The Treat pillar of the Ending the HIV Epidemic in the U.S. plan calls for comprehensive strategies to enhance linkage to, and engagement in, HIV medical care to improve viral suppression among people with HIV and achieve the goal of 95% viral suppression by 2025. The U.S. has seen large increases in the proportion of people with HIV who have a suppressed viral load. Viral suppression has increased 41%, from 46% in 2010 to 65% in 2018. An additional increase of 46% is needed to meet the Ending the HIV Epidemic in the U.S. goal. The rate of viral suppression among those in care increased to 85% in 2018, highlighting the need to ensure sustained care for people with HIV. Greater increases in all steps along the HIV care continuum are needed for those disproportionately impacted by HIV, especially the young, sexual and racial/ethnic minorities, people experiencing homelessness, and people who inject drugs. Informed by systematic reviews and current research findings, this paper describes more recent promising practices that suggest an impact on HIV care outcomes. It highlights rapid linkage and treatment interventions; interventions that identify and re-engage people in HIV care through new collaborations among health departments, providers, and hospital systems; coordinated care and low-barrier clinic models; and telemedicine-delivered HIV care approaches. The interventions presented in this paper provide additional approaches that state and local jurisdictions can use to reach their local HIV elimination plans’ goals and the ambitious Ending the HIV Epidemic in the U.S. Treat pillar targets by 2030.

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BACKGROUND

Prevention, care, and treatment efforts to end the American HIV epidemic by 2030 are guided by the Ending the HIV Epidemic (EHE) in the U.S. Initiative and the recently released HIV National Strategic Plan: A Roadmap to End the Epidemic (HIV Plan). The EHE plan includes 4 strategies visualized as pillars: Diagnose, Treat, Prevent, and Respond. The Treat pillar, summarized as “Treat people with HIV rapidly and effectively to reach sustained viral suppression,” calls for comprehensive strategies to enhance linkage to, and engagement in, HIV medical care; expand re-engagement and retention in care; and improve viral suppression among people with HIV (PWH). This paper describes the progress to date to reach the Treat pillar goal of 95% viral suppression by 2025 and summarizes recent interventions, promising practices, and new approaches that state and local health departments (HDs) and providers can utilize to reach EHE goals.

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Progress in Treat Indicators in the U.S

Indicators used to measure national progress on the Treat pillar are derived from data reported to the National HIV Surveillance System. Based on historical data from the Centers for Disease Control and Prevention (CDC) HIV Prevention Progress Report (2019) and recent data from the Monitoring Selected National HIV Prevention and Care Objectives report, this paper describes progress made in the following indicators relevant to the Treat pillar: linkage to care (measured by having ≥1 CD4 or viral load test within 1 month of diagnosis), receipt of HIV medical care (measured by documentation of ≥1 CD4 or viral load test in a calendar year), retention in care (measured by having ≥2 CD4 or viral load tests ≥3 months apart in a calendar year), and viral suppression (measured by a viral load result of <200 copies/mL at the most recent viral load test).

Overall, linkage to HIV care increased considerably between 2010 and 2018 (14%, from 70% in 2010 to 80% in 2018). Although the U.S. is close to achieving the linkage to care goal of 85% by 2020, a further 18% relative increase is needed to meet the 2025 and 2030 target of 95%. Far greater increases are needed to reach the target for disproportionately affected groups, such as racial/ethnic minorities. Based on 2018 data, linkage to care data range from 82% to 84% for Asians, Whites, and Hispanics/Latinos to 77% for Blacks/African Americans. In general, linkage to HIV medical care increased as age at time of diagnosis increased, suggesting that more attention is needed for individuals diagnosed at younger ages.

Considerably less progress has been made in both receipt of, and retention in, HIV medical care, essential steps toward ensuring people reach and sustain viral suppression. Receipt of care was relatively stable, with a 3% increase between 2016 (74%) and 2018 (76%). Retention in care increased a modest 5%, from 55% in 2010 to 58% in 2018. Although there are no specific 2030 targets for retention in care, the 90% 2020 retention in care target has still not been achieved. Far greater increases are needed for disproportionately affected groups, especially among male individuals who inject drugs (51% in 2018).

