

HIV INCIDENCE IN NEW YORK CITY, 2001

Estimates using the Serologic Testing Algorithm for Recent HIV Seroconversion (STARHS) on Specimens Testing HIV+ at Public Laboratories

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HIV Incidence: The Basics

Tracking the epidemic

New York City has the oldest, largest, and most heterogeneous HIV epidemic in the western world. It has evolved continuously, affecting people of both genders and from every race, age, neighborhood and socioeconomic status.

The Department of Health and Mental Hygiene (DOHMH) monitors the HIV epidemic through the HIV/AIDS reporting system. Medical providers and laboratories have been required by law to submit reports on HIV and AIDS defining conditions as follows:

- 1982-1993 – AIDS defining illnesses/opportunistic infections were reportable
- 1993-2000 – Additional AIDS-defining conditions and CD4 counts less than 200 cells/ μ L became reportable
- **June 1, 2000-present: In addition to previous AIDS-defining conditions, all positive Western blots, CD4 counts of 200-500 cells/ μ L, detectable viral loads, and all HIV-related clinical events became reportable**

Prevalence vs. incidence

- The prevalence of HIV/AIDS in NYC includes all people living with HIV and AIDS, regardless of when they acquired their infection. The prevalence is expressed as a percentage of the population at a point in time.
- The incidence is the number of new HIV infections or AIDS cases per year.
- We can use the HIV/AIDS reporting system to calculate AIDS incidence. But...
- ...a new HIV diagnosis does not necessarily mean a new infection. Many people only find out they are infected years after their initial infection – In 2001, 27% of new HIV diagnoses were made in people who already had AIDS, and thus had been infected for many years without knowing it.

- If everyone at risk in NYC was tested once per year, we could measure HIV incidence using the HIV/AIDS reporting system. But many people are not tested regularly, and many are not tested until they develop symptoms, often as long as a decade after they were first infected. Also, HIV positive people who were diagnosed prior to June 1, 2000 will not be reported until they have a reportable HIV or AIDS-related laboratory or clinical event.
- In order to measure incidence, we have to know approximately when a person first acquired HIV.

Why measure incidence?

- The people who were infected many years ago may be very different from the people who are getting infected today. **Accurately measuring incidence can help us understand how HIV is spreading now and where to more effectively focus prevention efforts.**
- **Incidence estimates can also help us measure our progress in reducing the spread of HIV in New York City over time.**

How do we measure the incidence of HIV?

- Before HIV reporting, we estimated incidence by following groups of people who were frequently tested for HIV. These studies were expensive and complicated, and the results did not represent the general population.
- A new laboratory method, STARHS, can be used to estimate HIV incidence in the population receiving HIV tests. It is a method of testing HIV positive specimens to distinguish between people who were infected within ~6 months prior to diagnosis and those who were infected more than ~6 months prior to diagnosis.



HIV reporting is not just a good idea. It's the law.

Why is it also a good idea?

Complete reporting of all HIV and AIDS-related events improves our ability to track and respond to the epidemic.

The more we know about HIV, the more we can do to stop it.

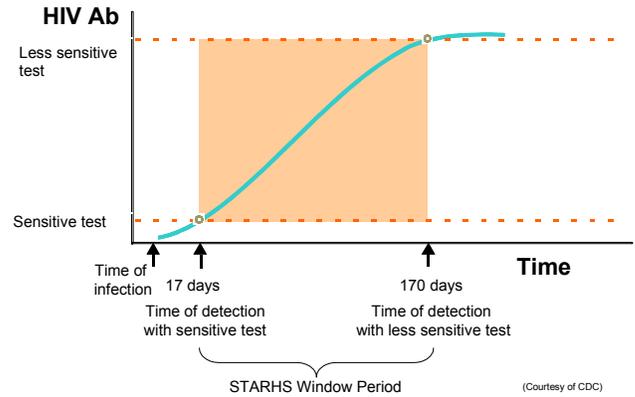
For assistance in reporting a case, call the DOHMH at (212) 442-3388.

Estimating HIV incidence in New York City using STARHS

What is STARHS?

