

# Cost-Effectiveness of Different Models of Antiretroviral Treatment Delivery in South Africa: Methods and Initial Results

Sydney Rosen

Center for International Health and Development  
Boston University, USA

and

Lawrence Long

Health Economics Research Office, Wits Health Consortium  
University of the Witwatersrand, South Africa

June 2006



# Overview of Presentation

---

1. Introduction
2. Methods
3. Initial Results
4. Next Steps

# Introduction

# Background

---

- International and national targets for ART access require reaching different kinds of patients in diverse settings.
- Many different treatment delivery strategies will be needed.
- Cost per patient reached is likely to vary widely by regimen, setting, facility characteristics, and patient characteristics.
- Understanding the likely range of costs and the factors determining the cost-effectiveness of different models of treatment delivery is essential to planning, expansion, and sustainability.

# Objectives of this Study

---

- What is the *average cost per successfully treated patient* of providing antiretroviral therapy to adult patients in South Africa under different models of treatment delivery?
- What are the main drivers of costs and why do costs differ among delivery models and sites?

# Variables Expected to Influence Cost of Providing ART to Adults

---

- ART-related variables
  - Treatment protocol (drugs, diagnostics)
  - Drug prices (generic v. branded, negotiated prices)
  - Patient mix (% first and second line regimens)
- Facility-related variables
  - Scale (number of patients treated per site)
  - Scope (other services provided in addition to ART)
  - Setting (urban, peri-urban, rural)
  - Facility level and type (hospital, clinic, health post, mobile unit, physician's office)
  - Human resource strategy (doctors v. nurses)
  - Sector (government, NGO, private)

# Variables Expected to Influence Effectiveness of Providing ART to Adults

---

- Facility-related variables
  - Treatment protocol (drugs, diagnostics)
  - Facility quality (experience, training, access to specialists, etc.)
  - Facility procedures (requirements for ART initiation, patient eligibility)
  - Level and type of adherence support
- Patient-related variables
  - Patient mix (starting CD4 counts, % naive, age)
  - Patient characteristics (education, socioeconomic level, social support, distance from facility, etc.)

# Methods

# Basic Approach

---

- Select  $\approx 6$  sites representing common or promising models of treatment delivery in South Africa.
- Enroll the first 100 patients at each site who became eligible for ART after January 1, 2005.
- Determine outcome of treatment for each subject 12 months after eligibility (successfully treated or not).
- Collect data from medical records on all resources used to treat study subjects for first 12 months after eligibility.
- Calculate cost of resources used.
- Estimate average “cost per successfully treated patient” for each site.

