Expanded HIV testing coverage is associated with decreases in late HIV diagnoses, New York City (NYC), 2001-2010 (Oral abstract #182)

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Background

- Concurrent HIV/AIDS diagnoses (late HIV diagnoses) accounted for 19.7% of all new diagnoses in NYC in 2012

- At the individual-level, late diagnosis is associated with
  - Increased rates of short term mortality, and intensive care unit admissions for opportunistic infections
  - Higher direct medical cost following HIV diagnosis

- At the population-level, late HIV diagnosis drives HIV incidence
  - Reducing late HIV diagnosis accompanied with timely ART initiation can reduce onward HIV transmission

Background, cont’d

• Efforts to substantially expand HIV testing have recently been undertaken in NYC
  – 2007: CDC launched Expanded HIV Testing Initiative in 25 jurisdictions nationally, including NYC
  – 2008: NYC DOHMH launched ‘The Bronx Knows’ initiative
    – Associated with decrease in proportion concurrently diagnosed with HIV in The Bronx
  – 2010: NYC DOHMH launched the ‘Brooklyn Knows’ initiative

Myers et al. JAIDS 2012
Objectives

HIV testing coverage → earlier diagnosis → ↓ late diagnosis

1. Describe citywide trends in recent HIV testing coverage and late HIV diagnosis rates during 2001-2010

2. Within NYC neighborhoods, were increases in recent HIV testing coverage associated with decreases in late HIV diagnosis rates during 2001-2010?
Methods – Data sources

• HIV testing coverage (exposure)
  – NYC Community Health Survey (CHS)
    – Annual surveys from 2003-2010 (2-year intervals, 2001/2 to 2009/10)
      – Applied 2003 testing coverage to 2001/2
    – Recent HIV testing: Proportion reporting having an HIV test in the last 12 months in each of 34 United Hospital Fund (UHF) neighborhoods

• Late HIV diagnosis (outcome)
  – NYC DOHMH Population-based HIV registry
  – Aggregate, ZIP code level data on the number of late HIV diagnoses, 2001-2010 (2-year intervals, 2001/2 to 2009/10)
  – Late HIV diagnosis defined as having CD4 ≤200 cell/µL or an AIDS defining illness within 31 days of HIV diagnosis
  – Late diagnosis rates per 100,000 population
    – 2000-2010 intercensal estimates (source: NYCDOHMH)
Methods – Data analysis

• Descriptive analysis to assess:
  – Citywide trends in HIV testing coverage and late diagnosis rates during 2001-2010
    – Analyzed in two year intervals (2001/2-2009/10)
  – Variability of late diagnosis rates across neighborhoods in 2009/10

• ZIP-code level longitudinal analysis
  – Influence of change in HIV testing coverage on change in late HIV diagnosis rates
    – 2001/2 compared to 2009/10
  – Used GEE to account for hierarchical data
    – e.g., clustering of ZIP codes within UHF neighborhoods
Objectives

↑ HIV testing coverage → earlier diagnosis → ↓ late diagnosis

1. Describe citywide trends in recent HIV testing coverage and late HIV diagnosis rates during 2001-2010

2. Within NYC neighborhoods, were increases in recent HIV testing coverage associated with decreases in late HIV diagnosis rates during 2001-2010?
## HIV diagnoses by sex in NYC, 2001-2010

