Brief Report

From Elimination to Eradication: Kenya's Systematic Defeat of Human African Trypanosomiasis as a Model for Zoonotic Disease Control

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From Elimination to Eradication: Kenya's Systematic Defeat of Human African Trypanosomiasis as a Model for Zoonotic Disease Control

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Abstract

Kenya's recent achievement of eliminating Human African Trypanosomiasis (HAT) as a public health problem, as validated by the World Health Organization, provides a critical model for the systematic defeat of complex zoonotic diseases. This success, marking the end of indigenous transmission since 2018, emerged from a century-long struggle against the disease in historically endemic foci like the Lambwe Valley, where it severely constrained socio-economic development. The elimination architecture rested on three synergistic pillars: a decentralized, community-based surveillance system that transformed health workers into frontline epidemiological sensors; the operationalization of a One Health framework through the Kenya Tsetse and Trypanosomiasis Eradication Council (KENTTEC), enabling integrated vector control and livestock treatment; and a robust post-elimination vigilance system integrated into national surveillance. Key innovations included the deployment of rapid diagnostic tests, targeted use of insecticide-treated targets, and the adoption of oral therapeutics like fexinidazole. Kenya's experience demonstrates that sustained elimination of a zoonosis requires transitioning from isolated interventions to a coordinated, cross-sectoral system. The model offers technically replicable and economically justifiable lessons for global efforts targeting the 2030 roadmap goals for neglected tropical diseases. This case proves that with strategic integration, political commitment, and sustained vigilance, the eradication of long-standing zoonotic threats is an achievable goal.

Keywords: human African trypanosomiasis; one health; disease elimination; zoonotic diseases; surveillance systems; Kenya; global health policy

Introduction

The recent World Health Organization (WHO) recognition of Kenya's elimination of human African trypanosomiasis (HAT) as a public health problem represents a paradigm shift in the control of neglected tropical diseases (NTDs) [1]. It demonstrates that complex zoonotic diseases can be systematically defeated through integrated approaches. Kenya's success marks a significant milestone in Africa and stems from a well-implemented framework combining the following components: (1) a decentralised diagnostic network leveraging community health workers as frontline surveillance agents [2]; (2) a successfully operationalised One Health infrastructure coordinating human and veterinary services through the Kenya Tsetse and Trypanosomiasis Eradication Council [3]; and (3) a post-elimination vigilance system maintaining diagnostic capacity despite zero indigenous cases since 2018 [4]. This milestone, emerging from a long struggle against HAT, provides a technically replicable model for other regions with endemic HAT. As global health efforts accelerate towards the 2030 NTD roadmap targets, Kenya's experience provides critical insights into the operational requirements for transitioning from disease control to the elimination and eradication of zoonotic threats.

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A Century of Scientific Struggle

The epidemiological significance of Kenya's HAT elimination extends beyond the absence of reported cases. It represents a fundamental rewriting of the historical relationship between disease, environment, and human development in Sub-Saharan Africa [5]. HAT was first documented along the Kenya-Uganda border in the early 20th century, and it later established persistent transmission foci that would challenge public health interventions for over a dozen decades [6]. The Lambwe Valley became the most resilient endemic focus, with the disease first detected there in the 1950s through human and livestock movement, creating a transmission hotspot that would require decades of targeted intervention to fully eliminate. This longevity reflects the persistence of *Trypanosoma brucei rhodesiense* and the ecological complexity of its transmission involving human populations, domestic animals, wildlife reservoirs, and multiple *Glossina* species [7].

The socioeconomic impact of HAT extended beyond the direct health consequences to significantly constrain agricultural productivity and rural development throughout western Kenya. Historical analyses demonstrate that the HAT-endemic regions experienced significantly reduced land utilisation rates [8]. Moreover, a substantial percentage of arable land in Lambwe Valley remained uncultivated at the epidemic's peak due to transmission risk [9]. This agricultural disruption perpetuated the vicious cycle of poverty and equally diminished healthcare access and nutritional status, thereby exacerbating disease severity.

The Elimination Architecture

Community Health Workers as Epidemiological Sensors

Kenya's surveillance revolution transformed community health workers from peripheral healthcare extenders to central epidemiological sensors in the HAT detection network. This stratagem recognised that traditional facility-based surveillance systems consistently underestimated HAT incidence in remote areas due to geographical and diagnostic limitations, and the disease's non-specific early presentation [10]. Moreover, the integration of rapid diagnostic tests (RDTs) into the community health packages facilitated decentralised testing with results available in fifteen minutes, significantly reducing the diagnostic delays.