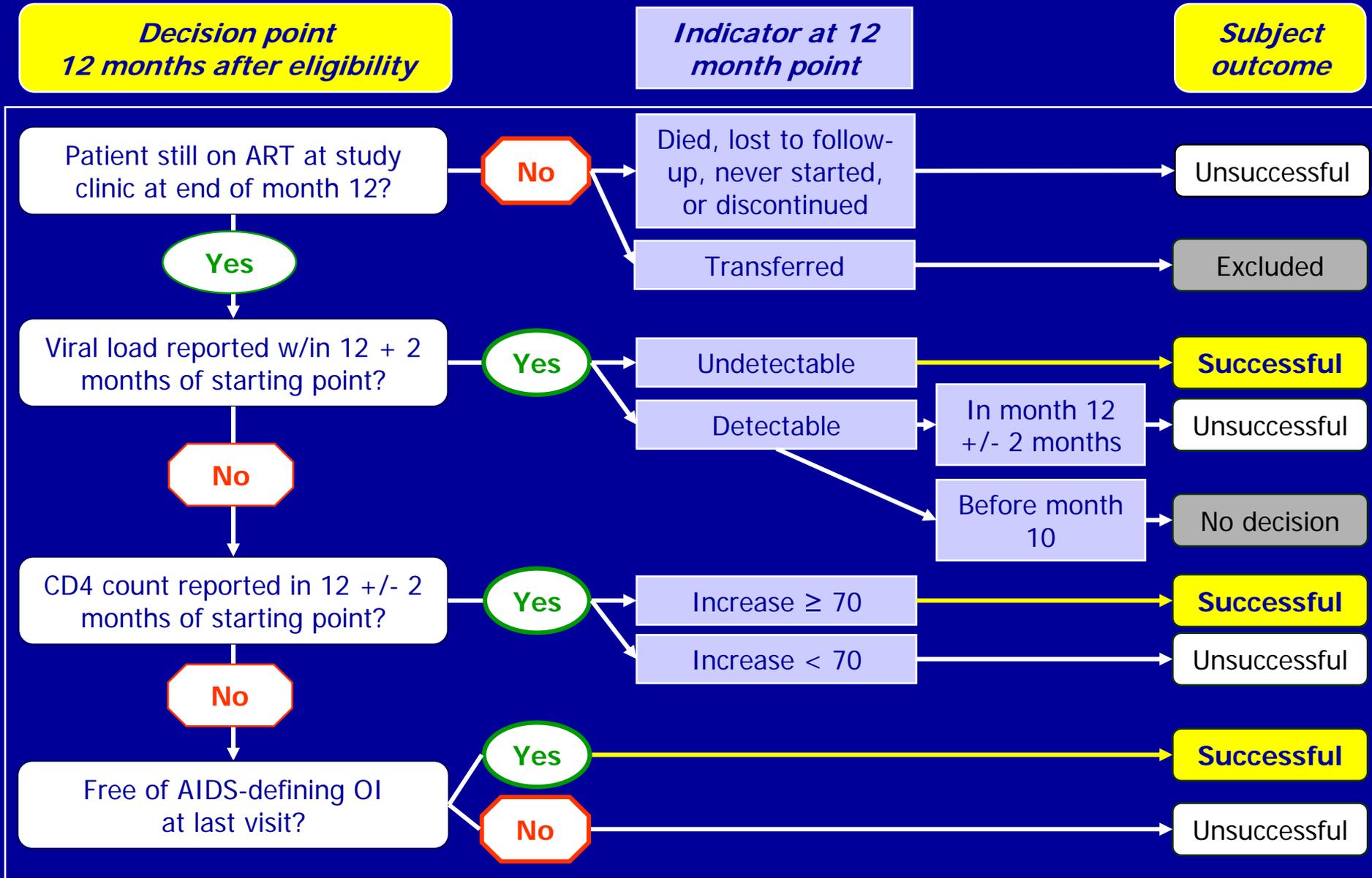
$$\text{Cost/} \\ \text{successfully} \\ \text{treated patient} = \frac{\text{Sum of all costs incurred for sample} \\ \text{of 100 patients over 12 months}}{\text{Number of successfully treated} \\ \text{patients } (\leq 100)}$$

# Definitions

---

- Starting point: medical eligibility for ART in SA ( $CD4 \leq 200$ ).
- Decision point: 12 months after medical eligibility.
- Successfully treated patient:
  - Undetectable viral load any time within 12+2 months of starting point; or
  - CD4 increase of 70 cells/ $\mu$ L at month 12 +/-2 months; or
  - No AIDS-defining OI at visit in month 12 +/- 2 months.
- Unsuccessfully treated patient:
  - Viral load still detectable at month 12 +/- 2 months; or
  - CD4 increase  $< 70$  cells/ $\mu$ L at month 12 +/- 2 months; or
  - AIDS-defining OI at visit in month 12 +/- 2 months; or
  - Never started ART or discontinued by end of month 12; or
  - Lost to follow-up by end of month 12; or
  - Died before end of month 12.
- Loss to follow-up:  $\geq 3$  months late for last scheduled doctor visit.
- Patients who transferred to another ART site are excluded.

# Determination of Subject Outcomes



# Costing 1: Variable Costs

---

- Variable costs are estimated per patient in the sample using individual medical record data.
- Variable costs include:
  - Drugs and labs used by sample and provided by study clinic (actual costs incurred by clinic).
  - Professionals' time (doctors, nurses, pharmacists, specialists) for each visit made by sample. (Cost = salary + benefits per month/average number of patients seen per month.)
  - Any other variable services and supplies provided by study clinic and used by sample (modified for each site).
- Time period for variable costs: ART eligibility to 12 months or last visit.
- Costs incurred prior to ART eligibility (including HIV test) are excluded.
- Costs of care not provided by study clinic and/or not reported on patient's medical record are omitted.

