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HIV/AIDS reporting in NYC

- 1982-1993: AIDS-defining illnesses/opportunistic infections reportable
- 1993-2000: Additional conditions and CD4 counts below 200 cells/ μ L reportable
- June 1, 2000 – present: Addition of positive Western blots, CD4 counts 200-500 cells/ μ L, detectable viral loads, and all HIV-related clinical events reportable

HIV in New York City, 2001

- 6,356 new HIV diagnoses reported in NYC during 2001 (as of 12/31/2002)
- 1,710 concurrently diagnosed with AIDS
- 4141 (65%) of new diagnoses were male
- 3401 (53%) were black
- 1478 (23.3%) were MSM
- 1723 (27%) were diagnosed by a public laboratory
- 2,487 deaths during 2001 among known persons living with HIV/AIDS

The need for incidence data

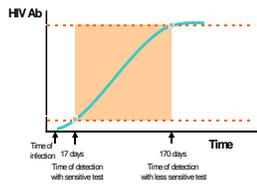
- HIV epidemic in NYC has been continuously evolving
- New HIV diagnoses do not mean new infections
 - HIV has a long and varying incubation period
 - 27% of new HIV diagnoses in NYC during 2001 concurrently diagnosed with AIDS represent infections that occurring as much as a decade or longer prior to diagnosis
 - The people who got infected years ago may be very different from the people getting infected today
- Incidence data can help target prevention resources to populations where HIV is spreading now

Sensitive/Less sensitive EIA or STARHS

STARHS = Serologic Testing Algorithm for Recent HIV Seroconversion (i.e., sensitive/less sensitive enzyme immunoassay [EIA] or "differential" assay)

- STARHS is a laboratory method that compares two test results to distinguish between early (within ~ 6 months) and established HIV infection
 - The first test is the highly sensitive standard EIA used to diagnose HIV infection
 - HIV+ specimens are re-tested using a less-sensitive modified version of the standard EIA (BioMérieux Virostatika) sensitive only to elevated levels of HIV antibody
 - A "positive" result suggests a more established infection
 - A "negative" result suggests an infection in the early stages
- Good performance characteristics for estimating HIV incidence at the appropriate level
 - CDC: No clinical utility

STARHS method to estimate stage of infection using a single diagnostic specimen



Objectives

- Combine HIV reporting data with STARHS to derive population-based estimates of HIV incidence in New York City
- Characterize groups at highest risk for incident HIV infection in NYC so that prevention resources can be targeted to them
- Establish baseline incidence rate for monitoring progress in reducing incident infections

Study population

- HIV+ persons: (n=1022)
 - reported to population-based HIV surveillance having a diagnostic Western blot performed at NYC or NYS public health laboratories
 - New HIV diagnosis during 2001
 - No reports of an AIDS diagnosis
 - Remnant diagnostic serum available
- HIV- persons: (n=113,681): All non-positive HIV tests performed by NYC and NYS PHL
 - excluding:
 - non-NYC residents
 - anonymous tests
 - known repeat negative HIV tests by same individuals
 - HIV for validation/confirmatory tests for other laboratories

Calculating HIV incidence

$$\text{Incidence} = n/n \times (365.25/170) \times 100$$

Where:

- n = number with evidence of infection within ~6 months of diagnosis
- N = n + plus the number of seronegatives at the public laboratories
- 170 (95% CI 162, 183) is the estimated number of days between infection and a reactive test on the less-sensitive EIA
- 365.25 is the number of days in a year

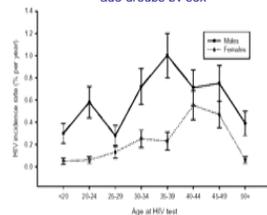
Estimating HIV incidence by transmission risk

- Transmission risk was unknown for 35% of new HIV diagnoses tested with the less sensitive EIA
- Risk factor removed from NYC and NYS PHL HIV testing requisition forms in 2000 – no risk data available for HIV- persons tested
- To approximate numbers of HIV- persons in risk categories, % in each risk category from 2002 NYC Community Health Survey (random household telephone survey) respondents applied to population of negative HIV tests

