Cost-effectiveness of initiating and monitoring HAART based on WHO versus US DHHS guidelines in the developing world

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Main study objective

Evaluate cost-effectiveness of:

- Current WHO “3 by 5” Guidelines versus
- Composite Guidelines based upon WHO Guidelines and USDHHS Guidelines

Three key components of US DHHS guidelines incorporated into Composite Guidelines

1. Initiate HAART at a CD4 count of <350 cells/mm^3 (versus <200 cells/mm^3)

2. Initiate HAART at viral load of >100,000 copies/ml (viral load not included in WHO “3 by 5” Guidelines)

3. Test every 3 months with CD4 & viral load (vs. every 6 months with CD4 only)

Methods

- ***Perspective:*** Societal
- ***Model design:*** Lifetime Markov Monte Carlo simulation model incorporating HIV transmission
- ***Starting population:*** Adult (15-49 years), heterosexual, treatment-naïve HIV-positive men and women in South Africa
- ***Costs:*** South African cost data expressed in 2005 US dollars

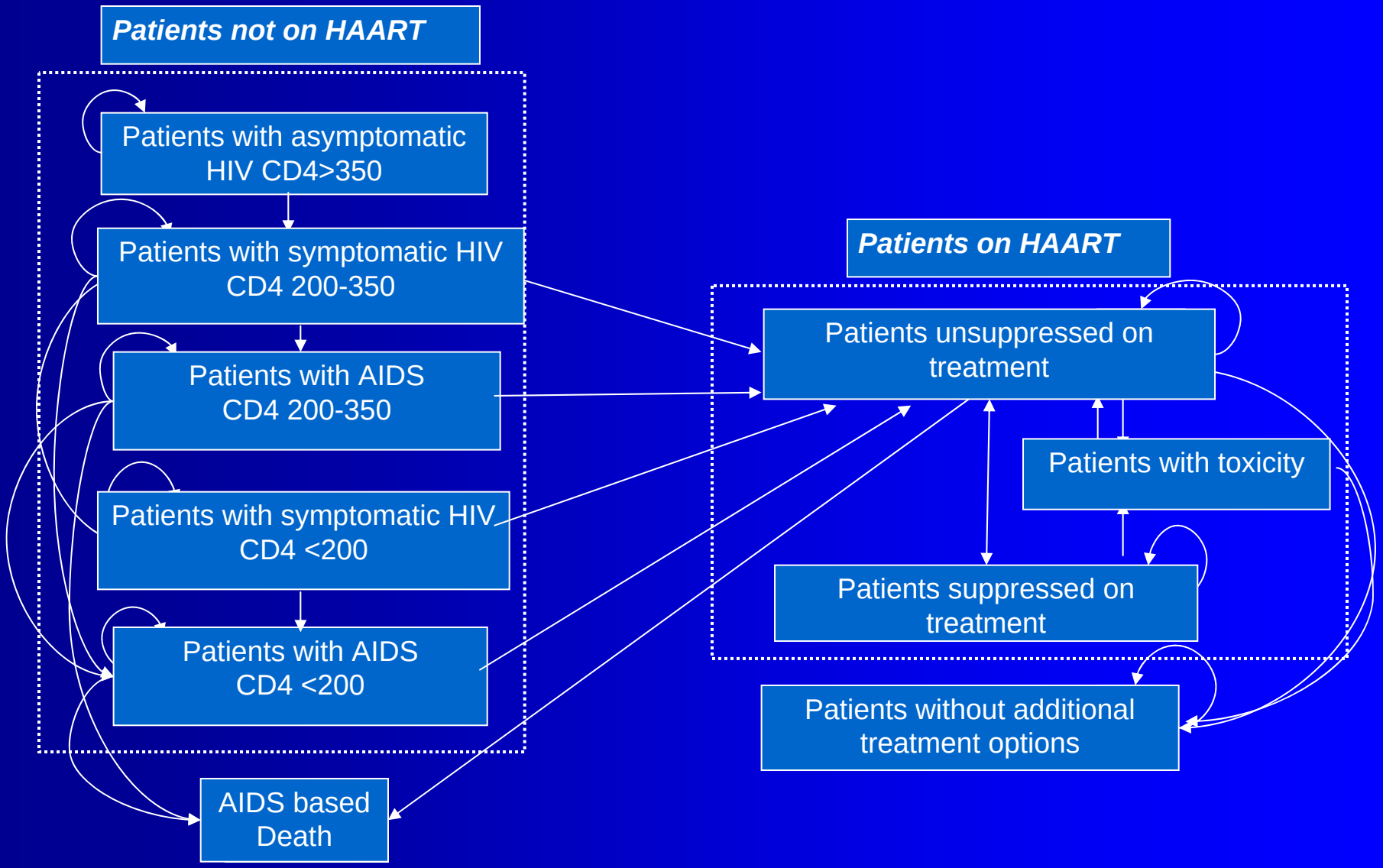
Methods (cont.)

