HIV Monitoring Strategies in Resource-Limited Settings

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Context

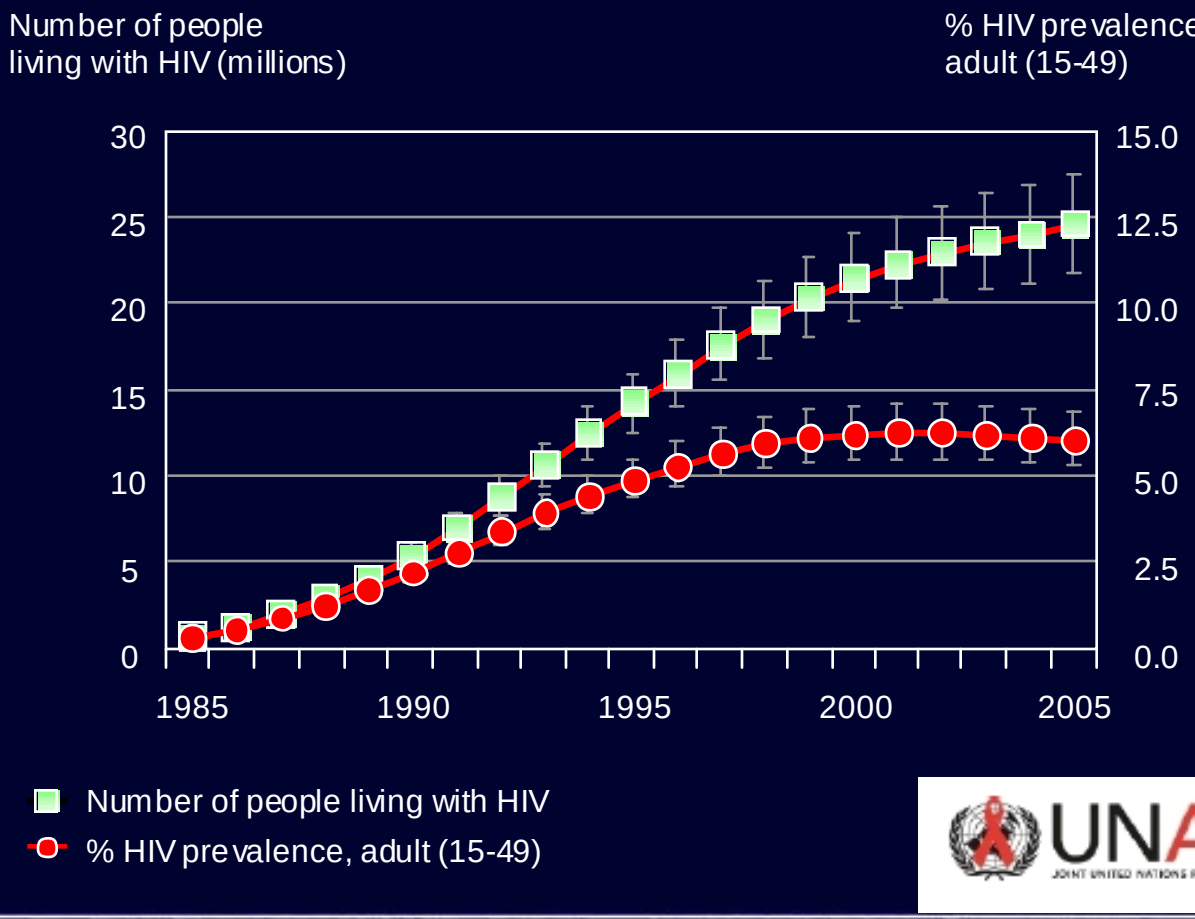
Although the number of infected people receiving highly active anti-retroviral therapy (HAART) for HIV in low- and middle- income countries increased dramatically, disease monitoring for the infected population is not well defined.

Purpose

Analyze the relative costs and effectiveness of monitoring patients with symptoms alone, with CD4 counts, or with CD4 counts and viral load measurements using data from South Africa.

