HIV treatment: Modelling and Scale up
What are the numbers telling us

Andrew Boulle

4th Southern African HIV Clinicians Society Conference
Outline

• National HIV population projections and treatment uptake (modelled best estimates)

• Service-based validation of modelling focussed on the Western Cape
% of HIV+ adults at different levels of engagement in HIV care

- Undiagnosed
- Diagnosed, ART-naïve
- Previously on ART
- Total on ART

Courtesy: Leigh Johnson
Thembisa Model 4.1
% of HIV+ adults at different levels of engagement in HIV care

53% drop over 10 years in percentage not on ART

Courtesy: Leigh Johnson
Thembisa Model 4.1
50% increase in HIV-infected population over 10 years

Courtesy: Leigh Johnson
Thembisa Model 4.1
30% drop over 10 years in absolute numbers not on ART

Courtesy: Leigh Johnson
Thembisa Model 4.1
Model 4.1

- Undiagnosed
- Diagnosed, ART-naïve
- Previously on ART
- Total on ART

Courtesy: Leigh Johnson
Thembisa Model 4.1
Counsellor completes HIV testing form

Patient sticker placed in counsellor’s logbook

Submitted to counsellor NPO

Original form placed in patient folder

Patient sticker with result forwarded to MOU HIV clinic for capturing in MOU HIV Register

Aggregate data submitted to Information Management

Courtesy: Nisha Jacob
Counsellor completes HIV testing form in duplicate. The original form is placed in the patient folder, while the duplicate form is placed at the facility lab collection point. Forms collected by the lab transport service for transfer to the lab. Forms received at the lab/provincial office for capturing into an integrated database.
Disease monitoring systems (eg HIV / TB)
Laboratory and pharmacy data
Hospital and primary care registration systems
Population register
Many other systems

Health information exchange
or
Data Centre
or
Whatever you want to call it

Clinical viewing
Care cascades and operational reports
Alerting engine (eg. NMC’s)
Management reporting
Epi analyses
Business intelligence
Research support and stewardship
PoCT vs Data Centre HIV Cascade Results for HIV+ (n=11,000, 1200 tested positive)

Courtesy: Nisha Jacob, UCT SPHFM Research Day presentation, September 2018
ART Status of patients testing HIV positive in primary care

Cascade known positive (n=1833)
- ART initiated already: 71%
- Immediate ART initiation: 15%
- Delayed ART initiation: 6%
- Not on ART: 8%

True new positives (n=592)
- ART initiated already: 41%
- Immediate ART initiation: 33%
- Delayed ART initiation: 25%

Courtesy: Nisha Jacob, UCT SPHFM Research Day presentation, September 2018
Triangulating the modelling with real data

Western Cape Province
Approach

Mortality surveillance

Morbidity surveillance

Health service associations with outcomes

Routine data / indicators

Triangulation
Rich picture

Health service implications
## Western Cape: YLLs

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>HIV/AIDS</td>
<td>13.7</td>
<td>13.2</td>
<td>12.4</td>
<td>11.7</td>
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<td>11.7</td>
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<tr>
<td>Interpersonal violence</td>
<td>7.6</td>
<td>8.3</td>
<td>8.3</td>
<td>9.2</td>
<td>10.3</td>
<td>11.3</td>
<td>10.5</td>
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<tr>
<td>Tuberculosis</td>
<td>10.9</td>
<td>8.6</td>
<td>8.6</td>
<td>7.4</td>
<td>6.8</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Diabetes mellitus</td>
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<td>4.6</td>
<td>4.5</td>
<td>4.3</td>
<td>4.3</td>
<td>5.5</td>
<td>5.9</td>
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<tr>
<td>Ischaemic heart disease</td>
<td>5.3</td>
<td>5.9</td>
<td>6.6</td>
<td>6.7</td>
<td>6.6</td>
<td>5.5</td>
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<tr>
<td>Cerebrovascular disease</td>
<td>4.6</td>
<td>4.8</td>
<td>5.1</td>
<td>5.2</td>
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<td>4.7</td>
<td>4.7</td>
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<tr>
<td>Trachea/bronchi/lung CA</td>
<td>3.4</td>
<td>3.5</td>
<td>3.8</td>
<td>3.7</td>
<td>4.1</td>
<td>3.9</td>
<td>4.1</td>
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<tr>
<td>Road injuries</td>
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<td>5.1</td>
<td>4.5</td>
<td>4.6</td>
<td>4.3</td>
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<tr>
<td>COPD</td>
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<td>3.2</td>
<td>3.5</td>
<td>3.8</td>
<td>3.9</td>
<td>3.5</td>
<td>3.8</td>
</tr>
<tr>
<td>Lower respiratory infections</td>
<td>4.1</td>
<td>4.1</td>
<td>4.8</td>
<td>4.2</td>
<td>4.2</td>
<td>2.7</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Top 10, ranked per 2015 (%)

