Risk Factors for Delayed Initiation of Medical Care After Diagnosis of Human Immunodeficiency Virus

Lucia V. Torian, PhD; Ellen W. Wiewel, MHS; Kai-Lih Liu, PhD; Judith E. Sackoff, PhD; Thomas R. Frieden, MD, MPH

Background: The full benefit of timely diagnosis of human immunodeficiency virus (HIV) infection is realized only if there is timely initiation of medical care. We used routine surveillance data to measure time to initiation of care in New York City residents diagnosed as having HIV by positive Western blot test in 2003.

Methods: The time between the first positive Western blot test and the first reported viral load and/or CD4 cell count or percentage was used to indicate the interval from initial diagnosis of HIV (non-AIDS) to first HIV-related medical care visit. Using Cox proportional hazards regression, we identified variables associated with delayed initiation of care and calculated their hazard ratios (HRs).

Results: Of 1928 patients, 1228 (63.7%) initiated care within 3 months of diagnosis, 369 (19.1%) initiated care later than 3 months, and 331 (17.2%) never initiated care. Predictors of delayed care were as follows: diagnosis at a community testing site (HR, 1.9; 95% confidence interval [CI], 1.5-2.3), the city correctional system (HR, 1.6; 95% CI, 1.2-2.0), or Department of Health sexually transmitted diseases or tuberculosis clinics (HR, 1.3; 95% CI, 1.1-1.6) vs a site with colocated primary medical care; nonwhite race/ethnicity (HR, 1.8; 95% CI, 1.5-2.0); injection drug use (HR, 1.3; 95% CI, 1.1-1.5); and location of birth outside the United States (HR, 1.1; 95% CI, 1.0-1.2).

Conclusions: A total of 1597 persons (82.8%) diagnosed as having HIV in 2003 ever initiated care, most within 3 months of diagnosis. Initiation of care was most timely when diagnosis occurred at a testing site that offered colocated medical care. Improving referrals by nonmedical sites is critical. However, because most diagnoses occur in medical sites, improving linkage in these sites will have the greatest effect on timely initiation of care.

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Because acute human immunodeficiency virus (HIV) infection is brief, self-limited, and challenging to diagnose, most HIV-positive persons are diagnosed 1 or more years into the chronic disease phase, and many are not diagnosed as having HIV until their infections have already progressed to AIDS. Expansion of testing opportunities and replacement of risk-based testing with routine testing can reduce delayed diagnosis. However, the full personal and public health value of timely diagnosis can be realized only when it is followed by timely initiation of medical care. Delayed care translates into lost opportunities for prevention, virologic and immunologic monitoring, timely initiation of antiretroviral therapy, and management of HIV and related health and social issues.

The Centers for Disease Control and Prevention and the Department of Health and Human Services recommend that HIV-related medical care with regular monitoring of viral load (VL) and CD4 cell count be initiated as early as possible after diagnosis, and the New York City Department of Health and Mental Hygiene has established 3 months as the benchmark for initiation of care. New York City, a high-morbidity area with more than 6000 new HIV and AIDS diagnoses annually and a cumulative total of more than 200,000 cases, has a comprehensive named HIV reporting system that permits the use of routinely reported laboratory test results to measure time from diagnosis to care and subsequent use of care. We used routine population-based surveillance data to calculate time to first visit and to evaluate risk factors for delayed care among New York City residents newly diagnosed as having HIV (non-AIDS) by positive Western blot test in 2003.

Methods

Data

New York State requires named reporting of all diagnoses of HIV and AIDS, all HIV-related illness, all positive Western blot tests for HIV antibody, all VL and CD4 cell count values, and all HIV genotypes. The New York City HIV/AIDS Reporting System (HARS) is a population-based registry that, since 1981, has been continuously updated with new, deduplicated diagnoses and laboratory results. All
incoming provider and laboratory reports that do not match an existing registry record initiate a field investigation with medical record review to confirm the case, date, and disposition of diagnosis and collect all other data required for surveillance and partner notification. HARS also obtains data through regular matches with other disease registries: the New York City Death Registry, the National Death Index, and the Social Security Death Master File. All data used in this analysis were drawn from HARS as of December 31, 2006.