# Costing 2: Fixed Costs

---

- Fixed costs are estimated for the clinic as a whole and divided by the number of active patients. (Pre-ART patients are multiplied by 2/7 to account for smaller number of scheduled clinic visits.)
- Fixed costs include:
  - Staff who provide clinic-wide services (e.g. managers, administrators).
  - Buildings and vehicles, including utilities, maintenance, insurance, etc.
  - Equipment, general supplies, communications.
  - Other fixed costs associated with providing ART.
- Time period for fixed costs: ART eligibility to 12 months or date of last scheduled visit.
- Fixed costs for subjects who died or were lost to follow-up are adjusted for number of months at study clinic.

# Initial Results

# Initial Site: Themba Lethu Clinic

---

- HIV clinic of Helen Joseph Hospital, Johannesburg, Gauteng Province.
- Public provincial hospital serving a large and diverse urban and peri-urban population.
- Largest ARV rollout site in country.
- Started providing ART in April 2004.
- Currently > 5,000 adult patients on ART.
- Funded by the South African Department of Health with scaleup support from PEPFAR (USAID/Right to Care).

# Patient Outcomes

---

12-month outcomes for the first 100 patients who became eligible for ART in 2005

<b>Outcome</b>	<b>n (%)</b>
Successfully treated	70
Viral load undetectable	66
No AIDS-defining OI at visit in month 12 +/-2	4
Unsuccessfully treated	30
Viral load still detectable at month 12 +/-2	4
CD4 increase < 70 at month 12 +/-2	2
Lost to follow-up (>3 months overdue)	23
Died	1
Total	100

# Costs

Type of cost	Total for sample		Per patient (full sample)		% of total
	Rand	USD*	Rand	USD*	
<b>Variable costs</b>	<b>R462,823</b>	<b>\$71,204</b>	<b>R4,628</b>	<b>\$712</b>	<b>91%</b>
Drugs	R272,085	\$41,859	R2,720	\$419	53%
Labs	R99,148	\$15,254	R991	\$152	19%
Clinic visits	R91,590	\$14,091	R916	\$141	18%
<b>Fixed costs</b>	<b>R47,116</b>	<b>\$7,249</b>	<b>R471</b>	<b>\$72</b>	<b>9%</b>
<b>Total costs</b>	<b>R509,939</b>	<b>\$78,452</b>	<b>R5,099</b>	<b>\$784</b>	<b>100%</b>

\*\$1 = R6.5

# Cost Effectiveness

---

- Number of patients in sample: 100
- Number of successfully treated patients: 70
- Total cost of treating patients in sample during 12 months following eligibility for ART: R509,939 (\$78,452)
- Cost per patient in sample: R5,099 (\$785)
- Cost per successfully treated patient in first 12 months following ART eligibility: R7,285 (\$1,121)

# Provisos

---

- Cost estimates are preliminary—refinements and further analysis still needed.
- Cost estimates depend on what is included, making comparisons across studies risky.
- Sample initiated ART early 2005—may differ from patients initiating in 2006 and later.
- Themba Lethu expected to have a low cost per successfully treated patient due to economies of scale; smaller sites are likely to cost more.
- Cost per successfully treated patient in year 2+ will differ; fewer clinic visits for most patients, but switch to second-line regimen for some.

# Next Steps

---

- Complete analysis for confirmed sites:
  - Themba Lethu Clinic in Gauteng Province (large, public, urban hospital)
  - 2 rural NGO clinics in Mpumalanga Province (different models)
  - 1 private GP reimbursement scheme
- Identify and analyze 2-3 remaining sites:
  - Mobile clinic;
  - Public hospital with functioning down-referral clinics;
  - Public rollout site in low-resource area; and/or
  - Other interesting model of treatment delivery.
- Compare and evaluate results across sites.
- Study also includes a survey of costs incurred by patients at each study site; analyze these data.
- Evaluate larger sample and longer follow-up period for Themba Lethu Clinic.

# Acknowledgements

---

- Themba Lethu Clinic
- Helen Joseph Hospital
- Gauteng Department of Health
- Right to Care
- USAID/South Africa
- PEPFAR
- Wits Health Consortium, University of the Witwatersrand
- Boston University School of Public Health