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Trends in Diagnoses of HIV Infection in the United States, 2002-2011

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Abstract

There has been increasing emphasis on care and treatment for persons with human immunodeficiency virus (HIV) in the United States during the past decade,^{1,2} including the use of antiretroviral therapy for increasing survival and decreasing transmission.¹ Accurate HIV diagnosis data recently became available for all states,³ allowing for the first time an examination of long-term national trends. These data can be used to monitor awareness of serostatus among persons living with HIV, primary prevention efforts, and testing initiatives. We examined trends in HIV diagnoses from 2002–2011 in the United States using data from the National HIV Surveillance System of the US Centers for Disease Control and Prevention (CDC).

Methods |

To assess trends in HIV diagnoses, we analyzed cases of HIV infection diagnosed during 2002–2011 among persons aged 13 years or older reported through December 2012. All data were collected through routine HIV surveillance mandated by laws or regulations in the 50 states and the District of Columbia. Ethical review for this data collection is waived.

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Author Contributions:

Ms Johnson and Dr Hall had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Johnson, Hall, Hu, Lansky, Mermin.

Acquisition, analysis, or interpretation of data: Johnson, Hall, Hu, Lansky, Holtgrave.

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Study supervision: Hall, Lansky, Mermin.

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Data on race/ethnicity were identified by health department personnel conducting active surveillance and reviewing medical records. Multiple imputation was used to assign transmission category to cases reported without an identified risk factor (124 447; 25.2%).³ Population denominators for calculating rates were obtained from the US Census Bureau.

We estimated annual percentage change (EAPC) in HIV diagnosis rates by using Poisson regression with no covariates⁴; logarithms of rate denominators served as offsets. Case counts (rather than rates) were used to analyze diagnoses by transmission category due to lack of population denominators. The significance of a trend was determined by whether the 95% confidence interval for the EAPC included 0. Data were analyzed using SAS version 9.3 (SAS Institute Inc).

Results |

During 2002–2011, 493 372 persons were diagnosed with HIV in the United States. The annual diagnosis rate decreased by 33.2% (EAPC = -4.0% ; 95% CI, -4.1 to -3.9) from 24.1 per 100 000 population in 2002 to 16.1 in 2011 (Table 1). Statistically significant decreases in the EAPC of diagnosis rates were found in nearly every demographic population with the largest changes observed in women, persons aged 35–44 years, and persons of multiple races. Changes were not evident for Asians or Native Hawaiians/other Pacific Islanders.

From 2002–2011, the annual number of HIV diagnoses decreased in persons with infection attributed to injection drug use or to heterosexual contact (Table 1). Diagnoses attributed to male-to-male sexual contact remained stable overall, increasing among males aged 13–24, 45–54, and 55 years or older, and decreasing among males aged 35–44 years (Table 2). The largest change (132.5%; EAPC = 10.5) was observed among males aged 13–24 years.

Discussion |

Nationally, the annual HIV diagnosis rate decreased more than 30% in the past decade. Declines were observed in several key populations; however, increases were found among certain age groups of men who have sex with men, especially young men. Because of delays in diagnosis, temporal trends in diagnoses and variations among groups may reflect earlier changes in HIV incidence.

This study is limited in that trends in diagnoses can be influenced by changes in testing patterns. The HIV testing services were expanded during the analysis period and early outcomes of testing initiatives often indicate increases in diagnoses until some level of testing saturation occurs. Our study found overall decreases in annual diagnosis rates despite the implementation of testing initiatives during the period of analysis. Although increases in diagnoses were found in young men who have sex with men, reports show that many at high risk do not test annually and the overall percentage of youth who had ever tested for HIV during the period of analysis was low compared with other age groups.^{5,6}

Among men who have sex with men, unprotected risk behaviors in the presence of high prevalence and unsuppressed viral load may continue to drive HIV transmission.⁶ Disparities

in rates of HIV among young men who have sex with men present prevention challenges and warrant expanded efforts.