Most relevant and encouraging are the large increases observed in viral suppression, the end goal of the Treat pillar. Between 2010 and 2018, the proportion of PWH (both in and out of care) who are virally suppressed increased 41%, from 46% in 2010 to 65% in 2018. Despite significant progress in viral suppression for all PWH, a 46% increase is still needed to reach the 2025 and 2030 targets of 95%. Far greater increases are needed for disproportionately affected groups, and reaching the 2030 target will depend on improvements in linkage to, receipt of, and retention in care. Disparities are observed among male individuals who inject drugs, who have lower viral suppression rates than those with infection attributed to male-to-male sexual contact (53% vs 67% in 2018). Disparities by race/ethnicity were also large, with viral suppression ranging from 70% to 71% for Asians and Whites to 64% for Hispanics/Latinos and 60% for Blacks/African Americans. In general, viral suppression increased as age increased. Higher viral suppression percentages are seen among those who received care (85% in 2018). A similar rate, 88% in 2019, is found among in-care Ryan White HIV/AIDS Program (RWHAP) participants.

The path to reaching EHE goals and the resources to do so for all PWH also vary considerably from state to state. According to the 2019 CDC progress report that examined progress in key indicators, among the 38 states with 2016 data available, 32% met and 39% made progress toward the intermediary 2020 national linkage to care target of 85%. The 2020 retention in care target of 90% was not met by any state, but more than half (55%) had made progress. Similarly, the viral suppression target of 80% was not met, but 68% of the states had made progress.

To reach the ambitious Treat pillar target that 95% of PWH achieve viral suppression by 2030, carefully crafted and targeted strategies are needed to address the complex challenges that are fueling HIV disparities. States and local jurisdictions are actively working on this, and in 46 states, counties, and cities have developed their own EHE plans that address the individual-, community-, and policy-level factors that affect the health and well-being of those most affected by HIV in their jurisdiction.

NOVEL APPROACHES FOR STATE AND LOCAL PLANS TO END THE HIV EPIDEMIC

Although progress has been made in the EHE indicators, the aforementioned data show that considerable work is still needed to achieve the 2030 targets, especially for populations disproportionately affected by HIV. The HIV Plan highlights the importance of reducing HIV-related disparities and health inequities and calls for the development and scale-up of evidence-based and evidence-informed interventions and best practices to address the well-documented challenges to HIV prevention, care, and treatment.

Through multiple systematic reviews conducted over the last decade, there is a robust and burgeoning collection of effective U.S.-based interventions and best practices that can lead to significant improvements in linkage, re-engagement retention, adherence, and viral
suppression.\textsuperscript{8−12} For example, Risher and colleagues\textsuperscript{12} 2017 comprehensive systematic review of linkage, retention, re-engagement, and adherence studies published through June 2015 identified 152 studies, most of which focused on adherence (77%) and retention (22%), with few focusing on linkage and re-engagement. Another important ongoing systematic literature review is CDC’s Compendium of Evidence-Based Interventions and Best Practices for HIV Prevention, which evaluates individual interventions for efficacy. It currently presents >40 domestic evidence-based and evidence-informed interventions that impact linkage, retention, and re-engagement outcomes.\textsuperscript{15} These sources form a rich resource from which state and local jurisdictions can identify interventions most suitable to address the EHE Treat pillar and the HIV Plan’s goal to improve HIV-related health outcomes of PWH. This paper provides background on current interventions and highlights more recent promising practices; enhancements to existing interventions; and new approaches selected from systematic reviews, recent publications, and conference proceedings that had statistically significant results in linkage, retention, or re-engagement outcomes. These more current interventions were selected specifically for HDs and providers to inform novel directions they could consider using to address the strategies in the HIV Plan and its objectives to link people to care rapidly and provide low-barrier access to HIV treatment; identify, engage, or re-engage people not in care or not virally suppressed; and increase retention in care and adherence to HIV treatment.

