Epidemiology of HIV among American Indians and Alaska Natives – United States, 2008-2011

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Abstract

American Indians/Alaska Natives (AI/AN) diagnosed with HIV infection have poorer survivorship and a higher percentage of Stage 3 (AIDS] diagnoses within one year of HIV diagnosis, compared to most race/ethnicity groups. National HIV surveillance data for 2008-2011 were used to determine diagnosis rates of HIV infection, persons living with HIV, and persons with a late diagnosis (Stage 3 within three months of HIV diagnosis) by selected characteristics for AI/AN and a combined other race/ethnicity group. The highest percentages of 862 AI/AN diagnosed with HIV infection were among males (75.7%), AI/AN aged 25-34 years (32.9%), persons living in large metropolitan areas (53.4%), and those diagnosed in outpatient facilities (39.4%). Among males, the majority of infections were attributed to male-to-male sexual contact (MSM) (71.8%). The percentage of infections attributed to injection drug use (IDU) for AI/AN females (28.5%) was greater than the other race/ethnicity group (15.2%). Probability of late diagnosis among AI/AN males was associated with: age >35 years, and diagnosis in emergency room or hospital, or outpatient settings, and among AI/AN females, diagnosis in hospital or emergency room. Early detection of HIV infection along with linkage to and retention in care are important for all populations, including AI/AN. Routine HIV screening at a variety of public health and outpatient facilities, and linkage to care are important to decrease HIV transmission and improve survival.

Keywords

American Indian/Alaska Native; human immunodeficiency virus; HIV/AIDS; Surveillance; Indian Health

Cover Page Footnote

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ABSTRACT

American Indians/Alaska Natives (AI/AN) diagnosed with HIV infection have poorer survivorship and a higher percentage of Stage 3 (AIDS] diagnoses within one year of HIV diagnosis, compared to most race/ethnicity groups. National HIV surveillance data for 2008-2011 were used to determine diagnosis rates of HIV infection, persons living with HIV, and persons with a late diagnosis (Stage 3 within three months of HIV diagnosis) by selected characteristics for AI/AN and a combined other race/ethnicity group. The highest percentages of 862 AI/AN diagnosed with HIV infection were among males (75.7%), AI/AN aged 25-34 years (32.9%), persons living in large metropolitan areas (53.4%), and those diagnosed in outpatient facilities (39.4%). Among males, the majority of infections were attributed to male-to-male sexual contact (MSM) (71.8%). The percentage of infections attributed to injection drug use (IDU) for AI/AN females (28.5%) was greater than the other race/ethnicity group (15.2%). Probability of late diagnosis among AI/AN males was associated with: age ≥35 years, and diagnosis in emergency room or hospital, or outpatient settings, and among AI/AN females, diagnosis in hospital or emergency room. Early detection of HIV infection along with linkage to and retention in care are important for all populations, including AI/AN. Routine HIV screening at a variety of public health and outpatient facilities, and linkage to care are important to decrease HIV transmission and improve survival.

Keywords: American Indian/Alaska Native, human immunodeficiency virus, HIV/AIDS, Surveillance, Indian Health

INTRODUCTION

According to the 2010 U.S. Census, a total of 5.2 million individuals reported their race as American Indian or Alaska Native (AI/AN), representing 1.7% of the U.S. population, including 2.9 million reporting AI/AN race alone and 2.3 million reporting AI/AN in combination with one or more other races (U.S. Census, 2012a). The Indian Health Service (IHS) funds health care for an estimated 2.1 million AI/AN, consisting of IHS direct health care services, tribally operated health care systems, and urban Indian health care centers (I/T/U) (IHS,

2011; Bertolli et al., 2008). In addition, many AI/AN receive health services from the usual public and private providers utilized by other Americans. Because AI/AN from recognized tribes living in certain geographic areas are eligible for free care through these tribal health systems, some AI/AN theoretically could have increased access for HIV testing and treatment than other populations.

While the total number of diagnoses of HIV infection reported annually in the United States for American Indian/Alaska Natives (AI/AN) is relatively small compared to the burden of HIV disease nationally, estimated rates of HIV infection are higher among AI/AN than some race/ethnicity groups (Asians and whites), with 9.3 AI/AN diagnosed per 100,000 population in 2011 (CDC 2013a). High rates of sexually transmitted diseases (STDs) among AI/AN populations, 4.1 and 4.6 times the rates among non-Hispanic whites for chlamydia and for gonorrhea respectively, demonstrate that AI/AN are at additional risk for acquiring or transmitting HIV infection (CDC, 2012a).

AI/AN have been reported to be disproportionately affected by HIV in terms of late diagnosis and lower survivorship (CDC, 2013a; CDC, 2009). In 2010, AI/AN had the second highest percentage (38%) of stage 3 HIV (AIDS) diagnosis within 1 year of initial HIV diagnosis compared to all other race/ethnicity groups (CDC, 2013a). AI/AN diagnosed during 2003-2007 had the lowest survival rate at 12, 24 and 36 months after an HIV diagnosis, compared to all other race/ethnicity groups except persons of multiple races (CDC, 2013a). A larger estimated percentage of AI/AN infected with HIV (24.7%) were undiagnosed by the end of 2009, compared to blacks/African Americans, Hispanics/Latinos and whites, potentially contributing to ongoing transmission (CDC, 2012b. Together, these statistics suggest late testing, late initiation of care, and lack of treatment or poor retention in care among AI/AN as compared to other race/ethnicity groups.