- STARHS stands for the “Serologic Testing Algorithm for Recent HIV Seroconversion.” It is also known as the “detuned assay” or the “Sensitive Assay/Less Sensitive Assay.”
- STARHS is a comparison of two tests on a single diagnostic specimen:
 1. The regular HIV antibody test that is used to diagnose HIV infection.
 2. A less sensitive version of the same test that only detects high levels of HIV antibody.
- The first test indicates whether the person is infected with HIV. If infected, the second, less-sensitive test can indicate whether or not the patient has a high level of HIV antibodies.
- Because a person’s level of antibody gradually increases in the early stages after infection, the result of the second test suggests whether they have been infected for a shorter (~6 months or less) or longer time.

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



Percent Infected within ~6 Months prior to Diagnosis and Incidence Estimates
Persons diagnosed with HIV by NYC DOHMH Public Health Laboratory and NYS Wadsworth Center during 2001

	% Infected within ~6 Months prior to Diagnosis	N Infected within ~6 Months prior to Diagnosis/ Total N WB-Positive	N WB-Negative	"Estimated annual incidence (% / year)"	95% CI ¹
Total	14.8	151 / 1022	113,681	0.29	(0.20 - 0.38)
Sex					
Male	15.7	96 / 613	35,357	0.58	(0.44 - 0.72)
Female	13.4	55 / 409	75,528	0.16	(0.10 - 0.22)
Race					
White	19.4	13 / 67	7,302	0.38	(0.28 - 0.49)
Black	14.1	84 / 594	41,688	0.43	(0.32 - 0.54)
Hispanic	14.9	51 / 343	48,675	0.22	(0.15 - 0.30)
Asian/Pacific Islander/ Native American	16.7	3 / 18	6,061	0.11	(0.06 - 0.16)
Age at diagnosis					
under 20	28.6	8 / 28	16,491	0.10	(0.05 - 0.15)
20-24	23.0	23 / 100	26,144	0.19	(0.12 - 0.26)
25-29	11.0	16 / 145	20,569	0.17	(0.11 - 0.24)
30-34	15.3	30 / 196	16,474	0.39	(0.28 - 0.50)
35-39	15.3	30 / 196	12,347	0.52	(0.39 - 0.65)
40-44	15.4	23 / 149	8,049	0.61	(0.47 - 0.75)
45-49	14.0	13 / 93	4,642	0.60	(0.46 - 0.74)
50+	7.0	8 / 115	8,266	0.21	(0.14 - 0.28)
under 25	24.2	31 / 128	42,635	0.16	(0.10 - 0.22)
25 +	13.4	120 / 894	70,347	0.37	(0.27 - 0.47)
Borough of Residence					
Manhattan	14.9	46 / 309	24,261	0.41	(0.30 - 0.52)
Bronx	11.8	35 / 296	36,451	0.21	(0.14 - 0.28)
Brooklyn	17.1	44 / 258	28,735	0.33	(0.24 - 0.43)
Queens	16.5	23 / 139	22,964	0.21	(0.14 - 0.29)
Staten Island	0.0	0 / 7	1,270	0.00	(0.00 - 0.51) ³
Transmission risk²					
Men who report sex with men	24.1	55 / 228	4,695	2.50	(2.10 - 2.80)
Injection drug use history	14.0	21 / 150	6,592	0.68	(0.53 - 0.83)
Heterosexual	15.6	43 / 276	77,152	0.12	(0.07 - 0.17)
Other/unknown/under investigation	8.7	32 / 368	22,453	0.31	(0.22 - 0.40)
Source					
STD clinics	23.5	38 / 162	20,645	0.39	(0.28 - 0.50)
CBOs	24.2	15 / 62	3,554	0.90	(0.72 - 1.10)
HHC	8.9	19 / 214	36,229	0.11	(0.06 - 0.16)
TB clinics	0.0	0 / 8	1,306	0.00	(0.00 - 0.49) ³
Private MDs	13.3	40 / 301	22,794	0.38	(0.28 - 0.48)
NYC Corrections	12.8	11 / 86	3,910	0.60	(0.46 - 0.74)
Other	14.8	28 / 189	4,524	1.30	(1.10 - 1.50)

¹ Assumes a Poisson distribution; CI's adjusted for variation in the mean interval between infection and detection using the less sensitive test.
² Negative denominators estimated using citywide survey risk data for respondents who tested for HIV in 2001 at public sites such as the following: counseling and testing sites, TB clinics, STD clinics, community health clinics, other health department sites and public clinics, or in prison.
³ Minimum estimate of upper 95% CI.

