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VIEWPOINTS

The Testing Imperative: Why the US Ending the Human Immunodeficiency Virus (HIV) Epidemic Program Needs to Renew Efforts to Expand HIV Testing in Clinical and Community-Based Settings

Bohdan Nosyk,[1,2] Anthony Todd Fojo,[3] Parastu Kasaie,[4] Benjamin Enns,[2] Laura Trigg,[2,5] Micah Piske,[2] Angela B. Hutchinson,[6] Elizabeth A. DiNenno,[6] Xiao Zang,[7] and Carlos del Rio[8]

[1]Faculty of Health Sciences, Simon Fraser University, Burnaby, British Columbia, Canada; [2]Health Economic Research Unit, Centre for Health Evaluation and Outcome Sciences, Vancouver, British Columbia, Canada; [3]Johns Hopkins University School of Medicine, Baltimore, Maryland, USA; [4]Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA; [5]School of Health and Related Research, Health Economics and Decision Modelling, Sheffield University, Sheffield, United Kingdom; [6]US Centers for Disease Control and Prevention, Atlanta, Georgia, USA; [7]Department of Epidemiology, Brown University School of Public Health, Providence Rhode Island, USA; and [8]Faculty of Medicine, Emory University, Atlanta, Georgia, USA

Data from several modeling studies demonstrate that large-scale increases in human immunodeficiency virus (HIV) testing across settings with a high burden of HIV may produce the largest incidence reductions to support the US Ending the HIV Epidemic (EHE) initiative's goal of reducing new HIV infections 90% by 2030. Despite US Centers for Disease Control and Prevention's recommendations for routine HIV screening within clinical settings and at least yearly screening for individuals most at risk of acquiring HIV, fewer than half of US adults report ever receiving an HIV test. Furthermore, total domestic funding for HIV prevention has remained unchanged between 2013 and 2019. The authors describe the evidence supporting the value of expanded HIV testing, identify challenges in implementation, and present recommendations to address these barriers through approaches at local and federal levels to reach EHE targets.

Keywords. HIV/AIDS; simulation model; Ending the HIV Epidemic; HIV testing; HIV prevention.

Despite advances in treatment and prevention, more than 36 000 individuals were diagnosed with human immunodeficiency virus (HIV) in the United States in 2019, and more than 1 in 5 persons (20.4%) received a late-stage diagnosis (stage 3 acquired immunodeficiency syndrome (AIDS) at diagnosis) [1, 2]. The Centers for Disease Control and Prevention (CDC) recommends routine HIV screening in most medical settings, with at least yearly screening for individuals at risk of acquiring HIV [3]. Furthermore, the US Preventive Services Task Force maintains a grade A recommendation for testing all adults aged 15 to 65 years at least once in their lifetime, thus compelling insurers to provide coverage for these services [4]. Despite this recommendation, fewer than half of US adults report ever receiving an HIV test, and fewer than 15% have been tested in the past year [5, 6]. The US CDC funds a large proportion of all HIV tests and 24% of new diagnoses in 2019 were made by CDC-funded tests [7]. In 2020, the US CDC reported 1 338 665 HIV tests across the nation, down 44% from 2019 largely because of the COVID-19 pandemic, and 56% from 2015, when the CDC funded 3 026 074 tests (Figure 1) [8]. Although specific budgetary estimates for testing are not available, total domestic funding (across multiple government agencies) for HIV prevention including testing was essentially unchanged from 2013 to 2019 [9]. We believe that HIV testing in Ending the HIV Epidemic (EHE) jurisdictions (which accounted for more than 50% of new HIV diagnoses in 2016–2017) must increase substantially to meet the goals of the EHE initiative [10, 11].

HIV testing is the entry point for both treatment and prevention—three-quarters of those receiving a new HIV diagnosis through CDC-funded tests are linked to care within 30 days and more than half undergo an interview to identify partners for testing and referral to treatment or preexposure prophylaxis (PrEP) [8]. Furthermore, the associated changes in sexual risk behavior following HIV diagnosis—as much as a 68% reduction in unprotected sex among those who know their HIV status [12]—represents the substantial additive value of HIV testing. Without considering the benefits of linkage to PrEP and reductions in stigma and normalization from more widespread HIV testing, routine screening represents good value for money so long as the yield exceeds 0.1% [13, 14]. The overall positivity rate for CDC-funded tests in the United States was 0.48% in 2020 but barely changed from 0.41% in 2015 [8].

