



# A Theoretical Framework for Evaluating Point-of-Care CD4 Technologies on Antiretroviral Therapy Initiation in Rural South African Clinics

Thandiwe Nkosi<sup>1,2</sup>, Pieter van der Merwe<sup>2,3</sup>

<sup>1</sup> Agricultural Research Council (ARC)

<sup>2</sup> University of Fort Hare

<sup>3</sup> Department of Public Health, Agricultural Research Council (ARC)

**Published:** 15 January 2000 | **Received:** 15 November 1999 | **Accepted:** 22 December 1999

**Correspondence:** [tnkosi@gmail.com](mailto:tnkosi@gmail.com)

**DOI:** [10.5281/zenodo.18531352](https://doi.org/10.5281/zenodo.18531352)

## Author notes

*Thandiwe Nkosi is affiliated with Agricultural Research Council (ARC) and focuses on Medicine research in Africa. Pieter van der Merwe is affiliated with Department of Public Health, Agricultural Research Council (ARC) and focuses on Medicine research in Africa.*

## Abstract

Initiating antiretroviral therapy (ART) promptly after an HIV diagnosis is critical for patient outcomes and epidemic control. In rural South African clinics, conventional laboratory-based CD4 testing, which determines ART eligibility, is often hampered by logistical delays. This leads to treatment initiation delays and patient loss to follow-up. Point-of-care (POC) CD4 technologies offer a potential solution, but their impact on the care pathway requires a structured theoretical evaluation. This article aims to develop a theoretical framework for evaluating how the introduction of a POC CD4 machine influences the time to ART initiation in rural clinics of the Free State, South Africa. The framework seeks to identify and interrelate key determinants across clinical, logistical, and patient-centred domains. The framework is constructed through a synthesis of established health systems and implementation science theories. It integrates constructs from the Capability, Opportunity, Motivation-Behaviour (COM-B) model and the Normalisation Process Theory (NPT) to map the hypothesised causal pathways from technology deployment to reduced time to ART initiation. Key insights: The framework posits that POC technology primarily reduces time to ART by eliminating specimen transport and central laboratory processing delays. A key theoretical insight is that the magnitude of this reduction is moderated by clinic-level factors; for instance, clinics with pre-existing weekend pharmacy closures may see a diminished benefit, as the theoretical time saved by POC testing could be negated by operational schedules. The proposed theoretical framework provides a structured, multi-level lens to hypothesise and investigate the complex impact of POC CD4 technologies. It moves beyond a simple input-output evaluation to consider the contextual and mechanistic factors that determine success in real-world rural clinic settings. Future empirical studies should apply this framework to guide mixed-methods data collection, focusing on testing the proposed moderating relationships. Programme implementers should use the framework to identify and address potential contextual barriers prior to POC technology rollout. point-of-care, CD4 count, antiretroviral therapy, theoretical framework, implementation science, rural health services, South Africa This article contributes a novel theoretical framework for evaluating

point-of-care diagnostics in low-resource settings, integrating behavioural and implementation science to explain how technology interacts with clinic systems to affect a critical treatment outcome.

**Keywords:** *Point-of-care testing, CD4 lymphocyte count, Antiretroviral therapy, Health services accessibility, Rural health services, Sub-Saharan Africa, Implementation science*

## ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

✉ **REQUEST FULL PAPER**

**Email:** [info@parj.africa](mailto:info@parj.africa)

Request your copy of the full paper today!

## SUBMIT YOUR RESEARCH

**Are you a researcher in Africa? We welcome your submissions!**

Join our community of African scholars and share your groundbreaking work.

**Submit at:** [app.parj.africa](http://app.parj.africa)



Scan to visit [app.parj.africa](http://app.parj.africa)

**Open Access Scholarship from PARJ**

Empowering African Research | Advancing Global Knowledge