The Specimens that Were Tested

- Serum from the specimens of NYC residents who tested positive for HIV in 2001 at the New York City and New York State public health laboratories was salvaged and matched to their HIV surveillance record to describe their sex, race, age and risk factor. All personal identifiers were removed before the specimens were sent to the STARHS laboratory at the NYS Wadsworth Center.
- **Does the sample include or represent everyone who was diagnosed with HIV in 2001?** No. The public laboratories tested the specimens of approximately 27% of the persons newly diagnosed with HIV in 2001. Cases in this sample do not represent all testers, only persons diagnosed at public laboratories. (See “Future of STARHS”, p. 4)

Calculating the Incidence Estimates

- We used this formula to calculate the annual incidence rates (expressed as % / year):

$$I = n/N \times (365.25/170) \times 100$$
- where n=the number with evidence of infection within ~6 months prior to diagnosis, and N=n+the number of seronegatives at the public laboratories. 365.25 is the number of days per year, and 170 is the estimated number of days (95% CI: 162, 183) between infection and a reactive test on the less sensitive test system that was used on these specimens. The confidence intervals reflect adjustments for sampling variability and uncertainty in the mean STARHS window period.
- Excluded from the calculations were all anonymous tests, known duplicate specimens, all specimens used for confirmatory and validation purposes only, and all negative specimens that were tested as part of a research protocol exempt from state reporting laws.

Interpretation of STARHS Results

In the tables below, the STARHS results are presented in 2 ways:

- Percent of persons tested with STARHS who show evidence of having been infected within ~6 months prior to their HIV diagnosis.
- The incidence rate for the population or portion of the population whose specimens showed evidence of having been infected ~6 months prior to diagnosis, expressed as percent per year.

The results represent the population tested at the public health laboratories in 2001. The results do not represent the incidence rate in all testers, nor do they represent the incidence rate in the general population.

Results of STARHS 2001: Highlights

- Among persons with a new HIV positive test at public laboratories in 2001, 15% showed evidence of having been infected within ~6 months prior to the HIV diagnosis.
- The incidence rate in the population tested was 0.3%/year.
- Among men who have sex with men (MSM), 24% were infected within ~6 months prior to diagnosis. The incidence rate was 2.5%/year.
- Incidence rates that were higher than the overall rate were observed in MSM, and women tested in the NYC jails and community-based organizations.
- Risk factor is unknown for 40% of this sample.

Assumptions And Limitation of STARHS

STARHS results should be cautiously interpreted

- STARHS relies on the level of high-affinity HIV antibody in a person's blood. If they have a low level of antibody, they may be in the early stages of infection. However, there are other people who have low levels of HIV antibody in their blood:
 - o AIDS patients
 - o Persons on antiretroviral therapy with successful viral suppression
 - o Persons on antiviral therapy for Hepatitis B
 - o Long-term natural non-progressors
- Because STARHS doesn't know why antibody levels are low, these people may appear to have been infected within ~6 months prior to diagnosis. STARHS results should be interpreted in light of the clinical and testing history data that accompany them.
- The probability of identifying someone within ~6 months of infection depends upon how frequently the person tests for HIV, and on whether testing is routine or risk-based. Persons in some risk categories are tested more frequently than others, and thus have an increased chance of being tested within ~6 months of infection.
- The optical density cutoff that is used to classify a specimen as showing evidence of infection within ~6 months prior to diagnosis is based on an average of 170 days (95% CI 162-183) days between infection and detection in a population. Antibody levels at different stages of infection vary from person to person, and thus the actual time of detection by the less sensitive assay may vary as well.

