern United States, increasing numbers of young black MSM are engaging in unprotected anal intercourse (23). The observation that ulcerative bacterial disease, especially syphilis, can facilitate both infection with and transmission of HIV increases these risks (20, 24–26). Young MSM, black MSM, and Hispanic MSM thus are at particular risk for primary and secondary syphilis and possibly HIV. However, many MSM (including young black and Hispanic MSM) might be reluctant to disclose having sex with men (12, 27). As with all male patients, care providers should assess STD-related risks among black and Hispanic males, including the sex of their sex partner, and provide counseling about safer sexual practices. For sexually active MSM, care providers should routinely ask about symptoms consistent with common STDs (for example, ulcers or lymphadenopathy) and perform at least annual serologic testing for syphilis and HIV (10).

The potential for co-infection with primary and secondary syphilis and HIV among MSM 15 to 19 years of

Table 2. **Rates of Primary and Secondary Syphilis Among Men Who Have Sex With Men in 27 States, 2005 to 2008***

Age Group	Reported Cases per 100 000 Males (95% CI)				Relative Change, %	Absolute Change
	2005	2006	2007	2008		
15–19 y	1.2 (0.9–1.5)	1.9 (1.6–2.3)	1.8 (1.5–2.2)	3.0 (2.6–3.6)	160.3	1.9
20–24 y	5.4 (4.8–6.0)	7.3 (6.6–8.0)	9.7 (8.8–10.6)	11.7 (10.7–12.7)	116.9	6.3
25–29 y	7.2 (6.5–8.0)	9.6 (8.7–10.5)	10.5 (9.6–11.4)	12.1 (11.2–13.1)	69.2	5.0
30–34 y	8.9 (8.1–9.8)	8.2 (7.4–9.1)	9.7 (8.8–10.6)	10.8 (9.9–11.8)	21.2	1.9
35–39 y	10.4 (9.5–11.4)	10.8 (9.9–11.8)	11.5 (10.6–12.5)	10.8 (9.9–11.8)	3.9	0.4
40–44 y	8.6 (7.8–9.4)	9.9 (9.0–10.8)	10.6 (9.7–11.6)	11.0 (10.1–12.0)	28.3	2.4
≥45 y	1.9 (1.7–2.1)	2.2 (2.0–2.4)	2.3 (2.1–2.5)	2.6 (2.4–2.9)	42.5	0.8

* Derived from regression analysis. Adjusted estimates are from the final Poisson model based on the distributions of race or ethnicity and region in the population.

age is rapidly growing. During 2004 to 2006, the greatest increases in AIDS diagnoses among males 10 to 24 years of age occurred among males aged 15 to 19 years (28); these increases coincide with the increases in primary and secondary syphilis among MSM 15 to 19 years of age that we report (**Table 2**). Of the males aged 15 to 19 years in whom HIV was diagnosed in 2006, 85% of black males, 81% of Hispanic males, and 90% of white males were MSM (28). Collectively, these data might reflect the tendency of adolescents in general (29) and adolescent MSM in particular (30) toward taking risks, the persistence of sexual risk behaviors among male high school students (31), and the unique stressors faced by school-aged MSM (32–37). Care providers and public health professionals should be sensitive to these issues (27, 36, 38). For example, care settings that emphasize confidentiality, are accessible by public transportation, and involve young adults in the function and delivery of care might be better received by adolescent MSM (36). Incorporating the Internet or text messaging into interventions might be promising (39–41). In addition, interventions successful for reducing HIV among young black and Hispanic MSM could be extended to address primary and secondary syphilis. Examples include interventions based on the Popular Opinion Leader model and strategies based on social networking (11, 42).

The disparity in rates of primary and secondary syphilis between black or Hispanic MSM and white MSM reported here have also been observed between heterosexual black or Hispanic men and white men (2). Multiple factors might contribute to these observed disparities, including access to health care and quality of care (13, 43, 44). How these factors might contribute to these disparities requires further investigation. Consensus exists that social determinants of health contribute to disparities in health outcomes, and successfully addressing these social determinants will require interventions at the community and societal levels (45, 46).

