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## Evaluating Testing Strategies for Identifying Youths With HIV Infection and Linking Youths to Biomedical and Other Prevention Services

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## Key Points

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### Question

Which HIV testing strategies best reach youths at high risk of infection?

### Findings

In this cohort study, targeted testing strategies performed significantly better at reaching young sexual minority males and sexual minority males of color and identifying youths with previously undiagnosed HIV infection when compared with universal screening strategies.

### Meaning

Reaching youths at highest risk of HIV infection may require implementation of targeted, community-based HIV testing strategies.

## Abstract

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### Importance

Most human immunodeficiency virus (HIV)–infected youths are unaware of their serostatus (approximately 60%) and therefore not linked to HIV medical or prevention services. The need to identify promising and scalable approaches to promote uptake of HIV testing among youths at risk is critical.

### Objective

To evaluate a multisite HIV testing program designed to encourage localized HIV testing programs focused on self-identified sexual minority males and to link youths to appropriate prevention services after receipt of their test results.

### Design, Setting, and Participants

Testing strategies were evaluated using an observational design during a 9-month period (June 1, 2015, through February 28, 2016). Testing strategies were implemented by 12 adolescent medicine HIV primary care programs and included targeted testing, universal testing, or a combination. Data were collected from local youth at high risk of HIV infection and, specifically, sexual minority males of color.

### Main Outcomes and Measures

Proportion of sexual minority males and sexual minority males of color tested, proportion of previously undiagnosed HIV-positive youths identified, and rates of linkage to prevention services.

### Results

A total of 3301 youths underwent HIV testing. Overall, 35 (3.6%) of those who underwent universal testing in primary care clinical settings, such as emergency departments and community health centers, were sexual minority males (35 [3.6%] were males of color) compared with 236 (46.7%) (201 [39.8%] were males of color) who were tested through targeted testing and 693 (37.8%) (503 [27.4%] were males of color) through combination efforts. Identification of new HIV-positive cases varied by strategy: 1 (0.1%) via universal testing, 39 (2.1%) through combination testing, and 16 (3.2%) through targeted testing. However, when targeted tests were separated from universal testing results for sites using a combined strategy, the rate of newly identified HIV-positive cases identified through universal testing decreased to 1 (0.1%). Rates of new HIV-positive cases identified through targeted testing increased to 49 (6.3%). Youths who tested through targeted testing (416 [85.1%]) were more likely to link successfully to local HIV prevention services, including preexposure prophylaxis, compared with those who underwent universal testing (328 [34.1%]).

### Conclusions and Relevance

The findings suggest that community-based targeted approaches to HIV testing are more effective than universal screening for reaching young sexual minority males (especially males of color), identifying previously undiagnosed HIV-positive youths, and linking HIV-negative youths to relevant prevention services. Targeted, community-based HIV testing strategies hold promise as a scalable and effective means to identify high-risk youths who are unaware of their HIV status.

## Introduction

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Nearly half of the estimated 62 000 youths (aged 13–24 years) infected with human immunodeficiency virus (HIV) living in the United States are unaware of their HIV status. Among racial and sexual minority

young males, fewer than half know their HIV status in contrast to the 80% of adults living with HIV who know their HIV status. Universal, non-risk-based HIV screening for all youths 15 years or older is recommended by the Centers for Disease Control and Prevention. Although testing data on youth across this age spectrum are sparse, testing rates among 15- to 19-year-old males who have ever had anal or vaginal sex is approximately 22%; this proportion has not significantly changed during the past 10 years.