**Interventions to Support Prompt Linkage to Care and Treatment**

Interventions with prompt action shortly after HIV diagnosis are more likely to link people to care.\textsuperscript{14,15} Specifically, interventions focusing on rapid treatment initiation show promise in decreasing time to viral suppression and increased retention.\textsuperscript{16} Retrospective and historical control studies of combined rapid linkage or referral and rapid antiretroviral therapy (ART) initiation that streamline intake processes and provide navigation services around the clock and enhance support to access medication regardless of payer source show promising findings.

The New Orleans—based CrescentCare Start Initiative, which offers enhanced navigation, expedited clinic intake, and immediate ART initiation at time of diagnosis throughout a network of HIV testing sites, sexually transmitted disease clinics, and a clinic referral network, found a substantial reduction in mean time to linkage (1.3 vs 30 days in historical cohort, \(p<0.0001\)) and time to viral suppression (30 vs 68 days in historical control, \(p<0.0001\)).\textsuperscript{17} Likewise, the Rapid Entry and ART in Clinic for HIV (REACH) program in the Atlanta Grady Health System, which removes institutional barriers to initial provider visit and ART, found significant decreases in the median time to viral suppression from beginning clinic enrollment, from 77 days in pre-REACH patients to 57 days in post-REACH patients (\(p=0.0022\)).\textsuperscript{18} Early referral to a clinic-based RAPID ART program in San Francisco found that viral suppression was achieved by 96% of those in the program within 1 year, and the median time from the start of ART to viral load suppression was 41 days, with no statistically significant difference between those referred early to the program (within 30 days) and those with delayed referrals (between 30 days and 6 months).\textsuperscript{19} In this special issue, Coffey et al. describe the citywide expansion of the RAPID ART program.

**Interventions to Identify and Re-engage People Who are Out of Care or Not Virally Suppressed**

Health department—based re-engagement interventions designed to identify PWH who are not in care are referred to as Data-to-Care (D2C) programs. These interventions use HIV surveillance data (the absence of lab results, indicating a gap in care, or persistent viremia, indicating ineffective treatment) to assign clients to dedicated staff to locate them and assist with linkage to, or re-engagement in, HIV care. D2C programs have been implemented in different ways over the years and vary in the data sources used to identify out-of-care status and the approaches taken to reach clients and re-engage them in care.\textsuperscript{20} D2C approaches that are HD—based and rely solely on surveillance data may be less likely to have a significant impact. Findings from a cluster randomized evaluation of a D2C program in King County, Washington found no significant effect of the intervention, highlighting the need for locally tailored and optimized D2C approaches.\textsuperscript{21}

Recent studies suggest that D2C programs that entail close collaboration between both the HD and providers for identification of people out of care and re-engagement activities may increase efficiency and improve re-engagement outcomes.\textsuperscript{22−24} Preliminary findings from CDC-funded randomized control cooperative re-engagement clinical trial (CoRECT) study, which was designed to evaluate effectiveness of a collaborative HD/provider re-engagement intervention in 3 U.S. cities, found significant improvements at all 3 sites in 2 of the 4 primary outcomes, time to re-engagement and proportion re-engaged, compared with usual services.\textsuperscript{25} Final results recently presented from the Connecticut site show significantly higher re-engagement in care at 90 days in the intervention versus the usual care arm,
but no statistically significant differences in long term retention in care and viral suppression.\(^{26}\) Sachdev and colleagues\(^{37}\) compared 3 different D2C strategies and data sources to identify people out of care: healthcare providers, HD HIV surveillance, and a combination list derived by matching an electronic medical record registry to HIV surveillance. They found that PWH identified as being out of care by providers were more likely to be located and enrolled in navigation linkage (40%) than PWH identified by surveillance (9%) or combination lists (24%). Nevertheless, PWH from all 3 sources who enrolled in navigation linkage showed improvements in viral suppression.

Other novel uses of data to identify and re-engage people in care have emerged in recent years and are showing promising results. Frequent and routine linking of clinic or surveillance data with jail booking rosters,\(^{28}\) electronic alerts from emergency department and hospital electronic medical records,\(^{29}\) or pharmacy discharge databases\(^{30,31}\) facilitate prompt identification of people recently lost to care or at risk of ART discontinuation and offer the opportunity for rapid delivery of re-engagement strategies. Findings from the Link-Up Rx pilot program in Michigan, which used prescription refill data to trigger a 3-tiered pharmacist—provider—HD re-engagement in care response over a 3-week period, suggest faster re-engagement than traditional D2C programs and improved service delivery for PWH.\(^{32}\) In this supplement, Thompson et al. describe another pharmacist-based medication adherence approach to promote viral suppression.