Our analysis has limitations. We excluded 23 states, so the findings reported here might not apply to all areas of the United States. The percentage of male cases in which the sex of the sex partner was reported increased slightly during 2005 to 2008 (2.5%), but this increase cannot explain the much larger increases in the rates of primary and secondary syphilis among MSM of different races or ethnicities. In addition, the disparity in rates between black and Hispanic MSM and white MSM reported here might be overestimates: Providers in private care settings see more white MSM but might be less likely than providers in public clinics to report cases of syphilis (47). However, given the magnitude of disparity in rates between black and Hispanic MSM compared with white MSM, this potential overestimation seems unlikely to account for these disparities.

We assumed that the same proportion of black, Hispanic, and white men were MSM. If this assumption is false, the magnitude of disparity in rates of primary and secondary syphilis among these MSM will probably vary from the results presented here. Recent reports suggest that MSM comprise less of the black male population than the white male population (16, 48): thus, the disparity in rates between black and white MSM might be larger than we report. As stated, our primary goal was to examine differences in rates by region and race or ethnicity and over time, not to estimate true rates. Because we used an overly inclusive denominator (all males, regardless of sex behavior), the rates reported here are substantial underestimates of the true rate of primary and secondary syphilis among MSM—a sobering consideration, especially regarding black MSM aged 15 to 29 years.

In summary, rates of primary and secondary syphilis increased each year during 2005 to 2008 among MSM of all races and ethnicities; rates among black MSM and Hispanic MSM were 8.0 times and 2.4 times, respectively, those of white MSM. Young MSM, who are also at risk for HIV, acquired primary and secondary syphilis at rates that sharply increased each year during 2005 to 2008. Interventions targeted at young MSM of all races and ethnicities are increasingly needed.

From the Centers for Disease Control and Prevention, Atlanta, Georgia.

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References

1. **Holmes KK.** Sexually Transmitted Diseases. 4th ed. New York: McGraw-Hill Medical; 2008.

2. **Centers for Disease Control and Prevention (CDC).** Sexually Transmitted Disease Surveillance, 2009. Atlanta: Department of Health and Human Services; 2010.

3. **Centers for Disease Control and Prevention (CDC).** Resurgent bacterial sexually transmitted disease among men who have sex with men—King County, Washington, 1997-1999. MMWR Morb Mortal Wkly Rep. 1999;48:773-7. [PMID: 11263546]

4. **Centers for Disease Control and Prevention (CDC).** Outbreak of syphilis among men who have sex with men—Southern California, 2000. MMWR Morb Mortal Wkly Rep. 2001;50:117-20. [PMID: 11393490]

5. **D'Souza G, Lee JH, Paffel JM.** Outbreak of syphilis among men who have sex with men in Houston, Texas. Sex Transm Dis. 2003;30:872-3. [PMID:

14646631]
6. **Nakashima AK, Rolfs RT, Flock ML, Kilmarx P, Greenspan JR.** Epidemiology of syphilis in the United States, 1941—1993. Sex Transm Dis. 1996;23:16-23. [PMID: 8801638]
7. **Peterman TA, Heffelfinger JD, Swint EB, Groseclose SL.** The changing epidemiology of syphilis. Sex Transm Dis. 2005;32:S4-10. [PMID: 16205291]
8. **Heffelfinger JD, Swint EB, Berman SM, Weinstock HS.** Trends in primary and secondary syphilis among men who have sex with men in the United States. Am J Public Health. 2007;97:1076-83. [PMID: 17463387]
9. Summary of notifiable diseases—United States, 2009. MMWR Morb Mortal Wkly Rep. 2011;58:1-100. [PMID: 21566560]
10. **Workowski KA, Berman S; Centers for Disease Control and Prevention (CDC).** Sexually transmitted diseases treatment guidelines, 2010. MMWR Recomm Rep. 2010;59(RR-12):1-110. [PMID: 21160459]
11. **Jones KT, Gray P, Whiteside YO, Wang T, Bost D, Dunbar E, et al.** Evaluation of an HIV prevention intervention adapted for black men who have sex with men. Am J Public Health. 2008;98:1043-50. [PMID: 18445795]
12. **O'Leary A, Fisher HH, Purcell DW, Spikes PS, Gomez CA.** Correlates of risk patterns and race/ethnicity among HIV-positive men who have sex with men. AIDS Behav. 2007;11:706-15. [PMID: 17295071]
13. **Valentine JA.** Impact of attitudes and beliefs regarding African American sexual behavior on STD prevention and control in African American communities: unintended consequences. Sex Transm Dis. 2008;35:S23-9. [PMID: 18923333]
14. **Peterman TA, Kahn RH, Ciesielski CA, Ortiz-Rios E, Furness BW, Blank S, et al.** Misclassification of the stages of syphilis: implications for surveillance. Sex Transm Dis. 2005;32:144-9. [PMID: 15729150]
15. **Anderson JE, Mosher WD, Chandra A.** Measuring HIV risk in the U.S. population aged 15-44: results from cycle 6 of the National Survey of Family Growth. Adv Data. 2006:1-27. [PMID: 17094643]
16. **Lieb S, Thompson DR, Misra S, Gates GJ, Duffus WA, Fallon SJ, et al; Southern AIDS Coalition MSM Project Team.** Estimating populations of men who have sex with men in the southern United States. J Urban Health. 2009;86:887-901. [PMID: 19911282]
17. **McCullagh P, Nedler JA.** Generalized Linear Models. New York: Chapman & Hall; 1989.
18. **SAS Institute.** SAS OnlineDoc 9.2. Cary, NC: SAS Institute; 2009.
19. **Centers for Disease Control and Prevention (CDC).** Primary and secondary syphilis among men who have sex with men—New York City, 2001. MMWR Morb Mortal Wkly Rep. 2002;51:853-6. [PMID: 12363336]
20. **Centers for Disease Control and Prevention (CDC).** Primary and secondary syphilis—United States, 2003-2004. MMWR Morb Mortal Wkly Rep. 2006;55:269-73. [PMID: 16543880]
21. **Centers for Disease Control and Prevention (CDC).** Trends in HIV/AIDS diagnoses among men who have sex with men—33 states, 2001-2006. MMWR Morb Mortal Wkly Rep. 2008;57:681-6. [PMID: 18583954]
22. **Sifakis F, Hylton JB, Flynn C, Solomon L, MacKellar DA, Valleroy LA, et al.** Prevalence of HIV infection and prior HIV testing among young men who have sex with men. The Baltimore Young Men's Survey. AIDS Behav. 2010;14:904-12. [PMID: 17968648]
23. **Centers for Disease Control and Prevention (CDC).** HIV infection among young black men who have sex with men—Jackson, Mississippi, 2006-2008. MMWR Morb Mortal Wkly Rep. 2009;58:77-81. [PMID: 19194368]
24. **Fleming DT, Wasserheit JN.** From epidemiological synergy to public health policy and practice: the contribution of other sexually transmitted diseases to sexual transmission of HIV infection. Sex Transm Infect. 1999;75:3-17. [PMID: 10448335]
25. **Galvin SR, Cohen MS.** The role of sexually transmitted diseases in HIV transmission. Nat Rev Microbiol. 2004;2:33-42. [PMID: 15035007]
26. **Warner L, Klausner JD, Rietmeijer CA, Malotte CK, O'Donnell L, Margolis AD, et al; Safe in the City Study Group.** Effect of a brief video intervention on incident infection among patients attending sexually transmitted disease clinics. PLoS Med. 2008;5:e135. [PMID: 18578564]
27. **Brooks RA, Etzel MA, Hinojos E, Henry CL, Perez M.** Preventing HIV among Latino and African American gay and bisexual men in a context of HIV-related stigma, discrimination, and homophobia: perspectives of providers. AIDS Patient Care STDS. 2005;19:737-44. [PMID: 16283834]