- ***Outcomes:***
  - Quality-adjusted life-years (QALYs)
  - Direct medical costs and indirect costs
  - Incremental cost per QALY
  - Outcomes reported for both “index patient” and patients to whom he or she transmits HIV
  - Net economic impact across all HIV+ adults in South Africa (5 yrs. and lifetime)

Methods (cont.)

- ***Participants:*** Model developed in conjunction with leading international and South African HIV clinical and economic experts :
  - **Dr. Osman Ebrahim** - Brenthurst Clinic, Johannesburg
  - **Dr. Ian Sanne** - University of the Witwatersrand, Johannesburg
  - **Dr. Nick Hellmann** - Gates Foundation
  - **Dr. Gillian Sanders** - Duke Clinical Research Institute

Markov model layout



Core model assumptions

Natural history:

- Baseline data from Auvert et al†
- Risk of disease progression based on viral load and CD4 cell counts
- All HIV-related deaths occur among patients with AIDS

†Auvert B, Males S, Puren A, Taljaard D, Carael M, Williams B. Can highly active antiretroviral therapy reduce the spread of HIV?: a study in a township of South Africa. J Acquir Immune Defic Syndr. 2004;36:613-21. Bertran Auvert (personal communication).

Core model assumptions (cont.)

Treatment:

- Patients in both groups received treatment regimens recommended in the current WHO “3 by 5” Guidelines.
- Probability of achieving successful virologic response decreases after virologic failure, but not after changing ARVs due to toxicity

Antiretroviral treatment regimens

- First-line HAART
  - d4T+3TC+[EFV (men) or NVP (women)]
- Alternate first-line HAART
  - Replace d4T with ZDV and/or NVP with EFV
- Second-line HAART
  - TDF+ddI+LPV/r
- Alternate second-line HAART
  - Replace TDF with ABC and/or LPV/r with SQV/r

Core model assumptions (cont.)

Identification of treatment failure:

- Current WHO “3 by 5” Guidelines: drop in CD4 count to <50% of peak value or less than 200 cells/mm^3
- Composite Guidelines: increase in viral load to >400 copies/ml

Core model assumptions (cont.)

HIV Transmission:

- Depends on the infected patient's sex, number of sexual partners, and viral load
- Reductions in viral load reduce HIV transmission
- In the base case, we assumed that HIV testing and counseling did not have an impact on reducing transmission of HIV

Health and Economic Outcomes
Index patient only

Strategy	Lifetime Costs ($)	Incremental Costs ($)	QALY* (years)	Incremental QALY
Current WHO "3 by 5" Guidelines	12,354	-	10.98	-
Composite Guidelines	22,677	10,323	13.07	2.09

Incremental Cost-Effectiveness Ratio:

Incremental cost/QALY: $ 4,939

*QALY : quality-adjusted life years.

Health and Economic Outcomes
(cont.) - Index patient and sexual partners

Strategy	Lifetime Costs ($)	Incremental Costs ($)	QALY* (years)	Incremental QALY
Current WHO "3 by 5" Guidelines	13,630	-	9.14	-
Composite Guidelines	25,856	12,226	12.3	3.16

Incremental Cost Effectiveness Ratio:

Incremental cost/QALY: $ 3,869

* QALY : quality-adjusted life years.