The means by which recommended universal testing could be initiated and sustained for specific populations of youth who are at risk of HIV infection is not specified by existing public health guidelines, and implementation of such routine youth-focused testing strategies is hampered by limited comparative effectiveness research. In the United States, HIV testing programs for youths have included clinical and nonclinical community-based approaches, although these are seldom systematically implemented or directly compared to establish best practices. In addition, it is not certain which approach is most efficacious for identifying undiagnosed HIV infections. Universal HIV screening in clinical settings (community health centers, emergency departments, and sexually transmitted diseases clinics) provides an established infrastructure for testing with provision of other needed health care services. However, HIV testing is performed at only 0.6% of primary care clinic visits among 15- to 19-year-old males, and testing rates are unknown for youth of other ages. Moreover, many health care settings are inconvenient and inaccessible, even if youths are aware of the need for and availability of testing. Primary care HIV screening may miss many at-risk youths given the relative low availability of HIV services in many primary care settings, perceptions of covert or overt hostility to sexual minorities, stigma associated with testing, lack of insurance, lack of age-appropriate services, and lack of understanding of exceptions of requirements for parental consent for HIV and sexually transmitted infection testing and treatment for those younger than 18 years.

An alternative to routine testing of entire populations of youth relies on targeted, nontraditional community-based testing to reach marginalized, at-risk youths, such as those who are homeless, runaway, or sexual minorities. Targeted, community-focused testing programs treat at-risk youths as hidden populations, using outreach approaches, such as mobile testing units and specialized, youth-friendly drop-in centers. Compared with universal, non-risk-based HIV screening, targeted testing might yield greater uptake of testing and higher proportions of HIV-positive test results. However, these strategies have not been directly compared with youth-focused universal screening approaches for reaching youths at high risk of infection and identifying undiagnosed HIV infections or with approaches that combine both strategies.

The questions of which youths to test and the most effective settings for testing bring attention to other questions about effective infrastructure for linking youths who test positive for HIV to HIV treatment services and those who test negative to HIV prevention services. In the recent past, many youths with newly diagnosed HIV (up to 70%) were not linked to HIV-related health care in a timely manner (eg, 1 month). Subsequently, linkage to care was identified as a national public health mandate, with demonstration of the cost-effectiveness of linkage to health care and empirical validation of best practices for linkage to health care leading to improved linkage success for youth. Many testing programs, especially those receiving Ryan White funding, developed linkage-to-care protocols for youths who test positive. More recently, validation of a range of HIV-related behavioral and biomedical prevention services, including preexposure prophylaxis (PrEP), has created the need for additional expansion of services provided in HIV testing programs. The need for comprehensive HIV testing and linkage to HIV-related health care and prevention services is a challenge not yet systematically addressed on a large scale. These approaches are necessarily built on better integration of clinical services, community resources, and public health objectives, providing major steps toward current efforts to reduce or eliminate HIV in the United States.

Given the lack of implementation data on community-focused approaches to comprehensive HIV testing

programs for youth, we evaluated a multisite HIV testing program designed to encourage localized HIV testing programs focused on self-identified sexual minority males (especially those of color) aged 13 to 24 years and to link youths to appropriate prevention services after receipt of their test results. Although observational in design and evaluation, these data provide important insights into needed infrastructures for comprehensive testing and linkage to prevention services for at-risk youth.

## Methods

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### Connect to Testing and Prevention Services

Connect to Testing and Prevention Services is a demonstration study conducted by the Adolescent Medicine Trials Network for HIV/AIDS Interventions (ATN) and sponsored by the Eunice Kennedy Shriver National Institute for Child Health and Human Development and the National Institute on Minority Health and Health Disparities. The project implemented and evaluated strategies for promoting uptake of HIV testing among at-risk sexual minority males of color aged 13 to 24 years and linking HIV-negative youths to HIV prevention services. Twelve ATN units (AMTUs; the clinical sites of the ATN) developed and implemented HIV-testing plans (eTable in the [Supplement](#)). Some AMTUs had limited testing programs in place through other ATN initiatives, but none had a well-developed effort to reach sexual minority males of color or had developed an infrastructure to link youths who tested HIV negative to prevention services. Study procedures were approved by the appropriate human subjects review board at each participating AMTU and those associated with each research team member's home institution. Informed consent was not required. Data were provided to the evaluation team in a fully deidentified and aggregated form. The study was determined exempt from review at all study sites.