HIV Incidence Estimates – All testers

	% early infection (total tested with LS-EIA)	nN	Annual Incidence Rate (95% CI)	RR (95% CI)
Total	14.8 (1022)	151 / 113,682	0.29 (0.20 – 0.38)	-
Sex				
Male	15.7% (813)	96 / 35,453	0.58 (0.44 - 0.72)	3.6 (2.6 – 5.0)
Female	13.4% (409)	55 / 75,583	0.18 (0.10 - 0.22)	referent
Race/ethnicity				
White	19.4% (87)	13 / 7,315	0.38 (0.28 - 0.49)	referent
Black	14.1% (594)	84 / 41,772	0.43 (0.32 - 0.54)	1.1 (0.6 - 2.0)
Hispanic	14.9% (343)	51 / 48,726	0.22 (0.15 - 0.30)	0.6 (0.3 - 1.1)
Asian/Pacific Islander/Native American	16.7% (18)	3 / 6,084	0.11 (0.08 - 0.16)	0.3 (0.1 - 1.0)
Age group				
under 20	28.6% (28)	8 / 16,499	0.10 (0.05 - 0.15)	0.6 (0.3 - 1.4)
20-24	23.0% (100)	23 / 26,167	0.19 (0.12 - 0.26)	1.1 (0.6 - 2.1)
25-29	11.0% (145)	16 / 20,585	0.17 (0.11 - 0.24)	referent
30-34	15.3% (196)	30 / 16,504	0.39 (0.28 - 0.50)	2.3 (1.3 - 4.2)
35-39	15.3% (196)	30 / 12,377	0.52 (0.39 - 0.65)	3.1 (1.7 - 5.6)
40-44	15.4% (149)	23 / 8,072	0.61 (0.47 - 0.75)	3.6 (1.9 - 6.8)
45-49	14.0% (93)	13 / 4,655	0.60 (0.46 - 0.74)	3.5 (1.7 - 7.3)
50+	7.0% (115)	8 / 8,274	0.21 (0.14 - 0.28)	1.2 (0.5 - 2.9)
Transmission risk factor				
MSM	24.1% (228)	55 / 4,750	2.5 (2.1 - 2.8)	20.8 (11.4 - 31.0)
IDU	14.0% (150)	21 / 5,821	0.78 (0.61 - 0.94)	6.5 (3.9 - 11.0)
Heterosexual	15.6% (276)	43 / 77,383	0.12 (0.07 - 0.17)	referent
Unknown/other/ under investigation	8.37% (368)	32 / 22,485	0.31 (0.22 - 0.40)	2.6 (1.6 - 4.1)

HIV Incidence estimates: age groups by sex



HIV Incidence Estimates – Males only

	% early infection (total tested with LS-EIA)	nN	Annual Incidence Rate (95% CI)	RR (95% CI)
Total	15.7% (813)	96 / 35,453	0.58 (0.44 – 0.72)	-
Race/ethnicity				
White	24.5% (49)	12 / 3,490	0.74 (0.58 - 0.90)	referent
Black	14.4% (326)	47 / 14,915	0.68 (0.53 - 0.83)	0.9 (0.5 - 1.7)
Hispanic	14.9% (228)	34 / 12,803	0.57 (0.44 - 0.70)	0.8 (0.4 - 1.5)
Asian/Pacific Islander/Native American	30.0% (10)	3 / 1,072	0.60 (0.46 - 0.74)	0.8 (0.2 - 2.9)
Age group				
under 20	62.5% (8)	5 / 3,631	0.30 (0.21 - 0.39)	1.1 (0.3 - 3.4)
20-24	34.6% (52)	18 / 6,636	0.58 (0.44 - 0.72)	2.1 (0.9 - 5.0)
25-29	9.0% (78)	7 / 5,386	0.28 (0.19 - 0.37)	referent
30-34	14.0% (121)	17 / 5,074	0.72 (0.56 - 0.87)	2.6 (1.1 - 6.2)
35-39	16.3% (120)	22 / 4,637	1.00 (0.80 - 1.2)	3.6 (1.5 - 8.4)
40-44	13.2% (91)	12 / 3,630	0.71 (0.55 - 0.86)	2.5 (1.0 - 6.4)
45-49	12.3% (65)	8 / 2,285	0.75 (0.59 - 0.91)	2.7 (1.0 - 7.4)
50+	9.0% (78)	7 / 3,878	0.39 (0.28 - 0.50)	1.4 (0.5 - 4.0)
Transmission risk factor				
MSM	24.1% (228)	55 / 4,750	2.5 (2.1 - 2.8)	20.8 (11.4 - 38.1)
IDU	12.4% (105)	13 / 1,017	2.7 (2.3 - 3.1)	22.5 (10.4 - 48.5)
Heterosexual	11.8% (110)	13 / 23,278	0.12 (0.07 - 0.17)	referent
Unknown/other/ under investigation	8.6% (170)	32 / 6,411	0.50 (0.38 - 0.62)	4.2 (2.0 - 8.8)