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Correspondence: B. Nosyk, Faculty of Health Sciences, Simon Fraser University, 8888 University Dr, Burnaby, BC V5A 1S6, Canada (bnosyk@sfu.ca).

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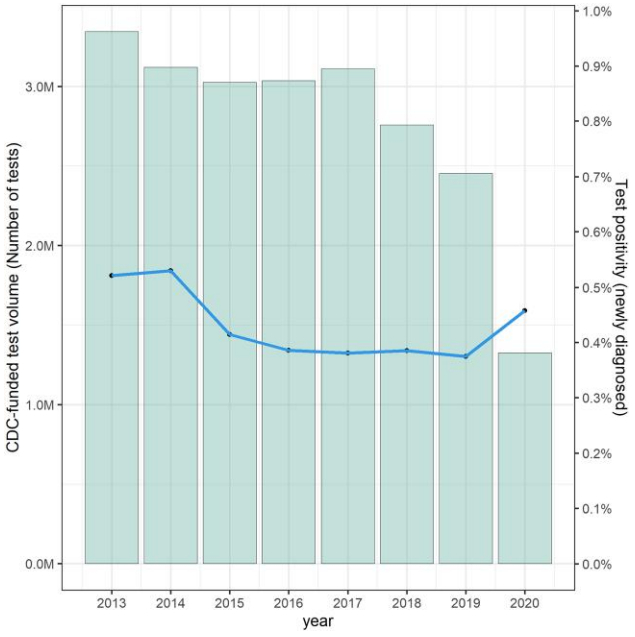

Figure 1. Total testing volumes and test positivity of Centers for Disease Control and Prevention–funded HIV tests (2013–2020).

This indicates considerable—and growing—unrealized value for routine HIV screening.

We have recently published articles using independently developed and locally calibrated simulation models estimating the efforts required to reach the EHE initiative's goal of a 90% reduction in new HIV infections by 2030 [15–17]. Fojo et al. (2021) estimated that biannual HIV testing for men who have sex with men and persons who inject drugs and annual testing for heterosexuals would yield a 55% decline in HIV incidence across EHE high-burden cities by 2030. This was two-thirds of the total reduction achievable by more resource-intensive combination strategies (including expanded PrEP uptake and viral suppression [via increased linkage, treatment] among people with HIV) [8]. Nosyk et al. (2020) assessed 5 different testing strategies alone and in combination. Delivered jointly, these strategies, which amounted to a 62% increase in monthly testing rate on average, prompted substantially larger incidence reductions than treatment and prevention interventions alone, and were estimated to generate long-term cost savings in most settings. Both modeling efforts in cities with a high burden of HIV concluded that large-scale increases in HIV testing in these settings would not only be a necessary component in any combination strategy that includes effective treatment but would account for the largest incidence reductions among the strategies considered [15, 17, 18]. Analyses from a national simulation model found that emphasizing the HIV care continuum to achieve viral suppression had the greatest impact on HIV incidence and underscored the importance of testing [19]. Simply put, far more individuals need to be tested to approach the ambitious EHE targets.

Although targeting testing to individuals at highest risk of infection has been promoted as a means of increasing diagnostic yield, it has limited reach compared with routinely offered opt-out screening that can significantly increase HIV testing rates and its potential population impact. Furthermore, a recent randomized controlled trial found that targeted HIV screening in emergency departments did not yield a higher rate of diagnoses than nontargeted screening [20].

Low levels of both HIV test offer and acceptance pose key challenges to expanding HIV testing. Testing uptake is constrained by HIV-related stigma, limited knowledge about HIV risk factors, and routine screening recommendations as well as uncertainty regarding reimbursement [21]. Although externally funded demonstration projects have proven successful in the past, routine screening is still not a realized standard of care in most clinical settings [21]. Test acceptance has ranged from 5% to 91% for opt-out testing in US clinical settings [22]; however, sustained testing with 97% acceptance was achieved elsewhere by incorporating testing into existing clinical pathways [23]. Stigma, low risk perception, prior testing, and fear of testing positive are among the most common reasons for declining testing [24]. Implementation strategies to increase HIV test acceptance are thus of vital importance. A systematic review found that personalized interventions to improve HIV testing uptake were lacking and technology-based strategies hold promise for improving HIV testing rates [24].