The Epidemic in SSA

HIV epidemic in sub-Saharan Africa, 1985-2005



UNAIDS
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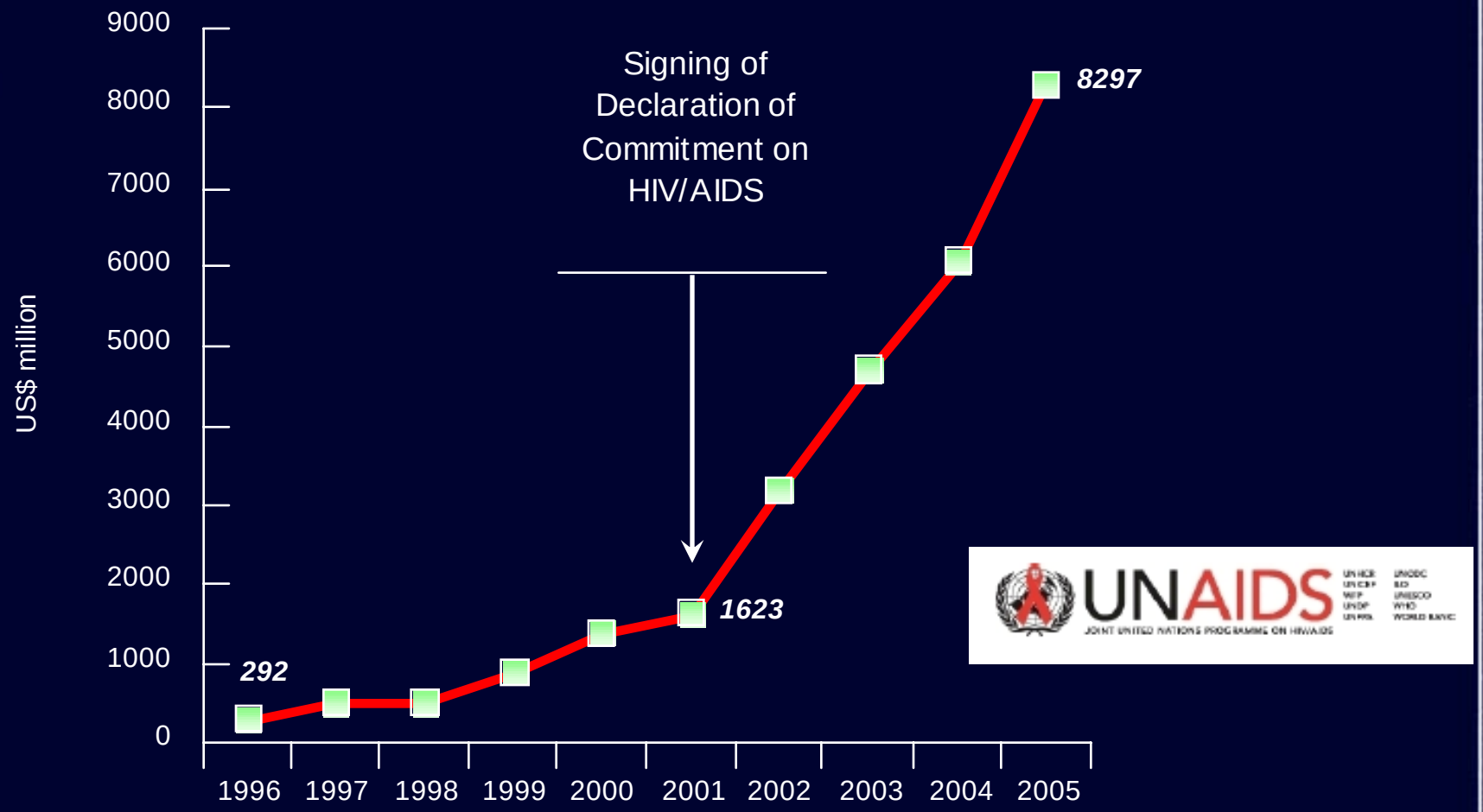
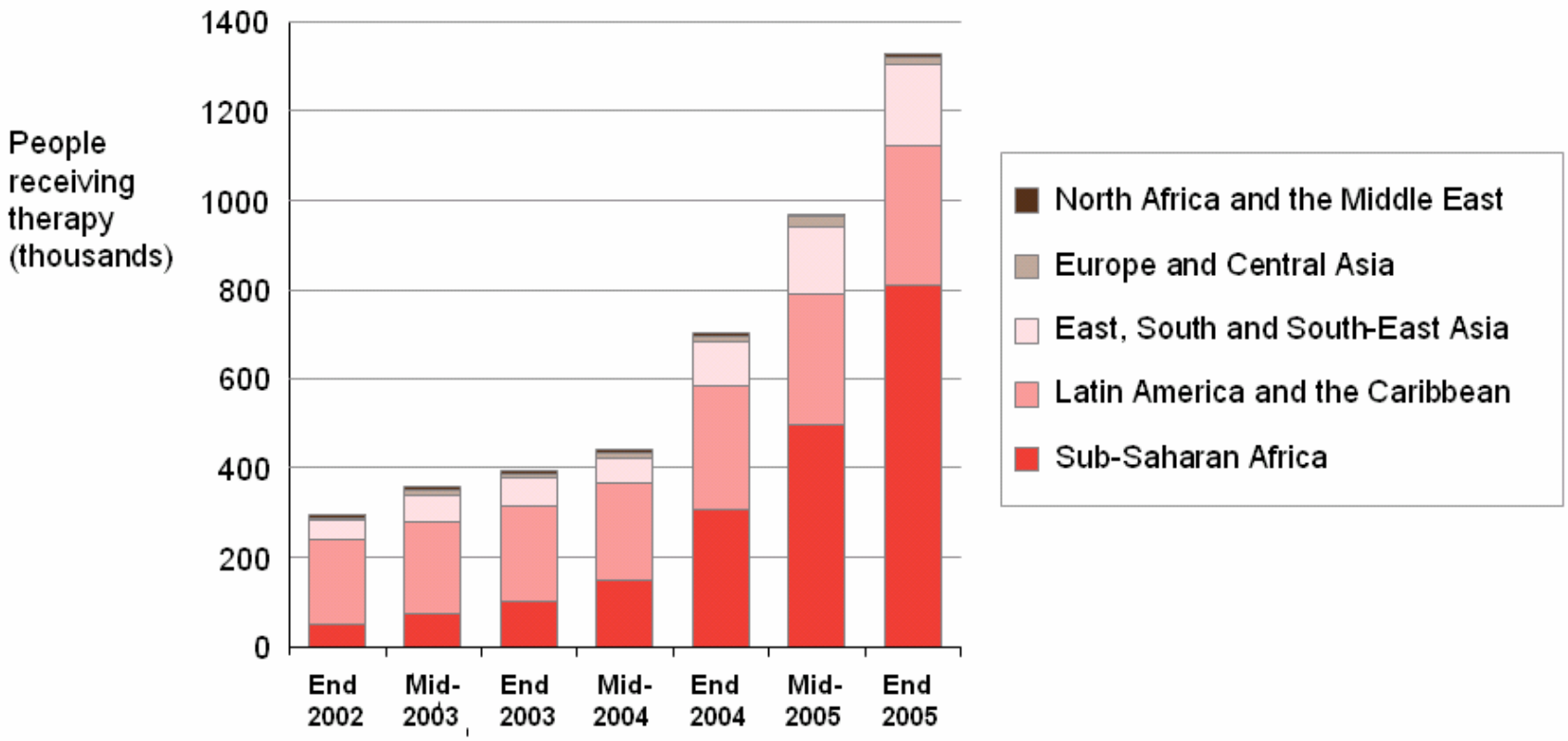
Funding for Global HIV