28. **Gavin L, MacKay AP, Brown K, Harrier S, Ventura SJ, Kann L, et al; Centers for Disease Control and Prevention (CDC).** Sexual and reproductive health of persons aged 10-24 years—United States, 2002-2007. MMWR Surveill Summ. 2009;58:1-58. [PMID: 19609250]
29. **Brookmeyer KA, Henrich CC.** Disentangling adolescent pathways of sexual risk taking. J Prim Prev. 2009;30:677-96. [PMID: 19949869]
30. **Garofalo R, Wolf RC, Kessel S, Palfrey SJ, DuRant RH.** The association between health risk behaviors and sexual orientation among a school-based sample of adolescents. Pediatrics. 1998;101:895-902. [PMID: 9565422]
31. **Centers for Disease Control and Prevention (CDC).** Trends in HIV- and STD-related risk behaviors among high school students—United States, 1991-2007. MMWR Morb Mortal Wkly Rep. 2008;57:817-22. [PMID: 18668019]
32. **Silenzio VM, Pena JB, Duberstein PR, Cerel J, Knox KL.** Sexual orientation and risk factors for suicidal ideation and suicide attempts among adolescents and young adults. Am J Public Health. 2007;97:2017-9. [PMID: 17901445]
33. **Grossman AH, Kerner MS.** Self-esteem and supportiveness as predictors of emotional distress in gay male and lesbian youth. J Homosex. 1998;35:25-39. [PMID: 9524920]
34. **Kosciw JG, Greytak EA, Diaz EM, Bartkiewicz MJ.** The 2009 National School Climate Survey. New York: Gay, Lesbian, and Straight Education Network; 2010.
35. **Diaz E, Kosciw JG.** Shared Differences: The Experiences of Lesbian, Gay, Bisexual, and Transgender Students of Color in Our Nation's Schools. New York: Gay, Lesbian and Straight Education Network; 2009.
36. **Brindis CD, Loo VS, Adler NE, Bolan GA, Wasserheit JN.** Service integration and teen friendliness in practice: a program assessment of sexual and reproductive health services for adolescents. J Adolesc Health. 2005;37:155-62. [PMID: 16026725]
37. **Rivers I.** Recollections of bullying at school and their long-term implications for lesbians, gay men, and bisexuals. Crisis. 2004;25:169-75. [PMID: 15580852]
38. **Valleroy LA, MacKellar DA, Karon JM, Rosen DH, McFarland W, Shehan DA, et al.** HIV prevalence and associated risks in young men who have sex with men. Young Men's Survey Study Group. JAMA. 2000;284:198-204. [PMID: 10889593]
39. **Bowen AM, Horvath K, Williams ML.** A randomized control trial of Internet-delivered HIV prevention targeting rural MSM. Health Educ Res. 2007;22:120-7. [PMID: 16849391]
40. **Carpenter KM, Stoner SA, Mikko AN, Dhanak LP, Parsons JT.** Efficacy of a web-based intervention to reduce sexual risk in men who have sex with men. AIDS Behav. 2010;14:549-57. [PMID: 19499321]
41. **Rhodes SD.** Hookups or health promotion? An exploratory study of a chat room-based HIV prevention intervention for men who have sex with men. AIDS Educ Prev. 2004;16:315-27. [PMID: 15342334]
42. **Kimbrough LW, Fisher HE, Jones KT, Johnson W, Thadiparthi S, Dooley S.** Accessing social networks with high rates of undiagnosed HIV infection: The social networks demonstration project. Am J Public Health. 2009;99:1093-9. [PMID: 19372521]
43. **Adimora AA, Schoenbach VJ.** Social context, sexual networks, and racial disparities in rates of sexually transmitted infections. J Infect Dis. 2005;191 Suppl 1:S115-22. [PMID: 15627221]
44. **Hogben M, Leichliter JS.** Social determinants and sexually transmitted disease disparities. Sex Transm Dis. 2008;35:S13-8. [PMID: 18936725]
45. **Blas E, Kurup ES, eds.** Equity, Social Determinants, and Public Health Programmes. Geneva: World Health Organization; 2010.
46. **Dean HD, Fenton KA.** Addressing social determinants of health in the prevention and control of HIV/AIDS, viral hepatitis, sexually transmitted infections, and tuberculosis [Editorial]. Public Health Rep. 2010;125 Suppl 4:1-5. [PMID: 20629250]
47. **St Lawrence JS, Montaño DE, Kasprzyk D, Phillips WR, Armstrong K, Leichliter JS.** STD screening, testing, case reporting, and clinical and partner notification practices: a national survey of US physicians. Am J Public Health. 2002;92:1784-8. [PMID: 12406809]
48. **Mosher WD, Chandra A, Jones J.** Sexual behavior and selected health measures: men and women 15-44 years of age, United States, 2002. Adv Data. 2005:1-55. [PMID: 16250464]