### POPULATION

This analysis included all persons reported to HARS who had an initial HIV (non-AIDS) diagnosis by positive Western blot in 2003, diagnosed by a known provider, and who resided in New York City at diagnosis (N=1928). We did not include diagnoses of concurrent HIV/AIDS or AIDS because New York State law requires that a physician make the diagnosis of AIDS by either the immunologic criterion (CD4 cell count <200/µL) or the diagnosis of an AIDS-defining condition. All patients with AIDS are by definition in medical care.

A total of 3373 persons were diagnosed as having HIV (non-AIDS) in 2003 and were reported to HARS. Our ability to calculate the time between diagnosis and first laboratory test required that both events be precisely defined and dated and that there be a single consistent, transparent definition of new HIV diagnosis. Thus, we required that patients’ conditions be diagnosed by positive Western blot test on blood or oral fluid drawn on a valid date in 2003 and reported by the testing laboratory to the state health department. A total of 917 diagnoses had no diagnostic Western blot in HARS. These presumptive physician diagnoses were eliminated from the analysis because they did not meet the criterion of a dated laboratory-confirmed diagnostic test, allowing calculation of the interval from initial diagnosis to first medical care, and because experience with medical record review in such cases indicates that although many cases are not new in 2003, standardized coding conventions require that we ascribe them to the year of report in the absence of other confirmatory data. Moreover, because all such diagnoses are made by physicians, the patient is by definition already in care. Other reasons for the elimination of cases included undergoing a laboratory test before initial HIV diagnosis (n=6), reference laboratory (not the true test site) or missing provider for the initial diagnostic test (n=297), and non-New York City residence at diagnosis (n=229).

### VARIABLE DEFINITIONS

We used the date of the first reported VL or CD4 cell count or percentage as the date of initiation of care. Both tests indicate care because they must be ordered by a physician. The interval from diagnosis to care was a continuous variable measured in days between the first positive Western blot test and first VL and/ or CD4 cell count. We defined a high-poverty zip code as one in which the income of 20% or more of the population was below the federal poverty level. Persons were classified by country of birth as born in the United States, in a US dependency, or in a foreign country. Foreign-born persons were categorized by region. Country of birth was also dichotomized as United States or outside the Unites States (includes US dependencies, foreign countries, and unknown).

We calculated the median VL and proportion of patients with a CD4 cell count less than 500/µL and/or a VL greater than 100 000 copies per millilitre at first visit. In HARS, the first reported CD4 cell count coincides with our dependent variable; thus, there is no true baseline CD4 cell count (CD4 cell count at diagnosis).

### STATISTICAL ANALYSIS

The population analyzed was compared with total 2003 HIV (non-AIDS) diagnoses in HARS to ascertain whether the elimination criteria resulted in significant differences. Standard bivariate methods were used to identify associations between candidate predictor variables and the dependent variable as divided into timely initiation (≤3 months), delayed initiation (>3 months), and never initiated care (Table 1). We also calculated the proportion of persons who initiated care who had a second visit.

We then conducted time-to-event analyses using months between diagnosis and first care (first VL and/or CD4 cell count report) as the dependent variable. Patients contributed observation time from the date of initial diagnosis by positive Western blot to the date of first care or were right censored at death, loss to follow-up via transfer to another jurisdiction, or the end of the analysis period. The Kaplan-Meier product-limit method was used to estimate the cumulative proportion initiating care by month after diagnosis, stratified by site of diagnosis. The log-rank test was used to determine whether the distribution of event times and the proportion of censored observations were equal across the 4 strata. Multivariate Cox proportional hazards regression was used to identify the factors associated with time to initiation of care and to calculate their hazard ratios (HRs). Variables with P < .05 in the bivariate cross-tabulations were eligible for inclusion in the Cox model. SAS statistical software, version 9.1 (SAS Institute, Inc, Cary, North Carolina), was used to conduct the analysis.

### RESULTS

#### DEMOGRAPHIC CHARACTERISTICS

The population analyzed mirrored all 2003 HIV (non-AIDS) diagnoses in HARS with respect to risk factor, sex, race, place of birth, and median age at diagnosis but contained significantly more persons living in high-poverty zip codes (63.5% vs 58.1%; P < .001).