Achieving the scale necessary to meet EHE goals will require innovative approaches to distributing and incentivizing testing. Self-testing kits can substantially increase testing frequency [25], particularly among people who have never tested for HIV or do not regularly access healthcare [26]. The CDC has piloted self-testing programs that have thus far been found to be cost saving [27], though state laws may limit their availability [28]. Such tests are available for purchase in many community pharmacies for $40 to $60; fully subsidizing their purchase or distributing them free of cost—as has been done for COVID-19 antigen tests—can extend their reach by eliminating the need for healthcare interaction and travel costs. Several jurisdictions have implemented novel strategies such as lotteries, direct cash payments, or pop-up vaccination sites at community and social events to incentivize COVID-19 vaccinations with varying degrees of success [29, 30]; such approaches could be adapted for HIV testing. Offering HIV testing alongside other preventive diagnostics may produce economies of scope, reduce stigma, and improve test acceptance [31]. Finally, a large-scale push for HIV testing would need to be met with increased health system capacity to sustain levels of linkage and retention in HIV care in the face of increased demand [32].

The EHE strategy rests on 4 pillars, and although enhancements in each are required, diagnosis is a rate-limiting step

to treatment access, response via partner services, and transmission cluster detection (pillars 3 and 4). Increasing HIV testing represents excellent value for money and the EHE initiative's goals are unlikely to be met without large-scale expansion within high-burden jurisdictions [33]. Recent declines in testing volumes in the United States are a cause for concern and urgent and concerted efforts are required at state, local, and federal levels to reach EHE goals.