Percent Infected within ~6 Months prior to Diagnosis and Incidence Estimates Persons diagnosed with HIV by NYC DOHMH Public Health Laboratory and NYS Wadsworth Center during 2001, men only

	% Infected within ~6 Months prior to Diagnosis	N Infected within ~6 Months prior to Diagnosis/ Total N WB-Positive	N WB-Negative	"Estimated annual incidence (% / year)"	95% CI ¹
Total (men only)	15.7	96 / 613	35,357	0.58	(0.44 - 0.72)
Race					
White	24.5	12 / 49	3,478	0.74	(0.58 - 0.90)
Black	14.4	47 / 326	14,868	0.68	(0.53 - 0.83)
Hispanic	14.9	34 / 228	12,769	0.57	(0.44 - 0.70)
Asian/Pacific Islander/ Native American	30.0	3 / 10	1,069	0.60	(0.46 - 0.74)
Age at diagnosis					
under 20	62.5	5 / 8	3,626	0.30	(0.21 - 0.39)
20-24	34.6	18 / 52	6,618	0.58	(0.44 - 0.72)
25-29	9.0	7 / 78	5,379	0.28	(0.19 - 0.37)
30-34	14.0	17 / 121	5,057	0.72	(0.56 - 0.87)
35-39	18.3	22 / 120	4,615	1.00	(0.80 - 1.20)
40-44	13.2	12 / 91	3,618	0.71	(0.55 - 0.86)
45-49	12.3	8 / 65	2,277	0.75	(0.59 - 0.91)
50+	9.0	7 / 78	3,871	0.39	(0.28 - 0.50)
under 25	38.3	23 / 60	10,244	0.48	(0.36 - 0.60)
25 +	13.2	73 / 553	24,817	0.63	(0.49 - 0.77)
Borough of Residence					
Manhattan	16.7	32 / 192	9,487	0.72	(0.56 - 0.87)
Bronx	13.8	22 / 160	9,960	0.47	(0.35 - 0.59)
Brooklyn	15.6	24 / 154	9,788	0.53	(0.40 - 0.66)
Queens	16.1	15 / 93	5,410	0.59	(0.45 - 0.73)
Staten Island	0.0	0 / 4	712	0.00	(0.00 - 0.90) ³
Transmission risk²					
Men who report sex with men	24.1	55 / 228	4,695	2.50	(2.10 - 2.80)
Injection drug use history	12.4	13 / 105	1,138	2.40	(2.00 - 2.70)
Heterosexual	11.8	13 / 110	23,127	0.12	(0.07 - 0.17)
Other/unknown/under investigation	8.8	15 / 170	6,396	0.50	(0.38 - 0.62)
Source					
STD clinics	24.0	30 / 125	10,888	0.59	(0.45 - 0.73)
CBOs	25.6	11 / 43	1,488	1.60	(1.3 - 1.9)
HHC	10.1	9 / 89	4,294	0.45	(0.33 - 0.57)
TB clinics	0.0	0 / 4	702	0.00	(0.00 - 0.92) ³
Private MDs	14.4	27 / 188	7,006	0.82	(0.65 - 0.99)
NYC Corrections	11.7	7 / 60	3,066	0.49	(0.37 - 0.61)
Other	11.5	12 / 104	1,680	1.50	(1.20 - 1.70)

¹ Assumes a Poisson distribution; CI's adjusted for variation in the mean interval between infection and detection using the less sensitive test.

² Negative denominators estimated using citywide survey risk data for respondents who tested for HIV in 2001 at public sites such as the following: counseling and testing sites, TB clinics, STD clinics, community health clinics, other health department sites and public clinics, or in prison.

³ Minimum estimate of upper 95% CI.

Limitations of these data

- The numerator represents unique individuals. The denominator represents both the unique individuals in the numerator and the total number of specimens that tested negative. There may be more than one negative specimen per person in the denominator. Because negative HIV tests are not reportable, we cannot entirely eliminate the duplicates in the denominator.