#### TIME FROM DIAGNOSIS TO CARE

Of the 1928 patients, 1597 (82.8%) newly diagnosed as having HIV had initiated care by the end of follow-up (Table 1), 1228 (63.7%) within 3 months and 369 (19.1%) after 3 months. Thus, 76.9% of persons ever initiating care did so within 3 months. No laboratory evidence of HIV-related care was available for 331 persons (17.2%) newly diagnosed as having HIV in 2003. Of those initiating care, 91.1% had at least 1 additional visit during follow-up.

Time to initiation of care was predicted by a combination of individual characteristics and 1 institutional variable (site of initial diagnosis). Significantly fewer injection drug users as opposed to persons with all other risks had initiated care within 3 months (50.6% vs 65.0%; P < .001); similar differences were found for nonwhite persons vs those of white race/ethnicity, persons in high-poverty zip codes vs persons in nonpoverty zip codes, and persons born in foreign countries, in US dependencies, or in an unknown birthplace (62.3%) vs persons born in the United States (65.7%).

Persons whose infections were diagnosed in community testing sites, city jails, and Department of Health sexually transmitted disease (STD) and tuberculosis (TB) clinics
## Table 1. Time From Initial Diagnosis to First Primary Care Visit in Persons Diagnosed as Having Human Immunodeficiency Virus (Non-AIDS) Infection by Positive Western Blot Test in New York City, 2003