**Interventions to Increase Retention in Care to HIV Treatment**

Effective retention interventions address the many factors associated with decreased engagement in care using multiple strategies, including case management, cognitive behavioral approaches, colocation of services, and appointment accompaniment.\(^{11,33}\) An observational cohort study of New York City’s HIV Care Coordination program, which combines outreach, case management, multidisciplinary clinical care, patient navigation, and ART adherence support, found significant improvements in engagement in care and viral suppression from pre- to post-enrollment among people with lower mental health functioning, unstable housing, or hard drug use.\(^{34}\)

Clinical care models tailored to the needs of the out-of-care population have also shown effectiveness. The Max Clinic in Seattle/King County, Washington was designed specifically to engage virally unsuppressed PWH who do not engage in conventional HIV care.\(^{35,36}\) The clinic includes walk-in access to care, high-intensity case management, and incentives for clinic visits and viral suppression and is integrated with other HD efforts to identify virally unsuppressed PWH. The clinic has engaged >200 PWH to date and, among those enrolled, viral suppression (defined as ≥1 viral load <200 copies/mL) quadrupled from 20% in the year before enrollment to 82% in the year after enrollment. The clinic was instrumental in engaging PWH who were part of a cluster outbreak of HIV among people who inject drugs.\(^{37}\) Other low-threshold clinic models are emerging that address the complex needs of specific populations, such as San Francisco’s Ward 26 clinic for PWH who are experiencing homelessness or are unstably housed\(^{38}\) and the CIRCLE Clinic in Jackson, Mississippi.\(^{39,40}\)

Financial incentive strategies can be incorporated in interventions offering a package of services to promote linkage, re-engagement, and retention in care. Although few studies have been designed to measure the direct contribution of financial incentives on prevention and care outcomes, the data show promising results for engaging the hardest-to-reach patients.\(^{41–44}\) The TLC+ site RCT in New York and the District of Columbia evaluated the efficacy of financial incentives and found a significant impact on viral suppression, with the largest effect seen in clinics with lower viral suppression at baseline.\(^{45}\) Successful implementation scale-up of financial incentive strategies will require addressing concerns of patients and providers, in particular negative attitudes toward the concept of paying people for health behaviors and sustainability. To examine this, Shelus and colleagues\(^{43}\) conducted a qualitative study of patients, staff, and site investigators involved in the TLC+ study. Overall, patients thought the intervention was beneficial and that the financial incentives were sufficient to encourage linkage and retention. However, nearly half of participants were opposed to the concept of paying people to link to care and thought it should be self-motivated. Staff and site investigators having varying opinions. Although many had positive attitudes toward financial incentives and recognized the value to clients, others were concerned with implementation challenges, including timing of the intervention immediately after an HIV diagnosis, negative attitudes toward paying people for health behaviors, the existence and strength of existing linkage programs, and financial sustainability. Addressing these perspectives and challenges will contribute to the successful scale-up of future financial incentive–based strategies.

Telemedicine-delivered HIV approaches have expanded considerably in recent years to provide HIV care and prevention services.\(^{46–48}\) Although the conceptual basis for such models to improve care engagement is strong, relatively few studies have evaluated their
impact on retention in care and viral suppression. Results to date support the feasibility and acceptability of this model. A community-based collaborative model in Alabama enrolled 240 patients and retained 76% over the first year. Successful implementation and scale-up of telemedicine approaches require that they be acceptable and accessible to clients. A survey of outpatient HIV clinic clients in Houston found that more than half (57%) of participants were more likely to use telehealth for their HIV care if available compared with in-person care, and 37% would use it frequently or always as an alternative to clinic visits. Concerns with this new care delivery approach included the ability of physicians to perform a good physical examination (37%), the safety of their personal information online (28%), and their ability to communicate effectively (17%). Lack of a personal computer or smartphone and not knowing enough about computers and smartphones were considered a barrier for 30% of respondents. Such concerns must be addressed to ensure uptake does not contribute to disparities in access to care. In this supplemental issue, Salgado et al. describe Georgia’s statewide telehealth program, including direct patient care via telemedicine and telementoring education for primary care providers, to offer specialized HIV care in underserved and rural areas.