Courtesy: Evans/Morden
Pie chart showing that health conditions requiring sustained support from the health service because of their chronicity (HIV/AIDS and NCDs) are the largest contributors to the burden of disease in the province.
Impact of ART eligibility guidelines on 24m mortality (natural causes)

CD4 200 eligibility era

CD4 350 eligibility era

CD4 500 eligibility era

Start ART within 6m probability

Died within 2 years (compliers)

CD4 count at first presentation in each era in ART-naïve patients (WC)

Courtesy: Meg Osler, unpublished
Approach

- Mortality surveillance
- Morbidity surveillance
- Health service associations with outcomes
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Triangulation
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Health service implications
HIV status among people admitted to medical wards in province and selected hospitals

- Meintjes demonstrated that more than half of medical admissions at GF Jooste were HIV-associated in 2013, higher than in 2003.

- HIV-associatedness of medical admissions seems not to have changed from 2013 to 2018, and the majority of those admissions are now in ART-experienced patients.

- Using a different methodology based just on routine data, this proportion is as high as 50% in high burden facilities (e.g. KDH).
Cryptococcal infection and disease in the WC

*2018 half-year data doubled
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Health service implications
Advanced HIV proxied by CD4 counts < 50 cells/µl

Unique patients with CD4<50 cells/µl per year

Proportion of patients per category per year

> 50% of all CD4<50 in ART-experienced

Osler. Clinical Infectious Diseases, Volume 66
Advanced HIV in 2016, proxied by CD4 < 50 cells/μl

- Prior anti-retroviral treatment
- First ever CD4
- Prior CD4
- Lost to follow-up
- ↑ viral load
- No viral load
- Virologically suppressed

Osler. Clinical Infectious Diseases, Volume 66
Analysis cohorts for HIV-associated TB

612,323 HIV patients first ascertained 2007-2016 linked to 168,951 TB patients first ascertained 2007-2016

- Removed TB prior to HIV and ART start at HIV ascertainment
- Cohort entry lagged by 3m to account for prevalent TB at HIV diagnosis

Analysis 1:
Full dataset
- 494,871 HIV patients linked to 115,374 TB patients

Analysis 2:
3 months lag
- 441,310 HIV patients linked to 61,813 TB patients

Source of TB cases
1. ETR/EDR register
2. Lab
3. Hospital diagnosis
4. Other e.g. drugs

Zinyakatira, IWHOD 2018
HIV-associated TB incidence on and off ART
Rates per 100,000

Gender Time on ART
- 0-6 months
- 6-12 months
- 1-2 years
- 2-3 years
- 4-5 years
- 5+ years
- Total
- Female
- Male

CD4 Count
- 0-49
- 50-199
- 200-349
- 350-499
- 500+
- No CD4 count in past 15 months

Off ART vs On ART

Zinyakatira, IWHOD 2018
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Health service implications
Retention in care for patients starting ART

Corrected 12m retention accounting for silent transfers – 66%

ART workbook, populated through Sinjani
Variation in 12m ART retention by subdistrict
# 2017 TB case-finding in the Western Cape