<table>
<thead>
<tr>
<th>Variable</th>
<th>First Visit ≤ 3 mo of Diagnosis&lt;sup&gt;a&lt;/sup&gt;</th>
<th>First Visit &gt;3 mo After Diagnosis</th>
<th>No Evidence of Any Visit&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Total&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1228 (63.7)</td>
<td>369 (19.1)</td>
<td>331 (17.2)</td>
<td>1928 (100)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>797 (63.3)</td>
<td>234 (18.6)</td>
<td>229 (18.2)</td>
<td>1260 (64.5)</td>
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<tr>
<td>Female</td>
<td>431 (64.5)</td>
<td>135 (20.2)</td>
<td>102 (15.3)</td>
<td>668 (34.6)</td>
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<td><strong>Race/ethnicity</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>621 (59.4)</td>
<td>222 (21.2)</td>
<td>203 (19.4)</td>
<td>1046 (54.3)</td>
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<tr>
<td>Hispanic</td>
<td>368 (64.8)</td>
<td>104 (18.3)</td>
<td>96 (16.9)</td>
<td>568 (29.5)</td>
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<tr>
<td>White</td>
<td>213 (78.0)</td>
<td>36 (13.2)</td>
<td>24 (8.8)</td>
<td>273 (14.2)</td>
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<tr>
<td>Asian or Pacific Islander</td>
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<td>6 (19.4)</td>
<td>4 (12.9)</td>
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<td>Other or unknown</td>
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<td>1 (10.0)</td>
<td>4 (40.0)</td>
<td>10 (0.5)</td>
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<td><strong>Age group, y</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-12</td>
<td>7 (100)</td>
<td>0</td>
<td>0</td>
<td>7 (0.4)</td>
</tr>
<tr>
<td>13-19</td>
<td>45 (60.8)</td>
<td>13 (17.6)</td>
<td>16 (21.6)</td>
<td>74 (3.8)</td>
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<tr>
<td>20-29</td>
<td>319 (70.3)</td>
<td>70 (15.4)</td>
<td>65 (14.3)</td>
<td>454 (23.5)</td>
</tr>
<tr>
<td>30-39</td>
<td>418 (62.7)</td>
<td>137 (20.5)</td>
<td>112 (16.8)</td>
<td>667 (34.6)</td>
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<tr>
<td>40-49</td>
<td>304 (58.9)</td>
<td>112 (21.7)</td>
<td>100 (19.4)</td>
<td>516 (28.0)</td>
</tr>
<tr>
<td>50-59</td>
<td>104 (65.0)</td>
<td>32 (20.0)</td>
<td>24 (15.0)</td>
<td>160 (8.3)</td>
</tr>
<tr>
<td>≥ 60</td>
<td>31 (62.9)</td>
<td>5 (10.0)</td>
<td>14 (28.0)</td>
<td>50 (2.6)</td>
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<td><strong>Transmission risk</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Men who have sex with men</td>
<td>432 (73.8)</td>
<td>83 (14.2)</td>
<td>70 (12.0)</td>
<td>585 (30.3)</td>
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<tr>
<td>Injection drug use history</td>
<td>88 (50.6)</td>
<td>49 (28.2)</td>
<td>37 (21.3)</td>
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<td>Heterosexual</td>
<td>250 (70.4)</td>
<td>68 (19.2)</td>
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<td>Perinatal</td>
<td>7 (100)</td>
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<td>0</td>
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<td>Unknown or under investigation</td>
<td>451 (55.9)</td>
<td>169 (20.9)</td>
<td>187 (23.2)</td>
<td>807 (41.9)</td>
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<td><strong>Poverty zip code</strong></td>
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<td>Low poverty</td>
<td>478 (67.9)</td>
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<td>105 (14.9)</td>
<td>704 (36.5)</td>
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<tr>
<td>High poverty</td>
<td>750 (61.3)</td>
<td>248 (20.3)</td>
<td>226 (18.5)</td>
<td>1224 (63.5)</td>
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<tr>
<td><strong>Site where diagnostic Western blot was performed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site with colocated medical care</td>
<td>1012 (66.5)</td>
<td>290 (19.1)</td>
<td>220 (14.5)</td>
<td>1522 (78.9)</td>
</tr>
<tr>
<td>Community testing site</td>
<td>72 (48.0)</td>
<td>27 (18.0)</td>
<td>51 (34.0)</td>
<td>150 (7.8)</td>
</tr>
<tr>
<td>City correctional system</td>
<td>39 (49.4)</td>
<td>18 (22.8)</td>
<td>22 (27.8)</td>
<td>79 (4.1)</td>
</tr>
<tr>
<td>Sexually transmitted disease clinic</td>
<td>101 (59.4)</td>
<td>32 (18.8)</td>
<td>37 (21.3)</td>
<td>170 (8.8)</td>
</tr>
<tr>
<td>Tuberculosis clinic</td>
<td>4 (57.1)</td>
<td>2 (28.6)</td>
<td>1 (14.3)</td>
<td>7 (0.4)</td>
</tr>
<tr>
<td><strong>Clinical status at first visit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median viral load, copies/mL</td>
<td>89579</td>
<td>115860</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>CD4 cell count &lt;350/mL only</td>
<td>247 (71.2)</td>
<td>100 (28.8)</td>
<td>0</td>
<td>347 (18.0)</td>
</tr>
<tr>
<td>Viral load &gt;100 000 copies/mL only</td>
<td>155 (91.2)</td>
<td>15 (8.8)</td>
<td>0</td>
<td>170 (8.8)</td>
</tr>
<tr>
<td>Both CD4 cell count &lt;350/mL and viral load &gt;100 000 copies/mL</td>
<td>70 (65.4)</td>
<td>37 (34.6)</td>
<td>0</td>
<td>107 (5.5)</td>
</tr>
<tr>
<td>Neither or never initiated care</td>
<td>756 (58.0)</td>
<td>217 (16.6)</td>
<td>331 (25.4)</td>
<td>1304 (67.6)</td>
</tr>
<tr>
<td><strong>Place of birth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>679 (65.7)</td>
<td>190 (18.4)</td>
<td>165 (16.0)</td>
<td>1034 (53.6)</td>
</tr>
<tr>
<td>US dependencies</td>
<td>41 (61.2)</td>
<td>15 (22.4)</td>
<td>11 (16.4)</td>
<td>67 (3.5)</td>
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<td>Foreign country</td>
<td>226 (60.4)</td>
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<td>374 (19.4)</td>
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<td>Caribbean</td>
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<td>29 (22.0)</td>
<td>23 (17.4)</td>
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<td>Central and South America</td>
<td>81 (65.9)</td>
<td>25 (20.3)</td>
<td>17 (13.8)</td>
<td>123 (6.4)</td>
</tr>
<tr>
<td>Africa</td>
<td>42 (53.8)</td>
<td>18 (23.1)</td>
<td>18 (23.1)</td>
<td>78 (4.0)</td>
</tr>
<tr>
<td>Other or unknown foreign country</td>
<td>23 (56.1)</td>
<td>7 (17.1)</td>
<td>11 (26.8)</td>
<td>41 (2.1)</td>
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<td>Unknown</td>
<td>282 (62.3)</td>
<td>85 (18.8)</td>
<td>86 (19.0)</td>
<td>453 (23.5)</td>
</tr>
<tr>
<td><strong>Place of birth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>679 (65.7)</td>
<td>190 (18.4)</td>
<td>165 (16.0)</td>
<td>1034 (53.6)</td>
</tr>
<tr>
<td>Outside the United States</td>
<td>549 (61.4)</td>
<td>179 (20.0)</td>
<td>166 (18.6)</td>
<td>894 (46.4)</td>
</tr>
</tbody>
</table>

