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Frequency and Predictors of Late HIV Diagnosis in the United States, 1994 through 1999

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Abstract

Background: The first step of CDC's Serostatus Approach to Fighting the Epidemic (SAFE) is diagnosis of HIV infection in all infected individuals. Subsequent steps include linking HIV infected persons to care and prevention services, and supporting them in adhering to prescribed treatment and in adopting and sustaining HIV risk reduction behavior. Success of this approach will depend on timeliness of HIV diagnosis. Our objective was to describe frequency and predictors of late HIV diagnosis.

Methods: We analyzed national HIV/AIDS surveillance data from 25 states that have conducted integrated HIV/AIDS surveillance since 1994. HIV diagnosis was considered "late" if an AIDS diagnosis was made within one year of HIV diagnosis. Data reported to CDC through June 2001 were adjusted for delays in reporting; mode of HIV exposure for cases initially reported without information on risk was statistically redistributed. We analyzed cases diagnosed from 1994 through December 1999 among persons aged 13 years and older by age group, sex, race/ethnicity, and HIV exposure mode. Summary Mantel-Haenszel odds ratios (OR_{MH}) were calculated for stratified analyses.

Results: Among all HIV diagnoses, percentage late (41) remained relatively stable during 1994 through 1999. Percentage late increased with age and ranged from 11 for persons aged 13-19 years to 58 for persons 50 years and older; was greater for men (46) than women (33); greater for whites (46) and Hispanics (49) compared with blacks (40); and greater for persons whose HIV exposure mode was male-to-male sexual contact (MMS) (46) or injection drug use (IDU) (44) compared with persons whose HIV exposure mode was heterosexual contact (HC) (35). After adjusting for age, probability of late diagnosis was greater for men than women (OR_{MH}=1.5); greater for whites (OR_{MH}=1.3) and Hispanics (OR_{MH}=1.5) compared with blacks; and greater for persons exposed through MMS (OR_{MH}=1.6) and IDU (OR_{MH}=1.2) compared with persons exposed through HC.

Conclusions: A substantial proportion of persons living with HIV received their diagnosis late--within the same year AIDS was diagnosed. After controlling for age, substantial differences in probability of late diagnosis by sex, race/ethnicity, and HIV exposure mode were still observed. To improve timeliness of HIV diagnosis, reasons for persistent delays in testing and potential interventions to increase testing among recently infected persons need to be identified.

Background

- The first step of CDC's Serostatus Approach to Fighting the Epidemic (SAFE)[1] is diagnosis of HIV infection in all infected individuals.
- Subsequent steps include linking HIV infected persons to care and prevention services, and supporting them in adhering to prescribed treatment and in adopting and sustaining HIV risk reduction behavior.
- Test seeking, diagnosis, entry to care, and risk reduction early in the course of HIV infection will enhance the success of this approach.

Objectives

- To determine the frequency and identify predictors of late HIV diagnosis.

Methods

- We used national HIV/AIDS surveillance data reported to CDC through June 2001 from 25 states* that have conducted integrated HIV/AIDS surveillance since 1994.
- To estimate the number of HIV and AIDS cases diagnosed from 1994 through December 1999 among persons aged 13 years and older, data were adjusted for delays in reporting; HIV exposure category for cases initially reported without risk information was statistically redistributed based on historical patterns of reclassification.
- Analysis was restricted to cases among whites, blacks, and Hispanics, and to cases attributed to the four most commonly reported HIV exposure categories (risk): heterosexual contact, male-to-male sexual (MMS) contact, injection drug use (IDU), and MMS-IDU.
- HIV diagnosis was defined as late if an AIDS diagnosis was made within one year of the first reported HIV diagnosis.

* Alabama, Arizona, Arkansas, Colorado, Idaho, Indiana, Louisiana, Michigan, Minnesota, Mississipi, Missouri, Nevada, New Jersey, North Carolina, North Dakota, Ohio, Oklahoma, South Carolina, South Dakota, Tennessee, Utah, Virginia, West Virginia, Wisconsin, and Wyoming.

Statistical Methods

Univariate Analysis

- Chi square test for difference in proportions
  - Compared proportion of all HIV diagnoses that were late, by age group (age at earliest diagnosis)
  - Stratified on age group to compare proportions that were late by —
    - sex
    - race/ethnicity
    - risk
  - Calculated weighted Mantel-Haenszel odds ratios (OR_{MH}) for stratified analyses

Multivariate Analysis

- Logistic regression
  - Estimated probability of late diagnosis
  - Stratified by sex
  - Simultaneously controlled for covariates—
    - age group
    - race/ethnicity
    - risk
  - Relationships between covariates were examined to assess possible statistical interaction

Results

- From 1994 through 1999, an estimated 104,780 persons had HIV diagnosed.
- Among these persons, an estimated 43,089 (41%) had HIV diagnosed late (i.e., within one year of AIDS diagnosis).
- By year of diagnosis, percent late was relatively stable.
- Percent late ranged from 16% among persons aged 13-24 years to 58% among persons aged 50 years and older.

