South Dakota Epidemiologic Profile of HIV/AIDS 1985-2014

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Acronyms

AIDS – Acquired Immune Deficiency Syndrome
CDC – Centers for Disease Control and Prevention
DIS – Disease Intervention Specialists (Department of Health field investigators)
eHARS – Enhanced HIV/AIDS Reporting System
HIV – Human Immunodeficiency Virus
HRH – High Risk Heterosexual
IDU – Injection Drug User
MSM – Men Who Have Sex with Men
NHAS – National HIV/AIDS Strategy
NIR- No Identified Risk
NRR- No Risk Reported
PS – Partner Services
SD DOH – South Dakota Department of Health
STD – Sexually Transmitted Disease

Definitions

HIV Prevalence − The number of persons living with HIV disease at a given time regardless of the time of infection, the date of diagnosis, or the stage of HIV disease. Although prevalence does not indicate how long a person has had a disease, it can be used to estimate the probability that a person selected at random from a population will have the disease. CDC reports prevalence as the number of persons living with HIV infection in a given population at a given time and also reports prevalence rates, calculated per 100,000 population.

Uses − Prevalence is useful for planning and resource allocation, as it reflects the number of people currently needing care and treatment services for their HIV infection. Prevalence rates are useful for comparing HIV disease between populations and for monitoring trends over time.

HIV Incidence − In general, incidence is expressed as the estimated number of persons newly infected with HIV during a specified time period (e.g., a year), or as a rate calculated by dividing the estimated number of persons newly infected with HIV during a specified time period by the number of persons at risk for HIV infection. It is important to understand the difference between HIV incidence and a new diagnosis of HIV infection. HIV incidence refers to persons newly infected with HIV, whereas a person newly diagnosed with HIV may have been infected years before being diagnosed.

Uses − Incidence estimates are useful for planning and allocation of funds, as well as evaluating the impact of prevention programs.

Exposure Categories

For the purposes of this report, HIV/AIDS cases were placed in one of several risk categories, based on information collected. Persons with more than one reported mode of exposure to HIV were assigned to the category that presented the greatest risk. Definitions are as follows:

Heterosexual (Heterosexual) − Heterosexual contact with a person with HIV or AIDS but no known risk factor

Injection Drug Use (IDU) − Injection drug use (non-prescribed)

Men Who Have Sex with Men (MSM) − Male sexual contact with other males

MSM and IDU − Male sex with males and injection drug use

No Indicated Risk (NIR) − Unspecified, or no identified risk (NIR), cases are those in persons who have no reported history of exposure at the time of the report date. This category includes persons for whom the surveillance protocols to document risk behavior information have not yet been completed, persons whose exposure history is incomplete because they have died, persons who have declined to disclose their risk behavior or who deny any risk behavior, and persons who do not know the HIV status or risk behaviors of their sex partners.

No Risk Reported (NRR) − Frequently, HIV and AIDS cases are reported to the state and local health department with no risk specified. The case is considered NRR if risk information is absent from the initial case report because the information had not been reported by the reporting source, had not been sought, or had not been found by the time the case was reported. Cases may remain NRR until epidemiologic follow-up has been completed and potential risks (exposures) have been identified. If epidemiologic follow-up has been completed and risk has not been identified within 12 months of being reported as NRR, the case may be considered NIR.

Other − Other includes hemophilia, blood transfusions, occupational hazards like a needle stick, and other modes of transmission that do not fall under HRH, IDU, MSM, NIR, NRR, or Perinatal.

Perinatal − Perinatal HIV cases are cases of HIV infection in children resulting from transmission from an HIV-positive mother.

SOUTH DAKOTA EPIDEMIOLOGIC PROFILE OF HIV/AIDS – 1985-2014

Background

Human Immunodeficiency Virus (HIV) is the cause of acquired immunodeficiency syndrome (AIDS). Both HIV-1 and HIV-2 cause AIDS but HIV-1 is found worldwide, whereas HIV-2 is found primarily in West Africa.

The transmission of HIV occurs primarily by sexual contact and by transfer of infected blood. Perinatal transmission from infected mother to neonate also occurs, either across the placenta, at birth, or via breast milk. Transmission of HIV via blood transfusion has been greatly reduced by screening donated blood for the presence of antibodies.

Worldwide, it is estimated that approximately 40 million people are infected, two-thirds of whom live in sub-Saharan Africa. Three regions, Africa, Asia, and Latin America have the highest rates of new infections. AIDS is the fourth leading cause of death worldwide.

Current HIV Testing Algorithm for Serum or Plasma Specimens

Testing begins with a combination immunoassay that detects HIV-1 and HIV-2 antibodies and HIV-1 p24 antigen. All specimens reactive on this initial assay undergo supplemental testing with an immunoassay that differentiates HIV-1 from HIV-2 antibodies. Specimens that are reactive on the initial immunoassay and nonreactive or indeterminate on the antibody differentiation assay proceed to HIV-1 nucleic acid testing for resolution. The results of this algorithm may be used to identify persons likely to benefit from treatment, to reassure persons who are uninfected, and for reporting evidence of HIV infection to public health authorities.[1]

1. Laboratories should conduct initial testing for HIV with an FDA-approved antigen/antibody combination immunoassay that detects HIV-1 and HIV-2 antibodies and HIV-1 p24 antigen to screen for established infection with HIV-1 or HIV-2 and for acute HIV-1 infection. No further testing is required for specimens that are nonreactive on the initial immunoassay.

2. Specimens with a reactive antigen/antibody combination immunoassay result (or repeatedly reactive, if repeat testing is recommended by the manufacturer or required by regulatory authorities) should be tested with an FDA-approved antibody immunoassay that differentiates HIV-1 antibodies from HIV-2 antibodies. Reactive results on the initial antigen/antibody combination immunoassay and the HIV-1/HIV-2 antibody differentiation immunoassay should be interpreted as positive for HIV-1 antibodies, HIV-2 antibodies, or HIV antibodies, undifferentiated.

3. Specimens that are reactive on the initial antigen/antibody combination immunoassay and nonreactive or indeterminate on the HIV-1/HIV-2 antibody differentiation immunoassay should be tested with an FDA-approved HIV-1 nucleic acid test (NAT).

• A reactive HIV-1 NAT result and nonreactive HIV-1/HIV-2 antibody differentiation immunoassay result indicates laboratory evidence for acute HIV-1 infection.

• A reactive HIV-1 NAT result and indeterminate HIV-1/HIV-2 antibody differentiation immunoassay result indicates the presence of HIV-1 infection confirmed by HIV-1 NAT.

• A negative HIV-1 NAT result and nonreactive or indeterminate HIV-1/HIV-2 antibody differentiation immunoassay result indicates a false-positive result on the initial immunoassay.

4. Laboratories should use this same testing algorithm, beginning with an antigen/antibody combination immunoassay, with serum or plasma specimens submitted for testing after a reactive (preliminary positive) result from any rapid HIV test.

Currently two types of tests are used for HIV screening and diagnosis in SD: GS HIV Combo Ag/Ab EIA and Multispot HIV-1/HIV-2 Rapid test (Bio-Rad).

GS HIV Combo Ag/Ab EIA is an enzyme immunoassay based on the principle of the sandwich techniques for the qualitative detection of HIV-1 p24 antigen and detection of envelope antibodies associated with HIV-1 and/or HIV-2 virus in human serum or plasma and its sensitivity in the HIV-1 known positive population was 100% (95% CI: 99.7%-100%), specificity in the low and high risk pediatric population was 99.75% (95% CI: 98.60%-99.96%).

Multispot HIV-1/HIV-2 Rapid test has a sensitivity of 100% (95% CI = 99.94 – 100.00%) and a specificity of 99.93% (95% CI = 99.79 – 100.00%).

The first test is used for screening purposes while the second is used for confirmatory purposes.

The goal of the current HIV-AIDS profile analysis in South Dakota was to identify epidemiologic characteristics of HIV/AIDS in the state, identify trends and gaps in patient care, case management, screening and diagnostic practices, and provide recommendations. Due to the low number of case reports, we were unable to calculate the estimated number of HIV cases in the state using CDC-provided guidelines. Therefore, this report will focus on the reported number of HIV/AIDS cases.

Case Definitions

Case definitions have changed several times since 1982 and have also undergone major revisions [2-7].

The CDC AIDS case definition has changed over time based on knowledge of HIV disease and physician practice patterns. The original definition was modified in 1985. In 1987, definition revisions incorporated a broader range of AIDS opportunistic infections and conditions and used HIV diagnostic tests to improve the sensitivity and specificity of the definition. In 1993, the definition expanded to include HIV-infected individuals with pulmonary tuberculosis, recurrent pneumonia, invasive cervical cancer, or CD4 T-lymphocyte counts of less than 200 cells per ml or a CD4+ percentage of less than 14. As a result of the 1993 definition expansion, HIV-infected persons were classified as AIDS earlier in their course of disease than under the previous definition. Regardless of the year, AIDS data are tabulated in this report by the date of the first AIDS defining condition in an individual under the 1993 case definition.

The case definition for HIV infection was revised in 1999 to include positive results or reports of detectable quantities of HIV virologic (non-antibody) tests. The revisions to the 1993 surveillance definition of HIV include additional laboratory evidence, specifically detectable quantities from virologic tests. The perinatal case definition for infection and remission of symptoms among children less than 18 months of age who are perinatally-exposed to HIV was changed to incorporate the recent clinical guidelines and the sensitivity and specificity of current HIV diagnostic tests in order to more efficiently classify HIV-exposed children as infected or non-infected.

Basic Demographics of South Dakota Population

South Dakota is a largely rural state in the Midwest with an area of 77,116 square miles and a population of 844,877.

Table 1. South Dakota Population by Race and Gender, 2013 Census Estimates

Total Population	**844,877**
White	725,386
American Indian	75,233
Black	15,735
Asian	9,863
Pacific Islander	622
Multiple Races	18,038
Hispanic	28,725
Non-Hispanic	816,152
Male	424,378
White	363,748
American Indian	37,216
Black	9,339
Asian	4,770
Pacific Islander	329
Multiple Races	8,976
Hispanic	15,417
Non-Hispanic	408,961
Female	420,499
White	361,638
American Indian	38,017
Black	6,396
Asian	5,093
Pacific Islander	293
Multiple Races	9,062
Hispanic	13,308
Non-Hispanic	407,191

Methods

We used Enhanced HIV/AIDS Reporting System (eHARS) report for all HIV/AIDS cases reported to SD DOH during 1985 - 2014 calendar years and analyzed using SAS Enterprise guide 4. Personal identifiers of data were removed and major risk factors were maintained in the dataset. Variables analyzed and included in this report are the ones commonly used by the HIV/AIDS prevention program of SD DOH. Analysis included frequency, t-test, and X^2 test. Significance was determined as a p value < 0.05.

Results

Direct Measures

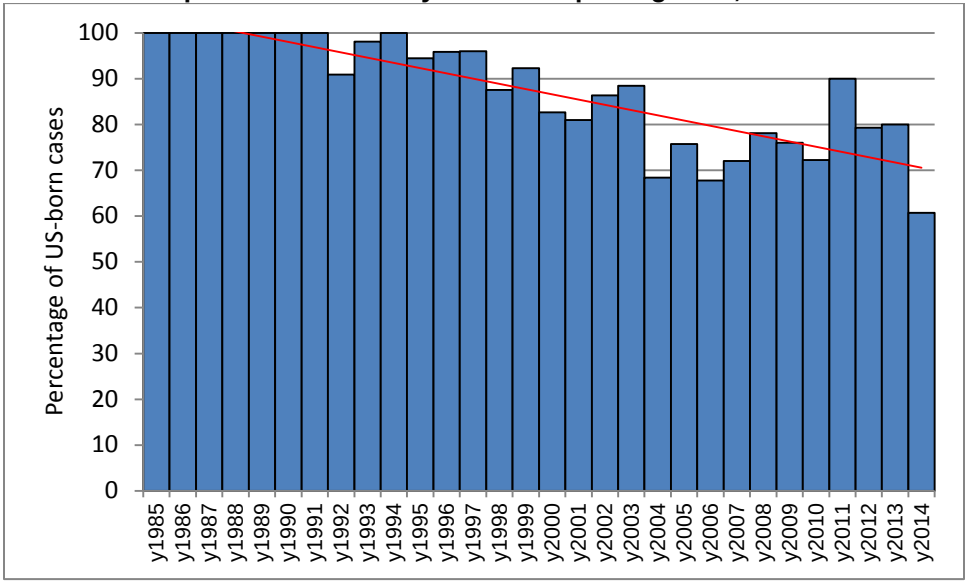
AIDS became a reportable condition in South Dakota in 1985 and HIV in 1988. Since then a total of 760 cases have been reported. To date 338 (47%) patients have HIV diagnosis only, 220

(30%) are classified as HIV and later AIDS, and HIV and AIDS were diagnosed simultaneously to 164 (23%) of cases.