HIV Treatment Globally



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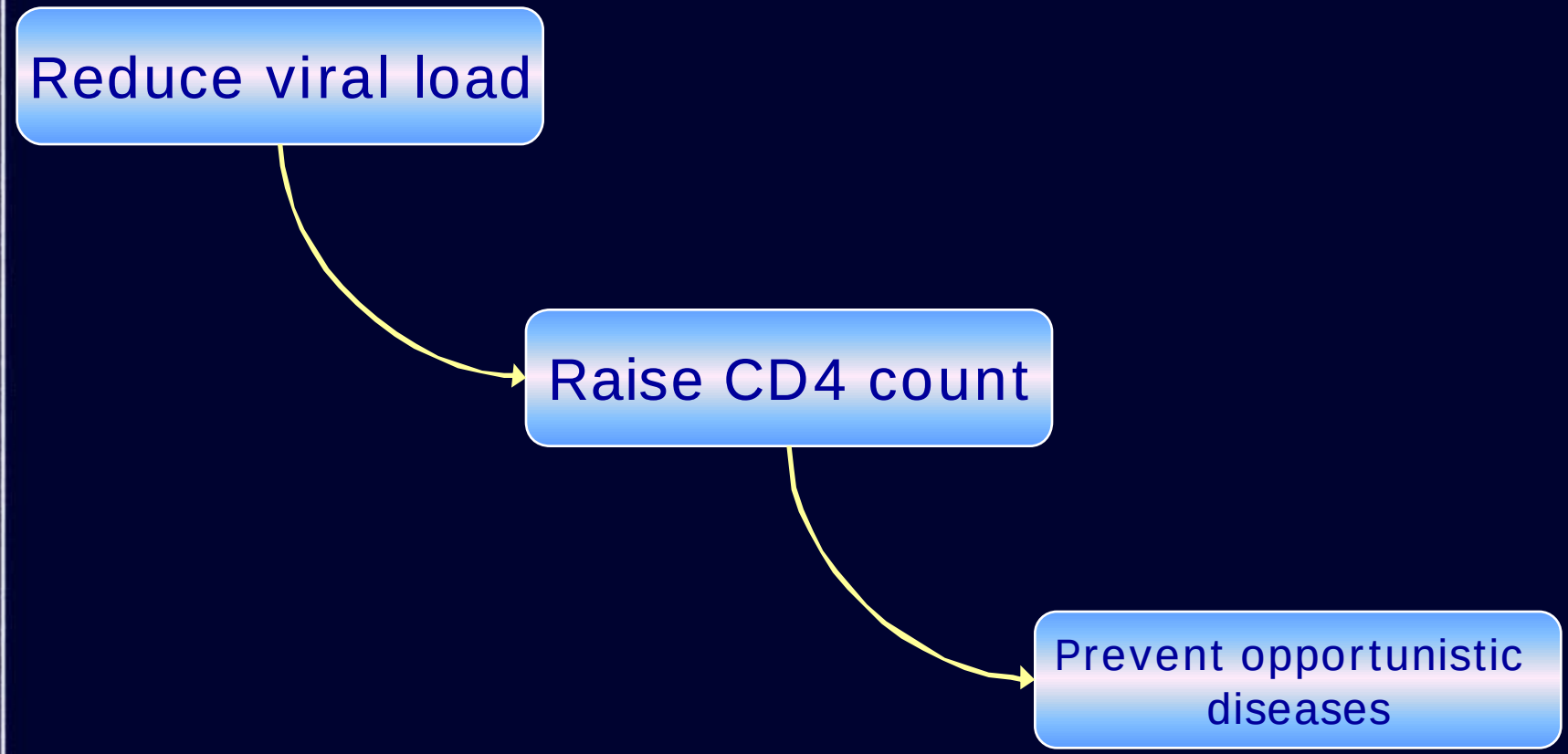
Effect of HAART

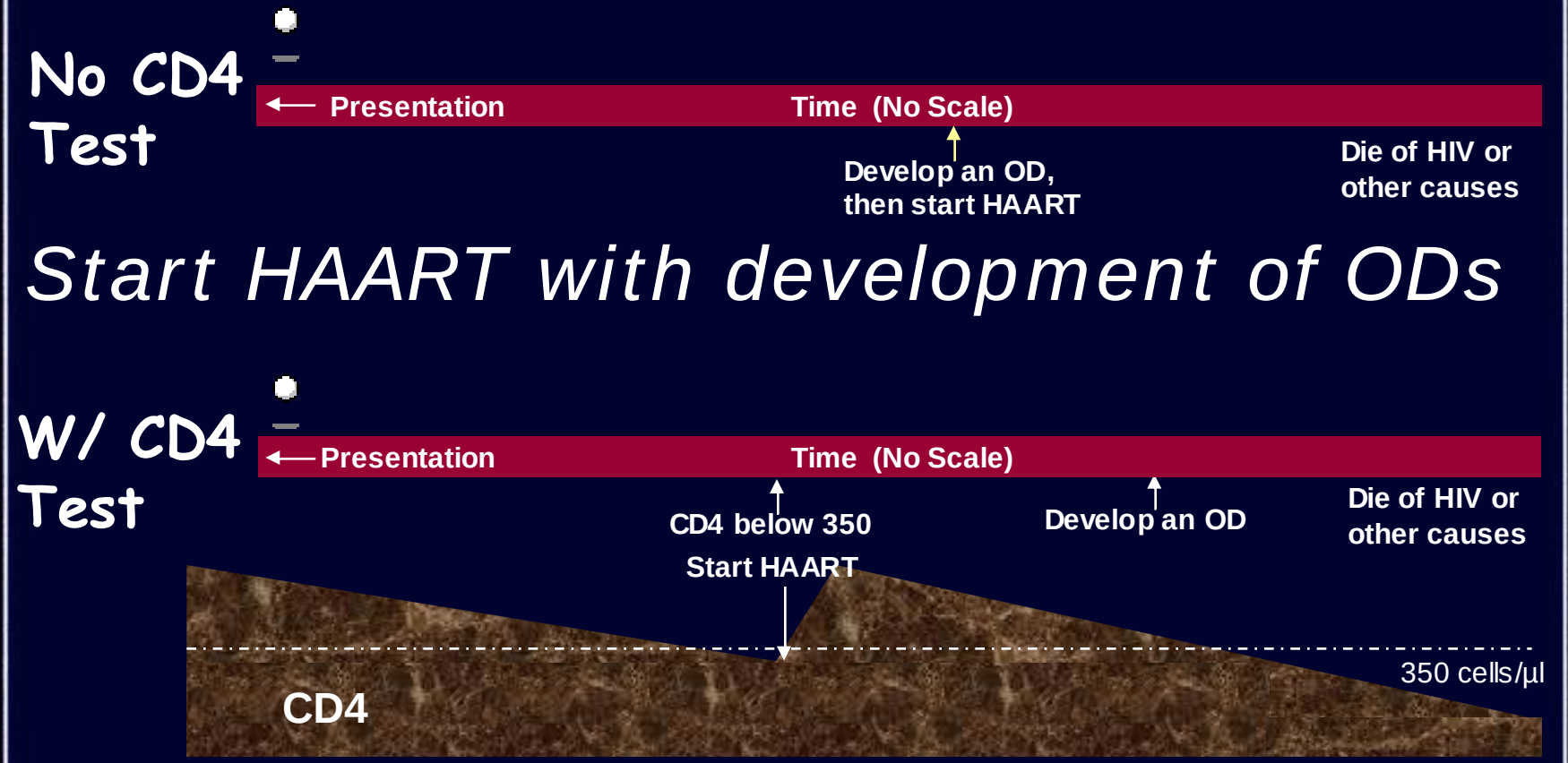


HIV Management in Africa

- Monitoring used to determine when to start HAART, when to switch from first line regimen to second line regimen, and when to stop HAART.

