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HIV, Chlamydia, Gonorrhea, and Primary and Secondary Syphilis among American Indians and Alaska Natives Within Indian Health Service Areas in the United States, 2007–2010

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Abstract

National rates from human immunodeficiency virus (HIV) and sexually transmitted disease (STD) surveillance may not effectively convey the impact of HIV and STDs on American Indian/Alaska Native (AI/AN) communities. Instead, we compared average annual diagnosis rates per 100,000 population of HIV, chlamydia (CT), gonorrhea (GC), and primary and secondary (P&S) syphilis,

from 2007 to 2010, among AI/AN aged 13 years residing in 625 counties in the 12 Indian Health Service Areas, all AI/AN, and all races/ethnicities to address this gap. AI/AN comprised persons reported as AI/AN only, with or without Hispanic ethnicity. Out of 12 IHS Areas, 10 had higher case rates for CT, 3 for GC, and 4 for P&S syphilis compared to rates for all races/ethnicities. Eight Areas had higher HIV diagnosis rates than for all AI/AN, but HIV rates for all IHS Areas were lower than national rates for all races/ethnicities. Two IHS Areas ranking highest in rates of CT and GC and four Areas with highest P&S syphilis also had high HIV rates. STD and HIV rates among AI/AN were greater in certain IHS Areas than expected from observing national rates for AI/AN. Integrated surveillance of overlapping trends in STDs and HIV may be useful in guiding prevention efforts for AI/AN populations.

Keywords

HIV/AIDS; Chlamydia; Gonorrhea; Syphilis; American Indians; Alaska Natives; Indian Health

Introduction

Human immunodeficiency virus (HIV) infections and sexually transmitted diseases (STDs) are important public health problems affecting American Indians/Alaskan Natives (AI/AN) in the United States. When comparing rates by race/ethnicity, AI/AN had the second highest chlamydia (CT) and gonorrhea (GC) rates and the third highest primary and secondary (P&S) syphilis rate in 2011 [1]. While annual rates of new diagnoses of HIV infection among AI/AN are lower than those for all other race/ethnicity groups except for whites and Asians, AI/AN have the poorest rates of surviving 12, 24, or 36 months after an HIV diagnosis compared with all other single race or ethnic groups [2]. In 2009, AI/AN comprised 0.5 % of all persons diagnosed with HIV in the United States [2] and represented 0.4 % of P&S syphilis, 1.0 % of GC, and 1.6 % of CT reports [1, 3].

National rates may not be sufficient to describe the impact of HIV and STDs on AI/AN communities. There are 566 federally recognized AI/AN tribes located in 35 states [4]. According to the 2010 US. Census, a total of 5.2 million individuals reported their race as AI/AN, including 2.9 million reporting AI/AN race alone and 2.3 million reporting AI/AN in combination with one or more other races [5]. Health care for an estimated 2.1 million AI/AN served by the Indian Health Service (IHS) includes direct care services by IHS, tribal health systems, and urban Indian health care centers (I/T/U), in addition to services received from other public and private providers [4]. The IHS-funded health care system is comprised of 12 regional administrative units, containing 625 service counties, which we will refer to as “IHS Areas” [4]. Whether clinical services for HIV or STDs are provided within or outside the IHS system, state health departments are responsible for reporting new HIV and STD diagnoses, without identifiers, to the Centers for Disease Control and Prevention (CDC) [1, 2]. However, as IHS Areas and tribal lands cross state lines, national surveillance data stratified by states cannot provide geographically aligned HIV and STD data for AI/AN populations that is useful for service programs in IHS Areas. CDC and IHS have collaboratively published AI/AN-specific STD surveillance reports by IHS Areas for 2004, 2007 and 2009, including Hispanic AI/AN, but these did not include HIV [3, 6, 7]. The

purpose of this analysis is to calculate rates of HIV, chlamydia, gonorrhea and P&S syphilis by IHS Areas and to compare those to national rates among all races/ethnicities and all AI/AN in a way that will be useful for improving HIV surveillance among AI/AN and guiding HIV and STD prevention and treatment services in those geographic areas [8].