The majority (86%) of South Dakota cases were born in the US, while 12% were born in Africa, 1% in Asia, <1% in Europe and 2% in South American nations.

However, the percentage of US-born HIV/AIDS cases appears to decrease over time.

Figure 1. Percentage of US and Non-US Born Individuals Diagnosed with HIV/AIDS and Reported to eHARS by Year of Reporting – SD, 1985-2014



The majority of cases reported to eHARS were diagnosed in South Dakota, while 2.1% were diagnosed in different states.

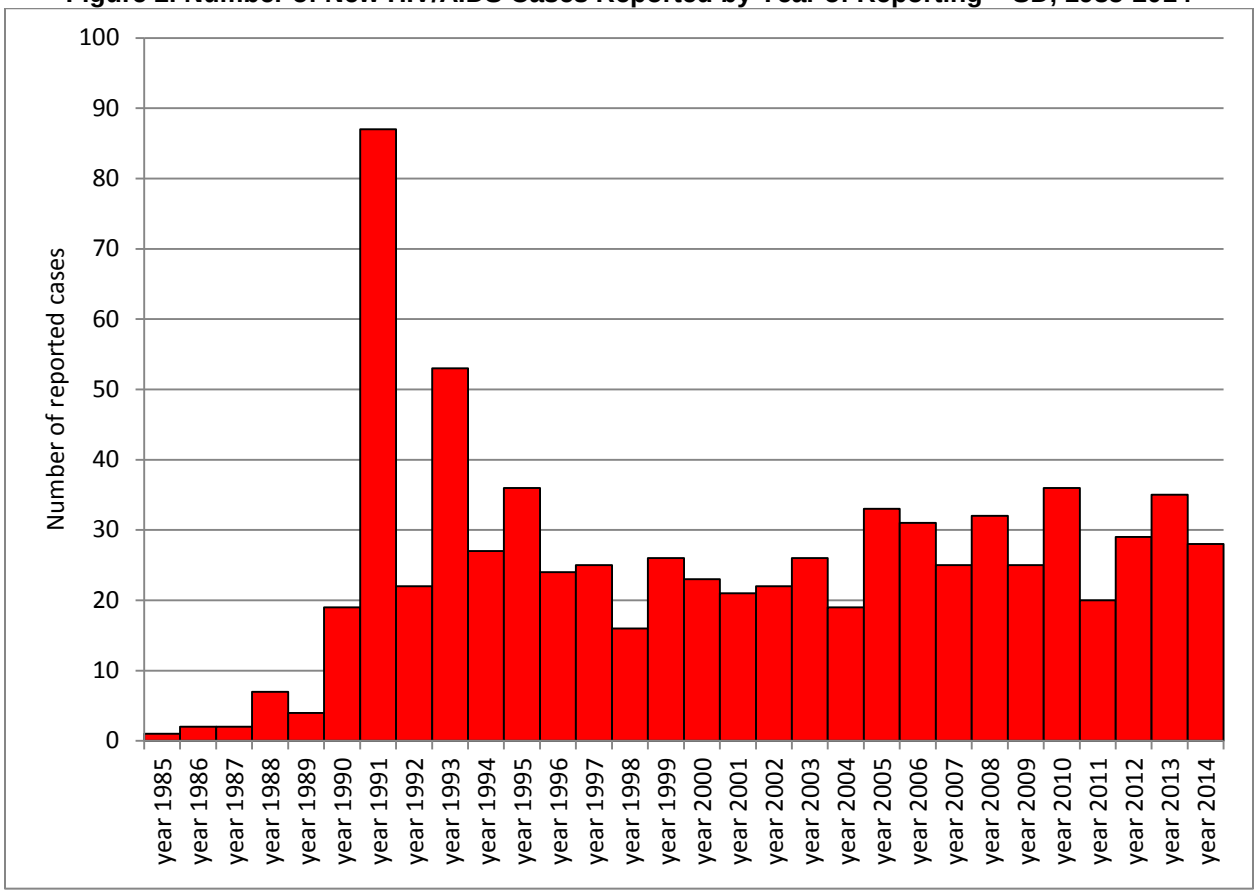
Table 2. Cases reported to eHARS by their diagnosis state – SD, 1985-2014

Diagnosis State	Frequency	Percent	Cumulative	Cumulative
			Frequency	Percent
Arizona	1	0.13	1	0.13
California	1	0.13	2	0.26
Colorado	3	0.39	5	0.66
Florida	1	0.13	6	0.79
Iowa	1	0.13	7	0.92
Minnesota	4	0.53	11	1.45
Mississippi	1	0.13	12	1.58
New York	3	0.39	15	1.97
Oklahoma	1	0.13	16	2.11
South Dakota	744	97.89	760	100

This graph shows new cases reported to the SD DOH. If we remove outliers from the list (years 1985-1989, 1991 and 1993) the average number of cases reported per year is 26.1 with an

incidence of 3.1 per 100,000 population and a prevalence of 65.8 per 100,000 population. This rate puts SD among one of the lowest incidence states in the nation[8].

Figure 2. Number of New HIV/AIDS Cases Reported by Year of Reporting – SD, 1985-2014



It appears that in the beginning of the HIV/AIDS epidemic the majority of cases reported to the SD DOH were classified as AIDS cases due to reporting requirements. That may result in a significant artifact of the surveillance system (e.g. focus on severe cases, AIDS reportable, but not HIV) while during the following years cases were detected at HIV status level. The case definition change in 1993 cannot explain the dramatic increase in case numbers in 1991. It appears that increased awareness among healthcare personnel and possibly misclassification of cases may have played a role in the sharp increase in 1991.

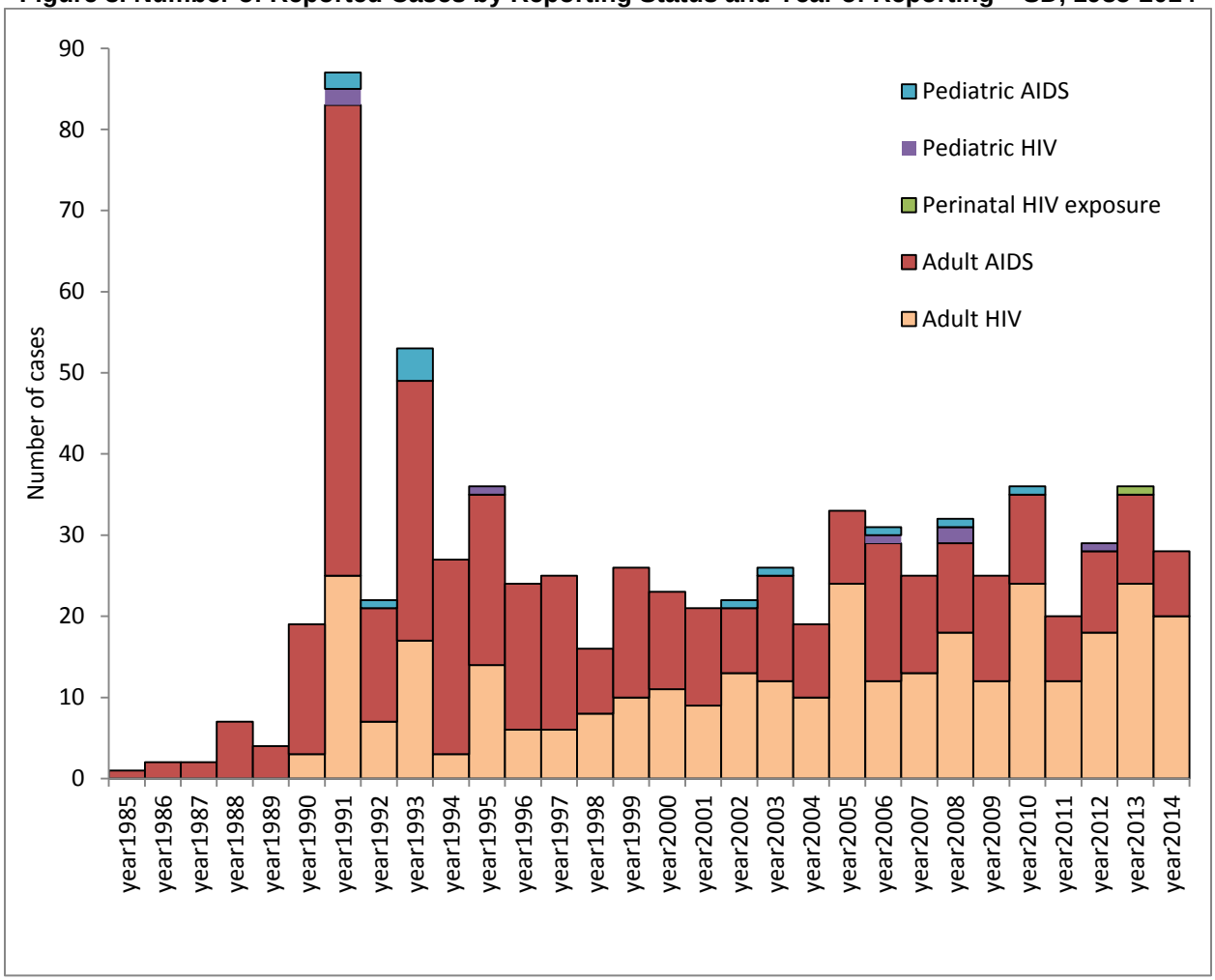
The CDC has changed case definitions several times (in 1982, 1985, 1987, 1993, and 2014)[2-7]. Each change added conditions previously unrecognized as HIV/AIDS related conditions (e.g. case definition sensitivity was gradually increased to capture more conditions and subsequently more cases). In 2006, CDC recommended screening for patients in all healthcare settings after the patient is notified that testing will be performed unless the patient declines (opt-out screening)[9]. Despite significant changes in case definitions (with increased sensitivity) and screening requirements (recommending screening for broader range of patients), the HIV/AIDS burden in South Dakota has remained stable over the years.