Which differences are driving these results? – Base Case (With transmission)

	ICER (/QALY)	% contribution for effectiveness	% contribution for cost
Impact of starting treatment at CD4<350	$1,254	51	27
Impact of viral load testing only	$3,700	41	65
Impact of testing every 3 months	$2,576	8	8

Countrywide results for South Africa: 5-year analysis

- Treating all HIV patients[‡] in South Africa according to Composite Guidelines would increase direct costs by $13 billion but result in:
  - 400,000 fewer deaths
  - 1 million fewer new AIDS cases
  - 320,000 fewer incident HIV cases

[‡]Assuming 5.1 million patients with HIV in South Africa

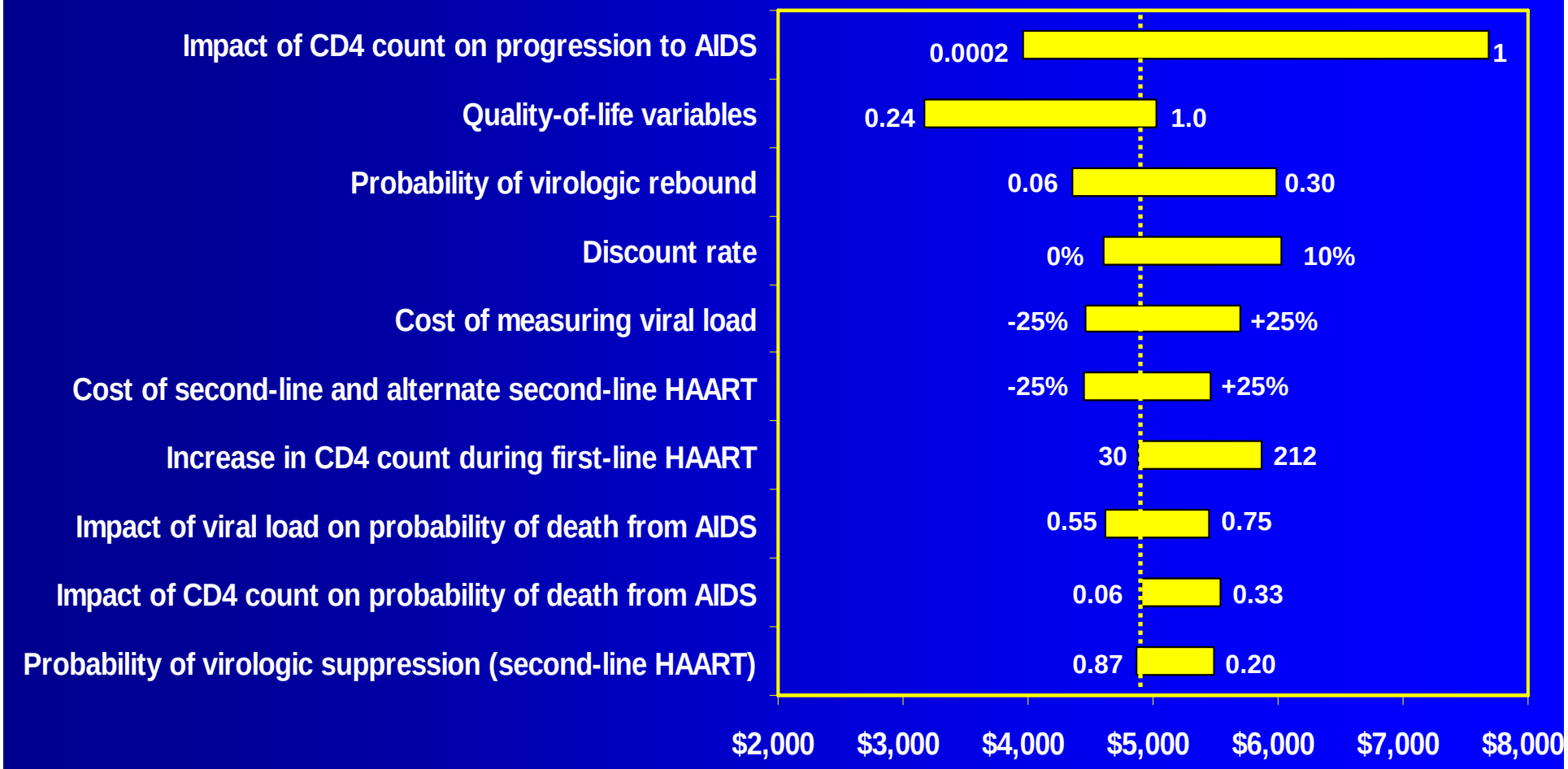
Indirect cost analysis

- We computed the indirect cost of AIDS-related death for the index patients
- Cost per patient = GDP per capita * potential working years of life lost
- Potential years of life lost are calculated by subtracting the average age at which individuals die in the Composite Guidelines arm versus the current WHO “3 by 5” Guidelines arm

