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HIV Incidence Estimates Using STARHS over the First Four and One-Half Years of Named HIV Reporting in NYC, 2000-2004

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BACKGROUND

Surveillance for HIV is based on new diagnoses of HIV. However, because most diagnoses occur one or more years into the latent phase of infection, HIV diagnoses do not accurately reflect HIV transmission. HIV incidence estimates can therefore be an important supplement to HIV surveillance data for monitoring changes in HIV transmission over time.

The serologic testing algorithm for recent HIV seroconversions (STARHS) is a useful and cost-effective laboratory method for estimating HIV incidence in populations. It has primarily been applied in research studies of high-risk populations.

Representative estimates of HIV incidence derived from large, population-based samples would not only be useful in targeting prevention activities and for epidemic monitoring, but for establishing a baseline and then evaluating the efficacy of HIV prevention activities over time.

Objective

This analysis combined STARHS with unlinked HIV surveillance data to monitor estimated HIV incidence among all persons testing at the NYC DOHMH Public Health Laboratories from the date of implementation of named HIV reporting on June 1, 2000, through December 31, 2004.

METHODS

•The population consisted of all persons:

- newly diagnosed with HIV infection during June 1, 2000, through December 31, 2004.
- reported to NYC HIV surveillance through September 30, 2005.
- testing positive at the NYC DOHMH Public Health Laboratories within 90 days of HIV diagnosis date and having remnant serum available.
- having a positive Western blot as their first reported HIV-related event.

•All identifying information was removed from specimens and associated data, and replaced with a randomly-assigned ID number.

•To maximize completeness of reporting of routine surveillance data, cases were de-linked only after 9 months had passed since the end of their semester of diagnosis.

- 85% of cases were reported to surveillance and fully investigated after a nine-month lag following the date of initial positive Western blot.

STARHS testing

•Specimens were sent to the New York State Department of Health Wadsworth Center for re-testing using a less-sensitive bioMerieux Vironostika microELISA.

- Recent infections were defined as new HIV diagnoses (not concurrently diagnosed with AIDS) which had a non-reactive result on the less-sensitive Vironostika.
- Long-term infections were defined as:
  - •New HIV diagnoses not concurrently diagnosed with AIDS which had a reactive result on the less-sensitive Vironostika.
  - •Any new HIV infection concurrently diagnosed with AIDS, regardless of less-sensitive Vironostika result.

Calculation of HIV incidence estimates

The population at-risk (denominator) was defined as all persons who:

- •tested at the NYC DOHMH Public Health Laboratories during the semester of diagnosis AND
- •had either a negative result or were determined by STARHS to be a recent positive.

The following formula was used:

$$I = n / (n + N) * (365.25 / 170) * 100$$

Where n= the number of recent HIV infections, and N = the number of people testing negative. 170 days represents the "window period" of the less-sensitive Vironostika.

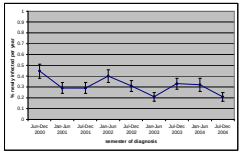
The risk category denominators were not directly available from laboratory data and therefore had to be estimated by applying risk distributions from the 2003 NYC Community Health Survey to the number of negatives.

RESULTS

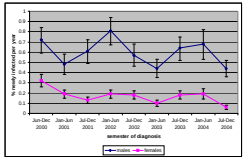
1: Estimated HIV Incidence Rates in the first semester, the final semester, and overall, New York City, 2000-2004