Possible explanations:

- Poor adherence to CDC recommendations on screening a wide range of patients

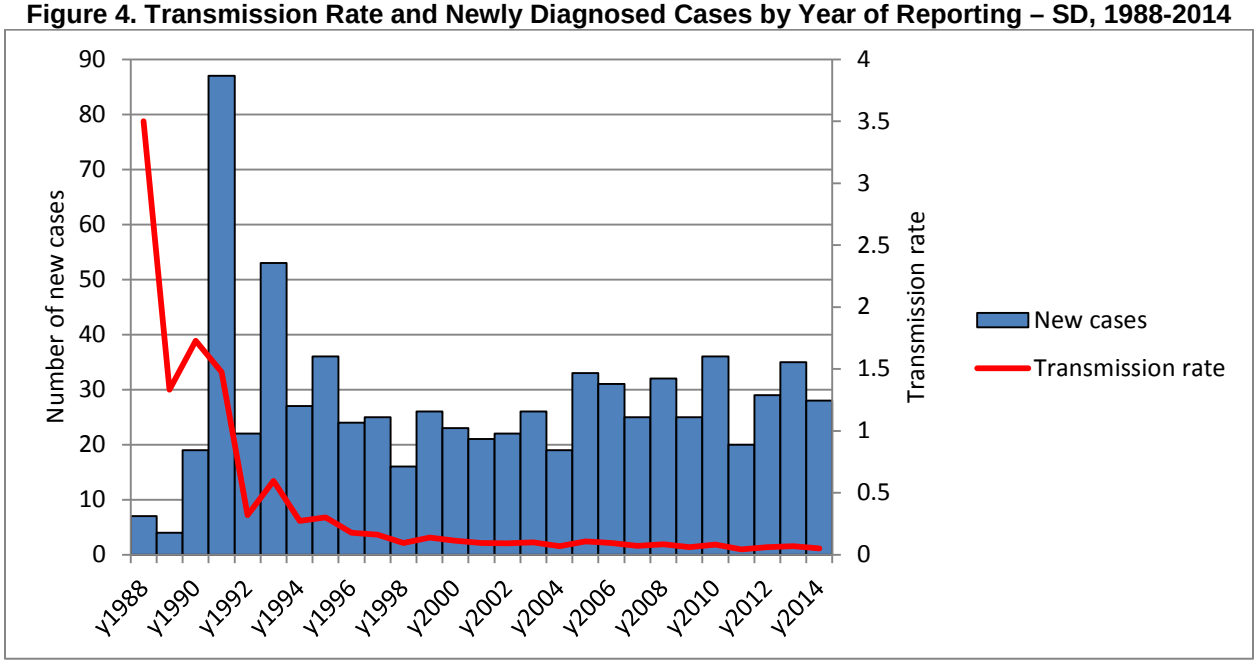
- Not targeting appropriate risk groups of patients
- Low transmission rate

Figure 3. Number of Reported Cases by Reporting Status and Year of Reporting – SD, 1985-2014



The transmission rate of a virus (number of newly reported cases in a year divided by the number of people known to be living with HIV/AIDS that year) has dramatically changed over the years. It was high in the beginning of the epidemic, but later dropped and still remains low. We have no explanation of this phenomenon, given the fact that in the absence of vaccine, the transmission rate is not expected to change over time.

Figure 4. Transmission Rate and Newly Diagnosed Cases by Year of Reporting – SD, 1988-2014



Demographic Characteristics of Reported Cases

During 1985-2014, HIV was diagnosed in 760 persons, of whom 563 (74%) were male and 197 (26%) were female. By race/ethnicity, 450 (59%) were white, 141 (19%) American Indians/Alaska Natives, 132 (17%) were black, 28 (4%) were Hispanic/Latino, and 7 (1%) were Asian.

The cumulative rate of diagnosed HIV/AIDS cases was 89.95 per 100,000 in SD. The cumulative rate for males was 2.8 times that for females (132.7/100,000 compared with 46.8/100,000).

By race/ethnicity, the rate was highest for blacks (838.9/100 000), and lowest for whites (62/100 000).

The cumulative rates for black females and black males were higher than those for all other groups (953/100,000 and 760/100,000, respectively). The third highest rate was for American Indian males (228/100,000).

Table 3. HIV/AIDS Diagnoses and Cumulative Rates among Persons in SD, by Race/Ethnicity and Sex – SD, 1985-2014

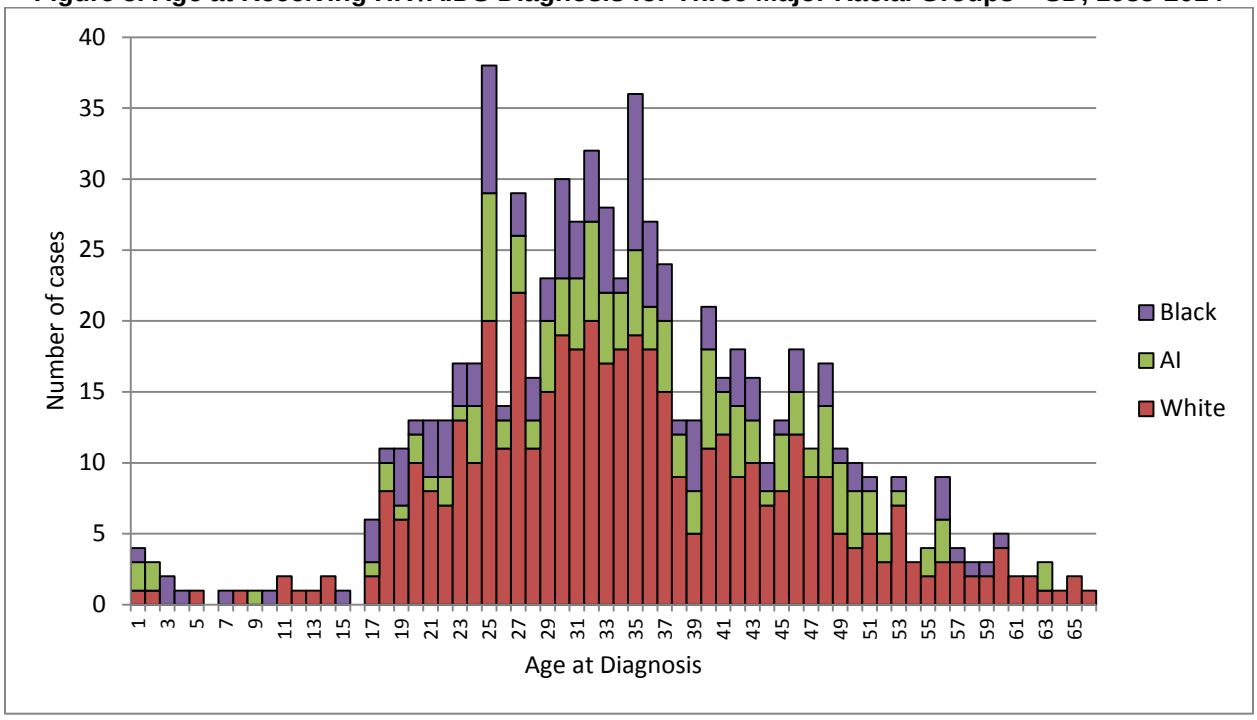
Race		Female	Rate* for females	Male	Rate* for males	Total	Rate* for total
White	Frequency	68	18.8	382	105.0	450	62.0
	Row Pct	15.11		84.89			
	Col Pct	34.52		67.85			
Black	Frequency	61	953.7	71	760.3	132	838.9
	Row Pct	46.21		53.79			
	Col Pct	30.96		12.61			
Hispanic	Frequency	7	52.6	21	136.2	28	97.5
	Row Pct	25		75			

	Col Pct	3.55		3.73			
Asian/Pacific Islander	Frequency	5	98.2	2	41.9	7	71.0
	Row Pct	71.43		28.57			
	Col Pct	2.54		0.36			
American Indian	Frequency	56	147.3	85	228.4	141	187.4
	Row Pct	39.72		60.28			
	Col Pct	28.43		15.1			
Unknown	Frequency	0		2		2	
	Row Pct	0		100			
	Col Pct	0		0.36			
Total	Frequency	197	46.8	563	132.7	760	89.95

*Rates are per 100,000 population

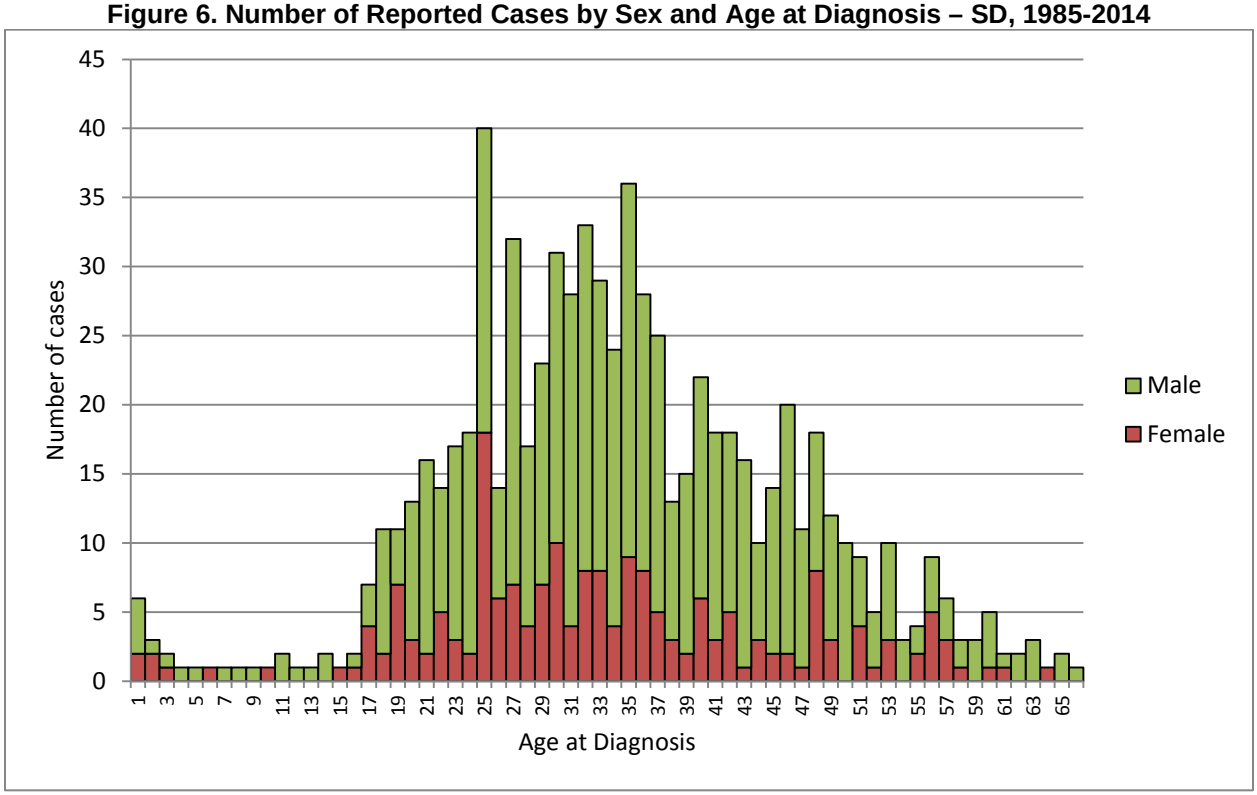
We focused our analysis on age at diagnosis among different racial groups. Since whites, American Indians and blacks represent the biggest segment (95%) of all HIV diagnosed cases, for study purposes we focused on those three races. This graph shows that age distribution of all races is equal at the time of diagnosis, thus there is no need to screen one particular age group in a specific race category.

Figure 5. Age at Receiving HIV/AIDS Diagnosis for Three Major Racial Groups – SD, 1985-2014



The gender distribution of cases at the time of diagnosis shows that males and females were diagnosed at almost the same age.

Figure 6. Number of Reported Cases by Sex and Age at Diagnosis – SD, 1985-2014



From 1985-2014 males aged 25–44 years old accounted for the biggest percentage of cases, 47%.