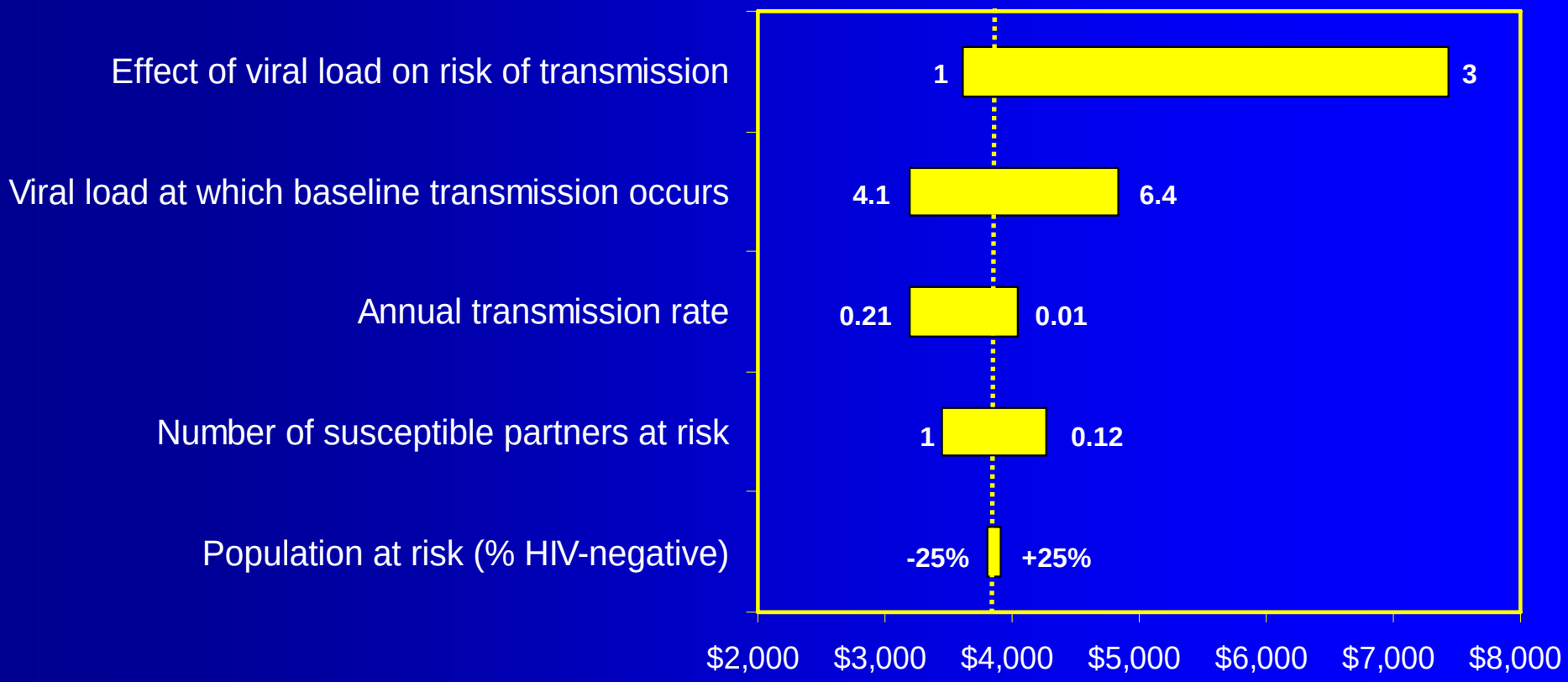
Economic impact for South Africa

- Treating all HIV-positive adults according to Composite Guidelines versus current WHO "3 by 5" Guidelines would result in ***cost savings*** of approximately **$61 billion**, due to:
  - Increased direct medical costs of $62 billion, offset by
  - Indirect cost savings of $123 billion

Results of Sensitivity Analysis



Results of Sensitivity Analysis
- variables that impact transmission



Conclusions

- Even without including indirect costs, it is ***highly*** cost-effective to implement Composite Guidelines
- Furthermore, each of the three components of the Composite Guidelines were found to be ***highly*** cost effective
- Including the impact of both transmission and indirect costs, modifying the WHO “3 by 5”guidelines is a cost-saving strategy for countries like South Africa

*WHO defines highly cost-effective interventions as < than GDP per capita in country studied ($4,900 for S.Africa in 2005)**

*Macroeconomics and Health: Investing in Health for Economic Development; Report of the Commission on Macroeconomics and Health; World Health Organization, December 2001