Abbreviation: NA, not applicable.

<sup>a</sup>Data are given as number (row percentage) of total row cases.

<sup>b</sup>Data are given as number (column percentage) of the total 1928 cases. Percentages may not total 100 because of rounding.
The Kaplan-Meier survival curve graphs the distribution of time to care by site of diagnosis (Figure). It illustrates the advantage of having an HIV infection diagnosed at a site that offers primary medical care, the early appearance of this advantage, and its persistence over time. Forty-one patients were censored because they died (n = 21) or moved out of New York City (n = 20) before initiating care or reaching the end of follow-up. The proportion of censored observations was equal across the 4 diagnostic provider strata.

Using a site with colocated medical care as the referent, the Cox proportional hazards regression analysis (Table 3) found that diagnosis at a community testing site conferred a 90% increase in the probability of delayed initiation of care per month during the 36- to 47-month follow-up (HR, 1.9; 95% confidence interval [CI], 1.5-2.3), whereas diagnosis in jail conferred a 60% increase (HR, 1.6; 95% CI, 1.2-2.0) and diagnosis at public STD and TB clinics conferred a 30% increase in the probability of delayed care (HR, 1.3; 95% CI, 1.1-1.6). Three individual factors predicted delayed care: nonwhite race (HR, 1.8; 95% CI, 1.5-2.0), injection drug use as the transmission risk (HR, 1.5-2.0), and diagnosis at a non-DAC medical center (HR, 1.6; 95% CI, 1.3-1.9). Birth outside the United States (HR, 1.1; 95% CI, 1.0-1.2).

Three hundred thirty-one persons (17.2%) initially diagnosed as having HIV (non-AIDS) in 2003 had no laboratory evidence of medical care by December 31, 2006. Site of initial diagnosis was the most important risk for this outcome. Diagnosis at a community testing site (adjusted odds ratio [AOR], 3.3; 95% CI, 2.3-4.8), jail (AOR, 2.4; 95% CI, 1.4-4.1), or city clinic (AOR, 1.6; 95% CI, 1.1-2.3) was the strongest predictor of failure to initiate care, followed by nonwhite race (AOR, 2.5; 95% CI, 1.6-3.8) and birth outside the United States (AOR, 1.3; 95% CI, 1.0-1.7).

Initial HIV diagnosis at a site without colocated medical care, nonwhite race/ethnicity, injection drug use, and birth without colocated primary medical care were significantly less likely than persons whose infections were diagnosed at sites that also offered primary medical care to have initiated care within 3 months (53.2% vs 66.5%) (Table 2). Significant differences were found in time to care within the nonmedical sites: 59.4% of patients whose infections were diagnosed at Department of Health STD and TB clinics initiated care within 3 months, whereas less than half (49.4% and 48.0%, respectively) of those whose infections were diagnosed in the New York City correctional system and community testing sites did so. Persons whose infections were initially diagnosed in jail and who had at least 1 HIV-related visit were also significantly less likely to have a second visit than persons whose infections were initially diagnosed in all other settings (73.7% vs 92.0%; P < .001).

Among medical sites, persons whose infections were diagnosed in 1 of New York City’s 32 designated AIDS centers (DACs) (medical centers that offer multispecialty integrated HIV primary care, clinical trials, and support services) were promptly linked to care in approximately the same proportions as those whose infections were diagnosed at non-DAC medical sites (Table 2). Residents of high-poverty zip codes had more timely linkage to care if their infections were initially diagnosed at a DAC than a non-DAC.