The AMTUs chose HIV testing strategies with input from their local community partners (coalitions) with an understanding of local needs and resources. The testing strategies followed 1 of 3 general approaches: universal screening in community-based and clinical settings, which attract large numbers of youths (eg, school-based health centers and hospital emergency departments); targeted testing at community-based events (such as pop-up youth-focused parties) at community venues where young people socialize and through mobile testing vans; and combination testing approaches that used universal screening and targeted testing strategies. Although the targeted venues were chosen to increase likely contact with young sexual minority males of color, these venues were not necessarily homogeneous in composition. In the case of combination testing, AMTUs often used targeted outreach events to direct youths to testing opportunities in youth-focused clinics. Each participating AMTU implemented locally tailored testing that was consistent with one of these strategies during a 9-month period from June 1, 2015, through February 28, 2016. The AMTUs received roughly US\$30 000 from the research sponsors to support their activities.

The HIV-negative youths were linked to prevention services and, if eligible, referred for PrEP. For the purposes of the demonstration project, prevention services were broadly defined to include referral for PrEP, behavioral counseling, referral to online resources, and linkage to other community-based prevention services. Most prevention services were external to the AMTU. Mental health, substance abuse, housing, and food security issues were addressed on an as-needed basis. None of the sites had preexisting infrastructure for PrEP delivery for minors. Three sites developed infrastructure for PrEP delivery to minors as part of the demonstration based on practitioner risk assessments and willingness to provide off-label prescription.

Newly identified HIV-positive youths across all AMTUs were linked to health care using an evidence-supported ATN linkage-to-care program. Our linkage-to-care program has successfully linked 80% of youths to HIV medical care within a mean of 42 days of initial diagnosis. The program relies on linkage-to-care specialists to make an initial medical appointment, remove barriers to accessing care, and monitor care engagement. In the current study, 98.2% of newly diagnosed HIV-positive youths were linked to health care

through this program, typically at the AMTU.

## Evaluation Data and Statistical Analysis

The AMTU staff submitted implementation logs to an external evaluation team every 3 months through the pilot study period (quarter 1: June 1, 2015, through August 31, 2015; quarter 2: September 1, 2015, through November 30, 2015; quarter 3: December 1, 2015, through February 28, 2016). Data reported in the logs offered summary descriptions of testing and linkage activity at each AMTU during the 3-month period. Data included the number of youths tested, the number of newly identified HIV-positive youths, select self-reported demographic characteristics, and referrals made.

The aims of the current investigation were to identify which testing strategy performed best at reaching young sexual minority males (especially those of color), which was best at identifying youths with undiagnosed HIV infection, and which strategy best facilitated linkage to prevention services. Data analyses were conducted with a series of 2-tailed, 2-group  $z$  tests of differences in proportion to compare each testing strategy against the other. Four of the 5 combination sites submitted their data in disaggregated form, allowing separation of testing data from universal settings from tests offered in targeted settings. We repeated all analyses with the disaggregated data (eg, including the universal testing data with the data for universal sites and the targeted testing data with the data for the targeted sites). Outcomes were the proportion (by testing strategy) of young sexual minority males tested, the proportion (by testing strategy) of young sexual minority males tested who self-identified as being of nonwhite race or Hispanic ethnicity, the proportion (by testing strategy) of newly identified HIV-positive youths, and the proportion (by testing strategy) of HIV-negative youths linked to prevention services, including PrEP. All analyses were performed using a  $z$  score calculator ([www.socscistatistics.com](http://www.socscistatistics.com)).

## Results

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A total of 3301 youths underwent HIV testing (targeted testing,  $n = 505$ ; universal testing,  $n = 962$ ; combination testing,  $n = 1834$ ). [Table 1](#) gives the number and percentage of newly diagnosed HIV-positive youths, sexual minority males, and sexual minority males of color who underwent testing. We also list the number and percentage of youths who received an HIV-negative test result and were referred to prevention services.