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References

1. Centers for Disease Control and Prevention (CDC); Health Resources and Services Administration; National Institutes of Health; HIV Medicine Association of the Infectious Diseases Society of America. Incorporating HIV prevention into the medical care of persons living with HIV. *MMWR Recomm Rep.* 2003; 52(RR-12):1–24.
2. Centers for Disease Control and Prevention (CDC). Vital signs: HIV prevention through care and treatment—United States. *MMWR Morb Mortal Wkly Rep.* 2011;60(47):1618–1623. [PubMed: 22129997]
3. Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 dependent areas—2011. http://www.cdc.gov/hiv/pdf/2011_monitoring_hiv_indicators_hssr_final.pdf. Accessibility verified June 24, 2014.
4. Ries LAG, Eisner MP, Kosary CL, et al. SEER Cancer Statistics Review, 1973–1999, 2002. http://www.seer.cancer.gov/archive/csr/1973_1999/overview.pdf. Accessibility verified June 24, 2014.
5. Centers for Disease Control and Prevention (CDC). HIV testing and risk behaviors among gay, bisexual, and other men who have sex with men—United States. *MMWR Morb Mortal Wkly Rep.* 2013;62(47):958–962. [PubMed: 24280915]
6. Centers for Disease Control and Prevention (CDC). Vital signs: HIV infection, testing, and risk behaviors among youths—United States. *MMWR Morb Mortal Wkly Rep.* 2012;61(47):971–976. [PubMed: 23190571]

Human Immunodeficiency Virus (HIV) Diagnoses Among Persons Aged 13 Years or Older in the United States

Table 1.

	HIV Diagnosis Rate/100 000 Population by Year of Diagnosis											% Change	EAPC (95% CI)
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2011		
Sex													
Male	35.8	33.5	33.2	31.4	31.2	31.5	30.3	28.4	26.9	26.1	27.1	-27.1	-3.1 (-3.2 to -3.0)
Female	13.0	11.7	11.2	10.3	10.1	9.9	9.2	8.1	7.2	6.6	49.2	-49.2	-6.6 (-6.8 to -6.4)
Age group, y													
13-24	12.5	12.4	13.2	13.6	14.8	16.1	17.3	17.5	17.6	17.3	38.4	38.4	4.6 (4.4 to 4.9)
25-34	39.8	36.0	35.5	33.5	32.6	32.9	31.8	29.5	28.5	27.8	-30.2	-30.2	-3.6 (-3.7 to -3.4)
35-44	46.2	42.7	41.2	37.6	36.6	34.8	31.3	28.0	25.0	22.9	-50.4	-50.4	-7.1 (-7.3 to -7.0)
45-54	25.9	24.7	23.9	23.0	22.9	23.2	22.0	19.8	18.3	17.8	-31.3	-31.3	-3.8 (-4.0 to -3.6)
55	6.2	5.9	6.2	5.8	5.7	6.0	5.9	5.3	5.0	4.8	-22.6	-22.6	-2.5 (-2.8 to -2.1)
Race/ethnicity ^a													
American Indian/Alaska Native	12.9	12.5	11.7	11.7	10.5	10.7	11.3	10.2	11.3	10.0	-22.5	-22.5	-2.3 (-3.8 to -0.8)
Asian	6.2	6.3	6.5	6.0	6.3	7.2	7.0	6.4	5.8	6.4	3.2	3.2	0.1 (-0.7 to 1.0)
Black	99.4	90.9	89.1	81.7	80.3	80.1	79.0	71.6	66.7	62.6	-37.0	-37.0	-4.4 (-4.6 to -4.3)
Hispanic ^b	37.5	34.3	31.9	30.0	30.3	29.7	27.3	25.5	22.6	22.0	-41.3	-41.3	-5.4 (-5.6 to -5.2)
Native Hawaiian/other Pacific Islander	16.1	26.7	20.4	20.8	26.3	21.3	22.0	21.8	14.3	16.7	3.7	3.7	-2.6 (-5.0 to -0.1)
White	10.1	9.5	9.4	9.0	8.8	8.8	8.1	7.5	7.2	6.9	-31.7	-31.7	-4.0 (-4.1 to -3.8)
Multiple races	52.5	43.1	45.8	47.5	39.4	42.1	38.1	33.2	25.7	22.5	-57.1	-57.1	-7.7 (-8.3 to -7.1)
Total	24.1	22.3	21.9	20.6	20.4	20.4	19.6	18.0	16.8	16.1	-33.2	-33.2	-4.0 (-4.1 to -3.9)
No. of HIV Diagnoses by Transmission Category and Year of Diagnosis ^c													
Males													
MTM sexual contact	26 021	25 251	26 240	25 838	26 313	27 614	27 466	26 685	26 035	26 033	0	0	0.3 (0.1 to 0.5)
Injection drug use	6004	5199	4592	4064	3860	3424	2937	2436	2102	1795	-70.1	-70.1	-11.8 (-12.5 to -11.1)
Both of the above	2850	2587	2473	2320	2085	1956	1732	1513	1397	1211	-57.5	-57.5	-8.6 (-9.4 to -7.8)
Heterosexual contact ^d													
Heterosexual contact ^d	5980	5628	5546	5040	5187	5266	5043	4508	4123	3910	-34.6	-34.6	-4.0 (-4.6 to -3.5)