Table 4. HIV/AIDS Cases by Age Group and Sex – SD, 1985-2014

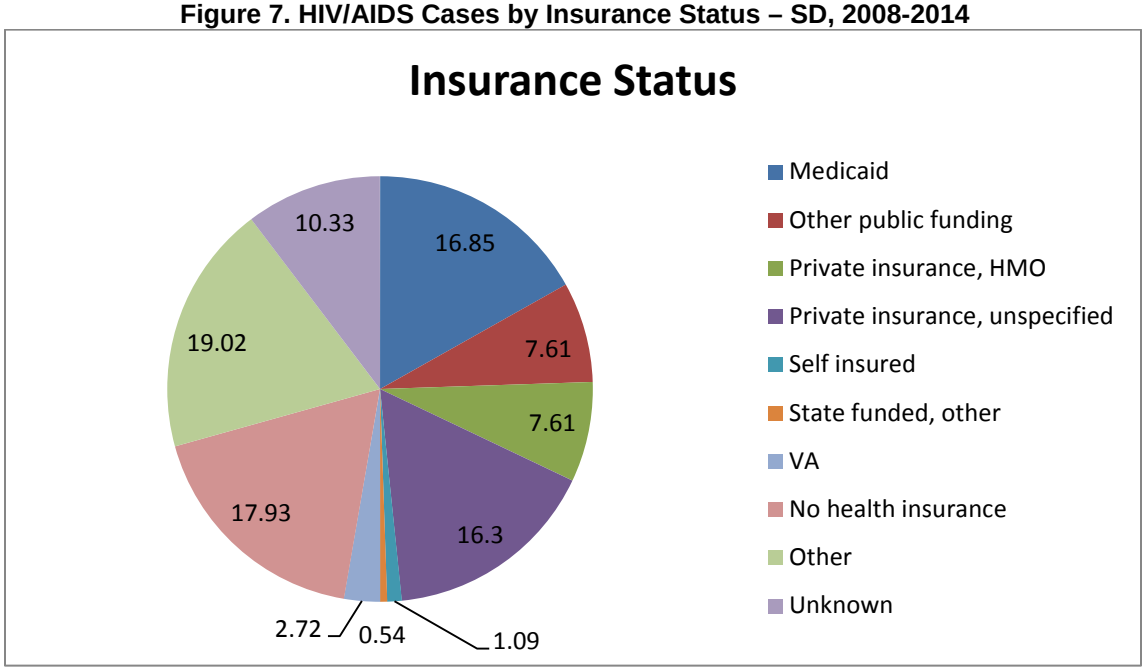
Age (years)		Female	Male	Total	Rate for total
0-1	Frequency	4	5	9	37.3
	Row Pct	44.44	55.56		
	Col Pct	2.04	0.89		
2-12	Frequency	3	8	11	8.6
	Row Pct	27.27	72.73		
	Col Pct	1.53	1.42		
13-24	Frequency	28	68	96	68.4
	Row Pct	29.17	70.83		
	Col Pct	14.29	12.08		
25-44	Frequency	120	360	480	232.8
	Row Pct	25	75		
	Col Pct	61.22	63.94		
45-64	Frequency	40	119	159	72.4
	Row Pct	25.16	74.84		
	Col Pct	20.41	21.14		
65+	Frequency	1	3	4	3.2
	Row Pct	25	75		
	Col Pct	0.51	0.53		
Total	Frequency	196	563	759	89.8

Socioeconomic Status

To evaluate the potential needs of reported HIV/AIDS cases we used insurance as a proxy measure for socioeconomic status (SES). Data were available for the 2008-2014 period only.

Among cases for this time period, 78 (60%) were classified as low income clients (defined as coverage by Medicaid, Other public funding or no health insurance), while 52 (40%) were classified as middle/high income clients (including VA, private insurance HMO, private insurance unspecified, self insured). This pie chart shows that a large proportion of cases are low income and need support for HIV/AIDS care and diagnostic issues from publicly funded programs.

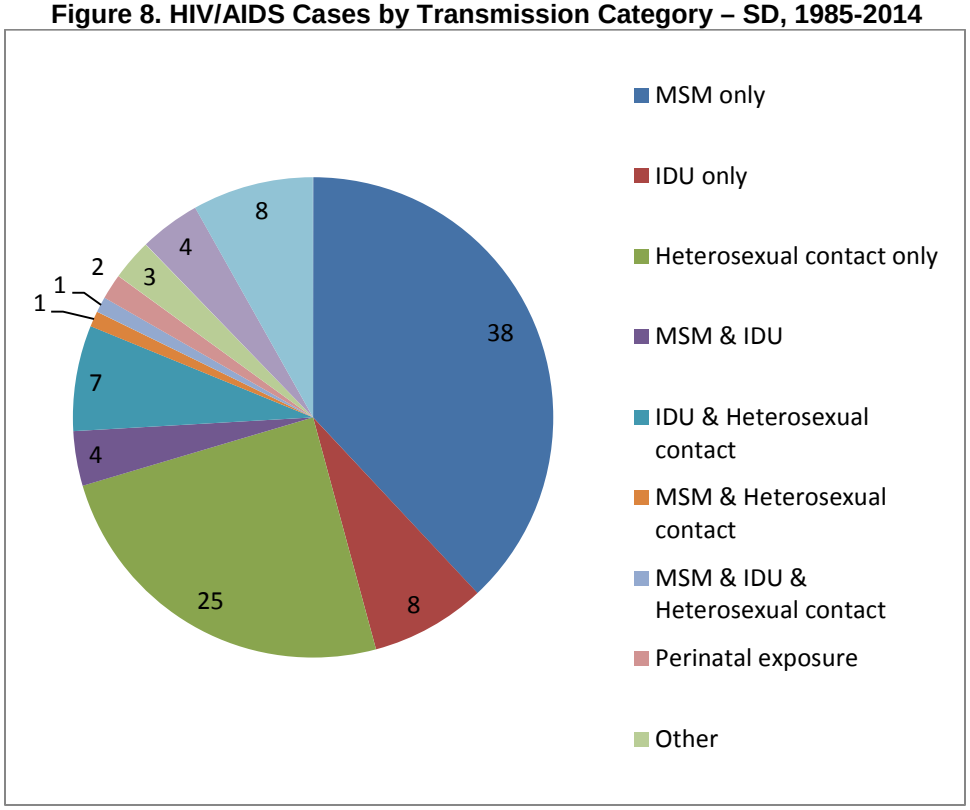
Figure 7. HIV/AIDS Cases by Insurance Status – SD, 2008-2014



Transmission Categories

HIV/AIDS is transmitted through sexual intercourse, perinatal exposure, breast milk, contaminated medical instruments (e.g. syringes), blood and blood products. Major transmission categories are listed on the graph shown below.

Figure 8. HIV/AIDS Cases by Transmission Category – SD, 1985-2014



By transmission category, 289 (38%) persons were classified as infected through male-to-male sexual contact, 187 (25%) through heterosexual contact, and 59 (8%) through injection drug use. These three categories comprise up to 70% of all cases.

Among the 563 males diagnosed with HIV infection, the predominant transmission category was male-to-male sexual contact (51%), followed by heterosexual contact (14%) and injection drug use (8%). Among the 197 females diagnosed with HIV infection, the primary transmission category was heterosexual contact (56%), followed by injection drug use (7%).

Transmission differs among racial groups. Among 450 whites 53.11% of cases were transmitted through male-to-male sexual contact, and rarely by heterosexual contact or injection drug use (12% and 7% respectively). In all other racial groups heterosexual contact was the predominant category of transmission (Blacks – 55%, Asian - 43%, Hispanic - 43%, AI – 31%).

We classified any MSM containing category as MSM transmission (includes: MSM only, MSM & IDU, MSM & Heterosexual contact, MSM & IDU & Heterosexual contact) due to the high probability of transmitting the virus and compared rates among whites and other racial minorities (American Indians and blacks) using X^2 test to those who acquired infection heterosexually. Results indicate that whites were more likely to acquire infection through MSM compared with other racial groups:

Results for whites vs. American Indians: p value <0.01, Point estimate: 1.6. 95% CI: 1.3-1.9
Results for whites vs. blacks: p value <0.01, Point estimate: 2.2. 95% CI: 1.8-2.7.

The male-to-female ratio is another indicator to evaluate transmission frequency among different racial groups. For South Dakota cases the transmission frequency was the highest among whites (5.6) and low among other racial groups (American Indians –1.5, Hispanic - 3, blacks –1.2,

Asian – 0.4). This indirectly indicates that whites are more likely to acquire infection through male-to-male sexual contact rather than heterosexually as opposed to other racial groups. Additional research is needed to determine whether whites are more likely to engage in homosexual activity compared to other racial groups.

When we classified any sexual transmission (MSM or heterosexual contact) as a transmission through sexual contact and compared it to injection drug use using X^2 test, the difference among racial groups was not significant:

Results for whites vs. American Indians: p value <0.06, Point estimate: 0.8. 95% CI: 0.7-1.0
Results for whites vs. blacks: p value <0.6, Point estimate: 1.1. 95% CI: 0.9-1.2.

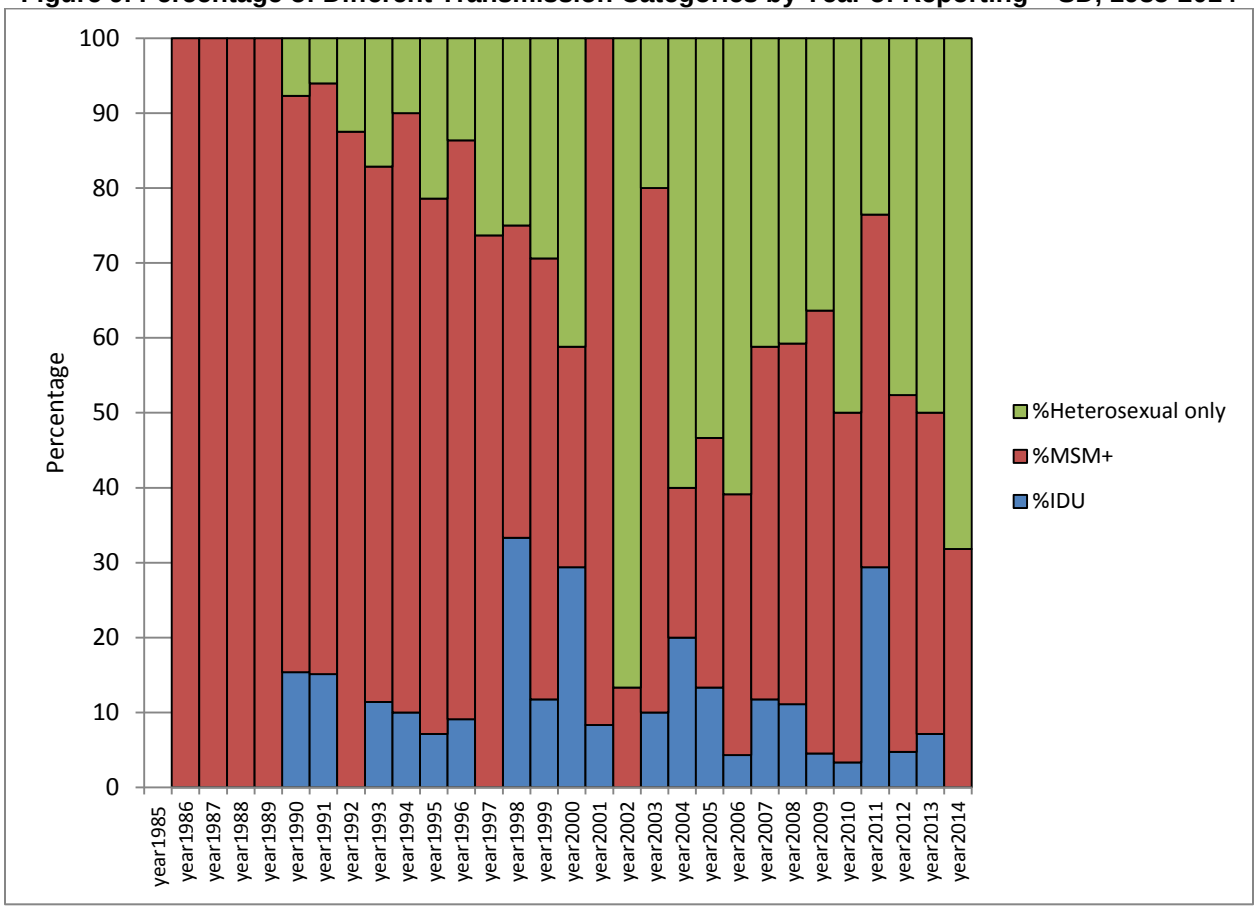
It appears that whites are more likely to acquire infection through IDU than through sex when compared with blacks, but less likely to acquire through IDU when compared with American Indians (Americn Indians acquire HIV more through sex rather than IDU). However, these differences were not statistically significant.

Indirect measures describing IDU prevalence among different racial groups are needed.