Median VL at first visit was lower in persons who initiated care within 3 months vs those who initiated care at more than 3 months; however, the proportion eligible for highly active antiretroviral therapy at first visit was approximately equivalent. Both initiation of care and CD4 cell count are time dependent and are possibly interactive events that are coincident in HARS. We did not observe differences in the proportion with a CD4 cell count of less than 350/µL and/or a VL of greater than 100 000 copies per milliliter across diagnostic sites; however, these values were reported at first visit, not at diagnosis, and they cannot by definition be reported for persons never initiating care. Thus, we could not explore the relationship between clinical symptoms and selection of diagnostic site or time to initiation of care.

### Table 2. Time From Initial Diagnosis to First Primary Care Visit by Site of Diagnostic Testing in Persons Diagnosed as Having Human Immunodeficiency Virus (Non-AIDS) Infection by Positive Western Blot Test in New York City, 2003

<table>
<thead>
<tr>
<th>Variable</th>
<th>First Visit ≤ 3 mo of Diagnosis</th>
<th>First Visit &gt; 3 mo After Diagnosis</th>
<th>No Evidence of Any Visit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1228 (63.7)</td>
<td>369 (19.1)</td>
<td>331 (17.2)</td>
<td>1928 (100.0)</td>
</tr>
<tr>
<td>Site without colocated medical care</td>
<td>216 (53.2)</td>
<td>79 (19.5)</td>
<td>111 (27.3)</td>
<td>406 (21.1)</td>
</tr>
<tr>
<td>Community testing site</td>
<td>72 (48.0)</td>
<td>27 (18.0)</td>
<td>51 (34.0)</td>
<td>150 (7.8)</td>
</tr>
<tr>
<td>City correctional system</td>
<td>39 (49.4)</td>
<td>18 (22.8)</td>
<td>22 (27.8)</td>
<td>79 (4.1)</td>
</tr>
<tr>
<td>Sexually transmitted disease clinic</td>
<td>101 (59.4)</td>
<td>32 (18.8)</td>
<td>37 (21.8)</td>
<td>170 (8.8)</td>
</tr>
<tr>
<td>Tuberculosis clinic</td>
<td>4 (57.1)</td>
<td>2 (8.6)</td>
<td>1 (14.3)</td>
<td>7 (0.4)</td>
</tr>
<tr>
<td>Site with colocated medical care</td>
<td>1012 (66.5)</td>
<td>290 (19.1)</td>
<td>220 (14.5)</td>
<td>1522 (78.9)</td>
</tr>
<tr>
<td>Designated AIDS center</td>
<td>477 (66.2)</td>
<td>144 (20.0)</td>
<td>100 (13.9)</td>
<td>721 (37.4)</td>
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<tr>
<td>Low-poverty zip code</td>
<td>129 (64.8)</td>
<td>38 (19.1)</td>
<td>32 (16.1)</td>
<td>199 (10.3)</td>
</tr>
<tr>
<td>High-poverty zip code</td>
<td>346 (66.7)</td>
<td>106 (20.3)</td>
<td>68 (13.0)</td>
<td>522 (27.1)</td>
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<tr>
<td>Not designated AIDS center</td>
<td>535 (66.6)</td>
<td>146 (18.2)</td>
<td>120 (15.0)</td>
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</tr>
<tr>
<td>Low-poverty zip code</td>
<td>254 (74.1)</td>
<td>52 (15.2)</td>
<td>37 (10.8)</td>
<td>343 (17.8)</td>
</tr>
<tr>
<td>High-poverty zip code</td>
<td>281 (61.4)</td>
<td>94 (20.5)</td>
<td>83 (18.1)</td>
<td>458 (23.8)</td>
</tr>
</tbody>
</table>

a Data are given as number (percentage) of row total.
b Data are given as number (percentage) of column total.
outside the United States predicted delayed initiation of care. Extensive literature has associated these and related factors (many not measured by HIV/AIDS surveillance) with reduced health care utilization and health disparities nationwide and in New York City.