  Percent late was greater for—
  - Men (45%) compared with women (31%);
  - Hispanics (48%) and whites (45%) compared with blacks (38%);
  - Persons with HIV attributed to male-to-male sex (45%), injection drug use (43%), and male-to-male sex and injection drug use (41%) compared with persons with heterosexually acquired HIV (33%).

Sociodemographic characteristics and HIV exposure category among persons with HIV diagnosed,* by timing of HIV diagnosis, 1994 through 1999—25 states

	Timing of HIV diagnosis				
	Late**		Not Late		
Characteristic	Number	(%)	Number	(%)	Total
Sex					
Male	34,688	(80)	43,215	(70)	77,903
Female	8,401	(20)	18,476	(30)	26,877
Race/ethnicity					
Black	22,199	(51)	36,328	(59)	58,527
White	17,167	(40)	21,266	(34)	38,433
Hispanic	3,723	(9)	4,097	(7)	7,820
Age group (years)					
13-24	1,918	(4)	9,908	(16)	11,826
25-29	5,049	(12)	11,163	(18)	16,212
30-39	18,606	(43)	24,809	(40)	43,415
40-49	12,222	(28)	11,968	(19)	24,190
50+	5,294	(12)	3,843	(6)	9,137
HIV exposure category (risk)					
Male-to-male sex (MMS)	20,664	(48)	25,052	(41)	45,716
Injection drug use (IDU)	10,674	(25)	14,393	(23)	25,067
Heterosexual contact	9,571	(22)	19,152	(31)	28,723
MMS-IDU	2,180	(5)	3,094	(5)	5,274
Total	43,089		61,691		104,780

* Estimates based on cases reported to CDC through June 2001 adjusted for reporting delay; HIV exposure category for cases initially reported without risk information was statistically redistributed.

**Late diagnosis was defined as having an AIDS diagnosis within one year of the first reported HIV diagnosis.

Univariate Results

Differences in proportions of HIV diagnoses that were late, by age group

	Timing of HIV diagnosis		
	Late	Not late	
Age group (years)	No. (%)	No. (%)	OR (95% CI)
13-24	1,918 (16)	9,908 (84)	Referent
25-29	5,049 (31)	11,163 (69)	2.3 (2.2, 2.5)
30-39	18,606 (43)	24,809 (57)	3.9 (3.7, 4.1)
40-49	12,222 (51)	11,968 (49)	5.3 (5.0, 5.6)
50+	5,294 (58)	3,843 (42)	7.1 (6.7, 7.6)
Total	43,089 (41)	61,691 (59)	

Age-adjusted differences in proportions of HIV diagnoses that were late, by sex, race/ethnicity, and risk

	Timing of HIV diagnosis		
	Late	Not late	
Characteristic	No. (%)	No. (%)	OR_{MH} (95% CI)
Sex			
Female	8,401 (31)	18,476 (69)	Referent
Male	34,688 (45)	43,215 (55)	1.6 (1.5, 1.6)
Race/ethnicity			
Black	22,199 (38)	36,328 (62)	Referent
White	17,168 (45)	21,266 (55)	1.3 (1.2, 1.3)
Hispanic	3,723 (48)	4,097 (62)	1.5 (1.5, 1.6)
Risk			
Heterosexual contact	9,571 (33)	19,152 (67)	Referent
Male-to-male sex (MMS)	20,664 (45)	25,052 (55)	1.6 (1.5, 1.6)
Injection drug use (IDU)	10,674 (43)	14,393 (57)	1.2 (1.2, 1.3)
MMS-IDU	2,180 (41)	3,094 (59)	1.3 (1.2, 1.4)

Multivariate Results

Probability of late testing among men and women, by age group, race/ethnicity, and risk