Methods

We used case reports from CDC surveillance systems of nationally notifiable diseases to calculate rates of HIV, chlamydia, gonorrhea and P&S syphilis among AI/AN [1, 2]. Using combined reports for 2007–2010, annualized numbers, percentages and rates of HIV and STD diagnoses per 100,000 population were calculated for AI/AN adults and adolescents aged 13 years. Denominators for rate calculations were based on postcensal estimates for 2007 through 2009 from the US Census Bureau, with 2009 postcensal estimates for 2010 denominators because census data for 2010 were not available at the time of this analysis [9]. For this analysis, persons reported with a diagnosis of HIV, chlamydia, gonorrhea or P&S syphilis were considered to have AI/AN race if the only race category checked on the surveillance case report was “American Indian/Alaska Native”, regardless of whether the case report described them as having Hispanic ethnicity, as used in similar reports [3, 6, 7]. The rates for IHS Areas are based on diagnoses for only AI/AN residing in the 625 service counties located in the 12 IHS Areas, representing 55.2 % of AI/AN nationally in this study. Rates include persons accessing care through I/T/U, private, or public health care facilities or venues. In 17 service counties that overlap across two IHS Areas, cases and denominators were redistributed by the estimated percentage of AI/AN population served by each IHS Area [3]. The federally assigned names of IHS Areas do not correspond to or represent tribal names or affiliation of cases therein. Rates by gender for chlamydia were displayed by individual IHS Areas to reflect differences in screening recommendations.

National and IHS Area-specific rates for new diagnoses of HIV infection, including HIV Stage 3 (AIDS), were calculated using cases reported to CDC through June 2011, for all AI/AN and all race/ethnic groups combined in the 46 states with HIV reporting to CDC since at least January 2007 to allow for statistical adjustments for reporting delays [2]. Maryland, Massachusetts, Hawaii, Vermont, the District of Columbia (DC) and six counties in Massachusetts (Nashville Area) were not included.

For chlamydia, gonorrhea and P&S syphilis case rates, national rates were calculated using case reports from all 50 states and the DC. Case reports for approximately 1 % of AI/AN persons with missing county information were not included in this analysis.

Data used for this analysis were collected as part of routine public health disease surveillance by state and local health departments and reported without personal identifiers to CDC for regional and national analyses. Therefore, this analysis did not involve human subject research and did not require additional CDC IRB review.

Results

Chlamydia

A total of 58,809 chlamydia cases were reported in 2007–2010 among adult and adolescent AI/AN, with 49,147 (83.6 %) residing within the service counties of the 12 IHS Areas (Table 1). All IHS Areas, except Nashville and California, had higher case rates, compared with the average annual US rate for chlamydia for all races/ethnicities (397.0 per 100,000) (Fig. 1). Three IHS Areas (Alaska, Aberdeen, and Billings) had chlamydia rates 4.1–7.6 times the US rate for all races/ethnicities. The overall rate of reported chlamydial infection among AI/AN females in IHS Areas was 3.6 times the rate among males (Table 1). When stratified by IHS Area and sex (Fig. 1 inset), to reflect screening recommendations for females, IHS Areas with the highest rates in Fig. 1 for all AI/AN remained high for both males and females. Chlamydia rates among AI/AN females in all IHS Areas were 2.6–4.7 times the rates among AI/AN males. Among AI/AN in IHS Areas, the majority of diagnoses (68.6 %) were among those aged 13–24 years (Table 1), the age group for which chlamydia screening is recommended.

Gonorrhea

A total of 9,561 cases of gonorrhea were reported in 2007–2010 among adult and adolescent AI/AN, with 6,974 (72.9 %) residing within the service counties of the IHS Areas (Table 1). While the average annual national gonorrhea rate for all AI/AN (95.1 per 100,000) was lower than that for all races/ethnicities (128.9 per 100,000), three IHS Areas (Alaska, Aberdeen, and Oklahoma) had higher gonorrhea case rates than national rates for AI/AN and for all races/ethnicities (Fig. 2). Overall, the gonorrhea rate for AI/AN in IHS Areas was 1.9 times as high among females as among males (Table 1). However, some IHS Areas had an AI/AN female-to-male rate ratio (data not shown) that was close to or <1:1 (Navajo, California) and in some other IHS Areas the rate ratio was 3:1 or higher (Oklahoma, Bemidji, and Billings). The highest gonorrhea rates occurred among AI/AN aged 13–24 years (Table 1).