HIV Incidence Estimates – Females only

	% early infection (total tested with LS-EIA)	nN	Annual Incidence Rate (95% CI)	RR (95% CI)
Total	13.4% (409)	55 / 75,583	0.16 (0.10 - 0.22)	-
Race/ethnicity				
White	5.6% (18)	1 / 3,657	0.06 (0.03 - 0.10)	referent
Black	13.8% (268)	37 / 25,848	0.31 (0.22 - 0.40)	5.2 (0.71 - 37.7)
Hispanic	14.8% (115)	17 / 34,807	0.10 (0.05 - 0.15)	1.7 (0.22 - 12.5)
Asian/Pacific Islander/Native American	0.0% (8)	0 / 4,824	0.00 (0.00 - 0.13)	0.0
Age group				
under 20	15.0% (20)	3 / 12,559	0.05 (0.02 - 0.08)	0.4 (0.10 - 1.4)
20-24	10.4% (48)	5 / 19,030	0.06 (0.03 - 0.10)	0.5 (0.15 - 1.4)
25-29	13.4% (67)	9 / 14,804	0.13 (0.08 - 0.19)	referent
30-34	17.3% (75)	13 / 11,116	0.25 (0.17 - 0.33)	1.9 (0.82 - 4.5)
35-39	10.5% (78)	8 / 7,499	0.23 (0.15 - 0.31)	1.8 (0.68 - 4.8)
40-44	19.0% (58)	11 / 4,287	0.55 (0.42 - 0.68)	4.2 (1.75 - 10.2)
45-49	17.9% (28)	5 / 2,272	0.47 (0.35 - 0.59)	3.6 (1.21 - 10.8)
50+	2.7% (37)	1 / 3,678	0.06 (0.03 - 0.10)	0.5 (0.06 - 3.6)
Transmission risk factor				
IDU	17.8% (45)	8 / 4,804	0.36 (0.26 - 0.46)	3.0 (1.4 - 6.5)
Heterosexual	18.1% (168)	30 / 54,705	0.12 (0.07 - 0.17)	referent
Unknown/other/ under investigation	8.6% (198)	17 / 16,074	0.23 (0.15 - 0.31)	1.9 (1.1 - 3.5)

Poisson regression analysis

NR: risk factor not included because data not available for regression at individual level

	Crude RR (95% CI)	Adjusted RR (95% CI)
Sex		
Male	3.63 (2.6 - 5.1)	2.84 (2.0 - 4.0)
Female	referent	referent
Race		
White	referent	referent
Black	1.1 (0.6 - 2.0)	1.6 (0.8 - 3.0)
Hispanic	0.8 (0.3 - 1.1)	1.0 (0.5 - 2.0)
Other	0.3 (0.1 - 1.0)	0.2 (0.1 - 0.6)
Age at diagnosis		
under 20	0.6 (0.3 - 1.4)	0.7 (0.3 - 1.5)
20-24	1.1 (0.6 - 2.1)	1.17 (0.6 - 2.2)
25-29	referent	referent
30-34	2.3 (1.3 - 4.2)	2.2 (1.2 - 4.2)
35-39	3.1 (1.7 - 5.6)	2.7 (1.5 - 5.1)
40-44	3.6 (1.9 - 6.8)	2.74 (1.4 - 5.3)
45-49	3.5 (1.7 - 7.3)	2.7 (1.3 - 5.8)
50+	1.2 (0.5 - 2.9)	1.0 (0.4 - 2.4)
Borough of Residence		
Manhattan	referent	referent
Bronx	0.5 (0.3 - 0.8)	0.6 (0.4 - 0.9)
Brooklyn	0.8 (0.5 - 1.2)	0.8 (0.5 - 1.3)
Queens + Staten Island	0.5 (0.3 - 0.8)	0.7 (0.4 - 1.1)

Limitations

- Estimates applicable only to population of HIV testers
- Data are representative of only 27% of new HIV diagnoses in NYC during 2001
- These estimates do not properly account for testing frequency, which varies widely in the population
- Large % of NIR among positives and limited risk data for negatives
- STARHS method has drawbacks including:
 - Mistakenly classifies non-early infections with low antibody levels as early infections
 - Natural non-progressors
 - AIDS cases
 - Persons on antiretroviral therapy
- Incidence rates may be further underestimated because:
 - Negative HIV tests not reportable and thus ability to de-duplicate negatives was restricted
 - HIV+ specimens from NYC and NYS labs which did not have sufficient remnant serum for testing with LS-EIA are not adjusted for in incidence estimates

Future HIV incidence surveillance in NYC

- NYC currently working with CDC toward testing 100% of new non-AIDS HIV diagnoses using STARHS for more representative incidence estimates
- Enhancements to collection of risk data being incorporated into HIV surveillance and HIV laboratory testing
- Collection of important data on testing history and frequency will become routine part of future HIV incidence surveillance
- CDC is working to develop successors to the LS Virostatika assay that can more accurately classify HIV infections in the early stages

Conclusions

- Overall HIV incidence estimate among testers is 0.29 % per year; incidence significantly higher among males compared to females
- Estimated HIV incidence is significantly higher in some subgroups, and these subgroups may be good candidates for intensified targeting of prevention resources.
 - MSM are at significantly higher risk for incident HIV infection at 2.5% per year
 - IDU also have significantly higher risk for HIV infection in both men and women
- Incidence estimates are highest among testers in their 30s and 40s, but this is likely an artifact of decreased routine testing and increased risk-based testing
- 15% of new non-AIDS HIV diagnoses show evidence of occurring in the ~6 months prior to HIV testing
- Quality data on testing frequency and risk factor would greatly augment HIV incidence estimates
- STARHS is a useful epidemiological tool that can potentially complement existing HIV/AIDS surveillance data
- This study is a useful starting point, but if LS EIA testing were extended to persons in NYC testing at private laboratories, estimates could be generalized to the population of all testers in NYC and better estimate population HIV incidence

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