



**Elizabeth Glaser
Pediatric AIDS Foundation**
Fighting for an AIDS-free generation



MASSACHUSETTS
GENERAL HOSPITAL

**MEDICAL PRACTICE
EVALUATION CENTER**

Prevention of Mother-to-Child Transmission of HIV and the Cost of Inaction

A modeling analysis of the increasing mother-to-child transmission rates in Kenya

For over thirty years, the AIDS epidemic has had widespread and wide-ranging impacts throughout Africa, yet remarkable progress has been made in many regions toward decreasing the number of new HIV infections and AIDS-related deaths from their peaks at the start of the century. In eastern and southern Africa, new HIV infections in children have decreased by 76% since 2000, while in western and central Africa, new pediatric infections have decreased by 56%.¹

After nearly a decade of decreases in new pediatric HIV infections, progress has stalled and there is significant risk of backsliding. The percentage of pregnant women receiving antiretroviral therapy (ART) has essentially been stagnant since 2014, and coverage has actually fallen slightly in western and central Africa.^{2,3} Despite years of focused efforts, in 2020 nearly half of the priority countries under the Start Free, Stay Free, AIDS Free initiative still reported MTCT rates in the double digits.⁴ In 2019, over 150,000 children worldwide acquired HIV, far from the internationally established goal of reducing new HIV infections among children to 40,000 annually.^{5,6} The COVID-19 pandemic has exacerbated preexisting challenges in eliminating mother-to-child transmission (MTCT) and illuminated the fragility of progress to date. There have been reported declines in access to prevention of mother-to-child transmission (PMTCT) services, including HIV testing and treatment.^{7,8,9,10,11}

While increases in MTCT have not been widespread, there have been instances of rising rates at the national and subnational level. For example, despite substantial progress since the peak of the HIV/AIDS epidemic, Kenya's MTCT rate increased from 8.3% in 2015 to 12.4% in 2018.¹² Across Kenya's eight highest-incidence counties, four saw increases in MTCT rates from 2015–2018, and five increased between 2018–2020.¹³ Furthermore, four of these high-incidence counties saw decreases in coverage of PMTCT services from 2015–2018.¹⁴

This brief examines the potential long-term impacts of rising MTCT rates in Kenya, using the Cost-Effectiveness of Preventing AIDS Complications (CEPAC) model. This case study highlights the fragility of programmatic gains and the critical need for increased resources and political will to support PMTCT services and prevent potential backsliding in PMTCT across African nations.

Kenyan Case Study

Using data from Kenya, the Elizabeth Glaser Pediatric AIDS Foundation and researchers at the Medical Practice Evaluation Center of Massachusetts General Hospital used the CEPAC-Pediatric Model, a validated computer simulation model of pediatric HIV disease progression and costs, to examine 1) the clinical and economic costs of the recent increase in MTCT

rates, as well as the additional costs if this increase continues; and 2) the benefits that would be realized if MTCT rates, instead of increasing, were to *decrease* to less than 5%. While clinical care practices and costs may change over time, this analysis uses current Kenya-specific clinical practice and cost data to project life expectancy and lifetime costs associated with varying MTCT rates.

The CEPAC-Pediatric Model simulates health outcomes for children from birth throughout the life course. HIV prevalence and incidence, as well as ART use and viral suppression among pregnant and breastfeeding women, determine MTCT risk. MTCT is modeled as a one-time risk during pregnancy and delivery and a monthly risk throughout breastfeeding. In the modeled simulation, all children experience monthly risks of non-HIV-related mortality, and children living with HIV face additional monthly risks of death from HIV-related causes.¹⁵ In this analysis, the model was first calibrated to match the MTCT risks observed in Kenya in 2015 and 2018.¹⁶ Next, researchers modeled scenarios in which MTCT either increased or decreased to different levels to determine the impact of possible future changes in MTCT. Monthly costs of ART and other HIV-related care in Kenya were derived from published sources.^{17,18} Model outcomes included life expectancy and per-person undiscounted cost, which were then converted to total population life years and costs by multiplying per-person values by the number of children born in Kenya in 2018.