HIV Diagnosis Rate/100 000 Population by Year of Diagnosis												
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	% Change	EAPC (95% CI)
Other ^e	155	118	107	83	79	52	60	39	37	31	-80.0	-16.3 (-23.0 to -9.0)
Subtotal	41 010	38 783	38 958	37 345	37 524	38 313	37 238	35 181	33 694	32 980	-27.1	-3.1 (-3.2 to -3.0)
Females												
Injection drug use	3892	3324	3060	2666	2443	2215	1981	1658	1358	1218	-68.7	-11.5 (-12.4 to -10.6)
Heterosexual contact ^d	11 695	10 896	10 651	10 094	10 169	10 262	9836	8755	8094	7507	-35.8	-4.1 (-4.4 to -3.8)
Other ^e	119	103	89	73	58	42	32	22	17	15	-87.4	-20.4 (-28.4 to -11.6)
Subtotal	15 705	14 323	13 800	12 834	12 670	12 519	11 850	10 435	9470	8740	-49.2	-6.6 (-6.8 to -6.4)
Total	56 715	53 106	52 758	50 179	50 194	50 832	49 088	45 616	43 164	41 720	-33.2	-4.0 (-4.1 to 3.9)

Abbreviations: EAPC, estimated annual percentage change; MTM, male-to-male.

^aDefinitions based on standards for the classification of federal data from the US Office of Management and Budget.

^bCan be of any race.

^cRates not provided due to lack of denominator data for risk populations from the US Census Bureau.

^dIndicates contact with a person known to have, or to be at high risk for, HIV infection.

^eIncludes hemophilia, blood transfusion, perinatal exposure, and risk factor not reported or not identified.

Human Immunodeficiency Virus (HIV) Diagnoses Among Males With Infection Attributed to Male-to-Male Sexual Contact

Table 2.

No. of HIV Diagnoses Among Males With Infection Attributed to Male-to-Male Sexual Contact by Year of Diagnosis ^a												
Age group, y	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	% Change	EAPC (95% CI)
13–24	2976	3207	3748	4107	4690	5449	6208	6528	6912	6919	132.5	10.5 (10.1 to 10.9)
25–34	7957	7474	7657	7506	7379	7867	7868	7854	7738	7929	–0.4	0.3 (0 to 0.6)
35–44	9782	9296	9284	8642	8563	8125	7264	6537	5824	5417	–44.6	–6.2 (–6.5 to –5.8)
45–54	3936	3933	4090	4145	4217	4564	4471	4185	4040	4145	5.3	0.6 (0.1 to 1.1)
55	1370	1342	1462	1439	1465	1609	1655	1581	1521	1623	18.5	2.0 (1.0 to 3.0)
Total	26 021	25 251	26 240	25 838	26 313	27 614	27 466	26 685	26 035	26 033	0	0.3 (0.1 to 0.5)

Abbreviation: EAPC, estimated annual percentage change.

^aThe number of HIV diagnoses resulted from statistical adjustment that accounted for missing transmission category.