The objective of this analysis was to characterize the public health impact of HIV disease in 2008-2011 among AI/AN adults and adolescents aged ≥13 years in the United States by demographics, transmission category, facility at diagnosis, and geographic factors, using four years of combined national surveillance data, in order to guide HIV prevention efforts . A second objective was to determine factors associated with late diagnosis and identify subgroups that may need additional attention for earlier testing and initiation of treatment.

METHODS

Data Collection

Case reports from the Centers for Disease Control and Prevention's (CDC) HIV surveillance system were used to calculate rates of HIV diagnoses and rates of living with a diagnosis of HIV infection (CDC, 2013a). Diagnoses of HIV infection are reported without personal identifiers to the National HIV Surveillance System (NHSS) by all states, the District of Columbia, and U.S. territories. New diagnoses of HIV infection made in IHS-funded facilities are expected to be reported to state or local health departments by providers and laboratories licensed in the state, even in facilities located in federally recognized tribal areas. With an estimated average of 216 new HIV diagnoses reported among AI/AN annually (CDC, 2013a), annual rates by demographics, risk factors, geographic region, and clinical characteristics, based on relatively small numbers, can be unstable from year to year, leading to difficulty in distinguishing random fluctuation from true changes in underlying risk of infection. Therefore, combined data for persons diagnosed from 2008-2011 were used to allow for comparison of AI/AN to a combined other race/ethnicity group for selected characteristics. AI/AN were defined

as persons having a race classification of AI/AN only and did not include Hispanic AI/AN or multi-race AI/AN. To focus on the epidemiology of HIV among AI/AN, and not on other individual race/ethnicity groups, some of which have much greater rates of HIV diagnoses, the rest of the U.S. population was combined into a single "other race/ethnicity group," a category comprised of Asian, black or African American, Hispanic or Latino (any race), Native Hawaiian or other Pacific Islander, white, and multi-race persons (including some multi-race AI/AN). HIV diagnosis rates by separate race/ethnicity groups are published annually (CDC, 2013a).

Data Analysis

We estimated the number, percentage, and average annual rates per 100,000 population for adults and adolescents aged ≥13 years diagnosed with HIV infection, regardless of stage of disease at diagnosis, during 2008-2011. Diagnoses of HIV reported to CDC through June 2012 from all 50 states and the District of Columbia (DC) (CDC, 2013a) were used. Rates of persons living with a diagnosis of HIV infection (prevalence) were based on individuals living at the end of 2010 who had been diagnosed in any year prior to and including 2010. Population denominators for the rates of HIV infection and AIDS were calculated using official post-censal estimates from the U.S. Census Bureau (U.S. Census, 2012b). The number of persons living with a diagnosis of HIV infection was assessed at the end of 2010 to allow at least 18 months for delays in reports of death information. Three levels of population density for area of residence at diagnosis were used based on the 2009 Office of Management & Budget's (OMB) definitions of metropolitan statistical areas (MSAs), with 2 urban categories of large metropolitan areas with a population of 500,000 or more persons and metropolitan areas with 50,000 to 499,999 persons, and one non-metropolitan category (rural) with less than 50,000 persons (OMB, 2009). Ten-year age groups were used for the main analyses of diagnoses of HIV infection, except for the 13-14 year old group, which had no AI/AN diagnoses; age groups were further combined to provide sufficient numbers for the multivariate modeling for late diagnosis. Pearson chi-square statistics were calculated using SAS version 9.3 (SAS Institute, Cary, NC) to assess differences across the two groups (late diagnosis vs. no late diagnosis) and prevalence ratios (PR) were used to assess differences within substrata of a group, for example, age categories for AI/AN (Spiegelman & Hertzmark, 2005). Calculations for chi-squares and prevalence ratios for population density of area of residence excluded persons without information on residence at diagnosis.

Definitions of Characteristics

Persons diagnosed with HIV infection were stratified by sex and HIV transmission risk factor and classified into the following hierarchy of transmission categories: 1) male-to-male sexual contact (men who have sex with men, MSM), including males who report sexual contact with both men and women, 2) injection-drug use (IDU), 3) both male-to-male sexual contact and injection-drug use (MSM/IDU), 4) heterosexual contact with a person of the opposite sex known to have HIV or be at high risk for HIV infection, and 5) all other risk factors combined (e.g., hemophilia and blood transfusion) (CDC, 2013a). Data were statistically adjusted for reporting delays and multiple imputation was used to assign transmission categories for cases missing risk factor information (Song & Green, 2012; McDavid et al., 2008). In 53 of 59 HIV surveillance project areas fewer than 30% of diagnoses of HIV infection reported in 2011 were missing risk factor information (Karch, Chen, & Tang, 2013). Facility type at diagnosis of HIV infection was grouped into 4 main categories: 1) CTS/STD/screening, including HIV counseling and testing sites (CTS), STD clinics, family planning, and other screening, diagnostic and referral agencies such as blood banks and insurance screening; 2) inpatient/emergency room (ER), including hospitals, long-term inpatient facilities and emergency rooms; 3) outpatient, including private

physician offices, as well as adult and pediatric, TB, drug treatment, community, mobile and other clinics; and 4) other, including correctional facilities and medical examiner offices.