To analyze temporal trends in transmission categories we focused on three transmission categories since 76% of all cases fall under those three3 groups: MSM, (includes all MSM alone or in combination with others), only heterosexual transmission, or only IDU. Transmission categories changed significantly across 30 years. In the beginning most reported cases fell under the MSM category; that category gradually declined and now more cases are transmitted through heterosexual contact. Please note that category called “MSM+” includes all patients where MSM is mentioned alone or in combination with others. Technically, this approach should have increased the percentage of MSM cases but it appears that even with this classification, MSM is declining and replaced by pure heterosexual or IDU transmission.

Futher analysis of temporal trends in behavioral changes in South Dakota’s population is needed to assess the validity of this observation.

Figure 9. Percentage of Different Transmission Categories by Year of Reporting – SD, 1985-2014



Possible explanations of the finding:

- Does it also reflect a common trend in SD (declined number of MSM)?
- Is it due to protected intercourse among MSM and unprotected among heterosexuals?
- Challenges with interviewing clients, not reporting their true orientation.

HIV Progression to AIDS

In the absence of treatment, AIDS usually develops 8 to 10 years after initial HIV infection. So it is crucial to detect cases at an early stage and provide appropriate management and care to prevent progression of HIV cases to AIDS.

AIDS was diagnosed at the time of detection in 207 cases (27% of all cases). By December 2014, 341 cases were still classified as HIV.

Poor management of HIV cases or diagnosing cases at a later HIV stage maybe responsible for rapid progression of HIV cases into AIDS. We calculated median time difference between AIDS and HIV diagnosis by date the case was first reported and obtained the following results:

- Median time between HIV and AIDS diagnosis – 5 years (mean 5.3).
- Median age at HIV diagnosis – 34 (range 0-68 years).
- Median age at AIDS diagnosis – 38 (range 0-68 years)
- Median age at death – 39 (range 0-74 years).

Figure 10. Median Number of Years between AIDS and HIV Diagnosis Among Reported Cases Who Have Been Diagnosed with HIV and Later Progressed to AIDS by Year of Reporting – SD, 1988-2012

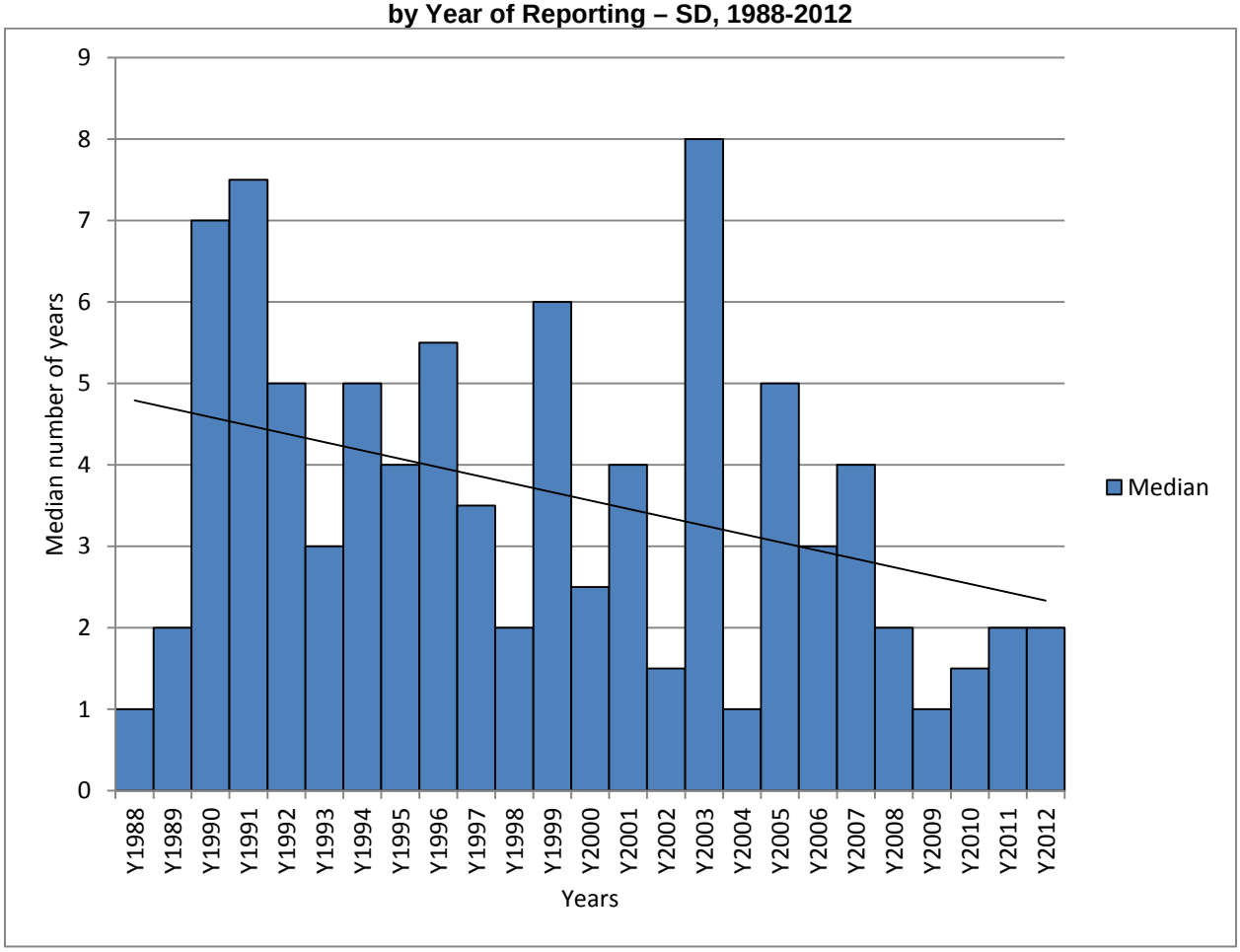


Figure 10 shows that HIV cases are progressing to AIDS much faster and the median number of years between HIV diagnosis and AIDS is rapidly decreasing. One would expect an opposite trend given the later advances of treatment and management of HIV cases.

Possible explanations:

- Poor management of HIV cases (linking to care, poor treatment, adherence to therapy, lack of treatment, etc.)
- Diagnosing cases at an advanced stage of HIV diseases when treatment and linking to healthcare resources is of limited use.

AIDS

A total of 418 patients received an AIDS diagnosis; 337 (81%) were male. AIDS patients were significantly older than HIV patients (t-test 4.48. $p<0.01$) with a mean age of 49.6 years (range 6-85 years) as opposed to HIV patients with mean age of 44.9 years (range 5-88 years).

Males are more likely to be diagnosed with AIDS compared with females (RR 1.2 (95% CI: 1.1 - 1.3. $p<0.01$).

Table 5. Distribution of AIDS and HIV Cases Among Different Racial Groups – SD, 1985-2014

Race		AIDS	HIV	Total
White, not Hispanic	Frequency	267	183	450
	Row Pct	59.33	40.67	
	Col Pct	63.88	53.98	
Black	Frequency	52	77	129
	Row Pct	40.31	59.69	
	Col Pct	12.44	22.71	
Hispanic	Frequency	17	11	28
	Row Pct	60.71	39.29	
	Col Pct	4.07	3.24	
Asian/Pacific Islander	Frequency	4	3	7
	Row Pct	57.14	42.86	
	Col Pct	0.96	0.88	
American Indian/Alaska Native	Frequency	78	63	141
	Row Pct	55.32	44.68	
	Col Pct	18.66	18.58	
Unknown	Frequency	0	2	2
	Row Pct	0	100	
	Col Pct	0	0.59	
Total	Frequency	418	339	757

It appears that different races have different proportion of AIDS cases. American Indians have an almost equal number of AIDS and HIV cases (55.3% and 44.7% respectively) while Hispanics have the highest reported proportion of AIDS (61%) cases. Surprisingly blacks have the lowest proportion of AIDS cases to HIV cases reported (40%) and the difference in this feature between whites and blacks is statistically significant (RR =0.5; 95% CI: 0.3-0.7; $p<0.01$). It appears that despite the highest rate of reported cases, blacks have a lower proportion of AIDS cases than whites.

Possible explanations:

- Blacks are diagnosed at an earlier stage of diseases (on HIV level while other racial groups are not).
- Blacks are screened more often than other racial groups (need supporting data about screening clients for HIV)

HIV/AIDS Mortality Data

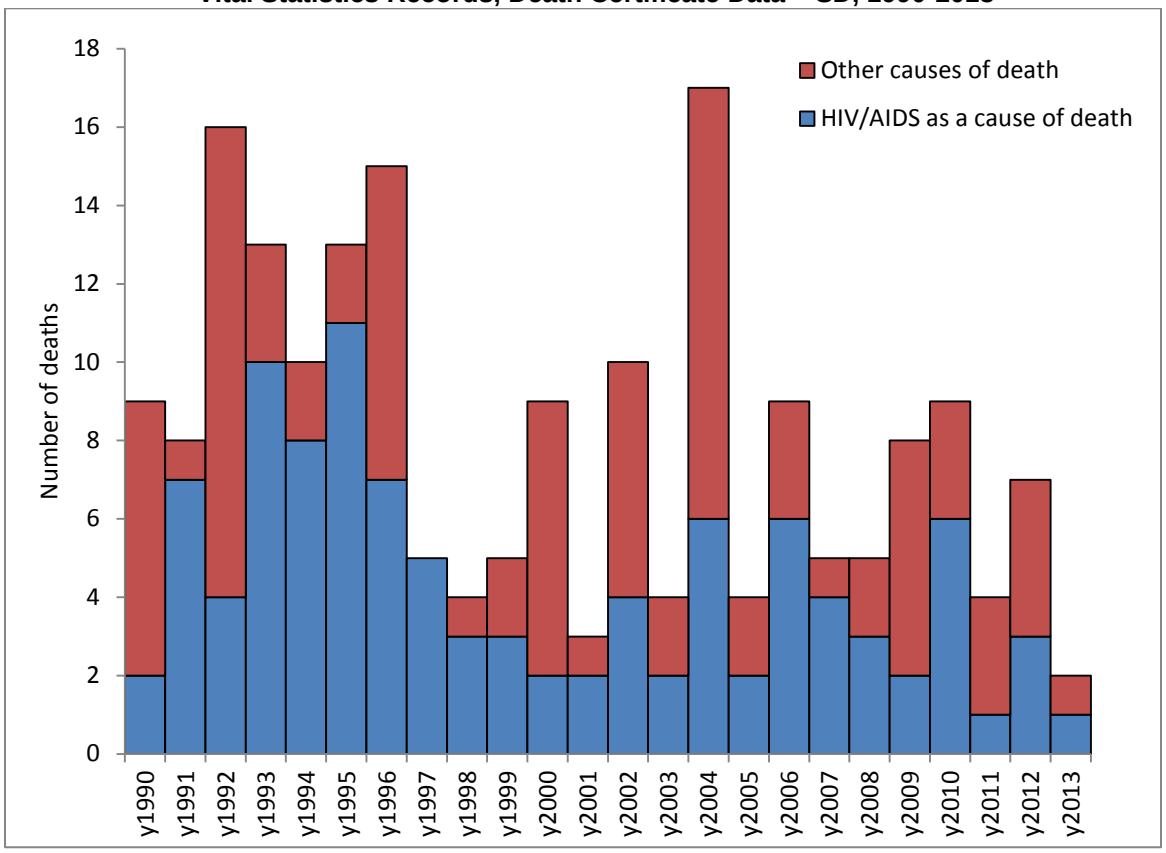
We have been able to link HIV/AIDS surveillance data with vital statistics records. A total of 211 cases reported to SD DOH have been classified as dead by December 2014. Only 194 (92%) cases were linked with death certificate records. Table 6 indicates HIV/AIDS was mentioned as a major cause of death in only 104 (54%) of the HIV/AIDS patients' death records. The remaining patients died from non-AIDS associated causes.