P&S Syphilis

A total of 285 cases of P&S syphilis were reported in 2007–2010 among adult and adolescent AI/AN, with 185 (65.0 %) residing within the service counties of the IHS Areas. The rate for AI/AN in the Tucson IHS Area was 4.9 times as high as the average US rate for all races/ethnicities (5.2 per 100,000) and 9.2 times the rate for the US AI/AN population (2.8 per 100,000) (Fig. 3). Additionally, AI/AN in three other IHS Areas (Phoenix, Navajo and Albuquerque) had rates of syphilis higher than both national rates. The rate of P&S syphilis cases in IHS Areas among AI/AN males was 2.0 times the rate among females and for all AI/AN the rate was highest in persons in the 25–34 year old age group (Table 1). A low male-to-female rate ratio, nearly a 1:1 ratio, was notable in Aberdeen, Bemidji, California, and Tucson (data not shown).

HIV

An estimated 957 AI/AN adults and adolescents were diagnosed with HIV infection in the 46 states during 2007–2010, with 571 (59.7 %) residing in the service counties of the IHS Areas at the time of diagnosis. Eight Areas had rates higher than the average HIV diagnosis rate for all AI/AN in the 46 states (9.7 per 100,000 population) with the highest found in the Phoenix, Albuquerque, Navajo, Alaska and Tucson Areas (Fig. 4). HIV diagnosis rates for AI/AN in all IHS Areas were lower than the national average rate for all races/ethnicities (19.5 per 100,000 population). AI/AN males had 2.8 times the rate of HIV diagnoses compared to AI/AN females (Table 1). Lower male-to-female HIV rate ratios, <2:1, were found in Alaska, Aberdeen, and Nashville and rate ratios higher than 4:1 were found in Albuquerque, California and Phoenix (data not shown). The highest average annual diagnosis rate occurred among persons aged 25–34 years (Table 1).

Alaska and Aberdeen ranked highest in rates of chlamydia and gonorrhea and relatively high in HIV rates. Similarly four IHS Areas, Phoenix, Albuquerque, Navajo, and Tucson, ranked high in syphilis and HIV rates.

Discussion

This paper provides a summary of HIV and STD case rates by IHS geographic regions that can help tribal and state governments and I/T/U facilities define HIV/STD prevention, testing, and treatment needs, and strengthen AI/AN communities' response to HIV and STDs. Ranked results for STDs among AI/AN by IHS Area for 2007–2010 were similar to earlier reports [3, 6, 7, 10]. HIV rates by IHS Area have not been previously published. Overlapping high rates of STDs with HIV were demonstrated in multiple IHS areas mainly concentrated in the Southwest and Alaska. The different concordance in ranking between chlamydia, gonorrhea, and P&S syphilis with HIV may be in part due to the different epidemiology of these four infections and varying screening practices, although all share a common risk factor of unprotected sex [1, 2].

Due to the disproportionate STD rates among AI/AN and consequent increased risk of HIV, IHS in collaboration with CDC prioritized the standard delivery of STD and HIV screening and treatment referral through the development of policies and performance measures [11–14]. IHS prenatal HIV screening increased during 2005–2008 from 54 to 80 % following implementation of the recommendation to screen all pregnant women [12, 15]. In addition, IHS added quality-of-care measures to IHS clinical databases to monitor HIV testing for pregnant women, patients aged 13–64 years, and those diagnosed with an STD [16]. Since 2006, IHS has supported and piloted universal routine opt-out testing for HIV, where allowed by local laws, and several tribal organizations have adopted resolutions supporting routine HIV testing [12, 16]. The implementation of these STD and HIV screening measures is likely to vary across IHS Areas or facilities [16, 17].

We found higher rates of chlamydia and gonorrhea in Alaska and Aberdeen, compared to the other IHS Areas, reflecting sharp increases in these Areas during 2009–2011 [18–20]. Syphilis outbreaks among AI/AN in Arizona during 2007–2009 explain the high rates of P&S syphilis in IHS Areas that included counties in Arizona, i.e., Tucson, Phoenix, and

Navajo [21, 22]. These outbreaks led to enhanced screening campaigns in non-traditional venues to identify even more infections [21].

