

# Reaching an AIDS-Free Generation in Côte d'Ivoire, Data Driven Policy Design for HIV/AIDS Response Programs: Evidence-Based Policy Design for HIV/AIDS Response Programs in Côte d'Ivoire

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## ABSTRACT

Sub-Saharan Africa is home to 24.7 million people living with HIV of an estimated total of 35.0 million people globally in 2013. It also accounts for almost 70% of the new HIV infections globally. In West Africa, Cote d'Ivoire has the highest HIV prevalence, or 3.7% of the 2012 population, and the two virus types (HIV-1 & HIV-2) are present. From an epidemiological standpoint, these unique attributes make Cote d'Ivoire unique. At the same time, existing HIV/AIDS modeling policies have been developed from the data of countries that do not have these peculiarities. This research develops a formal system dynamics model capturing the evolution of HIV/AIDS in Cote d'Ivoire for four decades, starting in 1990. The findings include a development of HIV/AIDS behavior pattern over time that led to the proposal of evidence-based policies.

## KEYWORDS

AIDS, AIDS Policy, Cote d'Ivoire, HIV Epidemic, Model, Resources Optimization, Simulation, System Dynamics

## 1. INTRODUCTION

The Human Immune-Deficiency (HIV) virus causes the potentially lethal Auto Immune Deficiency Syndrome (AIDS). The HIV/AIDS epidemic that started in 1981 is still a global concern. Despite a significant investment in resources, the epidemic affects almost all of the countries in the world. Today, the world is far from reaching an "AIDS-free generation." The global community describes an AIDS-free generation as a state in which three characteristics occur: First, virtually no children are born infected with the HIV virus. Second, teens and adults are at lower risk of becoming infected

DOI: 10.4018/IJSDA.2016010104

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due to the widespread use of HIV prevention tools. Third, if they acquire the virus, they have access to treatment that helps prevent them from developing AIDS. Cote d'Ivoire, one of the most affected countries in Africa, has benefited significantly from the global interventions, but it has yet to attain an AIDS-free generation.

The quest for a generation free of HIV/AIDS focuses this research on providing decision makers with strategies that prioritize the allocation of resources among different HIV response programs. The objective also includes a focus on data-based research that guides future budget allocations toward an AIDS-free generation in Côte d'Ivoire. To achieve these objectives, this research investigates the evolution dynamics of HIV/AIDS in Cote d'Ivoire and identifies policies that can lead to an AIDS-free generation.

We build a detailed system dynamics simulation model capturing the main dynamics of the evolution of HIV/AIDS in Cote d'Ivoire. We calibrate the proposed model to Cote d'Ivoire data from 1990 to 2012. This was followed by a collection and collation historic data from multiple public reports. In addition, a review of the data available from relevant literature provides the basis for the main inputs and assumptions in the model. The model captures not only the evolution of the epidemic in Cote d'Ivoire for the last 23 years, but it also projects HIV/AIDS dynamics 27 years into the future. With the calibrated system dynamics model, we simulate different HIV/AIDS policies and evaluate their impact in the future of the epidemic. Policy analysis and reflection on the applicability of proposed policies informs our recommendations.

We structure the remainder of the paper into four sections. Section 2 describes the current situation of HIV/AIDS in Cote d'Ivoire. Section 3 reviews the relevant literature. Section 4 delineates the steps followed in the design of the model. Section 5 emphasizes on model results and a summary of policy analysis. The paper contributes to our understanding of the HIV/AIDS epidemic in Cote d'Ivoire, its future dynamics and the impact of policy changes of different HIV/AIDS response program.

## **2. HIV/AIDS AND CURRENT POLICIES**

### **2.1. Global Situation of HIV Epidemic**

The fight against the HIV/AIDS epidemic was triggered thirty-three years ago by the discovery of five deaths from *Pneumocystis Carinii* Pneumonia in Los Angeles, USA (CDC, 1981). Since then, an unprecedented number of people have been affected by the global HIV/AIDS epidemic. According to the World Health Organization (WHO), approximately 35.3 million people were living with HIV and AIDS at the end of 2013.

Table 1 describes a few key terms used throughout the paper and in the model that critical for understanding, formulating assumptions and interpreting the model and its design.

### **2.2. HIV Epidemic in the Context of Cote D'Ivoire**

Cote d'Ivoire is a 322,463 km<sup>2</sup> country in West Africa, sharing borders with Ghana, Guinea, Burkina Faso, and Liberia. As of 2013, it had a population of about 22.8 million (CIA, 2014). The HIV prevalence<sup>1</sup> rate has significantly changed over the past two decades. The HIV prevalence has shot from 2.5% in the 1990s to 7.1% in early 2000, before collapsing to 3.7% in 2012 (DHS 2011-2012), with important disparities across different administrative regions of the country. Cote d'Ivoire has a generalized HIV epidemic<sup>2</sup> with the highest prevalence rate in the West African region. Populations at comparatively high risk for HIV infection include women aged 20–24, people in prostitution, youth, and the uniformed services. The prolonged political-military crisis (2000-2011), in addition to exacerbating the vulnerability of these groups, has created additional at-risk populations given the large-scale military deployment, massive population displacement, and increase in poverty. The mediocre rates (less than 60% in 2013) of retention in antiretroviral therapy (ART) services may have contributed to the overall drop in HIV prevalence noted between the last two DHS surveys,

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