<table>
<thead>
<tr>
<th></th>
<th>2001/2</th>
<th>2003/4</th>
<th>2005/6</th>
<th>2007/8</th>
<th>2009/10</th>
<th>RR&lt;sub&gt;09/10 vs 01/02&lt;/sub&gt; (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All HIV diagnoses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>10,057</td>
<td>8,126</td>
<td>7,665</td>
<td>7,392</td>
<td>6,530</td>
<td>0.64</td>
</tr>
<tr>
<td>(Rate&lt;sup&gt;1&lt;/sup&gt; per 100,000)</td>
<td>(124.6)</td>
<td>(100.3)</td>
<td>(93.3)</td>
<td>(84.4)</td>
<td>(79.9)</td>
<td>(0.62-0.66)</td>
</tr>
<tr>
<td><strong>Males N</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>6,618</td>
<td>5,557</td>
<td>5,564</td>
<td>5,488</td>
<td>4,919</td>
<td>0.73</td>
</tr>
<tr>
<td>(Rate per 100,000)</td>
<td>(174.5)</td>
<td>(146.0)</td>
<td>(144.0)</td>
<td>(139.6)</td>
<td>(128.0)</td>
<td>(0.71-0.76)</td>
</tr>
<tr>
<td><strong>Females N</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>3,439</td>
<td>2,569</td>
<td>2,101</td>
<td>1,904</td>
<td>1,611</td>
<td>0.46</td>
</tr>
<tr>
<td>(Rate&lt;sup&gt;1&lt;/sup&gt; per 100,000)</td>
<td>(80.4)</td>
<td>(59.8)</td>
<td>(48.3)</td>
<td>(43.0)</td>
<td>(37.2)</td>
<td>(0.43-0.49)</td>
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<tr>
<td><strong>Late HIV diagnoses</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>2,217</td>
<td>2,028</td>
<td>1,923</td>
<td>1,638</td>
<td>1,458</td>
<td>0.72</td>
</tr>
<tr>
<td>(Rate&lt;sup&gt;1&lt;/sup&gt; per 100,000)</td>
<td>(25.1)</td>
<td>(22.7)</td>
<td>(21.6)</td>
<td>(19.6)</td>
<td>(17.9)</td>
<td>(0.67-0.76)</td>
</tr>
<tr>
<td><strong>Males N</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>1,628</td>
<td>1,455</td>
<td>1,475</td>
<td>1,188</td>
<td>1,100</td>
<td>0.76</td>
</tr>
<tr>
<td>(Rate per 100,000)</td>
<td>(37.9)</td>
<td>(33.2)</td>
<td>(34.3)</td>
<td>(30.2)</td>
<td>(28.8)</td>
<td>(0.70-0.82)</td>
</tr>
<tr>
<td><strong>Females N</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>589</td>
<td>573</td>
<td>448</td>
<td>450</td>
<td>358</td>
<td>0.60</td>
</tr>
<tr>
<td>(Rate&lt;sup&gt;1&lt;/sup&gt; per 100,000)</td>
<td>(13.8)</td>
<td>(13.4)</td>
<td>(10.4)</td>
<td>(10.2)</td>
<td>(8.3)</td>
<td>(0.53-0.69)</td>
</tr>
</tbody>
</table>

<sup>1</sup>All rates are two year rates
Trends in recent HIV testing coverage and late HIV diagnosis rates, NYC 2001-2010

- HIV tested in last 12 months (%)
- Late HIV diagnosis rate (per 100K)

2001-2: 25.1
2003-4: 23.0
2005-6: 22.0
2007-8: 31.0
2009-10: 31.0

Rate of late diagnosis
Recent testing coverage
Trends in recent HIV testing coverage and late HIV diagnosis rates, NYC 2001-2010

HIV tested in last 12 months (%)

- 2001-2: 69
- 2003-4: 67
- 2005-6: 80
- 2007-8: 93
- 2009-10: 90

Late HIV diagnosis rate (per 100K)

- 2001-2: 25.1
- 2003-4: 23.0
- 2005-6: 25.1
- 2007-8: 31.0
- 2009-10: 17.9

Median CD4 count at diagnosis (cells/uL)

- 2001-2: 69
- 2003-4: 67
- 2005-6: 80
- 2007-8: 93
- 2009-10: 90

Legend:
- Red: Rate of late diagnosis
- Green: Recent testing coverage
- Gray: Median CD4 (late diagnoses)
Trends in recent HIV testing coverage, NYC 2001-2010 by borough of residence

Percent reporting HIV test in last 12 months

- Bronx
- Brooklyn
- Manhattan
- Queens
- Staten Island
- NYC Average

<table>
<thead>
<tr>
<th>Year</th>
<th>Bronx</th>
<th>Brooklyn</th>
<th>Manhattan</th>
<th>Queens</th>
<th>Staten Island</th>
<th>NYC Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001-2</td>
<td>34%</td>
<td>23%</td>
<td>17%</td>
<td>26%</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>2003-4</td>
<td>32%</td>
<td>31%</td>
<td>20%</td>
<td>26%</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>2005-6</td>
<td>33%</td>
<td>31%</td>
<td>20%</td>
<td>29%</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>2007-8</td>
<td>45%</td>
<td>30%</td>
<td>23%</td>
<td>32%</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>2009-10</td>
<td>45%</td>
<td>32%</td>
<td>23%</td>
<td>31%</td>
<td>17%</td>
<td>17%</td>
</tr>
</tbody>
</table>
Trends in late HIV diagnosis rates, NYC 2001-2010 by borough of residence

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronx</td>
<td>21.0</td>
<td>17.8</td>
<td>13.2</td>
<td>12.5</td>
<td>11.3</td>
</tr>
<tr>
<td>Brooklyn</td>
<td>13.2</td>
<td>12.8</td>
<td>13.2</td>
<td>12.5</td>
<td>9.3</td>
</tr>
<tr>
<td>Manhattan</td>
<td>7.2</td>
<td>5.5</td>
<td>5.5</td>
<td>5.5</td>
<td>5.5</td>
</tr>
<tr>
<td>Queens</td>
<td>6.1</td>
<td>6.1</td>
<td>4.3</td>
<td>4.3</td>
<td>3.8</td>
</tr>
<tr>
<td>Staten Island</td>
<td>7.2</td>
<td>6.1</td>
<td>4.3</td>
<td>4.3</td>
<td>3.8</td>
</tr>
<tr>
<td>NYC Average</td>
<td>17.8</td>
<td>13.2</td>
<td>10.7</td>
<td>9.8</td>
<td>7.4</td>
</tr>
</tbody>
</table>