A late HIV diagnosis was defined as a diagnosis of stage 3 HIV infection (AIDS) within 3 months of the date of diagnosis with HIV infection. The analysis was limited to adults and adolescents newly diagnosed during 2008-2010 to allow additional time for reports of stage 3 HIV infections. Prevalence ratios for the univariate and multivariate analyses were estimated using the log binomial regression method (Spiegelman & Hertzmark, 2005) and were considered significant if the 95% confidence interval (CI) of the prevalence ratio did not include one (1.0) or if the *P*-value was less than 0.05. The multivariate analysis was stratified by sex because of the differences in transmission categories among males compared with females, and retained variables that had at least one significant value ($P < .05$) in the univariate analysis.

Residence in a county where the Indian Health Service provides health care services (IHS service county) was used as a proxy for greater access to IHS-funded facilities, compared to less access in other counties. It was defined using previously developed methodology (CDC & IHS, 2009), consisting of residency in any of 625 IHS service counties included in one of 12 regional administrative units called Area Offices in 35 states (GAO, 2007). The rates represent diagnoses of HIV infection for all AI/AN residing in the IHS service counties, including those diagnosed in health care facilities not funded by IHS.

RESULTS

Diagnoses of HIV Infection

Among the 862 AI/AN adults and adolescents diagnosed during 2008-2011 (Table 1), the highest percentage of new diagnoses were among males (75.7%), individuals aged 25-34 years (32.9%), individuals diagnosed in an outpatient facility (39.4%), and individuals living in large metropolitan areas (53.4%). The majority of HIV infections diagnosed among males were attributed to male-to-male sexual contact (71.8%), similar to the other race/ethnicity group (76.4%). The percentage of new diagnoses among AI/AN females (24.3%) was similar to the other race/ethnicity group (22.5%), but the percentage of HIV infections attributed to injection drug use (IDU) among females (28.5%) was significantly higher than that for the other race/ethnicity group (15.2%, chi-square = 28.4869, $P < .0001$). The percentage of HIV infections attributed to IDU (9.0%) was higher among AI/AN males than among males in the other race/ethnicity group (6.8%, chi-square = 5.0000, $P = 0.0253$) and the percentage attributed to both male-to-male sexual contact and injection drug use (MSM/IDU), 10.0%, was also higher than that for the other race/ethnicity group (4.1%, chi-square = 57.2890, $P < .0001$). The percentage of HIV infections among AI/AN males attributed to heterosexual contact (9.0%) was significantly lower than for the other race/ethnicity group (12.7%, chi-square = 7.8424, $P = 0.0051$). Of AI/AN diagnosed with HIV infection, 25.9% lived in non-metropolitan (rural) areas with populations less than 50,000 people, compared to 6.4% for the other race/ethnicity group (chi-square = 550.3863, $P < .0001$). Nevertheless, more than two-thirds (72.5%) of HIV-infected AI/AN lived in urban areas at HIV diagnosis.

Rates of HIV Diagnosis

The estimated average annual rate of new diagnoses of HIV infection per 100,000 population for 2008-2011 among AI/AN adults and adolescents was 11.7, compared to 18.9 in the other race/ethnicity group (Table 1). The AI/AN diagnosis rate per 100,000 among males was three times that of females (18.1 vs. 5.6), but both rates were lower than for males and females in the other race/ethnicity group, 30.1 and 8.3, respectively. The HIV diagnosis rate of 16.1 per

100,000 for AI/AN living in large metropolitan areas at the time of diagnosis was considerably lower than the same rate for the other race/ethnicity group (23.7), but the rates were similar for AI/AN and the other race/ethnicity group living in smaller metropolitan and rural areas (Table 1).

Living with a Diagnosis of HIV infection

At the end of 2010, an estimated 3,187 AI/AN adults and adolescents were living with a diagnosis of HIV infection for a rate of 176.4 per 100,000 population (Table 2). Of these, 73.8% were male and 26.2% were female, with a rate among males (265.9 per 100,000) that was almost 3 times the rate among females (90.6 per 100,000). The highest rates of AI/AN living with HIV infection were among those aged 35-44 years (342.8 per 100,000) and those aged 45-54 years (310.2 per 100,000). The majority of AI/AN living with a diagnosis of HIV infection resided in a large metropolitan area when first diagnosed (61.4%). By transmission category, the majority of HIV infections among AI/AN males was attributed to male-to-male sexual contact (64.6%) and among females was attributed to heterosexual contact (65.2%). For females, the percentage of HIV infections attributed to IDU (31.8%) was higher among AI/AN than in the other race/ethnicity group (25.0%). For males, the percentage of HIV infections among AI/AN attributed to MSM/IDU (16.2%) was more than twice the percentage among the other race/ethnicity group (7.4%).

Late Diagnosis of HIV Infection

Late diagnosis, i.e., stage 3 HIV infection (AIDS) within 3 months of diagnosis, among all AI/AN adult and adolescents diagnosed during 2008-2010 did not differ significantly from that of the other race/ethnicity group (29.0% v. 27.7% [data not shown], chi-square = 0.5460, P= 0.4599). Among AI/AN, there was no statistically significant difference in the probability of late diagnosis for males compared to females (PR=1.20, CI 0.89, 1.62, P=0.2388) (Table 3).