Table 6. Major Cause of Death Among Patients Diagnosed with HIV/AIDS – Vital Statistics Records, Death Certificate Data – SD, 1985-2014

Causes of death	Frequency	Percent	Cumulative frequency	Cumulative percent
Alzheimer's disease	4	2.06	4	2.06
Chronic viral hepatitis	1	0.52	5	2.58
HIV/AIDS	104	53.61	109	56.19
Parkinson's disease	1	0.52	110	56.7
Assault, poisoning	2	1.03	112	57.73
Car accident	6	3.09	118	60.82
Diseases of circulatory system	26	13.4	144	74.23
Diseases of blood and blood forming organs	1	0.52	145	74.74
Diseases of intestines and peritoneum	2	1.03	147	75.77
Diseases of endocrine, nutritional and metabolic	3	1.55	150	77.32
Ill-defined or unspecified death	1	0.52	151	77.84
Injury of nerves and spinal cord	2	1.03	153	78.87
Intentional self-poisoning	1	0.52	154	79.38
Liver diseases, alcoholic liver, hepatic failure	6	3.09	160	82.47
Malignant neoplasms	22	11.34	182	93.81
Renal failure	1	0.52	183	94.33
Diseases of respiratory system, mainly pneumonia	6	3.09	189	97.42
Sepsis	2	1.03	191	98.45
Unspecified fall	1	0.52	192	98.97
Viral hepatitis	2	1.03	194	100

It appears that HIV/AIDS was mentioned more frequently as a cause of death among cases diagnosed in the beginning of epidemic while later other causes of death were more prominent. In more recent cases cause of death was not quite specific to conditions linked to HIV/AIDS.

Figure 11. Major Cause of Death among Patients Diagnosed with HIV/AIDS – Vital Statistics Records, Death Certificate Data – SD, 1990-2013



Possible explanations:

- Poor accuracy of death records while describing causes of death among patients diagnosed with HIV/AIDS
- Virus shows tendency of becoming less virulent compared to initially circulating strains. That phenomenon was believed to select less virulent strains of syphilis at the beginning of syphilis pandemic during medieval times. Earlier strains of syphilis caused higher mortality compared with the current ones. This phenomenon ensures further spread of the organism.
- Improved case management prevents deaths from HIV/AIDS thus shifting mortality to other causes. However, this contradicts the finding that the median number of years between HIV and AIDS diagnosis has recently decreased.

Screening for HIV/AIDS

We received data from 11 medical facilities that provided testing services during the last two years (2013 and 2014). While the number of tested individuals in 2014 increased 1.6 times, the number of positive test results appeared to decrease (0.29% vs 0.6%).

Table 7. Number of Samples Tested from 11 Medical Facilities by year – SD, 2013-2014

	2014	2013
Total number of samples tested	5,147	3,323
Total confirmed positive	15	20
Percent positive	0.29%	0.6%

Possible explanations:

- Screening targeted low risk individuals in 2014 as opposed to 2013.
- HIV/AIDS circulation appears to decrease in the state.

The SD DDOH does not receive information about screened population (age, sex, race and risk factors) and therefore, we are unable to determine what caused such a dramatic decrease in positivity rate among screened population while the number of screened individuals has greatly increased.

Cascade Analyses – Linkage to Care and Outcome of Care

The national HIV/AIDS strategy (NHAS) has three interdependent goals:

- Reduce the number of people who become infected with HIV
- Increase access to care and improve health outcomes for people living with HIV
- Reduce HIV-related health disparities

The prototypical HIV care cascade starts with an estimate of the number of HIV-infected persons living in a state at a particular point in time. Several more stages follow, leading to the final stage, viral suppression. That endpoint links to the NHAS goals insofar as persons with viral suppression are less likely to transmit HIV to others and tend to have better health outcomes than persons whose HIV infection is unsuppressed.

Cascade analyses are usually presented in bar charts where the data displayed in the bars meet definitions specific to stages of the cascade. Starting with the estimated number of HIV-infected persons living in the state, South Dakota's 2014 cascade was defined as follows:

1. HIV-infected persons: estimated number of HIV-infected persons living in South Dakota as of December 31, 2014. This number equaled the number of persons with an HIV diagnosis plus a 1% adjustment for under-reporting and 20% for those who are infected but undiagnosed.
2. HIV-diagnosed persons: number of HIV-diagnosed persons thought to be living in South Dakota as of December 31, 2014.
3. Linkage to HIV care: number of HIV-diagnosed persons with at least one reported CD4+ or viral load test result ever.
4. Retained in HIV care: number of persons linked to care with at least one CD4+ or viral load result during calendar year 2014.
5. Viral suppression: number of persons retained in care whose most recent viral load value in 2014 was less than 200 copies per milliliter (mL) of blood.

We addressed each step in the table below. It appears that South Dakota experiences difficulties in each step of care of HIV infected individuals. The number of patients in every racial, age, gender or diagnosis category is reduced gradually after each step resulting in an unacceptably low rate of patients with viral suppression. This latter finding theoretically should increase transmission rate in South Dakota patients, however, we see the opposite.

Table 8. Cascade Analyses – Linkage to Care and Outcome of Care – SD, 2014

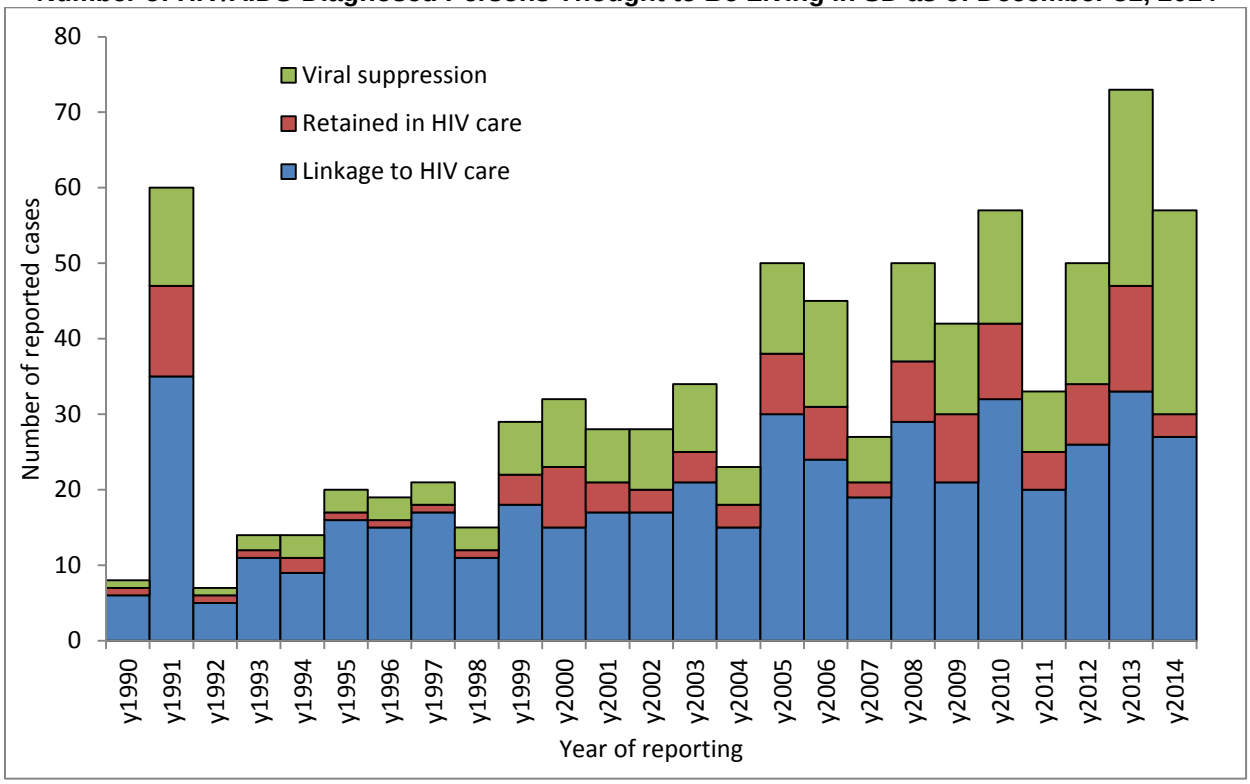
	HIV-infected persons: estimated number of HIV-infected persons living in SD as of December 31, 2014*	HIV-diagnosed persons: Number of HIV-diagnosed persons thought to be living in SD as of December 31, 2014	Linkage to HIV care: number of HIV-diagnosed persons with at least one reported CD4+ or viral load test result ever	Retained in HIV care: number of persons linked to care with at least one CD4+ or viral load result during calendar year 2014.	Viral suppression: number of persons retained in care whose most recent viral load value in 2014 was less than 200 copies per milliliter (mL) of blood
Diagnosis category	N	N	N (row %**)	N (row %**)	N (row %**)
Persons living with HIV	364	301	252 (84)	132 (44)	73 (24)
Persons living with AIDS	296	245	238 (97)	95 (39)	48 (20)
Unknown diagnosis status	3	3	1 (33)	1 (33)	0
Sex					
Male	467	386	339 (88)	148 (38)	78 (20)
female	197	163	152 (93)	80 (49)	43 (26)
Race					
White, not Hispanic	367	304	263 (87)	113 (37)	69 (23)
Black, not Hispanic	152	126	117 (92)	55 (44)	27 (21)
Hispanic	29	24	21 (88)	9 (38)	4 (17)
Asian/Pacific Islander	8	7	7 (100)	2 (29)	2 (29)
American Indian/Alaska Native	105	87	82 (94)	48 (55)	19 (22)
Unknown	1	1	1 (100)	1 (100)	0
Age group as of December 31, 2014					
2-12 years	8	7	7 (100)	3 (43)	2 (29)
13-24 years	12	10	8 (80)	5 (50)	1 (10)
25-44 years	234	194	181 (93)	85 (44)	45 (23)
45-64 years	361	299	264 (88)	121 (40)	66 (22)
65+ years	14	12	12 (100)	4 (33)	1 (8)
Total	664	549	491 (89)	228 (42)	121 (22)

* The estimated number of HIV-infected persons living in South Dakota as of December 31, 2014 was calculated by adding 1% adjustment for under-reporting and 20% for those who are infected but undiagnosed to the number of persons with an HIV diagnosis and thought to be living in the state as of December 31, 2014.
**Row percentage in these columns is based on the actual number of HIV-diagnosed persons thought to be living in South Dakota as of December 31, 2014.

Despite the low number of patients with viral suppression, recently diagnosed cases are more likely to experience viral load value in 2014 with less than 200 copies per milliliter (mL) of

blood. The graph below might introduce a certain level of bias since recently diagnosed cases are more likely to be alive and more likely to be linked and retained in care.

Figure 12. Cascade Analyses – Linkage to Care and Outcome of Care by Year of Case Reporting. Number of HIV/AIDS-Diagnosed Persons Thought to Be Living in SD as of December 31, 2014



Indirect Measures and Risk Behavior

Indirect measures such as STD and TB incidence provide information about:

- Levels of sexual activity in the state
- Transmission of STDs (burden of diseases transmitted through sexual route)
- Population behavior (using condoms, safe sex, vs. non-safe sex)
- TB cases that may be exacerbated and become more severe if not screened for HIV/AIDS

First, we looked at indirect measures such as co-infection rates of known HIV/AIDS cases with STDs.

Overall, there were 66 HIV/AIDS patients co-infected with either STDs or Hepatitis C according to 2010-2014 surveillance data (N=148). In particular: 26 (17.6%) patients were co-infected with Hepatitis C, 21 (14.2%) with syphilis, 11 (7.4%) with gonorrhea, and 18 (12.2%) with chlamydia.

To simplify analysis we classified the patient as American Indian if they reported American Indian as one of their races and blacks, if they reported “black” as one of their races. We calculated the number of events (one diagnosis of chlamydia was classified as a single event even if the patient was diagnosed with gonorrhea or syphilis in the same time), so every diagnosis was counted as a single event. We calculated cumulative rates per 100,000 population for each race for 2010-2014 data.