Gender differences in diagnosis rates of STDs and HIV among AI/AN in IHS Areas were similar to those found among other race/ethnicity groups, with higher rates for gonorrhea and chlamydia among females, and higher rates for P&S syphilis and HIV among males [1, 2]. Different screening opportunities, disease epidemiology and modes of transmission likely contribute to rate differences by gender in IHS Areas. AI/AN females in IHS Areas had over three times the rate of chlamydia diagnoses for AI/AN males, because a greater number of women are screened for chlamydia than men [1]. It is recommended that all sexually active women under the age of 25 be screened annually for chlamydia but there is no recommendation for male screening [11]. Despite national recommendations, screening coverage varies considerably by region and among health care facilities serving AI/AN populations [23, 24].

Since most commercially available nucleic acid–amplification tests (NAATs) now test simultaneously for both *C. trachomatis* and *N. gonorrhoeae*, more women in many clinical settings are being screened for gonorrhea. From 2007 to 2010, the overall female gonorrhea rate in IHS Areas was 2.0 times the male rate, a higher ratio than is seen nationally, where the rates in 2010 were similar for males and females [1]. This female-to-male ratio is consistent across all IHS Areas, except for the Navajo and California IHS Areas where the ratio is closer to 1:1. As most chlamydia and gonorrhea infections are asymptomatic in women, it is important that screening, treatment, and partner management activities be incorporated into IHS and other programs aiming to improve the health of AI/AN women and to prevent serious consequences of untreated infection such as infertility [13, 25]. In addition, expansion of urine-based screening, particularly in health care settings where males receive care, and improvement in partner notification strategies to test and treat males may lead to increased disease detection among males, while advancing the mission to protect women.

Males comprise the majority of all US persons diagnosed with P&S syphilis, with rates in males 7.2 times the rate among females; 67 % of reported infections were among men who have sex with men (MSM) in 2010 [1]. For P&S syphilis, compared to the national rate difference between males and females, we found a lower male-to-female rate ratio among AI/AN living in the service counties of the IHS Areas and AI/AN nationally, 2.0 and 2.7 respectively, with nearly equal gender-specific rates in 4 IHS Areas (Aberdeen California, Bemidji, Tucson). In the syphilis outbreaks in Arizona among AI/AN, a 1:1 gender case ratio was observed in 2003–2007 [22] and the majority of the cases in 2007–2009 were among women, suggesting a heterosexual outbreak [21].

Males comprise the majority of all US persons diagnosed with HIV, with rates 3.9 times those among females and 78 % of infections among persons diagnosed in 2010 were attributed to male-to-male sexual contact [2]. Among AI/AN in IHS Areas, HIV rates among males were 2.8 times those for females, but higher and lower ratios were found in some regions. The IHS tests more women than men for HIV, but recognizes that HIV is more prevalent among males and recommends that facilities find ways to extend HIV testing to

AI/AN males [12]. AI/AN, like many people, do not perceive themselves to be at risk for HIV [26] and 25 % of AI/AN infected with HIV are unaware of their status [27, 28]. Also, many AI/AN, especially in rural areas, may be reluctant to be tested in their own communities for HIV or STDs because of concerns about stigma and confidentiality [22, 29].

In 2007–2010, AI/AN youth, aged 13–24 years accounted for nearly 69 % of chlamydia and 59 % of gonorrhea reports among AI/AN in IHS Areas, but for only 28 % of P&S syphilis and 15 % of new HIV diagnoses. High chlamydia and gonorrhea rates among youth, including AI/AN youth, likely reflect sexual practices such as early age of sexual debut and exposure to multiple sex partners; such behaviors can lead to unintended pregnancy, repeat STDs and HIV infection [30–34]. Biologically, adolescent girls may be more vulnerable to certain STDs, like chlamydia, because of certain aspects of physical development [35, 36]. The highest rates of HIV and P&S syphilis diagnoses in IHS Areas were among AI/AN aged 25–34 years. In contrast, U.S. P&S syphilis rates in 2010 were highest among males aged 20–24 years [1]. In jurisdictions where risk information has been collected, most of the P&S syphilis cases were among MSM [1]. For HIV, higher rates among those aged 25–34 years may be explained by later diagnoses in the course infection, suggesting the need for increased testing in AI/AN aged <25 years.