- Patients can be monitored with symptoms alone, with symptoms and CD4, or with symptoms, CD4, and viral load measurement, similar to the standard of care in the US.

Examples

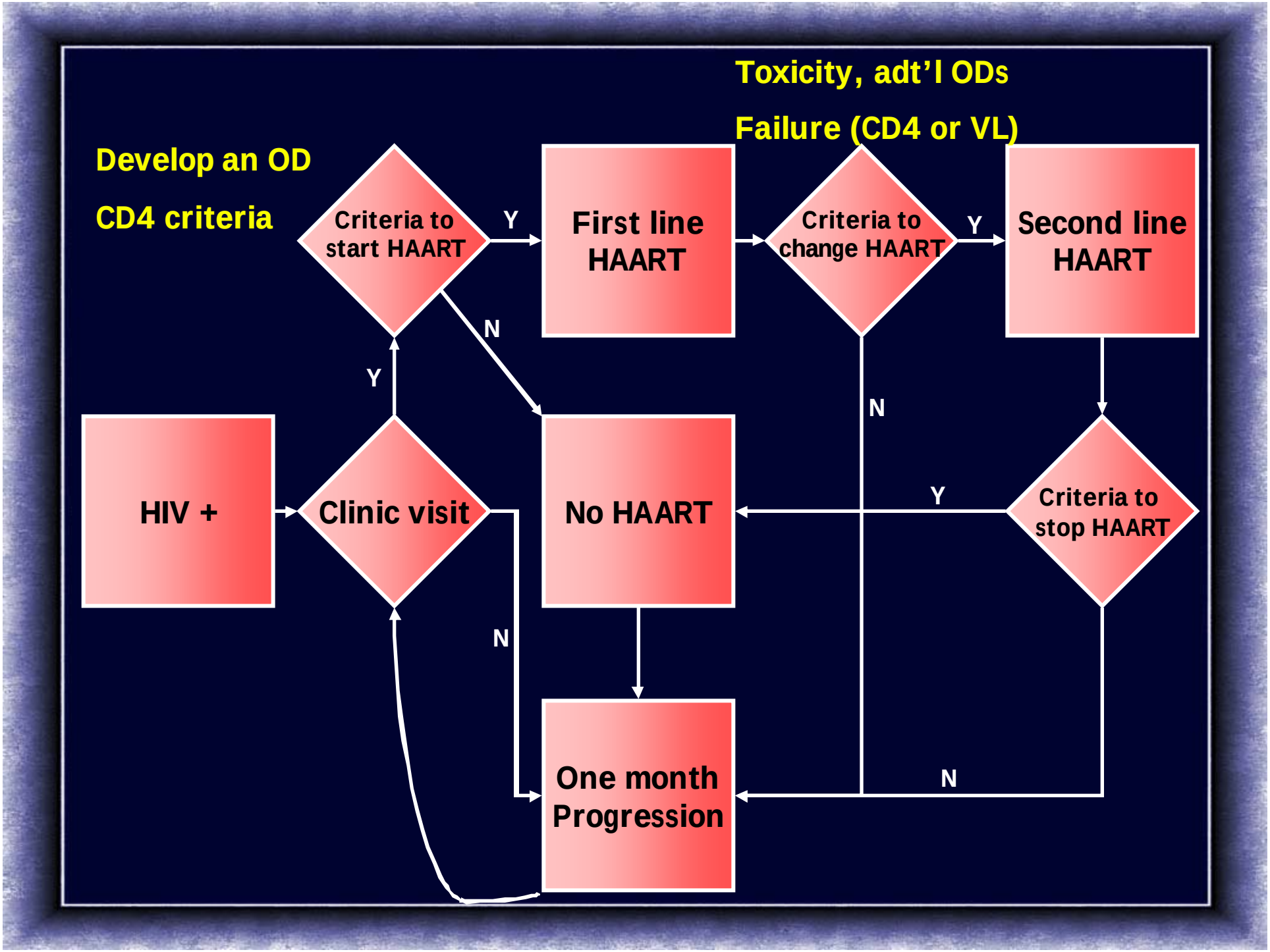


Start HAART with development of ODs

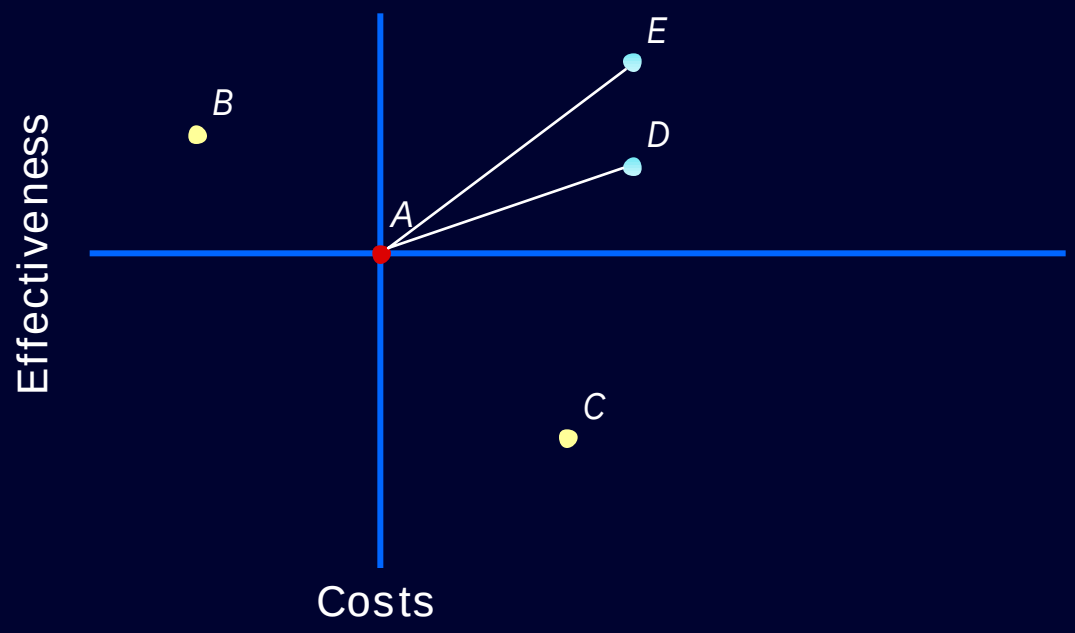
Start HAART when CD4 falls below 350 or with development of an OD