In the univariate analysis, the probability of late HIV diagnosis among AI/AN differed by age, facility of diagnosis, and residence in a county with IHS health facilities (Table 3) but not by sex, male or female transmission category, or population density of area of residence. The probability of late diagnosis increased with advancing age, especially for AI/AN aged 35-44 years (PR = 1.86, CI 1.10, 3.12, P= 0.0197) and 45 years and older (PR = 2.72, CI 1.65, 4.48, P< 0.0001), compared to the youngest group (13-24 years). Compared to AI/AN diagnosed at CTS/STD facilities, the probability of late diagnosis was higher for AI/AN diagnosed in outpatient settings (PR 5.0, CI 2.25, 11.13, P < 0.0001), in inpatient/ER facilities (PR 10.1, CI 4.62, 22.30, P <.0001), and in other facilities (PR 4.66, CI 1.79, 12.14, P = 0.0016). AI/AN residing in IHS service counties had a higher probability of late diagnosis (PR 1.49, CI 1.13, 1.96, P = 0.0050), compared to AI/AN living in counties without IHS health facilities.

Table 1. Estimated number, percent and rate of diagnoses of HIV infection among American Indians and Alaska Natives (AI/AN) aged ≥13 years compared to the other race/ethnicity group, by selected characteristics, 2008-2011, United States

Characteristic	AI/AN			Other Race/Ethnicity[a]			Total	
	No.	%	Rate[b]	No.	%	Rate[b]	No.	%
Sex								
Male	652	75.7	18.1	148,585	77.5	30.1	149,238	77.5
Female	210	24.3	5.6	43,122	22.5	8.3	43,332	22.5
Age group at diagnosis (yrs)								
13-14	0	0.0		172	0.1	0.5	172	0.1
15-24	139	16.1	8.8	37,943	19.8	22.1	38,081	19.8
25-34	284	32.9	21.6	51,932	27.1	31.6	52,216	27.1
35-44	220	25.6	18.3	47,356	24.7	28.8	47,576	24.7
45-54	153	17.8	11.9	37,282	19.4	21.0	37,435	19.4
55-64	52	6.1	5.6	13,495	7.0	9.5	13,547	7.0
65+	14	1.6	1.8	3,528	1.8	2.2	3,542	1.8
HIV transmission category - Male								
Male-to-male sexual contact	468	71.8	–	113,453	76.4	–	113,921	76.3
Injection drug use	59	9.0	–	10,075	6.8	–	10,134	6.8
Male-to-male sexual contact and injection drug use	65	10.0	–	6,087	4.1	–	6,152	4.1
Heterosexual contact[c]	59	9.0	–	18,811	12.7	–	18,870	12.6
Other[d]	1	0.2	–	160	0.1	–	161	0.1
HIV transmission category - Female								
Injection drug use	60	28.5	–	6,552	15.2	–	6,612	15.3
Heterosexual contact[c]	149	71.2	–	36,485	84.6	–	36,634	84.5
Other[d]	1	0.3	–	85	0.2	–	86	0.2
Facility type at diagnosis								
CTS/STD[e]	151	17.5	–	31,167	16.3	–	31,318	16.3
Inpatient/ER	183	21.2	–	37,064	19.3	–	37,247	19.3
Outpatient	340	39.4	–	71,376	37.2	–	71,715	37.2
Other	43	4.9	–	12,599	6.6	–	12,642	6.6
Unknown	146	16.9	–	39,502	20.6	–	39,647	20.6
Population density of area of residence at diagnosis[f]								
500,000+ (Large Metropolitan)	461	53.4	16.1	157,157	82.0	23.7	157,618	81.8
50,000 - 499,999 (Metropolitan)	165	19.1	10.8	20,943	10.9	11.4	21,108	11.0
<50,000 (Nonmetropolitan)	223	25.9	7.5	12,204	6.4	7.4	12,427	6.5
Unknown	14	1.6		1,403	0.7		1,417	0.7
Residence at diagnosis in IHS service county[g]								
Yes	539	62.5	11.6	35,784	18.7	16.0	36,323	18.9
No	323	37.5	11.7	155,923	81.3	19.8	156,246	81.1
TOTAL[h]	862	100	11.7	191,707	100	18.9	192,569	100

Note. The reported numbers have been statistically adjusted for reporting delays and missing risk factor information, but not incomplete reporting.

[a]Other race/ethnicity group comprises: whites, blacks/African Americans, Asians, Hispanics/Latinos, Native Hawaiians/other Pacific Islanders and multiple races, including American Indians and Alaska Natives of multiple race or with Hispanic ethnicity.

[b]Average annual rate of HIV diagnoses per 100,000 population. Rates are not calculated by transmission category, facility type or unknown area of residence because of lack of denominator data.

[c]Heterosexual contact with a person known to have, or to be at high risk for, HIV infection.

[d]Includes hemophilia, blood transfusion, perinatal exposure, and risk factor not reported or not identified.

[e]Includes counseling and testing sites (CTS), sexually transmitted diseases clinics (STD), family planning, and other screening, diagnostic and referral agencies.

[f]Population density of area of residence is based on Metropolitan Statistical Areas (MSAs) as defined by the Office of Management and Budget.

[g]Includes persons residing in one of the 625 counties where Indian Health Service (IHS) provides services.

[h]Because column totals for estimated numbers were calculated independently of the values for the subpopulations, values for each characteristic may not sum to the column total.