Notes

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References

1. U.S. Health and Human Services. Available at: https://ahead.hiv.gov/. Accessed 27 June 2022.
2. Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 dependent areas, 2019. HIV Surveillance Supplemental Report 2021; 26(No. 2). Available at: http://www.cdc.gov/hiv/library/reports/hiv-surveillance.html. Accessed 19 August 2022.
3. Branson BM, Handsfield HH, Lampe MA, et al. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. Morb Mortal Wkly Rep **2006**; 55:1–4.
4. Owens DK, Davidson KW, Krist AH, et al. Screening for HIV infection: US Preventive Services Task Force recommendation statement. JAMA **2019**; 321: 2326–36.
5. McQuillan GM, Kruszon-Moran D, Masciotra S, Gu Q, Storandt R. Prevalence and trends in HIV infection and testing among adults in the United States: the National Health and Nutrition Examination Surveys, 1999–2018. J Acquir Immune Defic Syndr **2021**; 86:523–9.
6. Patel D, Johnson CH, Krueger A, et al. Trends in HIV testing among US adults, aged 18–64 years, 2011–2017. AIDS Behav **2020**; 24:532–9.
7. DiNenno EA, Delaney KP, Pitasi MA, et al. HIV testing before and during the COVID-19 pandemic—United States, 2019–2020. MMWR Morb Mortal Wkly Rep **2022**; 71:820–4.
8. Centers for Disease Control and Prevention. CDC-funded HIV testing in the United States, Puerto Rico, and U.S. Virgin Islands. Available at: https://stacks.cdc.gov/view/cdc/31811. Accessed 27 February 2023.
9. Kaiser Family Foundation. U.S. federal funding for HIV/AIDS: trends over time. Available at: https://www.kff.org/hivaids/fact-sheet/u-s-federal-funding-for-hivaids-trends-over-time/. Accessed 27 June 2022.
10. Fauci AS, Redfield RR, Sigounas G, Weahkee MD, Giroir BP. Ending the HIV epidemic: a plan for the United States. JAMA **2019**; 321:844–5.
11. HHS. What is 'Ending the HIV Epidemic: A Plan for America'? Available at: https://www.hiv.gov/federal-response/ending-the-hiv-epidemic/overview. Accessed 13 December 2022.
12. Marks G, Crepaz N, Senterfitt JW, Janssen RS. Meta-analysis of high-risk sexual behavior in persons aware and unaware they are infected with HIV in the United States: implications for HIV prevention programs. J Acquir Immune Defic Syndr **2005**; 39:446–53.
13. Paltiel AD, Weinstein MC, Kimmel AD, et al. Expanded screening for HIV in the United States—an analysis of cost-effectiveness. N Engl J Med **2005**; 352:586–95.
14. Sanders GD, Anaya HD, Asch S, et al. Cost-effectiveness of strategies to improve HIV testing and receipt of results: economic analysis of a randomized controlled trial. J Gen Intern Med **2010**; 25:556–63.
15. Fojo AT, Schnure M, Kasaie P, Dowdy DW, Shah M. What will it take to End HIV in the United States?: a comprehensive, local-level modeling study. Ann Intern Med **2021**; 174:1542–53.
16. Quan AML, Mah C, Krebs E, et al. Improving health equity and ending the HIV epidemic in the USA: a distributional cost-effectiveness analysis in six cities. Lancet HIV **2021**; 8:e581–90.
17. Nosyk B, Zang X, Krebs E, et al. Ending the HIV Epidemic in the USA: an economic modelling study in six cities. Lancet HIV **2020**; 7:e491–503.
18. Krebs E, Zang X, Enns B, et al. The impact of localized implementation: determining the cost-effectiveness of HIV prevention and care interventions across six United States cities. AIDS **2020**; 34:447–58.
19. Jacobson EU, Hicks KA, Carrico J, et al. Optimizing HIV prevention efforts to achieve EHE incidence targets. J Acquir Immune Defic Syndr **2022**; 89:374–80.
20. Haukoos JS, Lyons MS, Rothman RE, et al. Comparison of HIV screening strategies in the emergency department: a randomized clinical trial. JAMA Netw Open **2021**; 4:e2117763.
21. Sanchez TH, Sullivan PS, Rothman RE, et al. A novel approach to realizing routine HIV screening and enhancing linkage to care in the United States: protocol of the FOCUS program and early results. JMIR Res Protoc **2014**; 3:e39.
22. Simmons R, Plunkett J, Cieply L, Ijaz S, Desai M, Mandal S. Blood-borne virus testing in emergency departments—a systematic review of seroprevalence, feasibility, acceptability and linkage to care. HIV Med **2022**; 24:6–26.
23. Gustafson R, Demlow SE, Nathoo A, et al. Routine HIV testing in acute care hospitals: changing practice to curb a local HIV epidemic in Vancouver, BC. Prev Med **2020**; 137:106132.
24. Gebrezgi MT, Mauck DE, Sheehan DM, et al. Acceptance of opt-out HIV screening in outpatient settings in the United States: a systematic review and meta-analysis. Public Health Rep **2019**; 134:484–92.
25. Katz DA, Golden MR, Hughes JP, Farquhar C, Stekler JD. HIV self-testing increases HIV testing frequency in high-risk men who have sex with men: a randomized controlled trial. J Acquir Immune Defic Syndr **2018**; 78:505–12.
26. Centers for Disease Control and Prevention. Reaching people who could benefit most from HIV self-testing. Available at: https://www.cdc.gov/endhiv/action/stories/self-testing-reaching-people.html. Accessed 19 August 2022.
27. Shrestha RK, Chavez PR, Noble M, et al. Estimating the costs and cost-effectiveness of HIV self-testing among men who have sex with men, United States. J Int AIDS Soc **2020**; 23:e25445.
28. Centers for Disease Control and Prevention. HIV self-testing. Available at: https://www.cdc.gov/hiv/basics/hiv-testing/hiv-self-tests.html. Accessed 19 August 2022.
29. Acharya B, Dhakal C. Implementation of state vaccine incentive lottery programs and uptake of COVID-19 vaccinations in the United States. JAMA Netw Open **2021**; 4:e2138238.
30. Sload J, Bechtolsheim B, Gifford D. Assessing the impact of vaccine lotteries on COVID-19 vaccination rates in the United States in 2021. Am J Public Health **2022**; 112:1130–3.
31. Bulstra CA, Hontelez JAC, Otto M, et al. Integrating HIV services and other health services: a systematic review and meta-analysis. PLoS Med **2021**; 18: e1003836.
32. Martin EG, Paltiel AD, Walensky RP, Schackman BR. Expanded HIV screening in the United States: what will it cost government discretionary and entitlement programs? A budget impact analysis. Value Health **2010**; 13:893–902.
33. Nosyk B, Zang X, Krebs E, et al. Ending the epidemic in America will not happen if the status quo continues: modeled projections for human immunodeficiency virus incidence in 6 US cities. Clin Infect Dis **2019**; 69:2195–8.