Medical providers who serve high-risk communities must, therefore, not only expand routine HIV testing but also ensure that it is coupled with proactive linkage to care. Large facilities have infrastructure specifically intended to mitigate individual barriers by facilitating applications for enabling factors (eg, entitlements, drug treatment, case management, housing, transportation, nutrition, and child care). Referrals will be smoother if linkage occurs within the same administrative entity and/or under the same roof. In the best of circumstances, post-test counselors can personally escort persons who have new positive test results to the on-site HIV clinic, introduce them to clinic personnel, and make the first appointment, perhaps even on the same day. Most of our patients had their infections diagnosed by medical providers. Although these sites performed significantly better than nonmedical sites, providers at these sites diagnosed the infections of most patients who did not make a timely transition to care. Thus, improvements in their services will have the greatest overall effect on initiation of care in the city. The Department of Health recently deployed experienced staff to New York City’s 10 largest reporting hospitals to facilitate initiation of care.

### Table 3. Univariate and Multivariate Analysis of Risk Factors for Delayed Initiation of Care in Persons Diagnosed as Having Human Immunodeficiency Virus (Non-AIDS) by Positive Western Blot Test in New York City, 2003

<table>
<thead>
<tr>
<th></th>
<th>No. of Cases</th>
<th>Timely, %</th>
<th>Delayed, %</th>
<th>HR (95% CI) Adjusted HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>1928</td>
<td>63.7</td>
<td>36.3</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Site where diagnostic Western blot was performed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site with colocated medical care</td>
<td>1522</td>
<td>66.5</td>
<td>33.5</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Community testing site</td>
<td>150</td>
<td>48.0</td>
<td>52.0</td>
<td>1.7 (1.4-2.1)</td>
</tr>
<tr>
<td>City correctional system</td>
<td>79</td>
<td>49.4</td>
<td>50.6</td>
<td>1.4 (1.1-1.8)</td>
</tr>
<tr>
<td>Sexually transmitted disease or tuberculosis clinic</td>
<td>177</td>
<td>59.3</td>
<td>40.7</td>
<td>1.2 (1.0-1.5)</td>
</tr>
<tr>
<td><strong>Race/ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>273</td>
<td>78.0</td>
<td>22.0</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Nonwhite</td>
<td>1655</td>
<td>61.3</td>
<td>38.7</td>
<td>1.7 (1.5-2.0)</td>
</tr>
<tr>
<td><strong>Transmission risk</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No injection drug use history</td>
<td>1754</td>
<td>65.0</td>
<td>35.0</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Injection drug use history</td>
<td>174</td>
<td>50.6</td>
<td>49.4</td>
<td>1.3 (1.1-1.5)</td>
</tr>
<tr>
<td><strong>Country of birth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>1034</td>
<td>65.7</td>
<td>34.3</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Outside the United States</td>
<td>894</td>
<td>61.4</td>
<td>38.6</td>
<td>1.1 (1.0-1.2)</td>
</tr>
</tbody>
</table>

**Abbreviations:** CI, confidence interval; HR, hazard ratio; NA, not applicable.

a Initiation of care was considered to have been timely if within 3 months of diagnosis and delayed if longer than 3 months after diagnosis.

b Data are given as row percentage of total row cases.
ever, because of the size, heterogeneity, and geographic
distribution of the epidemic, the Department of Health
relies heavily on the city’s more than 800 institutional
and more than 2400 individual diagnostic providers to
assist their patients who have new positive test results
to make the transition.

Public clinics and community-based organizations play
an important role in reaching out to persons not well served
by traditional health care institutions and providing sup-
portive environments to those who might not otherwise
undergo testing. Jails serve high-risk populations for whom
a new diagnosis of HIV may be only 1 of many problems.
As our data indicate, arranging postrelease or posttest care
and establishing bridges to medical care can be formi-
dable challenges for these sites. However, as testing tech-
nology changes and testing expands to more nonmedical
settings, including community outreach events and home-
based testing, these links will become increasingly impor-
tant. Our finding that most patients ever presenting for care
did so within 3 months suggests that there is a brief “best”
window of opportunity after diagnosis. All diagnostic pro-
viders should take full advantage of it by creating the best
linkage systems possible.