Table 2. Estimated number, percent, and rate of American Indians and Alaska Natives (AI/AN) living with a diagnosis of HIV Infection at the end of 2010, compared to the other race/ethnicity group, aged ≥13 years, by selected characteristics, United States

Characteristic	AI/AN			Other Race/ethnicity[a]		
	No.	%	Rate[b]	No.	%	Rate[b]
Sex						
Male	2,351	73.8	265.9	650,775	75.1	524.1
Female	836	26.2	90.6	216,129	24.9	165.7
Age group in 2010 (yrs)						
13-14	3	0.1	4.2	1,176	0.1	14.4
15-24	119	3.7	31.2	37,105	4.3	85.7
25-34	572	18	182.6	120,688	13.9	295.1
35-44	1,012	31.7	342.8	230,546	26.6	566.6
45-54	1,012	31.7	310.2	308,331	35.6	690.4
55-64	389	12.2	166.1	134,440	15.5	367.9
65+	80	2.5	43.4	34,622	4	85.9
HIV transmission category - Male						
Male-to-male sexual contact	1,518	64.6		438,890	67.4	
Injection drug use	259	11		86,257	13.3	
Male-to-male sexual contact and injection drug use	382	16.2		48,332	7.4	
Heterosexual contact[c]	172	7.3		70,384	10.8	
Other[d]	20	0.8		6,912	1.1	
HIV transmission category - Female						
Injection drug use	266	31.8		53,948	25	
Heterosexual contact[c]	545	65.2		156,161	72.3	
Other[d]	25	3.1		6,021	2.8	
Facility type at diagnosis						
CTS/STD[e]	465	14.6		94,693	10.9	
Inpatient/ER	484	15.2		156,525	18.1	
Outpatient	1,223	38.4		307,671	35.5	
Other	228	7.2		60,546	7	
Unknown/Missing	787	24.7		247,474	28.5	
Population density of area of residence at diagnosis[f]						
500,000+ (Large Metropolitan)	1,957	61.4	289.1	718,672	82.9	430.6
50,000 - 499,999 (Metropolitan)	521	16.3	137.6	86,287	10	186.5
<50,000 (Nonmetropolitan)	663	20.8	88.3	53,243	6.1	128.5
Unknown	46	1.4		8,707	1	
Residence at diagnosis in IHS service county[g]						
Yes	1,767	55.4	153.1	162,099	18.7	287.7
No	1,421	44.6	217.5	704,809	81.3	355.5
TOTAL[h]	3,187	100	176.4	866,908	100	340.5

Note. The reported numbers have been statistically adjusted for reporting delays and missing risk factor information, but not for incomplete reporting.

[a]Other race/ethnicity group comprises: whites, blacks/African Americans, Asians, Hispanics/Latinos, Native Hawaiians/other Pacific Islanders and multiple races, including American Indians and Alaska Natives of multiple race or with Hispanic ethnicity.

[b]Annual rate of HIV diagnoses per 100,000 population. Rates are not calculated by transmission category, facility type or unknown area of residence because of lack of denominator data.

[c]Heterosexual contact with a person known to have, or to be at high risk for, HIV infection.

[d]Includes hemophilia, blood transfusion, perinatal exposure, and risk factor not reported or not identified.

[e]Includes counseling and testing sites (CTS), sexually transmitted diseases clinics (STD), family planning, and other screening, diagnostic and referral agencies.

[f]Population density of area of residence is based on Metropolitan Statistical Areas (MSAs) as defined by the Office of Management and Budget (OMB).

[g]Includes persons residing in one of the 625 counties where Indian Health Service (IHS) provides services.

[h]Because column totals for estimated numbers were calculated independently of the values for the subpopulations, values for each characteristic may not sum to the column total. For the other race/ethnicity group, sex was missing for 4 persons and HIV transmission category was missing for 3 males.

Table 3. Estimated number, percent and probability of late diagnosis of HIV infection among American Indians and Alaska Natives, aged ≥13 years, by selected characteristics, 2008-2010, United States

Characteristic	Stage 3 (AIDS) within 3 months after HIV diagnosis						
	Total	Yes[a]		No[b]		Univariate Prevalence Ratio[c]	
	No.	No.	%	No.	%	PR (95% C.I.)	*P* value[d]
Sex							
Male	491	148	30.2	343	69.8	1.20 (0.89,1.62)	0.2388
Female	159	40	25.2	119	74.8	Referent	
Age group at diagnosis (yrs)							
13–24	89	15	16.4	75	83.6	Referent	
25–34	225	48	21.5	176	78.5	1.31 (0.77,2.24)	0.3120
35–44	172	52	30.4	120	69.6	1.86 (1.10,3.12)	0.0197
45+	164	73	44.6	91	55.4	2.72 (1.65,4.48)	<0.0001
HIV Transmission category - Male							
Male-to-male sexual contact	349	99	28.5	249	71.5	0.75 (0.50,1.13)	0.1680
Injection drug use	42	17	41.2	25	58.8	1.09 (0.65,1.13)	0.7391
Male-to-male sexual contact and injection drug use	53	14	25.7	39	74.3	0.68 (0.38,1.22)	0.1953
Heterosexual contact[e]	47	17	37.1	29	62.9	Referent	
Other[c,f]	1	1	85.7	0	14.3	**N/A**	
HIV Transmission category - Female							
Injection drug use	41	12	29.6	29	70.4	1.25 (0.70,2.21)	0.4516
Heterosexual contact[e]	117	28	23.5	90	76.5	Referent	
Other[c,f]	1	0	68.7	0	31.3	**N/A**	
Facility type at HIV diagnosis							
CTS/STD[g]	109	6	5.6	103	94.4	Referent	
Inpatient/ER	140	79	56.5	61	43.5	10.1 (4.62, 22.30)	<0.0001
Outpatient	247	69	27.9	178	72.1	5.00 (2.25,11.13)	<0.0001
Other	34	9	25.9	26	74.1	4.66 (1.79,12.14)	0.0016
Unknown/Missing	120	26	21.3	94	78.7	3.82 (1.64,8.91)	0.0019
Population density of area of residence at diagnosis[h]							
500,000+ (Large Metropolitan)	340	96	28.1	244	71.9	Referent	
50,000–499,999 (Metropolitan)	143	39	27.1	104	72.9	0.99 (0.72,1.36)	0.9565
<50,000 (Nonmetropolitan)	156	54	34.4	103	65.6	1.26 (0.96,1.66)	0.0989
Unknown[c]	10	0	0	10	100	**N/A**	
Residence at diagnosis in IHS service county[i]							
Yes	416	137	32.8	279	67.2	1.49 (1.13,1.96)	0.0050
No	234	52	22.1	182	77.9	Referent	
Total[j]	650	188	29.0	462	71.0		