Table 9. Surveillance Reports for STD Co-Infected HIV/AIDS Cases – SD, 2010-2014

Race	Number of Chlamydia events	Number of Gonorrhea events	Number of Syphilis events	Total number of STD events	Rate per 100,000 population
AI	5	6	3	14	18.6
Asian	2	0	0	2	19.5
Black	14	1	2	17	104.9
White	7	6	18	31	4.3

We also calculated the ratio between cumulative rates of HIV/AIDS and the rates of STD events for each race for 2010-2014 calendar years. To simplify analysis and avoid bias with under- or over reporting of transmission category, we included all HIV/AIDS cases reported in 2010-2014.

Table 10. STD and HIV/AIDS Events, Rates Per 100,000 Population and Ratio Between the Rates, General Surveillance Data reported to SD DOH – SD, 2010-2014.

Race	Number of STD events	STD event rate per 100,000 population	Number of HIV/AIDS cases	HIV/AIDS rate per 100,000	Population estimates	Ratio of rates (STD /HIV)
AI	9,856	13,100	35	46.5	75,233	281.6
Asian	110	1,115	3	30.4	9,863	36.7
Black	1,096	6,965	37	235.1	15,735	29.6
White	7,519	1,036	62	8.5	725,386	121.3

The biggest ratios between STD and HIV/AIDS event rates were observed among American Indians and whites.

Possible explanations:

- Other than sexual transmission occurs among American Indians and whites. Note, that American Indians have the highest rate of STDs but the rate of co-infection with STDs is 18.6. See the table above). While small, the difference in the black and Asian populations indicates sexual transmission of HIV/AIDS virus.
- Safe sex practices may be employed more frequently by whites (the lowest STD rate) than other racial groups, but this statement does not explain a big STD/HIV ratio for American Indians.
- Whites and American Indians with STDs are less likely to be screened for HIV/AIDS while blacks and Asians are more likely.

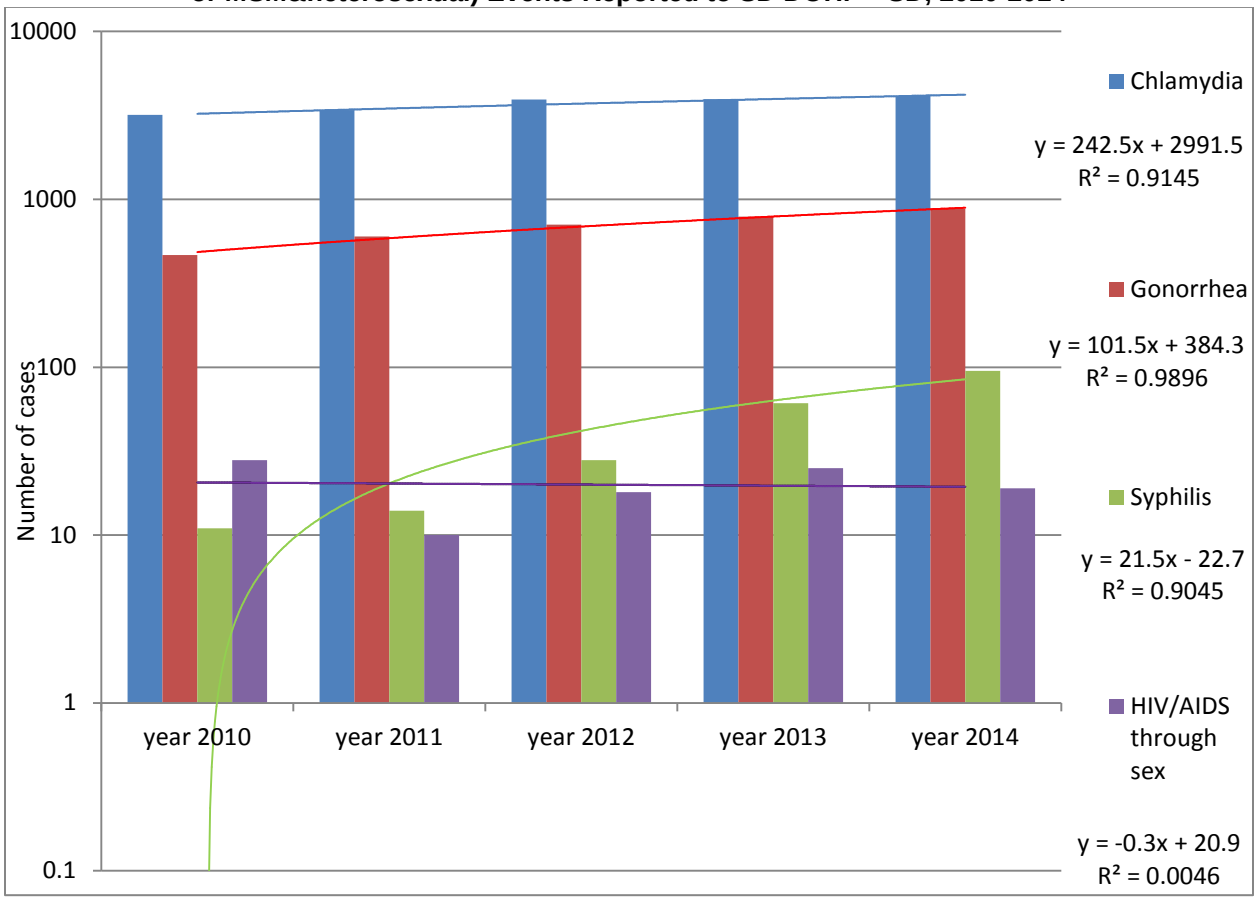
The data available from community health centers and local STD clinics covering the 2014 calendar year indicates that the total number of screened individuals for syphilis, chlamydia, and gonorrhea were 276, 1156, 1057, respectively, with positivity rates as high as 6% for syphilis, 15% for chlamydia and 6% for gonorrhea.

We do not have data indicating screening of patients for HIV/AIDS, nor characteristics of screened patients. The high positivity rate for STDs warrants adding HIV/AIDS screening in high/risk populations that are commonly affected by STDs.

Figure 13 below shows the number of reported STD (chlamydia, gonorrhea, and syphilis) cases during 2010-2014 on a logarithmic scale. This graph only includes HIV/AIDS cases with transmission category either MSM, heterosexual, or MSM&heterosexual. It does not include

cases with transmission categories other than sexual. The graph shows an upward trend in all STDs except for HIV/AIDS cases. In fact, HIV/AIDS is the only disease with a negative trend.

Figure 13. STD and HIV/AIDS (only includes transmission categories such as MSM, heterosexual, or MSM&heterosexual) Events Reported to SD DOH. – SD, 2010-2014



Possible explanations:

- Clients screened for STDs are not screened for HIV/AIDS
- Clients are screened for HIV/AIDS but the virus appears to spread through non-sexual routes during recent years.

The first bullet emphasizes the need for more targeted screening of STD infected individuals for HIV/AIDS.

The second bullet calls for better interviewing and obtaining more detailed information about behavioral risk factors of HIV/AIDS infected individuals.

This topic needs further exploration because such a sharp discordance of STD data with HIV/AIDS reports is quite unusual and warrants further investigation.

Tuberculosis (TB) Morbidity

During 1995-2014 only 10 HIV/AIDS cases have been identified as co-infected with TB. If we limit our analysis to 2010-2014 data, only 4 cases were co-infected with TB which represents only 2.7% of HIV/AIDS cases reported during 2010-2014, while co-infection with STDs is much higher for Hepatitis C (17.6%), syphilis (16.2%), gonorrhea (8.8%), and chlamydia (16.9%)

(counting events, not co-infected persons). This finding again underscores the need for screening TB infected individuals for HIV/AIDS.

Conclusions

- South Dakota is a low-incidence/prevalence state.
- The number of reported cases remains stable despite increased sensitivity of case definitions and higher number of screened individuals.
- The transmission rate has decreased over time.
- Whites are more likely than other racial groups to acquire infection through MSM.
- Transmission categories are changing over time. Although MSM remains the predominant category of transmission (38% of all reported cases), more heterosexual and IDU transmissions are recently reported.
- Predominantly males are reported (74% of cases).
- Racial minorities are disproportionately affected.
- All racial and gender groups are diagnosed at almost the same age, while age group 25-44 for males has the highest percentage (47%) of reported cases
- Non-HIV related causes of death became more prominent during recent years while HIV diagnosis as a major cause of death has decreased.
- Only half (54%) of death certificates of patients with known HIV/AIDS diagnosis have HIV/AIDS mentioned as a major cause of death in their death certificate.
- The HIV/AIDS (only sexually transmitted cases) trend does not follow the trend for other STDs reported to SD DOH.
- The median number of years between HIV and AIDS diagnosis has decreased over time.
- Different racial groups have different percentages of AIDS cases. Blacks have the lowest proportion of AIDS cases among all reported cases of black patients.
- The Number of patients in every racial, age, gender or diagnosis category is reduced gradually in a cascade analysis where linkage to care and outcome of care are explored.
- Co-infection rates with STDs is relatively high while the rate for TB remains low.

Recommendations

- Currently South Dakota does not receive information on patients screened for HIV/AIDS statewide, by age, sex, race, and screening facility. Given its low rate of HIV/AIDS incidence and the fact that South Dakota is one of the states in the nation with such a low burden, it is absolutely essential to target resources cost-effectively and select appropriate target populations for screening. Unfortunately, SD DOH does not have the data to evaluate screening policies, to identify gaps and needs of screening facilities. We recommend establishing sentinel sites to provide screening data by age, sex, race, and behavioral features (IDU, MSM, etc.) of clients to assess and modify current screening policies, to better identify target populations for the state and reduce the costs associated with unnecessary screening.
- Data regarding discordance with sexually transmitted HIV/AIDS and other STDS may indicate poor data collection and transmission category assignment of cases as well as poor screening of STD cases for HIV/AIDS. There is a need to develop culturally-acceptable methodologies of data collection and interview techniques for racial and ethnic minorities, or to improve existing ones. Screening policies for STD cases need to be re-evaluated.

- Data regarding faster progression to AIDS indicates that better management of HIV cases and/or diagnosing HIV at an early stage is warranted.
- Low rate of TB co-infection may indicate on poor screening of TB infected population for HIV/AIDS. We should emphasize the need for improved screening and changes in screening policy for TB patients.
- More detailed description of causes of death among HIV/AIDS positive individuals is needed. Only half of all HIV/AIDS patient deaths were attributed to HIV/AIDS in the death registry of the state. Validation studies of death certificates should be conducted.
- Estimates of cascade analyses, linkage to care and outcomes of care are poor. There is a need to link and retain patients in care with an ultimate goal of suppressing viral load.

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Glossary of Terms

Behavioral Data − Information collected to examine human behavior relevant to disease risk. For instance, relevant behavioral data for HIV risk may include sexual activity, substance use, condom use, etc.

Centers for Disease Control and Prevention (CDC) − The lead federal agency for protecting the public health and safety, providing credible information to enhance health decisions, and promoting health through strong partnerships. Based in Atlanta, Georgia, this agency of the U.S. Department of Health and Human Services serves as the national focus for developing and applying disease prevention and control, environmental health, and health promotion and education activities designed to improve the health of the people of the United States.

CDC Recommended Guidelines − An official, CDC-endorsed document that describes the policies, procedures and strategies for implementing specific HIV prevention activities.

Confidentiality − The protection of personal information collected by health organizations. An obligation to respect the privacy of a client by restricting access to and not willingly disclosing any information obtained in confidence.

Confirmed HIV-positive Test Result − An HIV-positive test result that is confirmed using a highly specific test. Both preliminary HIV-positive rapid test results and positive conventional test results must be confirmed by supplemental testing to provide an HIV diagnosis. The person is considered HIV-positive only if the confirmatory test result is positive.

Counseling and Testing − A process through which an individual receives information about HIV transmission and prevention, information about HIV tests and the meaning of tests results, HIV prevention counseling to reduce their risk for transmitting or acquiring HIV, and is provided testing to detect the presence of HIV antibodies.

Demographics − The statistical characteristics of human populations such as age, race, ethnicity, sex, and size.

Effective − Demonstrating the desired effect when widely used in practice or under real-world conditions that are considerably less rigorous and controlled than environments testing efficacy but that are still designed to ensure the desired effect can be attributed to the intervention in question.