Rate of late HIV diagnosis (per 100K)

RR = Relative Risk

- Bronx: RR=0.60*
- Brooklyn: RR=0.64*
- Manhattan: RR=0.71*
- Queens: RR=0.67*
- Staten Island: RR=0.90
- NYC Average: RR=0.53*

* p<0.05
Citywide late diagnosis rate in 2009/10 = 8.6 per 100K (IQR 3.6 to 12.7)
Objectives

↑ HIV testing coverage → earlier diagnosis → ↓ late diagnosis

1. Describe citywide trends in recent HIV testing coverage and late HIV diagnosis rates during 2001-2010

2. Within NYC neighborhoods, were increases in recent HIV testing coverage associated with decreases in late HIV diagnosis rates during 2001-2010?
Absolute change in recent HIV testing coverage 2001/2-2009/10

Quartiles
- +13.0% to +22.0%
- +7.0% to +12.9%
- +2.0% to +6.9%
- -8.0% to +1.9%

Absolute change in late HIV diagnosis rate 2001/2-2009/10

Quartiles
- -35.0 to -7.3
- -7.2 to -2.7
- -2.6 to +0.24
- +0.23 to +16.7
**Trends rates of late HIV diagnosis, NYC 2001-2010 by quartile of neighborhood change in HIV testing coverage**

<table>
<thead>
<tr>
<th>Quartile</th>
<th>Rate (per 100K)</th>
<th>RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>-8.0 to +1.9%</td>
<td>0.82</td>
</tr>
<tr>
<td>Q2</td>
<td>+2.0 to 6.9%</td>
<td>0.73</td>
</tr>
<tr>
<td>Q3</td>
<td>+7.0 to 12.9%</td>
<td>0.66*</td>
</tr>
<tr>
<td>Q4</td>
<td>+13.0 to 22.0%</td>
<td>0.59*</td>
</tr>
</tbody>
</table>

* p<0.05
Change in late diagnosis rate by change in recent HIV testing coverage, 2001/2-2009/10

Change in HIV testing coverage
Low  High

Quartile 1  Quartile 2  Quartile 3  Quartile 4

Change in late diagnosis rate (per 100K)

* p<0.05

Legend:
- All
- Females
- Males
Change in late diagnosis rate by change in recent HIV testing coverage, 2001/2-2009/10

Change in HIV testing coverage
Low  High
Quartile 1  Quartile 2  Quartile 3  Quartile 4

Change in late diagnosis rate (per 100K)

* p<0.05
Change in late diagnosis rate by change in recent HIV testing coverage, 2001/2-2009/10

Change in HIV testing coverage

Low  |  High

Quartile 1  |  Quartile 2  |  Quartile 3  |  Quartile 4

Change in late diagnosis rate (per 100K)

-20  |  -15  |  -10  |  -5  |  0  |  +5

* All
Females
Males
Strengths and limitations

• Strengths
  – Population-based
  – Longitudinal analysis at neighborhood level

• Limitations
  – Other factors changing within neighborhoods could explain changes in late diagnosis rates
    – E.g., declining incidence: ↓ HIV incidence → ↓ late dx
  – Neighborhood definitions may not differentiate actual neighborhoods very well
  – Testing data not available at ZIP code level
  – No CHS data for 2001/2
Summary and conclusions

• Substantial increases in recent HIV testing coverage accompanied by:
  • Significant decreases in the rate of late HIV diagnoses
    • Median CD4 among those diagnosed late has increased
  • Late HIV diagnosis rates remained highly variable across NYC neighborhoods in 2009/10
    • Additional studies needed to identify major determinants
• Expansion of HIV testing may have played a significant role in reducing late HIV diagnoses
  • Targeted efforts to further expand HIV testing are warranted
• Studies needed to assess within neighborhood trends in linkage and VL suppression
Acknowledgements

• NYC DOHMH HIV Epidemiology and Field Services Program, Bureau of HIV Prevention & Control
  – Provision of aggregate HIV surveillance data for analysis
Extra slides
Hypothesized relationships between HIV testing coverage and late HIV diagnosis

Exposure of interest

- Testing_initiatives
- Increased_testing

Outcome of interest

- Earlier_diagnosis
- Decreased_concurrent_dx
- Decreased_HIV_deaths
- Increased_linkage_to_care
- Earlier_ART_initiation
- Guideline_changes
- HIV_prevalence
- HIV_incidence
Change in late HIV diagnosis rate vs. change in recent HIV testing, NYC 2001-2010 (n=340 ZIP-code level observations)