Note. The reported numbers have been statistically adjusted for reporting delays and missing risk factor information, but not incomplete reporting.

[a]Late Diagnosis is defined as HIV Stage 3 (AIDS) diagnosis received <3 months of initial HIV diagnosis.

[b]HIV Stage 3 diagnosis ≥3 months after HIV diagnosis or no HIV Stage 3 (AIDS) diagnosis.

[c]Prevalence ratios exclude 'other' from male and female transmission categories and 'unknown' from population density of area of residence because of small cell size.

[d]Statistically significant if *p* value <0.05.

[e]Heterosexual contact with a person known to have, or to be at high risk for, HIV infection.

[f]Includes hemophilia, blood transfusion, perinatal exposure, and risk factor not reported or not identified.

[g]Includes counseling & testing sites (CTS), sexually transmitted diseases clinics (STD), family planning, & other screening, diagnostic and referral agencies.

[h]Population density of area of residence is based on Metropolitan Statistical Areas (MSAs) as defined by the OMB.

[i]Includes persons residing in one of 625 counties where Indian Health Service (IHS) provides services.

[j]Because column totals for estimated numbers were calculated independently of the values for the subpopulations, values for each characteristic may not sum to the column total.

In the univariate analysis stratified by sex, AI/AN males had a higher probability of late diagnosis with increasing age; diagnosis in an inpatient/ER, outpatient facility or other facility; and residence in an IHS service county (Table 4). In the multivariate model for AI/AN males, predictors of late diagnosis were age ≥35 years and diagnosis in an outpatient, inpatient/ER or other setting. For females, the only significant predictor of late diagnosis in the univariate model was diagnosis in an inpatient/ER facility (PR 6.81, CI 1.82, 25.4, $P = 0.0043$).

Table 4. Estimated number, percent and probability of late diagnosis of HIV infection among American Indian/ Alaska Native males, aged ≥13 years, by selected characteristics, 2008-2010, United States

Characteristic	Stage 3 (AIDS) within 3 months after HIV diagnosis					Prevalence Ratio			
	Total	Yes[a]		No[b]		Univariate	Multivariate	*P* value[c]	*P* value[c]
	No.	No.	%	No.	%	PR (95% C.I.)	PR (95% C.I.)	Univariate	Multivariate
Age group at diagnosis (yrs)									
13–24	73	11	15.7	62	84.3	Referent	Referent		
25–34	180	42	23.5	138	76.5	1.50(0.83,2.71)	1.30(0.74,2.29)	0.1830	0.3617
35–44	130	43	32.8	87	67.2	2.09(1.16,3.76)	1.79(1.03,3.13)	0.0136	0.0390
45+	108	52	48	56	52.0	3.06(1.74,5.39)	2.44(1.43,4.16)	0.0001	0.0011
Facility Type at HIV Diagnosis									
CTS/STD[d]	86	5	5.8	81	94.2	Referent	Referent		
Inpatient/ER	101	60	59	41	41.0	10.1(4.27,23.94)	8.64(3.64,20.49)	<0.0001	<0.0001
Outpatient	188	56	30	132	70.0	5.13(2.14,12.31)	4.59(1.92,10.98)	0.0002	0.0006
Other	27	8	28.7	19	71.3	4.92(1.75,13.83)	4.64(1.67,12.91)	0.0025	0.0033
Unknown/Missing	88	19	22	69	78.0	3.77(1.48,9.59)	3.33(1.31,8.45)	0.0053	0.0113
Residence at diagnosis in IHS service county[e]									
Yes	307	105	34.3	202	65.7	1.47(1.08,1.99)	1.14(0.85,1.53)	0.0134	0.3898
No	184	43	23.3	141	76.7	Referent	Referent		
Total[f]	491	148	30.2	343	69.8				

Note. The reported numbers have been statistically adjusted for reporting delays and missing risk factor information, but not for incomplete reporting.

[a]Late Diagnosis is defined as HIV Stage 3 (AIDS) diagnosis received <3 months of initial HIV diagnosis.

