

# The Shifting Paradigm of Care for Adults Living With HIV: Smoking Cessation for Longer Life

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There are few truths in medical science that are as agreed upon as this: smoking is bad for health. In persons with human immunodeficiency virus (HIV) infection, smoking is a scourge, with recent prevalence estimates of 42%, which Reddy et al, in this issue of *The Journal of Infectious Diseases*, translated to an estimated 247 586 smokers among those in HIV care in the United States [1, 2]. It is hypothesized that adults living with HIV start smoking at younger ages, smoke more heavily and for a longer duration, and have lower rates of cessation than the general population in the United States. However, population-based estimates are not available. The problem may seem insurmountable, particularly because a delay in the manifestations of harm from smoking creates a lack of urgency for cessation. Because the HIV infection paradigm has changed from an acutely terminal illness to a chronic infection with a life expectancy approaching that of uninfected adults, the paradigm of how we protect the health of people living with HIV has also evolved.

Reddy et al estimate a gain in life expectancy of 5.7 years among men and 4.6 years among women who quit smoking upon entering into HIV care [2]. The authors predict that if a quarter of HIV-

infected adults quit smoking, 265 000 years of life could be regained at the population level. It is reasonable to assume that there is also an increased quality of life, not only quantity of life, given the strong associations of smoking with a poorer immunologic response to antiretroviral therapy (ART) and the development of cancer, cardiovascular disease, chronic obstructive pulmonary disease, and lower respiratory tract infections [3]. After accounting for nonadherence to ART and imperfect retention in HIV care, this gain in life expectancy persists. This is a critical contribution to our understanding of the potential impact of smoking cessation in HIV-infected populations that have higher rates of nonadherence and loss to follow-up than the European cohorts and managed-care settings that have assessed the impact of smoking on life expectancy [4, 5]. As shown in figure 4 in the article by Reddy et al, compared with other life-saving interventions, such as chronic disease interventions and hepatitis C treatment in the general population, and even ART initiation at higher CD4<sup>+</sup> T-cell counts and improved adherence among HIV-infected adults, smoking cessation resulted in a greater per-person survival gained. These estimates suggest smoking cessation is a game changer for the field of HIV medicine.

This is a modeling study, however, so the validity of the findings relies heavily on the assumptions and parameter estimates. Parameters used were referenced to published estimates (or informed modifications of estimates) from the North American AIDS Cohort Collaboration

on Research and Design (NA-ACCORD), the Collaboration of Observational HIV Epidemiological Research, HIV Research Network, the Danish HIV Cohort Study, the ART Cohort Collaboration, the HIV Network for Prevention Trials, the Centers for Disease Control and Prevention's HIV Surveillance Report, pooled estimates from established cohorts of HIV-uninfected adults, and the US National Health Interview Survey ([Supplementary Materials](#)). The findings presented were estimated from the use of a published, Monte Carlo microsimulation model of HIV natural history and treatment, which has been previously used to inform policy by evaluating clinical outcomes, costs, and cost-effectiveness of strategies for treating HIV infection and its complications in the United States (details of which are publically available). Further, the findings have external validity via comparison to estimates of life expectancy from the traditional life table approach from HIV-infected adults in the United States and Europe [4, 5]. Finally, the 10 sensitivity analyses presented showed stable estimates, even when relaxing assumptions and modifying parameter estimates of mortality, the timing of smoking cessation and relapse, ART adherence, loss to follow-up, and CD4<sup>+</sup> T-cell count and age at entry into care and ART initiation. Given the dose-response relationship between smoking and many negative health outcomes, simply achieving a decrease in smoking intensity (rather than total cessation) may also show an increase in life expectancy.

The “treatment as prevention” paradigm in the HIV field references the use

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of ART in HIV-infected adults to reduce transmission to uninfected adults. ART also prevents negative health outcomes in adults with HIV infection, as demonstrated by NA-ACCORD and Strategic Timing of Antiretroviral Therapy (START) study findings that HIV treatment at all CD4<sup>+</sup> T-cell counts prevents HIV-associated death and AIDS-related and non-AIDS-related events, and as reinforced by the analyses of START secondary outcomes showing reductions in cancers and cardiovascular events among those who immediately initiated treatment [6, 7]. In 2013, the HIV primary care guidelines demonstrated the shift in the HIV care paradigm, retaining ART at the center of HIV care but paying increased attention to interventions that protect the long-term health of adults with HIV [8].