Clinical and economic costs of rising rates of MTCT

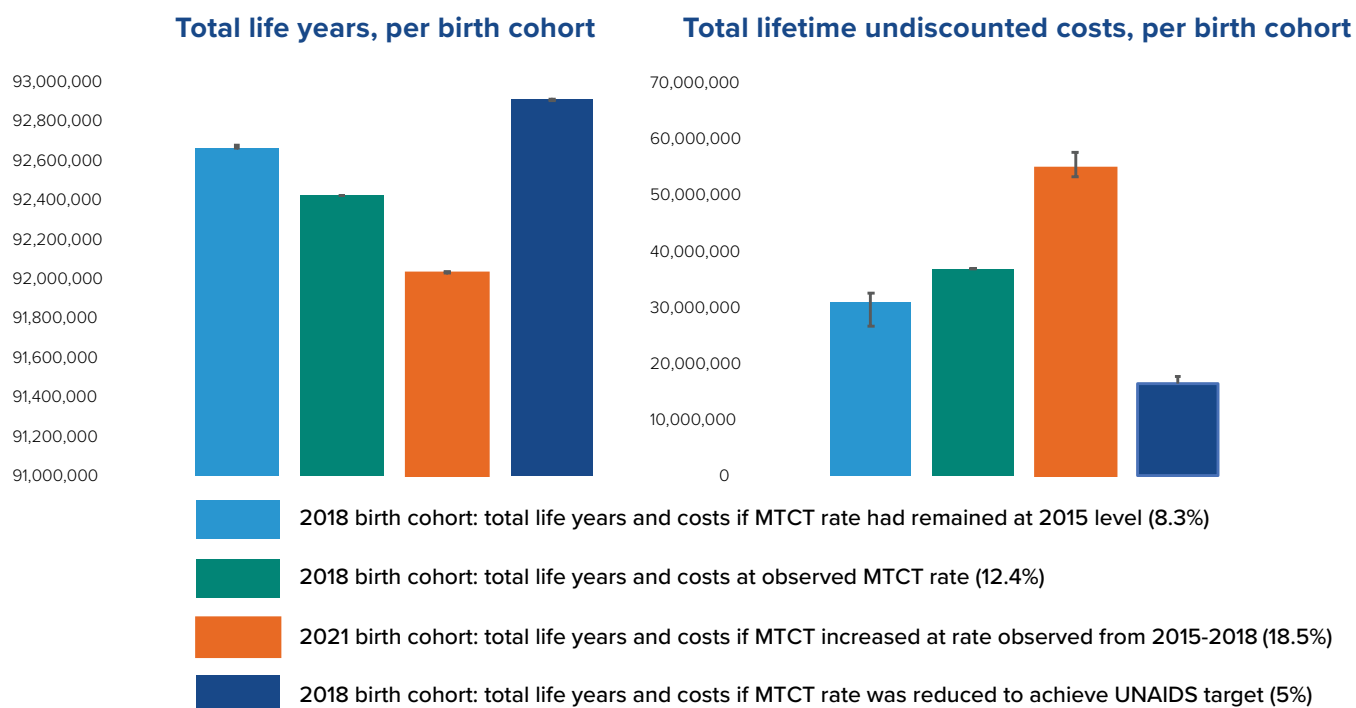
The CEPAC-Pediatric researchers first examined the impact of the increase in Kenya’s MTCT rate between 2015 and 2018. The model found that the recent rise in MTCT, from 8.3% to 12.4%, led to a decline in life expectancy for the entire population of children, both with and without HIV, from 62.7 years to 62.6 years. While this decrease may initially seem small, this translates to a total of **245,000 life years lost** among all children born in Kenya in 2018. Additionally, rising MTCT led to a projected **additional \$6 million** in lifetime HIV-related care costs for children born in 2018 alone, compared with costs if rates of MTCT had remained stable.

Researchers then simulated further clinical and economic costs if Kenya keeps moving backward on MTCT. If the MTCT rate continued to increase at the same rate observed from 2015–2018, by the end of 2021, Kenya would experience 394,000 life years lost, and lifetime costs for infants born in 2021 would increase by a further \$18 million compared with those born in 2018.

Benefits of eliminating MTCT

Conversely, the CEPAC model looked at the potential population-wide clinical and economic benefits of eliminating MTCT. The model projected outcomes that might occur if, instead of increasing from 2015–2018, Kenya’s MTCT rate had dropped to the global UNAIDS’ target of less than 5% in 2018. Achieving this milestone would have **saved 489,000 life years** for Kenya’s citizens and reduced total lifetime costs for children born in 2018 by **\$21 million**.

Figure 1. CEPAC Pediatric Model, MTCT scenarios in Kenya



Conclusions

Mother-to-child transmission of HIV does not just affect an infant, a mother, or a family. Rather, as this modeling shows, rising rates of MTCT impact an entire nation by decreasing life expectancy and increasing care costs. Furthermore, upfront investments to eliminate MTCT would improve life expectancy and reduce HIV-related costs for future generations.

Kenya's increase in MTCT is not unique. The well-documented data on increases in MTCT can provide an example and call to action for other African countries and the donor community. This is not the time for complacency, but rather the time to focus and intensify political will and financial resources to reduce and eventually eliminate MTCT. With 90% of all children living with HIV globally located in Africa, fulfilling the promise of an AIDS-free generation would be a seismic epidemiological victory with impact felt well beyond African borders.

Endnotes

- 1 AIDSinfo.unaids.org.
- 2 UNAIDS. [Start Free Stay Free AIDS Free 2019 Report](#), 2019.
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- 12 Kenya Ministry of Health, National AIDS and STI Control Programme. Accelerating universal health coverage through an integrated national stock-taking of elimination of mother-to-child transmission of HIV and syphilis and reproductive maternal, neonatal, child and adolescent health. Poster presentation; July 2019; Nairobi.
- 13 High-incident counties are Homabay, Nairobi, Siaya, Kisumu, Kakamega, Migori, Busia, and Nakuru.
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- 15 Ciaranello AL, Morris BL, Walensky RP, Weinstein MC, Ayaya S, Doherty K, et al. Validation and calibration of a computer simulation model of pediatric HIV infection. *PLoS One*. 2013;8(12):e83389. doi: 10.1371/journal.pone.0083389. PMID: 24349503; PMCID: PMC3862684.
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- 17 Clinton Health Access Initiative. 2017 CHAI ARV reference price list. 2017. <https://www.clintonhealthaccess.org/2017-chai-arv-reference-price-list/>. Accessed August 31, 2021.
- 18 U.S. Centers for Disease Control and Kenya Ministry of Health. The cost of comprehensive HIV treatment in Kenya: report of a cost study of HIV treatment programs in Kenya. 2013. <http://nacc.or.ke/wp-content/uploads/2016/03/Report-ART-Costing-Project-Kenya1.pdf>. Accessed August 31, 2021.

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