	Men	Women
	OR (95% CI)	OR (95% CI)
Age group		
13-24	Referent	Referent
25-29	2.2 (2.0, 2.3)	2.2 (1.9, 2.4)
30-29	3.6 (3.4, 3.8)	3.4 (3.1, 3.8)
40-49	4.9 (4.6, 5.2)	5.0 (4.5, 5.5)
50+	6.5 (6.0, 7.0)	7.2 (6.4, 8.2)
Race/ethnicity		
Black	Referent	Referent
White	1.2 (1.2, 1.2)	1.1 (1.0, 1.1)
Hispanic	1.5 (1.4, 1.6)	1.4 (1.2, 1.5)
Risk		
Heterosexual contact	Referent	Referent
Male-to-male sexual (MMS)	1.3 (1.2, 1.3)	NA
Injection drug use (IDU)	1.2 (1.1, 1.2)	1.1 (1.0, 1.2)
MMS-IDU	1.0 (0.9,1.1)	NA

Probability of late testing among whites, blacks, and Hispanics by sex, age group, race/ethnicity, and risk

Male	White	Black	Hispanic
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age group			
13-24	Referent	Referent	Referent
25-29	2.6 (2.2, 2.9)	2.1 (1.9, 2.3)	1.8 (1.4, 2.2)
30-39	4.8 (4.3, 5.4)	3.2 (3.0, 3.5)	2.4 (2.0, 3.0)
40-49	6.9 (6.1, 7.8)	4.2 (3.8, 4.6)	3.2 (2.6, 4.0)
50+	9.3 (8.1,10.6)	5.5 (5.0, 6.1)	4.7 (3.6, 6.1)
Risk			
Heterosexual contact	Referent	Referent	Referent
Male-to-male sexual (MMS)	1.0 (0.9, 1.1)	1.4 (1.3, 1.5)	1.0 (0.9, 1.2)
Injection drug use (IDU)	0.9 (0.8, 1.0)	1.3 (1.2, 1.4)	0.8 (0.7, 0.9)
MMS-IDU	0.8 (0.7, 0.9)	1.2 (1.1, 1.3)	0.7 (0.6, 0.9)

Female	White	Black	Hispanic
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age group			
13-24	Referent	Referent	Referent
25-29	2.5 (2.0, 3.1)	2.0 (1.8, 2.3)	2.3 (1.6, 3.4)
30-39	3.9 (3.2, 4.7)	3.3 (3.0, 3.7)	3.4 (2.4, 3.7)
40-49	4.9 (4.0, 6.1)	5.0 (4.4, 5.6)	4.8 (3.3, 7.0)
50+	7.6 (5.9, 9.8)	7.1 (6.2, 8.2)	6.4 (4.0, 10.2)
Risk			
Heterosexual contact	Referent	Referent	Referent
Injection drug use (IDU)	0.9 (0.8, 1.1)	1.2 (1.1,1.2)	0.9 (0.7, 1.1)

Summary

- A substantial proportion (41%) of HIV-infected persons received their diagnosis late in the course of infection—within the same year AIDS was diagnosed.
- Percent of diagnoses that were late increased with age.
- Univariate analysis showed significant differences in age-adjusted probability of late diagnosis by sex, race/ethnicity, and risk.
- Some of these differences were attenuated in the multivariate analysis. Relationships of age group, race/ethnicity, and risk were examined by fitting a model that included terms to assess possible interaction among the three covariates. The model showed significant interaction between—
  - Age, race/ethnicity, and risk for men;
  - Risk and race/ethnicity for women.
- The final model, stratified by sex and race/ethnicity, showed that risk was not a strong predictor for late testing, but was strongest among black men and black women.

Limitations

- Because data were from only 25 states, these findings may not be nationally generalizable.
- The data are not representative of all confidential HIV diagnoses, especially by race/ethnicity. Analysis was restricted to cases among whites, blacks, and Hispanics because the number of cases in other racial/ethnic groups was too small for meaningful analysis.
- HIV-infected persons who tested anonymously were not reported to surveillance and not included in the analyses. If such persons had HIV diagnosed anonymously more than a year before AIDS, but delayed entry to care, they may contribute to an overestimate of late diagnosis.
- The strength of age group as a predictor for late diagnosis may be due to selection bias. We may have selected for late diagnosis among older persons infected during the peak of the epidemic in the mid-1980s[2] who delayed testing. For young persons infected more recently, most late HIV diagnoses would be among those whose infection progressed rapidly to AIDS.

Conclusions

- A substantial proportion of HIV-infected persons received their diagnosis late in the course of infection—within the same year AIDS was diagnosed.
- Frequency of late diagnosis varied by age, sex, race/ethnicity, and risk; race/ethnicity and risk appeared to be closely interrelated and may be acting as surrogates for other factors associated with late diagnosis.
- Increasing awareness of serostatus and improving linkage to care and prevention services will require consideration of complex behavioral and cultural factors and implementation of multiple strategies.

References

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