Similar to the idea of an infectious disease prophylaxis package for those presenting for care at low CD4<sup>+</sup> T-cell counts [9], a comorbidities-prevention package including smoking cessation, mental health evaluation and treatment, and weight management could result in more healthy life-years for adults with HIV infection. Other prevention modules may be required as the landscape of the chronic disease burden continues to unfold. The success of a comorbidities-prevention package would rely on the effectiveness of the interventions in the package. Reddy et al suggest that smoking cessation should be at the heart of such a

package [2]. The low rates of success among HIV-infected adults who attempt to cease smoking are disheartening. Use of the transtheoretical model to understand not only whether the HIV-infected adult is interested in quitting, but also whether they are ready to quit, and cessation programs combining pharmacotherapy and counseling have shown promise [3]. Factors associated with persistent smoking, such as psychiatric diagnoses (in particular, depression [10]), may provide additional clues for increasing the smoking cessation rates. Although there are no known serious interactions of ART and smoking cessation pharmacotherapy, this must continue to be monitored with the advent of new antiretrovirals [11, 12]. New models of smoking cessation programs for adults living with HIV and establishment of best practices may improve cessation rates [13]. Figure 1 provides a few current resources for smoking cessation in HIV-infected adults.

The success of a comorbidities-prevention package would also rely on timing and on reducing barriers to harness existing resources. Reddy et al assumed cessation at entry into care and ART initiation [2]. Addressing smoking cessation, mental health issues, and weight management at entry into care may be overwhelming to patients, and, therefore, implementing the interventions among patients who have achieved stability during ART may be preferable,

as patients will have demonstrated success with an intervention and may be more ready to tackle another health issue. In a sensitivity analysis by Reddy et al, in which the smoking cessation assumption was relaxed to cessation 5 or 10 years after entering care, results still showed substantial life expectancy gains [2]. Use of existing resources and incorporation of technology into the delivery of comorbidity-prevention interventions will likely be necessary owing to the need for multidisciplinary interventionists. Specific to smoking cessation, a real-time connection between the so-called “vital sign” of tobacco use recorded in the electronic medical record [14] and state-level resources for smoking cessation (eg, programs with counseling, support networks, and nicotine replacement resources) may reduce the barriers to smoking cessation interventionists and increase cessation success.

Finally, it is possible that smoking cessation programs and other comorbidity-prevention interventions could influence retention in care. A decrease in retention in care among HIV-infected patients could be the result of patients being overwhelmed with too many interventions at the same time. Conversely, an increase in the frequency of retention in HIV care could be the result of patient satisfaction in access to smoking cessation assistance, weight management counseling and tools, or mental health treatment. Given

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**Resources for smoking cessation in HIV-infected adults.**

The AIDS Education and Training Center Program provides a information on cessation interventions that can occur in the clinic: <https://aidsetc.org/guide/smoking-cessation>.

The Veterans Administration provides an a handbook for HIV clinicians that contains information about their role in helping their patients cease smoking.  
<http://www.hiv.va.gov/provider/manual-primary-care/smoking-cessation.asp>.

The Centers for Disease Control and Prevention's Tips From Former Smokers campaign has a special resource for HIV-infected adults: <http://www.cdc.gov/tobacco/campaign/tips/groups/hiv.html>.

The US government's Smoke Free website offers personalized information to help individuals cease smoking: <https://smokefree.gov/>.

**Figure 1.** Smoking-cessation resources for clinicians and their adult patients with human immunodeficiency virus (HIV) infection.

the decades that HIV-infected individuals can survive when using ART, understanding factors influencing retention in care during the decades that follow initial viral suppression will be critical to the healthy aging of the HIV-infected population.

In summary, the findings presented by Reddy et al answer important questions about the quantity of life gained from smoking cessation among adults living with HIV in the United States, and they take into account nonadherence to ART and imperfect retention in HIV care [2]. This study makes clear that we must prioritize smoking cessation among adults with HIV if we want them to have an increase in the quantity (and likely quality) of life. By showing that smoking cessation results in a greater gain in life expectancy than ART initiation at higher CD4<sup>+</sup> T-cell counts or improved adherence to ART, there should be renewed urgency to implement smoking cessation programs, thereby continuing to shift the paradigm of HIV care to the increasingly important prevention of comorbidities after ART initiation.

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