This analysis is subject to limitations that may under-
estimate the proportion of patients who initiate care. First,
before June 1, 2003, undetectable VLs and CD4 cell counts
higher than 500/µL were not reported. We presumed that
all patients newly diagnosed as having HIV were antiret-
roviral naive and would have had a detectable VL on their
first primary care visit23-27 or that our routine medical rec-
ord review would obtain any VL and CD4 cell count re-
results not reported by laboratories. Standard commercial as-
says may not be sensitive enough to detect the low levels
of viral replication occurring in long-term nonprogres-
sors during latent infection.28,29 However, these cases are
thought to be rare, and some of their VLs may have been
measured and reported before reaching set point.

Country of birth outside the United States is docu-
mented for 23% of patients newly diagnosed as having HIV
in New York City.31 One-quarter of foreign-born persons
were born in regions where non-B subtypes predominate.
The VLs of persons with non-B and recombinant sub-
types may be underestimated by assays optimized for sub-
type B,32 potentially underestimating initiation of care in
43% to 78%,33,34 of persons who acquired HIV in their home
country, during travel, or from persons infected with vari-
ant subtypes. Some VL assays more accurately quantitate
non-B subtype VLs than others,35 but because HARS does
not contain data on the VL assay used by the reporting labo-
ratory, we cannot estimate the proportion misclassified as
not initiating care for this reason.

Although we restricted our analysis to persons who
were residents of New York City at diagnosis, some pa-
tients may have relocated after diagnosis and received
medical care in another reporting jurisdiction. Patients
who moved out of New York City would be officially trans-
ferred to their new jurisdiction (and, thus, lost to follow-
up) under the Centers for Disease Control and Preven-
tion’s Routine Interstate Duplicate Review protocol only
at the time of progression to AIDS (ie, we would not know
that they were no longer city residents until they were
diagnosed as having AIDS).

Finally, laboratory reporting indicates testing but does
not provide any insight into the quality or characteris-
tics of the care. Thus, it is possible that some patients’
first laboratory report represented a visit to the emer-
gency department rather than a medical provider with
whom there would be an opportunity to establish an on-
going primary care relationship.

The past 2 decades have seen the steady transforma-
tion of HIV/AIDS from an almost inevitably fatal disease
to a chronic manageable condition. The value of early
diagnosis and timely initiation of primary care grows with
each passing year as new options in diagnosis, antiret-
roviral therapy, and medical management become avail-
able. Timely diagnosis is the essential first step,36,37 but
it must be followed by timely initiation of care.

This report shows the size and nature of the chal-
lenge of linking persons with a new positive HIV diag-
nosis to care in a high-morbidity urban environment. New
York City offers many settings for HIV diagnosis and ex-
pert care and has an extensive institutional support sys-
tem for persons with HIV. The 32 DACs are distributed
throughout the 5 boroughs and are accessible 24 hours
a day by what is arguably the best public transportation
system in the United States. Medical and prescription drug
benefits are designed to ensure that no person goes with-
out care or highly active antiretroviral therapy because
of lack of resources. Case management, housing, and nu-
tritional benefits are available. The DACs and large med-
ical facilities have the administrative capacity to reduce
many traditional barriers to care by arranging entitle-
ments and ensuring access to support services; most pri-
ivate physicians who treat patients with HIV/AIDS have
institutional relationships with hospitals that offer these
services.

Despite this, more than one-third of our patients were
not promptly linked to care. As advances in therapy ex-
tend length and quality of life for persons with HIV and
AIDS, public health authorities, their community part-
ers, and primary care physicians must proactively iden-
tify and assist those at risk for delayed care so that all
HIV-infected persons, regardless of their individual risk
factors and resources, can take prompt advantage of the
increasingly sophisticated therapeutic options available
to them.

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Correspondence: Lucia V. Torian, PhD, HIV/AIDS Epide-
miology and Field Services Program, Bureau of HIV/
AIDS Prevention and Control, New York City Depart-
ment of Health and Mental Hygiene, 346 Broadway, Room
701, CN 44, New York, NY 10013.

Author Contributions: Study concept and design: Torian,
Wiewel, and Frieden. Acquisition of data: Torian, Wiewel,
and Sackoff. Analysis and interpretation of data: Torian,
Wiewel, Liu, and Sackoff. Drafting of the manuscript:
Torian. Critical revision of the manuscript for import-
ant intellectual content: Torian, Wiewel, Liu, and Sackoff.
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Study supervision: Torian.
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11. NY Health Laws §63.4.