[b]HIV Stage 3 diagnosis ≥3 months after HIV diagnosis or no HIV Stage 3 (AIDS) diagnosis.

[c]Statistically significant if p value 0.05.

[d]Includes counseling and testing sites (CTS), sexually transmitted diseases clinics (STD), family planning, and other screening, diagnostic and referral agencies.

[e]Includes persons residing in one of 625 counties where Indian Health Service (IHS) provides services.

[f]Because column totals for estimated numbers were calculated independently of the values for the subpopulations, values in each column may not sum to the column total.

DISCUSSION

General Findings

Males, individuals aged 25-34 years, those diagnosed in an outpatient facility, individuals living in a large metropolitan area at diagnosis, and individuals living in an IHS service county accounted for the highest percentages of AI/AN diagnosed with HIV infection. The epidemiologic profile of HIV among AI/AN was similar to that of the other race/ethnicity group, with a few exceptions: the percentage of infections attributed to IDU was significantly higher for AI/AN females; the percentage of infections attributed to IDU and MSM/IDU was significantly higher for AI/AN males, while the percentage attributed to heterosexual contact was lower; and

AI/AN had 4 times the percentage of HIV-diagnosed persons living in a rural area at diagnosis, although rates of diagnosis of HIV infection were the same.

Transmission Category

The majority of diagnoses of HIV infections among AI/AN were among males, particularly among MSM, which is consistent with the disproportionate impact of HIV on MSM among all races/ethnicities (CDC, 2013a; Burks, et al. 2011). The relatively lower proportion of infections attributed to heterosexual contact among AI/AN males, compared to the other race/ethnicity group, was likely due to the higher percentage of infections attributed to IDU. Considering that over 28% of HIV infections diagnosed among AI/AN females were attributed to IDU and over 90% of diagnoses among males were attributed to MSM, IDU or both MSM/IDU, prevention counseling and HIV treatment may need to address both risk behaviors. IDU and other substance abuse among AI/AN of both sexes has been associated with poverty, unemployment and historical trauma and with sexual behaviors that increase HIV risk (CDC, 2012c; NASTAD, 2004; Simoni, et al. 2004; Diamond, et al. 2001; Baldwin, et al. 1996). While the number of new HIV infections due to IDU in the United States has decreased overall, likely due to substance abuse treatment and syringe exchange programs (Hall, et al. 2008), access to such risk-reduction programs may be especially challenging in rural areas, where many AI/AN live. Cultural norms, including reticence about discussing drug use or sexual activities, and stigma regarding homosexuality have been previously described (GAO, 2007) and could result in late diagnosis if HIV testing decisions are based on behavioral risk assessment in lieu of testing as part of standard practice. Since 2006, consistent with CDC recommendations (Branson, et al. 2006), IHS has supported and piloted universal routine testing for HIV, where allowed by local laws, and several tribal organizations have adopted supporting resolutions (IHS, 2012a; Reilley, et al. 2010). In addition to implementing universal HIV screening for all patients aged 13-64 years, health care systems can develop culturally sensitive prevention counseling strategies for AI/AN, especially MSM and IDU, to identify persons who need more frequent HIV screening (Branson, et al. 2006).

Late diagnosis

The percentage of AI/AN diagnosed with Stage 3 HIV infection (AIDS) within 3 months of their HIV diagnosis (29%) was similar to that among HIV-infected persons in the other race/ethnicity category (27%), indicating the need for improvement in the coverage of testing efforts among both groups. Early diagnosis and treatment maximizes the survival and prevention benefits of antiretroviral therapy (CDC, 2009; Hall, et al. 2006; Hall, 2012). It was expected that AI/AN diagnosed late would be older, similar to other studies for all races/ethnicities, because older age is a risk factor for HIV disease progression due to diminished immune function or presence of comorbid conditions, and because testing may be motivated by symptoms of Stage 3 HIV infection (CDC, 2009; Hall, et al. 2006). The association of late diagnosis for males and females with diagnosis in a hospital or ER may be due to advanced disease with symptoms or requiring hospitalization.

The higher probability of late diagnosis for residents of counties with IHS facilities, which was significant in the univariate analyses for all AI/AN and for males warrants exploration because the presence of I/T/U facilities is expected to increase convenient access to testing. However, testing must be perceived as a need by AI/AN and their providers, and be acceptable to AI/AN persons served by I/T/U facilities, to increase testing opportunities and test delivery (GAO, 2007; IHS, 2012a; Native Communities, 2004; Lapidus, et al. 2006). IHS recommends that facilities consider methods to improve HIV testing among males and has piloted universal

screening for females and males in some IHS facilities, with some tribal support. IHS also has strived to increase routine testing by adding quality-of-care performance measures to IHS clinical databases to indicate date of last HIV test for patients aged 13-64 years and to calculate the proportion of eligible patients who have not been tested (IHS, 2012a; IHS, 2013) , which is likely to increase testing for both AI/AN males and females.

Among the other race/ethnicity group, males whose HIV infections were attributed to MSM and MSM/IDU had a lower probability of late diagnosis than heterosexuals (CDC, 2013a; Helms, et al. 2009), reflecting more frequent testing behaviors in these groups, but there was no statistically significant difference for AI/AN MSM and MSM/IDU in our study. This result may be due to factors that could include greater stigma in AI/AN communities, a lack of accessible testing venues for frequent testers, or concerns about confidentiality, particularly on tribal lands (GAO, 2007; NASTAD, 2004; Lapidus, et al. 2006).