The architecture of this system combined active case-finding through mobile community health teams with passive surveillance fortified at sentinel health facilities across historically endemic counties. These sentinel sites benefitted from comprehensive equipment upgrades, including microscopy capabilities, reliable cold chain systems for test kit preservation, and specimen storage facilities [4]. Additionally, health personnel underwent proper training on the distinctive epidemiological and clinical features of HAT. This dual-layered approach created a surveillance system with remarkable sensitivity that was critical in the final stages of the elimination campaign.

The One Health Operationalisation

Kenya's elimination strategy recognised that human-focused interventions alone would prove insufficient for sustainable control. The establishment of the Kenya Tsetse and Trypanosomiasis Eradication Council (KENTTEC) in 2012 offered the institutional architecture necessary for cross-sectoral coordination [3]. This move bridged the traditional divide between human medical services and veterinary public health and facilitated the implementation of integrated vector management strategies.

The evolution of vector control reflected an increasing understanding of tsetse ecology and behaviour. Early campaigns relied predominantly on large-scale aerial spraying of insecticides that achieved initial suppression but with significant environmental and cost implications. The timely transition to insecticide-treated targets represented a paradigm shift in vector control methodology [11]. These cloth devices impregnated with deltamethrin insecticide exploited tsetse visual attraction and resting behaviors to achieve dramatic reductions in fly densities with minimal environmental

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impact. These interventions achieved tsetse population reduction exceeding 90% within high-priority foci.

Subsequently, the systematic treatment of livestock with modern trypanocides addressed the critical animal reservoir component of rhodesiense HAT. The coordination between public health authorities and veterinary services enabled mass treatment campaigns in designated buffer zones around historical case foci [7]. This integrated initiative strategically interrupted the animal-human transmission bridge, demonstrating that zoonotic disease elimination requires simultaneous intervention at multiple ecological levels.

Maintaining Vigilance After Elimination

The transition from elimination to sustained control represents the most challenging phase of disease eradication programs. Kenya's post-elimination strategy addressed this challenge through three complementary mechanisms: (1) the institutionalisation of HAT surveillance within integrated disease surveillance and response (IDSR) systems; (2) the maintenance of strategic diagnostic capacity at regional reference laboratories; and (3) the development of a tiered response protocol for suspected case identification [4].

The sustained vigilance proved its value when a Belgian tourist developed HAT after returning from the Maasai Mara in 2022, triggering immediate outbreak investigation and response activities that confirmed no local transmission had occurred [12]. This incident highlighted the persistent risk of imported cases and the necessity of constant clinical awareness even after elimination validation. Additionally, therapeutic advances have transformed HAT management, with oral fexinidazole replacing the complex parenteral regimens that historically complicated treatment in remote settings [13]. These pharmaceutical innovations improve patient outcomes and enhance the feasibility of elimination by simplifying case management.

Transferable Lessons for Global NTD Control

Kenya's HAT elimination provides a tested model for zoonotic disease control, with transferable components applicable across epidemiological contexts. The community health worker network has demonstrated utility across multiple disease programs, including malaria control and COVID-19 response, demonstrating the value of integrated community surveillance platforms [4]. Also, the KENTTEC institutional model offers a blueprint for cross-sectoral coordination that could be adapted for other zoonoses like rabies or Rift Valley fever.

The economic argument for Kenya's approach extends beyond health benefits to encompass significant development returns. Historical analyses indicate that HAT-affected households experienced agricultural productivity deficits below regional averages [8]. Consequently, elimination generates substantial economic gains through recovered land productivity and agricultural output, making the elimination investment economically justifiable.

Conclusion

Kenya's elimination of human African trypanosomiasis as a public health problem represents a significant moment in global health. It demonstrates that even long–established neglected tropical diseases can be defeated through strategic integration of community systems, cross-sectoral coordination, and sustained political commitment. The methodological innovations developed through Kenya's protracted battle with HAT provide technically validated tools for other elimination programs. As the global efforts move toward the 2030 NTD road map targets, Kenya's experience provides a practical framework and demonstration that complex zoonotic diseases can be systematically controlled through coordinated and sustainable intervention systems.

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