Presentation title
ART TREATMENT PROGRAMME 2004

• Cabinet decision in 29\textsuperscript{th} November 2003
• Initial sites were hospital based, required central review
• National Costing Model of HIV/AIDS Treatment 2010
  Cost affordability vs. cost effectiveness
  – CD4+ less than 350 cells/mm\textsuperscript{3}
  – All AIDS defining illness
  – Expanded access to treatment in PMTCT (B)
  – Replacement of D4T with TDF
  – Shift to primary health care, with nurse provided treatment and pharmacy assistants
• Median CD4+ at treatment initiation 84 vs. 114 cells/mm$^3$
• LTFU at 1 year is similar 8.9% vs. 12.1% (2009) overall remained below 11%
• Over 7 years were 8172 person years – LTFU 25% and 16% had died (MR = 3.59 per 100 person years)
LTFU AND MORTALITY RATES

Fig. 1. Monthly rates of mortality, loss to follow-up and transfer over 84 months at an HIV treatment program at the Themba Lethu clinic in Johannesburg, South Africa. LTF, loss to follow-up.
Probability of viral rebound

- Suppression <400c/ml within 6 months
- Rebound – two consecutive viral loads > 400c/ml; or one viral >5,000c/ml

87% switches to second-line regimen were related to virologic failure

CD4+ response

Mean CD4 count gain after 6 months of treatment was 117 cells/mm³ and the increase was greater for those with CD4 counts < 200 at baseline (122 cells/mm³) than those with
Incident TB by baseline CD 4 count (Poisson regression model)

21.7/100py (17.5-26.7)

A van Rie, I Sanne et al Int. TB and Lung Dis. Paris 2008
Treatment initiation in TB patients

- ACTG A5221 (STRIDE)
  - Early initiation of ART in patients with tuberculosis and CD4 counts <50 cells/mm$^3$ reduces AIDS morbidity and mortality

The New England Journal of Medicine
Total cost and potential cost savings of the national antiretroviral treatment (ART) programme in South Africa 2010 to 2017

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\textsuperscript{2} Health Economics and Epidemiology Research Office (HE\textsuperscript{2}RO), Wits Health Consortium, South Africa
\textsuperscript{3} Faculty of Health Sciences, University of the Witwatersrand, South Africa
\textsuperscript{4} National Department of Health, South Africa
\textsuperscript{5} National Treasury, South Africa
\textsuperscript{6} Centre for Infectious Disease Epidemiology and Research, University of Cape Town, South Africa
\textsuperscript{7} Enhancing Children’s HIV Outcomes (ECHO), Wits Health Consortium, South Africa
\textsuperscript{8} Department of Epidemiology, Boston University School of Public Health, US
## Old South African Guidelines

**Eligibility**
- **Adults**: CD4 <200 cells/mm³ or WHO stage 4
- **Children**: CD4 15% to 20% or WHO stage 3 or 4

**Regimens**
- **Adults**: d4T + 3TC + EFV/NVP; AZT + ddI + LPV/r
- **Children <3 yrs**: d4T + 3TC + LPV/r; AZT + ddI + NVP

## New South African Guidelines

**Eligibility**
- **Adults**: CD4 <350 cells/mm³ for TB/HIV co-infected or pregnant pts, <200 cells/mm³ or WHO stage 4 for all others
- **Children**: Early Paediatric Treatment

**Regimens**
- **Adults**: TDF + 3TC + EFV/NVP for all new initiates; TDF + 3TC + LPV/r if failing d4T- or AZT-containing regimens/ AZT + 3TC + LPV/r if failing TDF-containing regimens
- **Children <3 yrs**: ABC + 3TC + LPV/r; AZT + ddI + NVP

## Full WHO Guidelines

**Eligibility**
- **Adults**: CD4 <350 cells/mm³ or WHO stage 4 for all
- **Children**: Early Paediatric Treatment

**Regimens**
- As in “New South African Guidelines”
Additional conditions

• **New drug purchasing system (RL/FDC):**
  – ARV drugs at prices set in reference list (modelled on CHAI/ GPRM/ SCMS prices)
  – Fixed-dose combination where possible

• **Task shifting (TS):**
  – ARV initiation and management by nurses under physician supervision
  – ARV dispensing by pharmacy assistants under pharmacist supervision
Health-state transition model
National ART Cost Model (NACM)

- 6-monthly transitions between types of care and CD4-defined health states
- Number of patients initiating ART from ASSA2003 model
  - Initiation rate (coverage of newly eligible pts)
    - 80% in pts with <200 CD4 cells/mm$^3$
    - 27% in pts with 200-350 CD4 cells/mm$^3$
- Transition probabilities and rates of mortality, loss to follow-up, and first-line treatment failure based on 2 large Johannesburg cohorts:
  - Themba Lethu Clinic Cohort (n= 9,502)
  - Harriet Shezi Children’s Clinic (n= 3,748)
- Transition probabilities and rates depend on CD4 cell count/ percentage and, for adult first-line treatment, also on time on treatment
- Model is evaluated for 2010/11 to 2016/17, with a run-in between 2003/4 and 2009/10
Regimen distribution (Adults)