AI/AN females, consistent with findings among females generally, likely have more testing opportunities than males when they receive prenatal care, seek family planning services, have annual cervical cancer screening or attend other medical visits (GAO, 2007; IHS, 2012a; CDC, 2009). In addition, in 2006, IHS implemented HIV screening recommendations for all pregnant women. Additionally, enhanced HIV and STD screening was recommended as a follow-up to any positive STD test for all females and males (Branson, et al. 2006; IHS, 2012a). The IHS also instituted quality indicators in IHS facilities, which resulted in substantial increases in prenatal HIV screening during 2006-2011 (GAO, 2007; IHS, 2013; Reilley, et al. 2010).

While HIV diagnosis rates were more than twice as high for AI/AN residing in metropolitan than in rural areas, more than 25% of AI/AN diagnosed with HIV resided in rural areas, demonstrating that HIV is not only an urban concern for Native Americans. Forty one percent of AI/AN adults and adolescents lived in rural areas in 2010, compared to 16% of the other race/ethnicity group (U.S. Census, 2012b). Native American communities in rural areas offer factors than can strengthen HIV care and prevention, including strong family, tribal and community ties, spirituality, traditionalism, and cultural practices (NASTAD, 2004; Native Communities, 2004). On the other hand, rural residence for large numbers of AI/AN can present challenges for HIV prevention, testing, and linkage to care and treatment, because of geographic isolation, limited resources, reduced access to care, confidentiality concerns, stigma, and poverty (GAO, 2007; NASTAD, 2004; Reilley, et al. 2010; Native Communities, 2004; Rural, 2009).

HIV Prevention Efforts

A number of federal, state, tribal and community-based organizations have conducted culturally appropriate campaigns to increase awareness of HIV risk and promote HIV testing among AI/AN (NASTAD 2004; IHS, 2012a; IHS, 2012b; ANTHC, 2013). Social marketing approaches are underway to raise HIV and STD awareness among AI/AN, especially because of high rates of STDs among some AI/AN (CDC, 2012a). There are also campaigns to combat the stigma attached to being a "Two Spirit" male (gay, bisexual, or transgendered) and to HIV testing in general (Burks, et al. 2011; NNAAPC, 2012). Such efforts could reduce the number of late diagnoses among AI/AN, improve survival, and prevent further transmission, because studies show that persons who are aware of their HIV infection are more likely to reduce the risk behaviors that transmit the virus to others (CDC, 2009; Hall, et al. 2006; Marks, et al. 2005). CDC's High-Impact HIV Prevention (HIP) approach emphasizes HIV testing and linkage to and retention in care as well as treatment early in HIV infection. This is likely to improve health outcomes as well as prevent transmission of the virus to others (CDC, 2011; Cohen, et al. 2011). The National HIV/AIDS Strategy (NHAS) calls for reducing new HIV infections, increasing

access to care and improving health outcomes for people living with HIV, and reducing HIV-related health disparities (ONAP, 2010). In accordance with NHAS, CDC has recommended improvements in HIV surveillance efforts in AI/AN communities (CDC, 2013b).

Limitations

This report is subject to several limitations. Hispanic and multi-race AI/AN were included in the other race/ethnicity group to be consistent with CDC HIV Surveillance Reports which use mutually-exclusive race/ethnicity categories (CDC 2013a); therefore these estimates for AI/AN do not fully represent the burden of HIV in AI/AN communities. In the 2010 Census, 44 percent of persons who identified as AI/AN reported being AI/AN in combination with one or more other races (U.S. Census 2012a). Some underreporting of HIV may have occurred due to confusion about case reporting responsibilities for persons diagnosed on tribal lands or in a state other than his or her state of residence (NASTAD, 2004). In addition, there is evidence of misidentification of race/ethnicity for AI/AN in some surveillance systems, varying from 3.5% to 55%, that may lead to underestimation of HIV rates among AI/AN (NASTAD, 2004; Bertolli, et al. 2007), particularly in urban areas. It also should be noted that AI/AN residing in IHS service counties at the time of diagnosis may have been diagnosed in non-IHS facilities or diagnosed outside of those counties. Because information identifying reporting facilities of specific tribal health systems was not consistently collected by the national HIV surveillance system during 2008-2011, the percentage of AI/AN initially diagnosed with HIV infection at tribal health system facilities is not known. Statistical results comparing a relatively small population (AI/AN) to the extremely large other race/ethnicity group must be interpreted carefully because the relative uncertainty for an estimate of small proportion is large.

CONCLUSION

AI/AN at risk for HIV infection present unique needs and opportunities for HIV prevention. Increased routine HIV testing for AI/AN living in rural as well as larger metropolitan areas at a variety of public health clinics and outpatient facilities could reduce stigma and prevent late diagnoses. Better identification of AI/AN would contribute to improved HIV surveillance and prevention, especially in urban areas. Higher percentages of injection drug use among HIV-infected AI/AN is an indication for the provision of HIV prevention and treatment services integrated with substance abuse rehabilitation and outreach tailored to this population. Early detection of HIV infection along with linkage to and retention in care are needed for AI/AN, especially among MSM and IDU, to decrease HIV transmission and improve survival.

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