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Appendix Table 1. Reported Cases of Primary and Secondary Syphilis in All States and by Region, 2005 to 2008

Characteristic of Cases	Included States (n = 27)				Excluded States (n = 23)			
	2005	2006	2007	2008	2005	2006	2007	2008
All states								
Total cases, *n*	5642	6320	6895	8151	3066	3412	4545	5312
Sex, %								
Female	14	13	12	13	18	19	19	21
Male	86	87	88	86	82	81	81	79
Unknown	0	0	0	0	0	0	0	0
Race or ethnicity, %								
Black	36	37	40	42	46	49	50	54
Hispanic	17	17	18	17	11	11	11	12
White	42	40	37	35	31	30	29	27
Other	3	4	3	3	2	3	3	2
Unknown	2	3	2	3	10	7	7	4
Region, %								
Midwest	18	15	15	17	6	6	5	7
Northeast	10	10	11	10	23	22	24	23
South	37	37	39	41	63	65	64	63
West	35	37	35	33	8	7	7	7
By region								
Midwest								
Total cases, *n*	1003	971	1042	1361	190	205	215	358
Sex, %								
Female	11	12	11	12	12	20	15	20
Male	89	88	89	88	88	80	85	80
Unknown	0	0	0	0	0	0	0	0
Race or ethnicity, %								
Black	39	39	45	44	43	44	40	51
Hispanic	7	9	10	10	5	5	4	2
White	49	49	40	41	47	43	50	42
Other	2	1	2	2	3	6	3	1
Unknown	3	2	2	4	2	2	3	3
Northeast								
Total cases, *n*	555	661	757	794	706	739	1078	1225
Sex, %								
Female	11	9	8	6	4	4	3	4
Male	89	91	92	94	96	96	97	96
Unknown	0	0	0	0	0	0	0	0
Race or ethnicity, %								
Black	35	35	37	36	29	29	30	37
Hispanic	12	11	11	16	13	19	23	21
White	45	48	44	42	20	24	27	26
Other	2	4	3	3	2	8	8	6
Unknown	5	3	4	3	36	20	11	10
South								
Total cases, *n*	2115	2355	2663	3311	1918	2222	2925	3370
Sex, %								
Female	20	19	18	22	23	24	25	28
Male	80	81	82	78	77	76	75	72
Unknown	0	0	0	0	0	0	0	0
Race or ethnicity, %								
Black	56	59	61	65	57	61	63	66
Hispanic	13	13	12	11	8	7	7	7
White	29	26	24	22	32	30	26	24
Other	1	1	1	1	1	0	1	1
Unknown	1	1	1	1	1	2	3	3
West								
Total cases, *n*	1969	2333	2433	2685	252	246	327	359
Sex, %								
Female	9	8	6	5	23	15	21	17
Male	91	92	94	95	76	84	78	83
Unknown	0	0	0	0	0	2	1	0
Race or ethnicity, %								
Black	12	15	14	15	8	11	9	8
Hispanic	27	27	31	29	40	28	20	34
White	51	48	46	45	41	43	38	49
Other	7	7	5	6	8	5	10	6
Unknown	3	4	3	4	3	13	22	4