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</thead>
<tbody>
<tr>
<td>AZT+3TC+LPV/r</td>
<td>0%</td>
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<td>4%</td>
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<tr>
<td>TDF+3TC+LPV/r</td>
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<td>AZT+ddI+LPV/r</td>
<td>3%</td>
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<td>AZT+3TC+EFV/ NVP</td>
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<tr>
<td>TDF+3TC+EFV/ NVP</td>
<td>4%</td>
<td>9%</td>
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<td>75%</td>
<td>37%</td>
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<tr>
<td>d4T+3TC+EFV/ NVP</td>
<td>93%</td>
<td>84%</td>
<td>61%</td>
<td>11%</td>
<td>60%</td>
<td>13%</td>
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</tbody>
</table>
# Results:
Regimen distribution (Children)

<table>
<thead>
<tr>
<th>Regimen</th>
<th>Old guidelines</th>
<th>New guidelines</th>
<th>Full WHO guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>AZT + ddI + LPV/r</td>
<td>1.8%</td>
<td>1.7%</td>
<td>1.7%</td>
</tr>
<tr>
<td>AZT + ddI + EFV</td>
<td>0.8%</td>
<td>0.7%</td>
<td>0.7%</td>
</tr>
<tr>
<td>ABC + 3TC + EFV</td>
<td>0.0%</td>
<td>33.0%</td>
<td>33.0%</td>
</tr>
<tr>
<td>d4T + 3TC + EFV</td>
<td>51.4%</td>
<td>14.1%</td>
<td>14.1%</td>
</tr>
<tr>
<td>ABC + 3TC + LPV/r</td>
<td>0.0%</td>
<td>24.0%</td>
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</tr>
<tr>
<td>d4T + 3TC + LPV/r</td>
<td>45.8%</td>
<td>26.4%</td>
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Results:
Total number of patients

Number of patients over time

→Growth in number of patients on ART over time as a result of prevalence is higher than growth in patients as a result of increase in eligibility
## Regimen distribution (Adults)

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#### Regimen distribution (Children)

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<td>0.8%</td>
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<td>0.7%</td>
<td>2.6%</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>33.0%</td>
<td>9.4%</td>
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<td>9.4%</td>
</tr>
<tr>
<td>d4T + 3TC + EFV</td>
<td>51.4%</td>
<td>46.2%</td>
<td>14.1%</td>
<td>1.2%</td>
<td>14.1%</td>
<td>1.2%</td>
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<tr>
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<td>24.0%</td>
<td>71.7%</td>
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<td>71.7%</td>
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<tr>
<td>d4T + 3TC + LPV/r</td>
<td>45.8%</td>
<td>50.1%</td>
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<td>13.4%</td>
<td>26.4%</td>
<td>13.4%</td>
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</tbody>
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### Results:

**Total cost [million 2009 ZAR]**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>2010/11</th>
<th>2016/17</th>
<th>Total</th>
<th>2010/11</th>
<th>2016/17</th>
<th>Total</th>
<th>Change on Full cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Old Guidelines</strong></td>
<td>7,729</td>
<td>19,053</td>
<td><strong>94,647</strong></td>
<td>4,900</td>
<td>12,090</td>
<td>59,961</td>
<td>-33%</td>
</tr>
<tr>
<td><strong>New Guidelines</strong></td>
<td>8,317</td>
<td>22,869</td>
<td><strong>110,152</strong></td>
<td>5,190</td>
<td>14,865</td>
<td><strong>70,489</strong></td>
<td>-35%</td>
</tr>
<tr>
<td><strong>Change on Old GL (Full cost)</strong></td>
<td>8%</td>
<td>20%</td>
<td>17%</td>
<td>-29%</td>
<td>-22%</td>
<td>-25%</td>
<td>-</td>
</tr>
<tr>
<td><strong>Full WHO Guidelines</strong></td>
<td>9,731</td>
<td>25,209</td>
<td><strong>124,925</strong></td>
<td>6,044</td>
<td>16,323</td>
<td><strong>79,565</strong></td>
<td>-33%</td>
</tr>
<tr>
<td><strong>Change on Old GL (Full cost)</strong></td>
<td>27%</td>
<td>33%</td>
<td>32%</td>
<td>-11%</td>
<td>-14%</td>
<td>-16%</td>
<td>-</td>
</tr>
</tbody>
</table>

→ The total cost of the programme increases by 17% and 32%, resp., for the New Guidelines and WHO Guidelines scenarios, as a result of both higher numbers of patients and higher drug cost for TDF-containing regimens.
Progress of the National Treatment Program

- 2.7 Million patients initiated on treatment at over 1400 facilities
- >95% HIV testing and treatment offered in pregnancy; >90% of TB patients are offered HIV testing, the early initiation of treatment is only variably implemented
- PMTCT rates below 3.8% at 6 weeks
- Mortality rates have declined from 2004-2012 (540,000 to 370,000)
- Drug pricing is low – but companies are not investing in the chemical production facilities
- Key population remain a focus
Clinic reported HIV drug stock-out

Percentage of surveyed facilities reporting ARV and/or TB stock outs
HIVDR patterns following first-line ART

- M184V in 64% of patients failing
- Several TAMs in the population
- K65R at 5%

HIVDR patterns following first-line ART

- K103N
- V106M
- Y181C
- G190A

Using Cloud Computing, centralization of script information, multiple pick-up points can be considered
Pharmacy automation enables predictive stock management

Reduction in patient waiting time, missed clinic visits, and improvement in adherence

50% reduction in cost/script dispensed
Robotic Picking Head