Although fewer youths were tested at sites implementing a targeted HIV-testing strategy than by those offering universal testing or combination HIV-testing strategies, targeted testing reached more sexual minority males and more sexual minority males of color than did universal or combination testing strategies ([Table 1](#)). Compared with universal screening, combination testing also reached more young sexual minority males and young sexual minority males of color. Compared with universal screening, targeted testing and combination testing each identified a significantly larger proportion of previously undiagnosed HIV infections. No significant difference in identification of HIV infections was identified in AMTUs that used targeted testing compared with those that used a combination testing strategy. Overall, 1946 youths (59.9%) who tested negative for HIV were linked to a prevention service, including services that provided PrEP. Youths tested through targeted and combination strategies were more likely to be linked to prevention services compared with youths who were tested using a universal screening strategy ([Table 1](#)).

The results of disaggregated tests are given in [Table 2](#). The success of the combination testing strategy in reaching sexual minority males of color and sexual minority males in general and in identifying previously undiagnosed HIV infections appears to be attributable to the targeted testing component rather than to the universal screening offered by the AMTUs. In addition, most of the HIV-positive youths identified were tested at a targeted event rather than through universal screening. Young sexual minority males of color and

young sexual minority males in general were most likely to be tested at a targeted event. Youths were most likely to be linked to prevention services through targeted testing strategies than through universal strategies.

## Discussion

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We evaluated the outcomes of a demonstration program designed to identify promising strategies for HIV testing among young sexual minority males (particularly sexual minority males of color) and to link HIV-negative youths to prevention services. Compared with non-risk-based universal screening, targeted testing directed specifically toward at-risk sexual minority males tested fewer individuals overall but tested more sexual minority males of color, tested more sexual minority males in general, identified more youths with previously undiagnosed infections, and was more successful in linkage of those with negative test results to behavioral and biomedical prevention services. The proportion of youths testing HIV positive using targeted strategies suggests that these strategies hold particular promise for identifying youths for whom immediate linkage to health care and prevention services is crucial. Although universal screening is a component of public health education about HIV infection and normalizes testing among youths, this approach identifies relatively few infections and reaches few young sexual minority males, particularly those of color, unless combined with targeted testing strategies. Combination (targeted and universal screening) strategies were successful in linking at-risk HIV-negative youths to prevention services, including PrEP, compared with universal strategies alone, attributable primarily to targeted screening.

These data suggest that current recommendations for community-wide, non-risk-based screening of youths may be important to reduce stigma and increase public understanding of HIV infection but may not reach populations at high risk of infection, for whom prevention services are most needed. We found that strategies combining targeted and routine non-risk-based screening are more successful and targeted strategies alone better still in reaching youth at high risk of HIV infection compared with non-risk-based screening alone. Our data suggest that efforts to promote health equity for those most at risk for HIV infection in the United States (young sexual minority males of color) require targeted attempts to connect with those youths and link them to appropriate treatment or prevention services. These targeted services for young sexual minority males of color require direct input from the involved communities to reflect the social and structural determinants that affect HIV testing and prevention behaviors in those communities and to reduce the stigma that may be associated with targeted testing efforts. Community-by-community strategies would likely rely on combinations of universal and targeted testing combined with community engagement.

These data provide a response to a recent call to action that notes the specific role for youth-serving clinicians and the health care system in general for HIV testing, treatment, and prevention among youth. This role includes offering HIV screening for all youths, provision of education about risk and protection, prompt linkage to HIV medical care for youths who test positive, and linkage to prevention services, such as HIV prevention education and PrEP, for eligible youths who test negative. Although PrEP provision, as one prevention service among several, is not yet widely accepted by most youth-serving clinicians and not yet approved by the US Food and Drug Administration for minor youths, this seems to be fertile ground suitable for strategic new prevention infrastructure investment during the next several years.