Appendix Table 2. Rates of Primary and Secondary Syphilis Among MSM, by U.S. Region, 2005 to 2008

Region and Race or Ethnicity of MSM	Reported Cases per 100 000 Males			
	2005	2006	2007	2008
Midwest				
Black	10.2	10.6	14.1	13.6
Hispanic	4.7	4.9	5.2	6.5
White	2.7	2.5	2.1	2.8
Northeast				
Black	9.7	11.5	13.8	14.7
Hispanic	3.9	4.5	5.6	8.2
White	2.0	2.5	2.4	2.6
South				
Black	13.0	15.9	20.5	23.1
Hispanic	3.0	4.2	4.1	3.9
White	2.6	2.8	2.6	2.7
West				
Black	8.5	14.4	16.3	17.9
Hispanic	5.9	6.9	8.8	9.4
White	6.3	6.9	7.0	8.1

MSM = men who have sex with men.

Appendix Table 3. Rates of Primary and Secondary Syphilis Among MSM in the United States, by Race or Ethnicity and Age Group, 2005 to 2008

Race or Ethnicity and Age Range of MSM	Reported Cases per 100 000 Males				Absolute Change*	Relative Change, %†
	2005	2006	2007	2008		
Black						
15–19 y	5.2	10.3	9.2	14.7	9.5	180.3
20–24 y	17.4	26.7	41.6	46.4	29.0	166.8
25–29 y	21.0	27.3	33.3	36.9	15.9	76.2
30–34 y	20.1	17.6	23.1	24.4	4.3	20.9
35–39 y	19.9	20.7	27.9	22.5	2.6	12.7
40–44 y	14.6	14.7	18.4	21.9	7.3	50.4
≥45 y	2.9	4.1	3.9	3.9	1.0	33.2
Total	11.2	13.8	17.4	18.9	7.7	68.6
Hispanic						
15–19 y	1.0	1.4	1.7	3.3	2.3	247.7
20–24 y	5.0	6.6	10.0	10.8	5.8	115.5
25–29 y	6.0	8.4	9.9	11.3	5.3	89.9
30–34 y	6.9	7.5	8.2	10.1	3.2	45.2
35–39 y	8.6	9.8	9.7	9.7	1.1	13.5
40–44 y	6.6	8.9	10.3	10.2	3.6	56.1
≥45 y	2.0	1.9	2.4	2.4	0.4	19.5
Total	4.7	5.7	6.7	7.3	2.6	55.3
White						
15–19 y	0.4	0.4	0.5	0.8	0.4	86.4
20–24 y	2.8	3.3	3.2	4.7	1.9	65.1
25–29 y	4.2	5.6	5.3	6.4	2.2	51.3
30–34 y	6.4	5.5	6.2	6.8	0.4	6.6
35–39 y	8.4	8.4	7.8	7.8	–0.6	–7.3
40–44 y	7.7	8.7	8.1	8.3	0.6	7.2
≥45 y	1.7	1.9	1.8	2.3	0.6	40.7
Total	3.4	3.7	3.5	4.0	0.6	17.6

MSM = men who have sex with men.
* Calculated as (rate in 2008 – rate in 2005).
† Calculated as [(rate in 2008 – rate in 2005)/rate in 2005] × 100%.