Overlapping high rates of STDs and HIV were demonstrated within multiple IHS Areas. An STD can facilitate acquisition or transmission of HIV infection, some STD pathogens may be more virulent in the presence of HIV, and both are transmitted by unprotected sexual behavior [35, 37]. IHS and CDC, as well as urban and tribal health organizations, have collaborated to develop HIV/STD prevention campaigns targeting AI/AN populations [38–40]. Many of these have used social networking to educate AI/AN youth [39–41]. CDC supports strategies to improve STD and HIV awareness among AI/AN and other targeted groups and calls for an integrated approach to HIV and STD prevention, screening, treatment and surveillance [8, 42].

Our results should be interpreted with caution because of several limitations. In this ecological analysis, it was not possible to ascertain if multiple diagnoses occurred among the same individuals or to establish a temporal relationship between STDs and HIV. HIV data were excluded for 5 IHS service counties in Massachusetts because the state did not have confidential name-based HIV reporting as of January 2007, to allow for statistical adjustments for reporting delays. It was not possible to report STDs or HIV by transmission risk category because risk data are not collected for chlamydia and gonorrhea and are incomplete for P&S syphilis. Comparison of HIV and STD diagnoses was limited to AI/AN residents of counties served by the IHS, which are largely rural, although some contain large cities. We were unable to determine whether high rates were associated with urban residence. There is evidence of considerable misidentification of race/ethnicity for AI/AN, which may lead to underestimation of HIV and STD national rates among AI/AN and in some of the IHS Areas [43, 44]. In addition, STD rates are based on reported cases whereas HIV rates are based on estimated cases, i.e., reported cases statistically adjusted upward for expected reporting delays [2]. Also the relationship between time of infection and time of diagnosis varies considerably by type of infection, with some STDs diagnosed in persons

experiencing acute symptoms whereas HIV can be asymptomatic for 8–10 years. Finally, higher and lower rates of STDs and HIV found among certain IHS regions may reflect actual rates of disease but also can reflect differences in screening opportunities, access to care, completeness of reporting, local outbreaks, geographic isolation, or rates of race misidentification [10].

Conclusions

Results from this analysis of national and local rates of STDs and HIV in geographic areas with greater concentrations of AI/AN, including Hispanic AI/AN, indicate that the impact of STDs and HIV on AI/AN living in certain IHS Areas is greater than the overall national rates among AI/AN and emphasizes the potential value of integrating efforts to control STDs and HIV in these areas.

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Fig. 1.

Rates of chlamydia diagnoses among American Indians and Alaska Natives 13 years residing in Indian Health Service Areas compared to US rates, 2007–2010

Note. American Indians and Alaska Natives (AI/AN) include persons with Hispanic and non-Hispanic ethnicity, but not multiple races.

^aTwelve Indian Health Service (IHS) Areas composed of counties with at least one IHS-funded healthcare facility serving AI/AN.

^bU.S. AI/AN includes all AI/AN in 50 states and District of Columbia (residing in IHS and non-IHS Areas).

^cU.S. All Races includes all race/ethnicity groups in 50 states and District of Columbia (including AI/AN).

^dSource: Bureau of Census, postcensal population files for 2007–2009 (2010 not available therefore 2009 population estimates used).

Fig. 2.

Rates of gonorrhea diagnoses among American Indians and Alaska Natives 13 years residing in Indian Health Service Areas compared to US rates, 2007–2010

Note. American Indians and Alaska Natives (AI/AN) include persons with Hispanic and non-Hispanic ethnicity, but not multiple races.

^aTwelve Indian Health Service (IHS) Areas composed of counties with at least one IHS-funded healthcare facility serving AI/AN.

^bU.S. All Races includes all race/ethnicity groups in 50 states and District of Columbia (including AI/AN).

^cU.S. AI/AN includes all AI/AN in 50 states and District of Columbia (residing in IHS and non-IHS Areas).

^dsource: Bureau of Census, postcensal population files for 2007–2009 (2010 not available therefore 2009 population estimates used).

Fig. 3.

Rates of primary and secondary syphilis diagnoses among American Indians and Alaska Natives 13 years residing in Indian Health Service Areas compared to US rates, 2007–2010

Note. American Indians and Alaska Natives (AI/AN) include persons with Hispanic and non-Hispanic ethnicity, but not multiple races.