CONCLUSIONS

A wide variety of interventions discussed in this paper suggest a positive impact on care-related outcomes that can be used by HDs and service providers to achieve the goals of the EHE Treat pillar. To date, HIV prevention research has focused on the effectiveness of HIV interventions, but relatively few studies evaluate implementation strategies needed to effectively bring them to scale in multiple settings and populations. Federal agency funding for implementation research collaborations among academic institutions, HDs, clinics, and community-based organizations, such as the NIH-funded EHE initiatives, facilitate the exploration of these questions and can further contribute to the design, evaluation, and effective implementation of interventions that are most relevant for public health practice and local HIV priorities.

The 30-year-old RWHAP serves as a model for how to reach sustainable viral suppression. This program has achieved steadily increasing rates of viral suppression. Many of the interventions described here were carried out in RWHAP clinics, were funded at least in part through RWHAP-funds, and have manuals to guide implementation in HIV clinics and other settings.

Although a robust collection of interventions exist that can be implemented to address the Treat pillar, further research, using shared outcome measures and well-designed controlled studies, is needed to better understand how and what aspects of the interventions contributed to their effectiveness. Many of the intervention evaluations lack an adequate control group, thereby impacting internal validity and resulting in limited generalizability. Several of the interventions involve multiple components, which collectively show efficacy, but are not designed or powered to shed light on the contributions that each of these components have on significant changes in patient outcomes. Further, findings from several systematic reviews of linkage, retention, and care interventions observe that the lack of standard measures across studies make it difficult to compare the relative impact of interventions designed to address the same focus area. Ultimately, viral suppression must be the central focus of efforts to improve the HIV care continuum because it extends the lives of PWH and prevents HIV transmission. Interventions that improve HIV clinic visit attendance that have a clear impact on viral suppression are needed to end the HIV epidemic and should be prioritized for implementation. All contemporary evaluations of HIV care continuum interventions need to include viral suppression as an outcome measure, even if it is not the primary outcome targeted by the intervention.

The coronavirus disease 2019 (COVID-19) pandemic has created new barriers to care linkage, treatment adherence, and care retention. This public health crisis has catalyzed rapid implementation of telemedicine and other technology-based communication approaches to support the needs of PWH. Federal and local policies changed rapidly to support implementation of remote care. Telemedicine in particular was rapidly scaled-up in RWHAP-funded clinics throughout the country, and many states made changes to their prescription drug policies to allow dispensation of >1 month of medication at a time, which may have supported treatment continuity compared with pre-COVID-19 conditions. However, the pandemic has highlighted deep-rooted health inequities for communities of color in the U.S., reflecting many of the same factors underpinning disparate HIV outcomes.

Reaching the ambitious EHE Treat targets by 2030 will be especially challenging in the context of decentralized health care and the complex social factors that result in profound health injustice. Interventions need to address health equity, variability in adequate health insurance, unstable housing, food insecurity, substance abuse, and mental health challenges, especially affecting the young, sexual and racial/ethnic minorities, those with criminal justice experience, and people experiencing poverty. These populations each face unique
healthcare needs as well as unique structural barriers affecting their ability to link to and adhere to care and treatment. As such, it is imperative to implement interventions designed, tested, and tailored to specific populations. However, there are still relatively few interventions designed to address disparities in specific populations, such as racial/ethnic or sexual minorities. Furthermore, disparities are even more profound when examined at the intersections of race, age, gender, and sexual orientation, and interventions rarely address multiple and intersecting social identities that, when taken together, produce disparate health outcomes. The combination of interventions and best practices selected to address the EHE goals will vary for different state, county, and city jurisdictions and will need to be adapted to address the needs of local communities and populations. Significant progress has been made; however, the remaining work required to achieve the EHE 2030 Treat targets is clearly outlined for the large community of committed individuals and institutions who are needed to realize these goals.

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