## Limitations

There are several limitations of these data that bear mention. First, we were unable to obtain accurate counts of the number of youths exposed to testing opportunities at all sites because these data were not consistently operationalized across sites and, in some cases, were not recorded. These data therefore do not allow us to reliably determine the likelihood that youths will accept HIV testing through any of these strategies. Among the 6 sites for which we can estimate exposure and testing acceptance rates, acceptance

varied widely (6% to 100%). The AMTUs with the highest testing acceptance rates approached the fewest youths for testing. Indeed, the correlation between the number of tests offered and the number accepted among the 6 sites providing both pieces of data are strong and negative ( $r = -0.86$ ). Future research might investigate whether one strategy vs another is more acceptable to youths who accept testing. A second limitation of these data are that they were reported to us in aggregate for each site, making it impossible to treat AMTU as a covariate or examine whether nesting of youths within AMTUs should be adjusted for in analysis. We also could not disaggregate targeted vs universal testing outcomes for one combination testing site. Complete disaggregation might allow us to reflect more accurately on the relative contribution of targeted testing efforts vs universal screening efforts across participating AMTUs.

Third, regarding linkages to prevention services and PrEP, missing data and varied definitions across AMTUs of what counted as having linked a youth to such service preclude our ability to examine linkage to these services in detail. Site-level resources were far too modest to allow us to develop and implement a cross-site common means of determining referral follow-up to prevention services. Each AMTU also developed its own criteria for risk stratification of youths, and these criteria differed substantially across sites. Fourth, the reasons for the success of the targeted vs universal screening strategy were not systematically investigated in our demonstration. We speculate that the targeted strategies required higher levels of community engagement and made more effective use of local street knowledge than strategies capitalizing on conventional care settings. Our speculations about the role of community engagement and expertise must be assessed in future empirical investigations.

## Conclusions

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Young sexual minority males of color aged 13 to 24 years bear a disproportionate and increasing burden of the US HIV epidemic. HIV testing provides these youths an entryway to accessing HIV-related health care management and prevention services. Identifying feasible, acceptable, and effective strategies to engage youths in testing remains a critical step in decreasing the excess burden of HIV on these youths. Highly targeted strategies in youth-friendly formats are feasible and scalable and may prove to be more cost-efficient at identifying the youths most in need of testing compared with routinized universal screening strategies.

## Notes

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### Supplement.

**eTable.** AMTU Site Characteristics

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## Figures and Tables

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**Table 1.****Frequency of HIV-Positive Tests Results, Youth Demographic Characteristics, and Linkage to Prevention Services by Testing Strategy<sup>a</sup>**

Characteristic	No. (%) of Patients		
	Targeted Testing (n = 505)	Universal Testing (n = 962)	Combination Testing (n = 1834)
HIV positive	16 (3.2)	1 (0.1)	39 (2.1)
Gay or bisexual male	236 (46.7)	35 (3.6)	693 (37.8)
Gay or bisexual male of color	201 (39.8)	35 (3.6)	503 (27.4)
HIV negative and linked to prevention services	416 (85.1)	328 (34.1)	1202 (67.0)

Abbreviation: HIV, human immunodeficiency virus.

<sup>a</sup>All comparisons are significantly different at  $P < .01$  except the comparison between targeted and combination testing on identification of previously undiagnosed HIV infection.

**Table 2.****Frequency of HIV-Positive Tests Results, Youth Demographic Characteristics, and Linkage to Prevention Services by Testing Strategy, Disaggregated<sup>a</sup>**

Characteristic	No. (%) of Patients	
	Targeted Testing (n = 780)	Universal Testing (n = 1596)
HIV positive	49 (6.3)	1 (0.1)
Gay or bisexual male	482 (61.8)	138 (8.6)
Gay or bisexual male of color	448 (57.4)	136 (8.5)
HIV negative and linked to prevention services	622 (85.1)	471 (29.5)

Abbreviation: HIV, human immunodeficiency virus.

<sup>a</sup>All comparisons are significantly different at  $P < .01$ .