^aTwelve Indian Health Service (IHS) Areas composed of counties with at least one IHS-funded healthcare facility serving AI/AN.

^bU.S. All Races includes all race/ethnicity groups in 50 states and District of Columbia (including AI/AN).

^cU.S. AI/AN includes all AI/AN in 50 states and District of Columbia (residing in IHS and non-IHS Areas).

^dSource: Bureau of Census, postcensal population files for 2007–2009 (2010 not available therefore 2009 population estimates used).

Fig. 4.

Estimated rates of HIV diagnoses among American Indians and Alaska Natives, aged C13 years residing in Indian Health Service Areas compared to US rates, 2007–2010

Note. American Indians and Alaska Natives (AI/AN) include persons with Hispanic and non-Hispanic ethnicity, but not multiple races.

^aTwelve Indian Health Service (IHS) Areas composed of counties with at least one IHS-funded healthcare facility serving AI/AN.

^bU.S. All Races includes all race/ethnicity groups in 46 states (including AI/AN).

^cU.S. AI/AN includes all AI/AN in 46 states (residing in IHS and non-IHS Areas).

^dNashville area: HIV data excluded for 5 IHS service counties in Massachusetts because the state did not have confidential HIV reporting since January 2007, to allow for statistical adjustments for reporting delay.

^eBillings and Bemidji rates based on <12 cases. Rates based on estimated numbers <12 should be interpreted with caution because the estimates have a relative standard error >30% and are considered unreliable.

^fEstimated average annual rate of diagnosis with HIV infection, including Stage 3 (AIDS), adjusted for reporting delays, but not for incomplete reporting. Source: Bureau of Census, 2007–2009 postcensal population files (2010 not available therefore 2009 population estimates used).

Table 1

Diagnoses of chlamydia, gonorrhea, P&S syphilis, and HIV among American Indians and Alaska Natives aged C13 years, residing in Indian Health Service Areas by sex and age group, 2007–2010

	Chlamydia ^a		Gonorrhea ^a		P&S Syphilis ^a		HIV ^b	
	No. (%)	Rate per 100,000 ^c	No. (%)	Rate per 100,000 ^c	No. (%)	Rate per 100,000 ^c	Estimated No. (%)	Rate per 100,000 ^c
Sex								
Male	10,470 (21.3)	388.1	2,339 (33.5)	86.7	121 (65.4)	4.5	417 (73.0)	15.6
Gender	38,637 (78.6)	1,385.4	4,630 (66.4)	166.0	64 (34.6)	2.3	154 (27.0)	5.6
Age								
13–24	33,727 (68.6)	1,972.7	4,085 (58.6)	238.9	52 (27.9)	3.0	84 (14.7)	4.9
25–34	12,044 (24.5)	1,202.5	1,958 (28.1)	195.5	76 (40.8)	7.5	189 (33.1)	19.0
35–44	2,516 (5.1)	287.2	639 (9.2)	73.0	38 (20.5)	4.3	151 (26.4)	17.3
45–54	668 (1.4)	78.6	227 (3.3)	26.7	17 (9.2)	2.0	108 (18.9)	12.8
55+	192 (0.4)	18.3	66 (0.9)	6.3	3 (1.6)	0.3	34 (6.0)	3.3
Totals ^d	49,147	895.8	6,974	127.1	185	3.4	571	10.5

American Indians and Alaska Natives (AI/AN) include persons with Hispanic and non-Hispanic ethnicity, but not multiple races. Twelve Indian Health Service (IHS) Areas composed of counties with at least one IHS-funded healthcare facility serving AI/AN

^a Average annual rate of diagnoses of chlamydia, gonorrhea, and primary and secondary syphilis

^b Estimated average annual HIV diagnosis rate, including Stage 3 (AIDS), adjusted for reporting delays, but not for incomplete reporting. HIV data excluded for 5 IHS service counties in Massachusetts because the state did not have confidential HIV reporting since January 2007, to allow for statistical adjustments for reporting delay

^c Source: Bureau of Census, 2007–2009 postcensal population files (2010 not available therefore 2009 population estimates used)

^d Totals and percentages may differ because of rounding or missing data for sex or age