The future of STARHS in New York City

- Positive HIV specimens archived from the beginning of named reporting (June 1, 2000) to the end of 2000, as well as specimens from year 2002 onward will be de-linked and tested in an identical manner.
- Plans are being developed to test specimens from non-public laboratories incidence estimates represent all testers.
- Remember, even when we are able to perform STARHS on all the specimens from every laboratory, the results will still represent only those persons getting HIV tests and not the entire population of NYC

Percent Infected within ~6 Months prior to Diagnosis and Incidence Estimates
Persons diagnosed with HIV by NYC DOHMH Public Health Laboratory and NYS
Wadsworth Center during 2001, women only

	% Infected within ~6 Months prior to Diagnosis	N Infected within ~6 Months prior to Diagnosis/ Total N WB- Positive	N WB- Negative	"Estimated annual incidence (% / year)"	95% CI ¹
Total (women only)	13.4	55 / 409	75,528	0.16	(0.10 - 0.22)
Race					
White	5.6	1 / 18	3,656	0.06	(0.03 - 0.10)
Black	13.8	37 / 268	25,811	0.31	(0.22 - 0.40)
Hispanic	14.8	17 / 115	34,790	0.10	(0.05 - 0.15)
Asian/Pacific Islander/ Native American	0.0	0 / 8	4,824	0.00	(0.00 - 0.13) ³
Age at diagnosis					
under 20	15.0	3 / 20	12,556	0.05	(0.02 - 0.08)
20-24	10.4	5 / 48	19,025	0.06	(0.03 - 0.10)
25-29	13.4	9 / 67	14,795	0.13	(0.08 - 0.19)
30-34	17.3	13 / 75	11,103	0.25	(0.17 - 0.33)
35-39	10.5	8 / 76	7,491	0.23	(0.15 - 0.31)
40-44	19.0	11 / 58	4,276	0.55	(0.42 - 0.68)
45-49	17.9	5 / 28	2,267	0.47	(0.35 - 0.59)
50+	2.7	1 / 37	3,677	0.06	(0.03 - 0.10)
under 25	11.8	8 / 68	31,581	0.05	(0.02 - 0.09)
25 +	13.8	47 / 341	43,609	0.23	(0.15 - 0.31)
Borough of Residence					
Manhattan	12.0	14 / 117	14,217	0.21	(0.14 - 0.28)
Bronx	9.6	13 / 136	25,621	0.11	(0.06 - 0.16)
Brooklyn	19.2	20 / 104	18,146	0.24	(0.16 - 0.32)
Queens	17.4	8 / 46	17,011	0.10	(0.05 - 0.15)
Staten Island	0.0	0 / 3	533	0.00	(0.00 - 1.20) ³
Transmission risk²					
Injection drug use history	17.8	8 / 45	5,453	0.31	(0.22 - 0.40)
Heterosexual	18.1	30 / 166	54,025	0.12	(0.07 - 0.17)
Other/unknown/under investigation	8.6	17 / 198	16,057	0.23	(0.15 - 0.31)
Source					
STD clinics	21.6	8 / 37	9,066	0.19	(0.12 - 0.26)
CBOs	21.1	4 / 19	1,945	0.44	(0.33 - 0.55)
HHC	8.0	10 / 125	31,143	0.07	(0.03 - 0.11)
TB clinics	0.0	0 / 4	556	0.00	(0.00 - 1.20) ³
Private MDs	11.5	13 / 113	15,329	0.18	(0.11 - 0.25)
NYC Corrections	15.4	4 / 26	779	1.10	(0.89 - 1.30)
Other	18.8	16 / 85	2,723	1.30	(1.10 - 1.50)

¹ Assumes a Poisson distribution; CI's adjusted for variation in the mean interval between infection and detection using the less sensitive test.

² Negative denominators estimated using citywide survey risk data for respondents who tested for HIV in 2001 at public sites such as the following: counseling and testing sites, TB clinics, STD clinics, community health clinics, other health department sites and public clinics, or in prison.

³ Minimum estimate of upper 95% CI.



Because the less-sensitive EIA component of STARHS is classified as an investigational new device (IND) by the FDA, it is approved for research and epidemiological purposes only.

Individual results are difficult to interpret and do not have any demonstrated clinical utility.

NYC is exploring the feasibility of making STARHS available to people presenting for HIV testing in NYC with the understanding that the testing algorithm is still experimental and not approved for clinical use.

The Commissioner of Health and Mental Hygiene urges all New Yorkers to get tested for HIV and discuss the results with their doctor and their partner(s).

Knowing your HIV status as early as possible can help prevent further transmission and can help you and your doctor make decisions about your health.

To receive this report via e-mail, send an e-mail request to: hivreport@health.nyc.gov

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