Ethnicity − The client's self-report of whether they are of Hispanic or Latino origin.

Epidemic − The occurrence of cases of an illness, specific health-related behavior, or other health- related events in a community or region in excess of normal expectancy.

Epidemiologic Profile − Document that describes the effect of the HIV/AIDS epidemic on an area in terms of sociodemographic, geographic, behavioral, and clinical characteristics. The profile is a valuable tool that is used at the state and local levels by those who make recommendations for allocating HIV prevention and care resources, planning programs, and evaluating programs and policies.

Epidemiology − The study of the causes, spread, control, and prevention of disease in human beings.

Healthcare Setting − Setting in which both medical diagnostic and treatment services are provided.

Health Disparity − A particular type of health difference that is closely linked with social or economic disadvantage.

High-prevalence Setting − A geographic location or community with an HIV seroprevalence greater than or equal to one percent.

High-risk Individual − Someone who has had unprotected sex or has shared injecting equipment in a high prevalence setting or with a person who is living with HIV.

Incidence − The number of new cases in a defined population within a certain time period (often a year). It is important to understand the difference between HIV incidence, which refers to new HIV infections, and new HIV diagnosis. New HIV diagnosis is a person who is newly identified as HIV infected, usually through HIV testing. These persons may have been infected recently or at some time in the past.

Individual-level Risk Factors − Characteristics of individuals that may explain health status or behavior (e.g., age, sex, marital status).

Injection Drug User (IDU) − Someone who uses a needle to inject drugs into his or her body.

Intervention − A specific activity (or set of related activities) intended to change the knowledge, attitudes, beliefs, behaviors, or practices of individuals and populations to reduce their health risk.

Low-prevalence Setting − A geographic location or community with a low HIV seroprevalence (or low incidence).

Men who have sex with men (MSM) − Men who report sexual contact with other men (that is, homosexual contact) and men who report sexual contact with both men and women (that is, bisexual contact), whether or not they identify as "gay."

MSM/IDU − Men who report both sexual contacts with other men and injection drug users as risk factors for HIV infection.

Metropolitan Statistical Area – A geographic entity defined by the U.S. Office of Management and Budget (OMB) for use by Federal statistical agencies in collecting, tabulating, and publishing Federal statistics. Each metro area consists of one or more counties (except in New England, where cities and towns are the basic geographic units) and includes the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core. A metro area contains a core urban area of 50,000 or more population.

Non-healthcare Setting − A setting in which neither medical, diagnostic, nor treatment services are provided, but health screening may be provided.

Prevalence − The total number of cases of a disease in a given population at a particular point in time. HIV/AIDS prevalence refers to persons living with HIV, regardless of time of infection or diagnosis date. Prevalence does not give an indication of how long a person has had a disease and cannot be used to calculate rates of disease. It can provide an estimate of risk that an individual will have a disease at a point in time.

Prevention Program − An organized effort to design and implement one or more interventions to achieve a set of predetermined goals, for example, to increase condom use with non-steady partners.

Prevention Services − Interventions, strategies, programs, and structures designed to change behavior that may lead to HIV infection or other diseases. Examples of HIV prevention services include street outreach, educational sessions, condom distribution, and mentoring and counseling programs.

Priority Population − A population identified through the epidemiologic profile and community services assessment that requires prevention efforts due to high rates of HIV infection and the presence of risky behavior.

Qualitative Data − Non-numeric data, including information from sources such as narrative behavior studies, focus group interviews, open-ended interviews, direct observations, ethnographic studies, and documents. Findings from these sources are usually described in terms of underlying meanings, common themes, and patterns of relationships rather than numeric or statistical analysis. Qualitative data often complement and help explain quantitative data.

Quantitative Data − Numeric information -- such as numbers, rates, and percentages -- representing counts or measurements suitable for statistical analysis.

Race − A client's self-reported classification of the biological heritage with which they most closely identify.

Recruitment − The process by which individuals are identified and invited to become participants in an intervention or other HIV prevention service, such as counseling, testing, and referral.

Relevance − The extent to which an intervention plan addresses the needs of affected populations in the jurisdiction and other community stakeholders.

Risk Behaviors − Behaviors that can directly expose individuals to HIV or transmit HIV, if virus is present (e.g., unprotected sex, sharing unclean needles). Risk behaviors are actual behaviors in which HIV can be transmitted. Risk behaviors are behaviors in which a single instance of the behavior can result in a transmission.

Risk Factors − Based on observations of behaviors and contexts in which HIV is likely to be transmitted (e.g., lifetime number of sex partners, crack use, environmental factors like membership in a demographic group highly impacted by HIV, using expired condoms, internet use, etc.). Influencing factors of behavioral risk refers to associations with risk or risk correlates and risk contexts, not behavioral determinants.

Rural − An area with a population of less than 2,500 located outside of a larger urban area.

Seroprevalence − The number of people in a population who test HIV-positive based on serology (blood serum) specimens. Seroprevalence is often presented as a percent of the total specimens tested or as a rate per 1,000 persons tested.

Surveillance − The ongoing and systematic collection, analysis, and interpretation of data about occurrences of a disease or health condition.

Target Populations − The primary groups of people served. Target populations are defined by both their risk(s) for HIV infection or transmission as well as their demographic characteristics and the characteristics of the epidemic within this population.

Transmission Risk − A behavior that places the priority population at potential risk for HIV infection or transmission.

Variable − Data that can be measured or observed and can differ from person to person.

Technical Notes

Confidentiality

Due to federal confidentiality laws and a desire to respect the privacy of those living with HIV or AIDS, case numbers have been combined where appropriate. Counties or regions with five (5) or fewer cases are represented as ≤5 and counties or regions with zero cases are represented as 0.

The HIV/AIDS Surveillance System in South Dakota

The South Dakota Department of Health (DOH) receives funding from the Centers for Disease Control and Prevention (CDC) to assess the progression of HIV/AIDS in the state. The data gathered is used to describe those infected with HIV or AIDS and to anticipate changes in the disease at the local, regional, and national levels.

South Dakota HIV/AIDS data are summarized annually to help the DOH to:

- Monitor the incidence and estimated prevalence of HIV/AIDS in the state;
- Assess the risks for HIV infection and develop effective HIV prevention programs;
- Assess the medical and supportive needs of those living with HIV/AIDS;
- Develop surveillance methods to allow for a more current estimate and characterization of HIV/AIDSrisks and needs;
- Justify necessary federal and state funding to support continued HIV/AIDS prevention, services, and surveillance activities. This report includes HIV/AIDS data regarding South Dakota residents for the reporting period ending December 31, 2014. Consistent with HIV/AIDS surveillance activities in other states, South Dakota HIV/AIDS surveillance actively maintains an extensive statewide network of reporting sites in public, private, inpatient, outpatient, clinical, and laboratory settings.

Methods

A diagnosis of AIDS and/or HIV is legally reportable in South Dakota and must be reported to the Department of Health within 3 days of diagnosis. The South Dakota Department of Health is authorized by SDCL 34-22-12and 44:20 to collect and process mandatory reports of communicable diseases by physicians, hospitals, laboratories, and other institutions. These data are stored in the HIV/AIDS Reporting System (eHARS) database. Data from eHARS are continuously being updated. Statistics and trends presented in this report were derived from HIV/AIDS cases data reported to the South Dakota Department of Health cumulatively from1985 through December 31, 2014. Data displayed as persons with HIV/AIDS should be interpreted as individuals who have either been diagnosed with HIV or AIDS the first time diagnosed, as some people may have progressed to AIDS before ever being diagnosed with HIV.

Core Surveillance

AIDS became a reportable condition in 1985, at which time the South Dakota Department of Health established a surveillance system to track newly diagnosed AIDS cases. In 1993, the surveillance system was expanded when confidential HIV infection (non-AIDS) was added as a reportable condition. Standardized case report forms are used to collect sociodemographic information, mode of exposure, laboratory and clinical information, vital statistics (i.e. living or dead), and referrals for treatment of services. HIV surveillance data may underestimate the level

of recently-infected persons because some infected persons either do not know they are infected or have not sought medical care. It may, at times, even overestimate the number of people infected as de-duplication activities with other states often uncovers a previously diagnosed individual. Additionally, new cases are reported at all points along the clinical spectrum of disease when first diagnosed; therefore, HIV infection data may not necessarily represent the characteristics of persons who have recently been infected with HIV.

Perinatal Surveillance
Perinatal HIV/AIDS surveillance is the ongoing and systematic collection of information on HIV-infected pregnant mothers and perinatally-exposed and HIV-infected children. Medical record abstractions are conducted for all HIV-exposed children and their mothers; the children are followed until their infection status is determined. These data address the prevention of perinatal transmission, including perinatal care, HI counseling and testing during pregnancy, and the use of antiretroviral medications among pregnant mothers and newborns.

South Dakota HIV Counseling and Testing Data
The South Dakota Department of Health HIV/AIDS program has six HIV test sites and provides funds to community based organizations around the state to conduct HIV testing. Testing data is compiled in a secure data collection system. Private HIV testing and counseling is provided by physicians in a variety of clinical settings. All newly identified HIV positives must be reported to the South Dakota Department of Health within 3 days.

South Dakota STD Surveillance
The Sexually Transmitted Disease (STD) Program offers STD clinical services, including testing, laboratory diagnosis and treatment. The program conducts statewide surveillance to determine STD incidence and trends. In addition, the program conducts partner counseling and referral services for persons with HIV and STDs to reduce the spread of HIV and STDs. In South Dakota, in addition to HIV and AIDS, chancroid, Chlamydia, gonorrhea, and syphilis are reportable STDs.

Prevalence
2014 US Census Bureau estimates were used to calculate prevalence rates. The prevalence rate of those infected with HIV or AIDS in South Dakota can be calculated by using the number of people living with HIV or AIDS in the state (549) by the general population of SD (844,877) and multiplying by 100,000.
(549/ 844877) x 100,000 = 65.8

Therefore there are 65.8 people infected with HIV or AIDS for every 100,000 people living in the state.

Incidence
The number of newly diagnosed cases in a section of the population divided by the number of people in the entire population creates a number that is known as an incidence rate and is used to calculate the risk of getting a disease. To calculate the incidence rate for persons infected with HIV or AIDS during 1985-2014, we removed outliers from the list (reported cases during 1985-1989, 1991 and 1993), calculated the average number of cases reported in each year excluding

the ones mentioned above, divided the average number of cases diagnosed during 1985-2014 by the population of the state (844,877) and multiplied by 100,000.

(26.1/ 844877) x 100,000 =3.1

An incidence rate of 3.1 means that for every 100,000 people living in the state during 1985-2014, 3.1 were newly diagnosed with HIV or AIDS.

Case Definition Changes

The CDC AIDS case definition has changed over time based on knowledge of HIV disease and physician practice patterns. The original definition was modified in 1985. In 1987, definition revisions incorporated a broader range of AIDS opportunistic infections and conditions and used HIV diagnostic tests to improve the sensitivity and specificity of the definition[12]. In 1993, the definition expanded to include HIV-infected individuals with pulmonary tuberculosis, recurrent pneumonia, invasive cervical cancer, or CD4 T-lymphocyte counts of less than200 cells per ml or a CD4+ percentage of less than 14[13]. As a result of the 1993 definition expansion, HIV-infected persons were classified as AIDS earlier in their course of disease than under the previous definition. Regardless of the year, AIDS data are tabulated in this report by the date of the first AIDS defining condition in an individual under the 1993 case definition.

The case definition for HIV infection was revised in 1999 to include positive results or reports of detectable quantities of HIV virologic (non-antibody) tests[14]. The revisions to the 1993 surveillance definition of HIV include additional laboratory evidence, specifically detectable quantities from virologic tests. The perinatal case definition for infection and remission of symptoms among children less than 18 months of age who are perinatally exposed to HIV was changed to incorporate the recent clinical guidelines and the sensitivity and specificity of current HI diagnostic tests in order to more efficiently classify HIV-exposed children as infected or non-infected.