Model Inputs

- Health status determined by…
  - Age, gender
  - Current, lowest, and highest measured CD4
  - Current and steady state viral load
  - Medication toxicity
  - Treatment failure
  - History of opportunistic diseases
- Clinical data obtained from Cape Town AIDS Cohort and Khayelitsha MSF Clinic



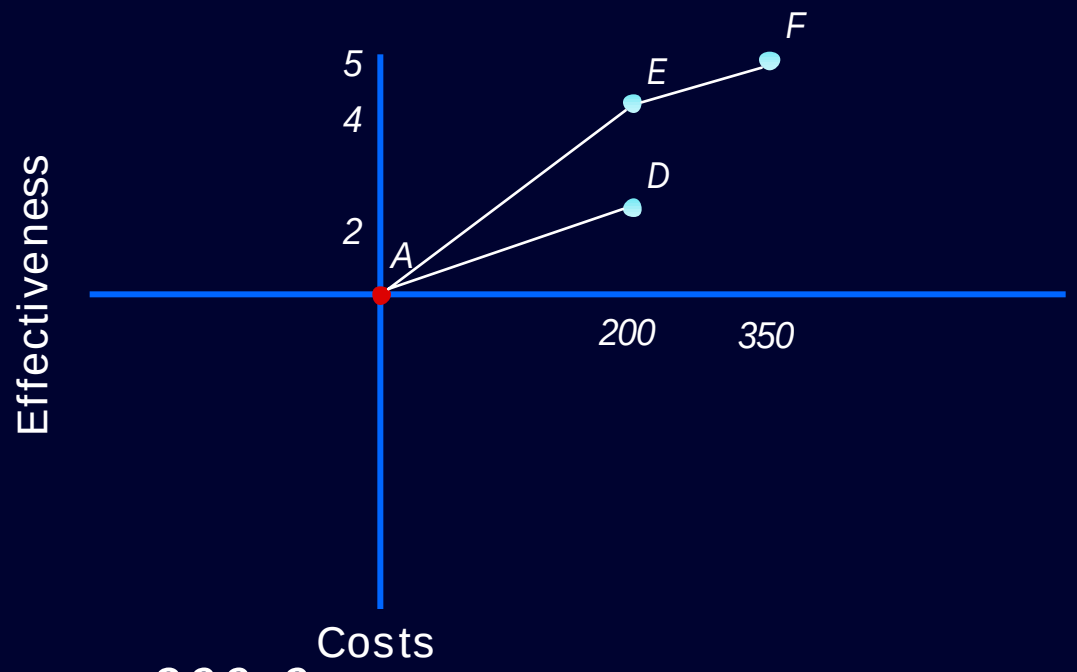
Cost-Effectiveness



Value measured in incremental cost-effectiveness ratio:

$$ICER = \frac{Cost_X - Cost_A}{Effectiveness_X - Effectiveness_A}$$

Cost-Effectiveness

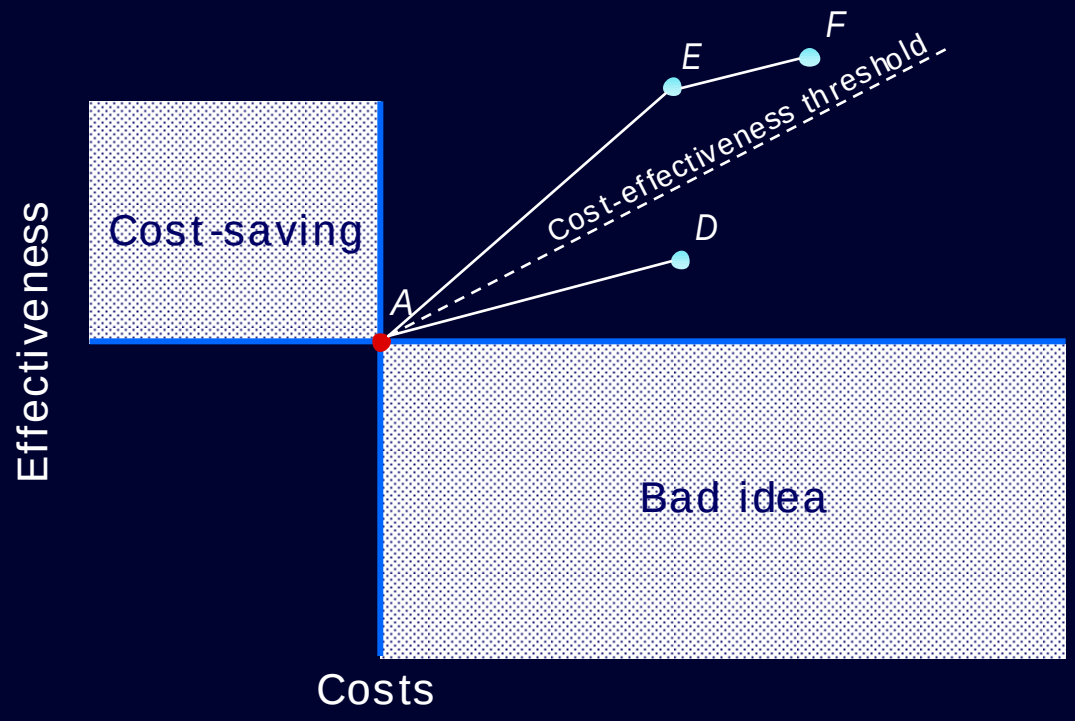


$$ICER_{D-A} = \frac{200-0}{2-0} = 100$$

$$ICER_{E-A} = \frac{200-0}{4-0} = 50$$

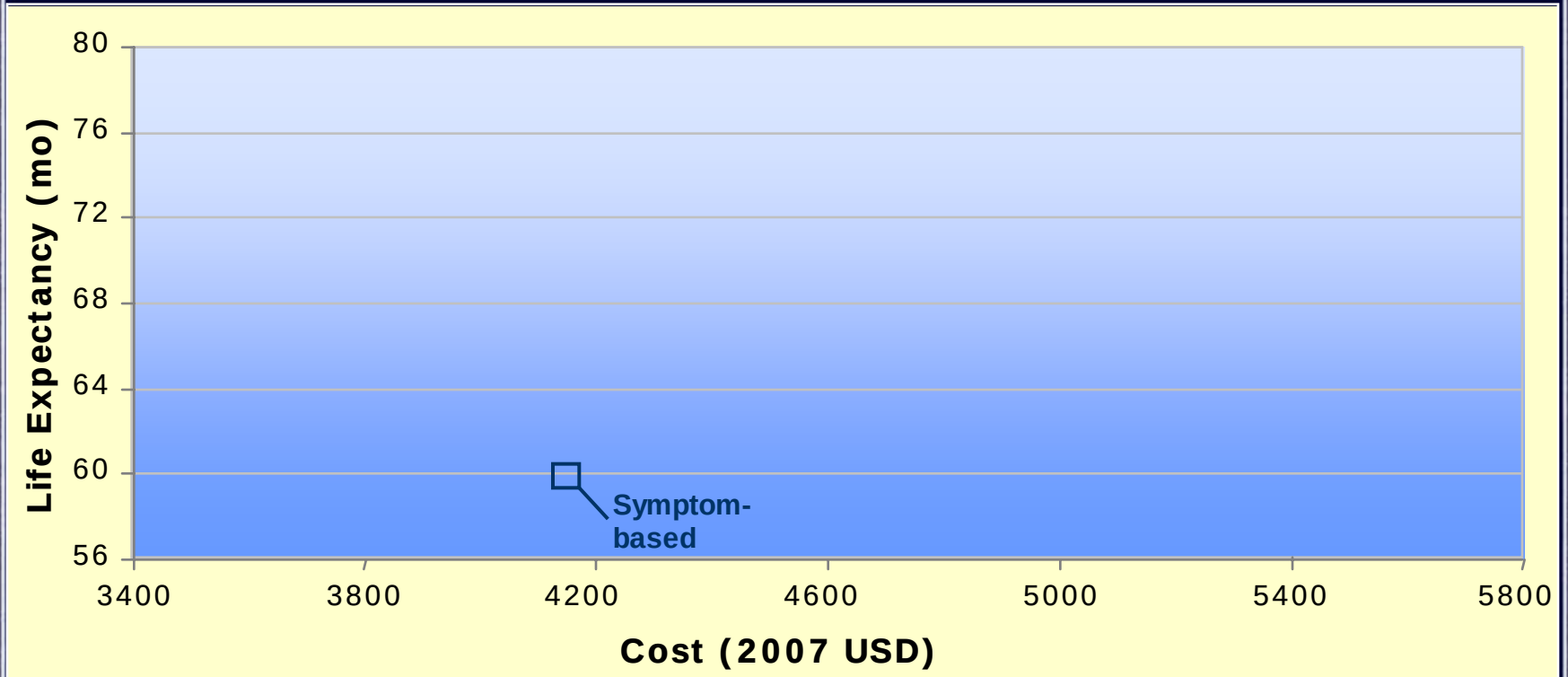
$$ICER_{F-E} = \frac{350-200}{5-4} = 150$$

Cost-Effectiveness

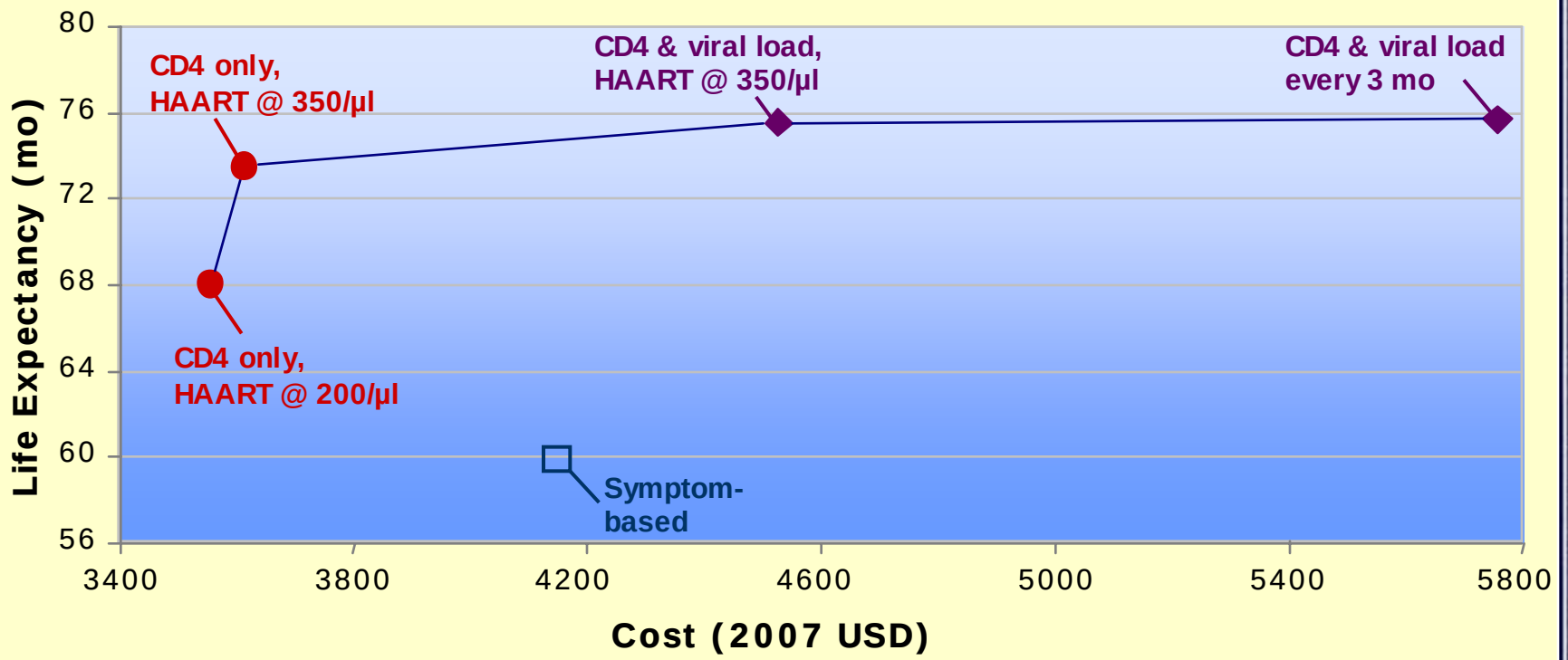


Cost-effectiveness threshold: the amount of money that we are willing to spend to gain one unit of effectiveness