	Jun-Dec 2000 *(First semester)*	Jul-Dec 2004 *(Final semester)*	June 2000 - Dec 2004 Overall
TOTAL	0.45% (0.38% - 0.51%)	0.21% (0.17% - 0.25%)	**0.31% (0.28% - 0.34%)**
SEX			
Male	0.72% (0.59% - 0.84%)	0.44% (0.36% - 0.52%)	**0.59% (0.52% - 0.65%)**
Female	0.32% (0.26% - 0.38%)	0.06% (0.04% - 0.08%)	**0.17% (0.15% - 0.19%)**
RACE/ETHNICITY			
Black	0.71% (0.59% - 0.83%)	0.28% (0.22% - 0.34%)	**0.44% (0.39% - 0.48%)**
Hispanic	0.35% (0.28% - 0.42%)	0.20% (0.15% - 0.25%)	**0.28% (0.25% - 0.31%)**
White	0.47% (0.31% - 0.64%)	0.14% (0.07% - 0.21%)	**0.36% (0.30% - 0.42%)**
Asian/PI	0.08% (0.01% - 0.16%)	0.00% (0.00% - 0.11%)	**0.09% (0.06% - 0.12%)**
Native American	1.90% (0.16% - 3.81%)	N/A	**2.11% (0.93% - 3.37%)**
Other/unknown	0.04% (0.00% - 0.08%)	0.04% (0.01% - 0.08%)	**0.03% (0.02% - 0.04%)**
AGE GROUP (YEARS)			
under 20	0.28% (0.18% - 0.38%)	0.20% (0.12% - 0.28%)	**0.22% (0.18% - 0.26%)**
20-24	0.34% (0.25% - 0.43%)	0.14% (0.09% - 0.19%)	**0.24% (0.20% - 0.27%)**
25-29	0.45% (0.33% - 0.57%)	0.15% (0.10% - 0.21%)	**0.28% (0.24% - 0.32%)**
30-34	0.57% (0.43% - 0.71%)	0.35% (0.25% - 0.46%)	**0.37% (0.31% - 0.42%)**
35-39	0.84% (0.64% - 1.04%)	0.30% (0.19% - 0.41%)	**0.54% (0.46% - 0.61%)**
40-44	0.58% (0.39% - 0.77%)	0.40% (0.26% - 0.55%)	**0.45% (0.37% - 0.52%)**
45-49	0.58% (0.35% - 0.82%)	0.21% (0.09% - 0.34%)	**0.49% (0.40% - 0.58%)**
50+	0.40% (0.24% - 0.56%)	0.05% (0.00% - 0.10%)	**0.29% (0.23% - 0.35%)**
under 25	0.32% (0.25% - 0.39%)	0.16% (0.12% - 0.21%)	**0.23% (0.20% - 0.26%)**
25 +	0.57% (0.48% - 0.65%)	0.27% (0.22% - 0.32%)	**0.39% (0.35% - 0.43%)**
BOROUGH OF RESIDENCE			
Bronx	0.60% (0.49% - 0.71%)	0.21% (0.15% - 0.27%)	**0.31% (0.27% - 0.35%)**
Brooklyn	0.42% (0.31% - 0.53%)	0.24% (0.17% - 0.31%)	**0.36% (0.31% - 0.41%)**
Manhattan	0.71% (0.56% - 0.85%)	0.19% (0.13% - 0.25%)	**0.44% (0.38% - 0.49%)**
Queens	0.23% (0.16% - 0.31%)	0.19% (0.13% - 0.26%)	**0.25% (0.21% - 0.29%)**
Staten Island	0.47% (0.04% - 0.94%)	0.30% (0.03% - 0.60%)	**0.32% (0.19% - 0.46%)**
Unknown	0.03% (0.00% - 0.06%)	0.16% (0.08% - 0.24%)	**0.09% (0.07% - 0.11%)**
TRANSMISSION RISK			
MSM	3.79% (2.97% - 4.60%)	2.84% (2.24% - 3.43%)	**3.02% (2.64% - 3.36%)**
IDU history	2.54% (1.71% - 3.39%)	1.04% (0.46% - 1.67%)	**1.67% (1.36% - 1.97%)**
Heterosexual	0.29% (0.23% - 0.35%)	0.08% (0.05% - 0.11%)	**0.14% (0.12% - 0.16%)**
Other/unknown risk	0.33% (0.26% - 0.39%)	0.09% (0.06% - 0.12%)	**0.25% (0.22% - 0.28%)**

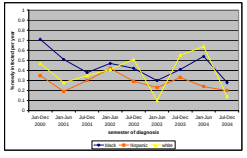
2: Overall estimated incidence trends



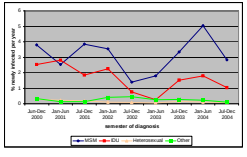
3: Estimated incidence trends by sex



4: Estimated incidence trends by race



5: Estimated incidence trends by risk factor



Summary of results

•Overall HIV incidence experienced a significant decarease after the first semester (June-December 2000), but there were no significant changes during 2001-2004.

•HIV incidence estimates were highest among MSM, but no trend was observed.

•IDU also showed high HIV incidence estimates and though unstable, showed a significant overall decrease.

•Males consistently had higher incidence than females; no consistent trend was observed.

•Persons aged 25 years and older had significantly higher estimated HIV incidence than persons less than 25 years old.

DISCUSSION

Limitations

- STARHS can misclassify recent and long-term infections, although data suggest these "cancel each other out" when analyzing aggregate data.
- Laboratory or provider reports sent after de-linking occurred could not be considered in analysis.
- Incidence rates may be biased by the exclusion of new diagnoses without specimens.
- Incidence rates do not account for varying testing frequency between subgroups.
- Sample represented only 21% of new diagnoses in NYC during this period.

Conclusions

- These data suggest that HIV incidence in NYC declined initially after 2000, and then remained steady during 2001-2004.
- Incidence trends in risk categories were difficult to interpret due to wide variations in completeness of risk factor data over the course of the analysis period. Risk factor estimates are also problematic because risk data for numerators was derived from surveillance but denominators had to be estimated using data derived from a household survey, not necessarily representative of the population tested here.
- Regardless, HIV transmission was high among MSM and IDU despite widespread prevention activities targeted toward these populations.
- Estimates among IDU are somewhat higher than reported in other studies, which may be a reflection of an underestimated denominator.
- A more representative sample and better accounting of HIV testing behaviors would enhance understanding of HIV transmission in the NYC population; these efforts are underway both in NYC and nationally.
- Using new diagnoses as a measure of the leading edge of the HIV epidemic is not ideal; developing accurate measures of HIV incidence should continue to be a high priority for epidemic monitoring, targeting prevention resources, and evaluating the efficacy of prevention activities.

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