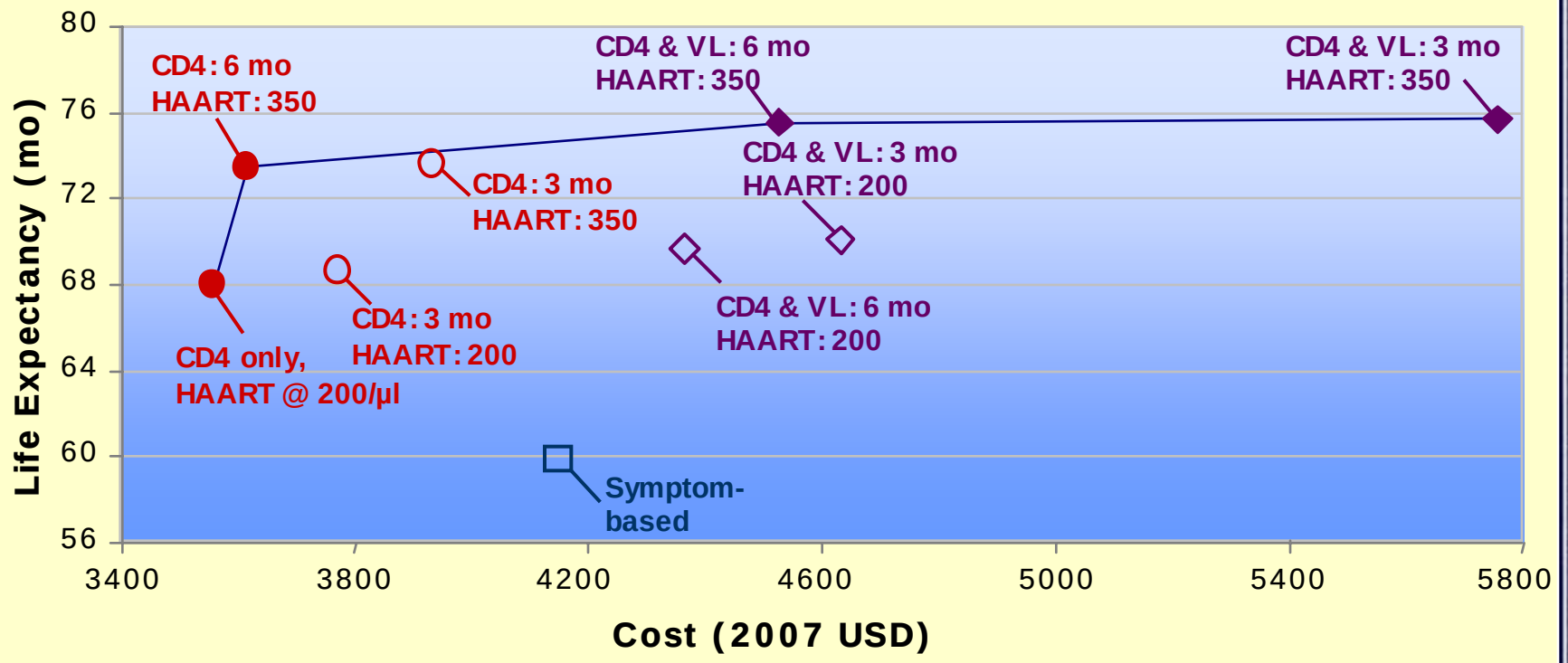
Results



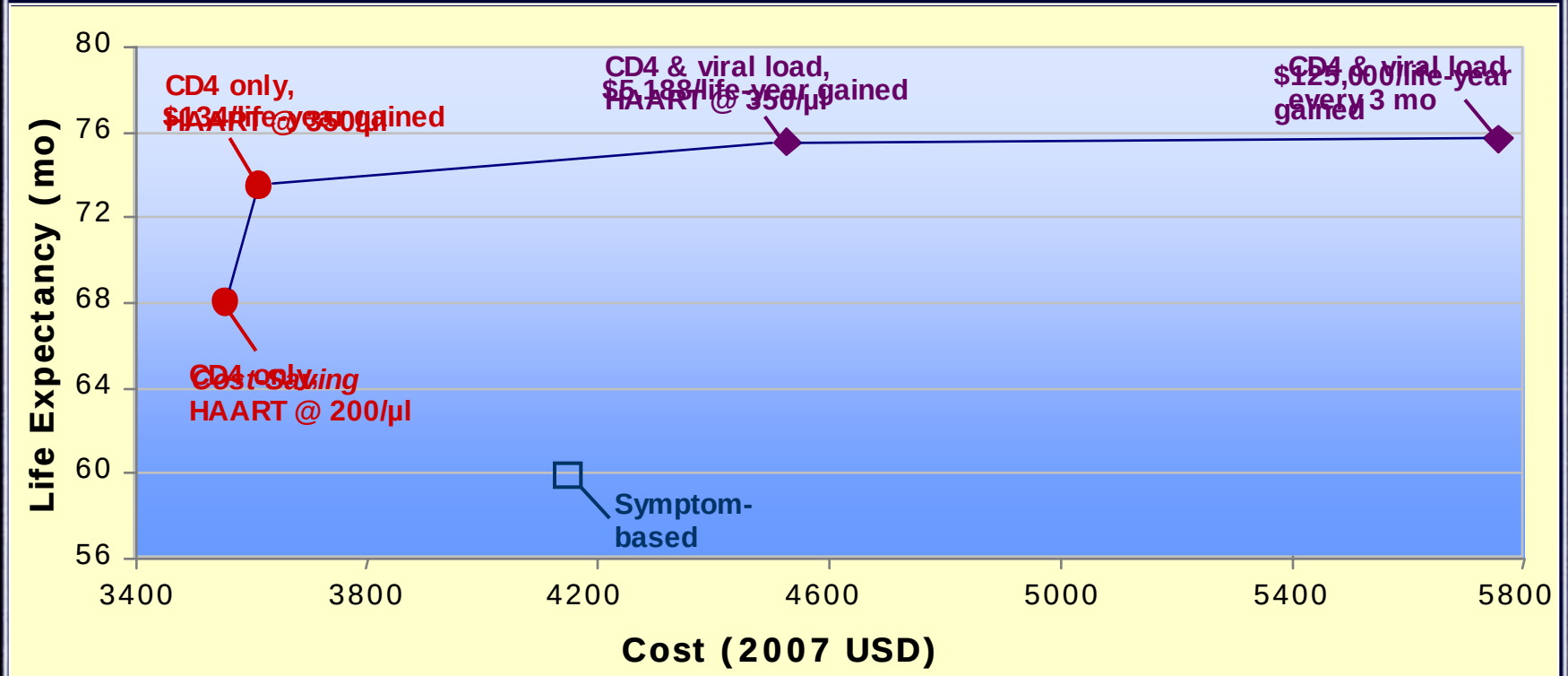
Results



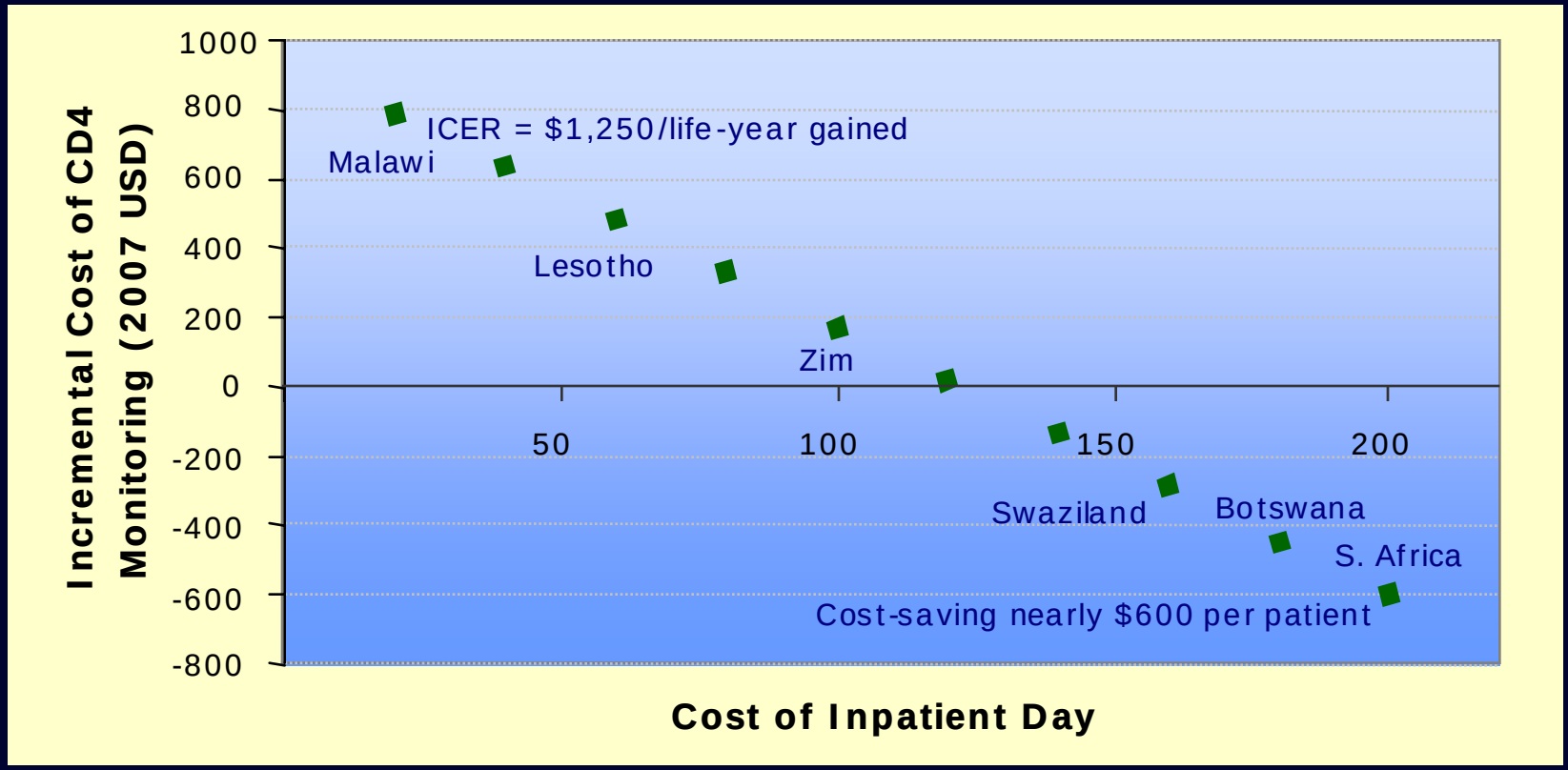
Results



Results



Sensitivity Analysis



Conclusions

- Compared to symptom-based management, CD4 monitoring could substantially increase length of life in many parts of southern Africa.
- This increase in life expectancy may save health care costs by reducing number of opportunistic diseases and inpatient days.

Conclusions

- Cost savings may be realized in countries where hospital costs are relatively high (South Africa, Botswana, Namibia, Swaziland).
- The World Health Organization considers an intervention cost-effective if the incremental cost-effectiveness ratio is around twice the per-capita GDP.

Conclusions

- By that standard, monitoring CD4 even in places where hospital costs are very low (e.g. Malawi) is a cost-effective intervention.

- Starting HAART at CD4 350 cells/µl was substantially more effective than starting at CD4 200 cells/µl at a small additional cost.

Conclusions

- As access to treatment improves in resource-limited settings, the large investments in HAART could be greatly leveraged by monitoring CD4 and initiating treatment before development of symptoms.
- Technological challenges for monitoring CD4 are fewer today with low-cost diagnostic equipment.

Conclusions

- Providing access to CD4 monitoring for one million people and starting HAART at a CD4 of 200 cells/µl could provide 683,000 years of life more than providing HAART without CD4 monitoring.

- Starting HAART at 350 cells/µl could provide an additional 450,000 years of life.

Limitations

- Most data was taken from Cape Town region
  - Burden of disease
  - Availability of health care
- Did not account for indirect costs such as lost wages and travel time.

Acknowledgments

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