## Report on TB/HIV Collaborative Activities

<table>
<thead>
<tr>
<th>Quarter 1 to Quarter 4 of 2017</th>
<th>Quarter 1 to Quarter 4 of 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total number of TB patients:</strong></td>
<td><strong>Total number of TB patients:</strong></td>
</tr>
<tr>
<td>41,549</td>
<td>45,722</td>
</tr>
<tr>
<td><strong>Proportion of registered TB patients with known HIV status</strong></td>
<td><strong>Proportion of registered TB patients with known HIV status</strong></td>
</tr>
<tr>
<td>40,420</td>
<td>43,171</td>
</tr>
<tr>
<td>97.3%</td>
<td>94.4%</td>
</tr>
<tr>
<td><strong>Proportion of all TB patients known to be HIV positive</strong></td>
<td><strong>Proportion of all TB patients known to be HIV positive</strong></td>
</tr>
<tr>
<td>15,997</td>
<td>17,807</td>
</tr>
<tr>
<td>38.5%</td>
<td>38.9%</td>
</tr>
<tr>
<td><strong>Proportion of all TB patients known to be HIV positive on CPT</strong></td>
<td><strong>Proportion of all TB patients known to be HIV positive on CPT</strong></td>
</tr>
<tr>
<td>13,796</td>
<td>15,945</td>
</tr>
<tr>
<td>66.2%</td>
<td>88.5%</td>
</tr>
<tr>
<td><strong>Proportion of all TB patients known to be HIV positive on ART</strong></td>
<td><strong>Proportion of all TB patients known to be HIV positive on ART</strong></td>
</tr>
<tr>
<td>13,651</td>
<td>12,420</td>
</tr>
<tr>
<td>85.3%</td>
<td>61.7%</td>
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</tbody>
</table>
## 2017 TB case-finding

### Western Cape Province

<table>
<thead>
<tr>
<th>Total TB cases</th>
<th>Initiated treatment</th>
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<tbody>
<tr>
<td><strong>56,789</strong></td>
<td><strong>43,005 (75.7%)</strong></td>
</tr>
</tbody>
</table>

#### Drug susceptibility

- **MDR**: 1,682 (3.0%)
- **XDR**: 60 (0.1%)
- **RIF**: 215 (0.4%)
- **Mono/Poly**: 457 (0.8%)
- **Sensitive**: 29,870 (52.6%)
- **Not tested**: 24,505 (43.2%)

### Ascertainment basis

- **In register**: 38,923 (68.5%)
- **Lab confirmed**: 29,214 (67.9%)
- **Retreatment cases**: 42,659 (75.6%)
- **Extra-pulmonary TB cases**: 17,618 (31.0%)
- **Not in register**: 4,921 (11.4%)

### Ascertained diagnosis

- **First evidence**: 18,889 (43.0%)
- **<7d**: 21,297 (49.6%)
- **<14d**: 19,862 (46.2%)
- **<28d**: 15 (0.0%)
- **>28d**: 1,785 (4.2%)

### Initial treatment

- **Microscopy**: 1,532 (2.7%)
- **LPA**: 1,896 (4.4%)
- **Culture**: 3,049 (7.1%)
- **Xpert**: 15,737 (27.7%)
- **Lab confirmed**: 21,297 (49.6%)

### Drug specimen

- **ICD10 code**: 147 (0.3%)
- **TB Hospital admission**: 450 (0.8%)
- **Other**: (0.0%)

### Previous TB episodes

- **None**: 40,752 (71.8%)
- **1**: 10,613 (18.7%)
- **2**: 3,561 (6.3%)
- **3**: 1,259 (2.2%)
- **>3**: 604 (1.1%)

### Duration between repeat TB episodes

- **<1 yrs**: 3,762 (23.5%)
- **<2 yrs**: 3,574 (22.3%)
- **<3 yrs**: 2,036 (12.7%)
- **<4 yrs**: 1,485 (9.3%)
- **<5 yrs**: 1,174 (7.3%)
- **>5 yrs**: 4,003 (25.0%)

### Demographics

#### Age

- **0 to 14**: 5,533 (9.7%)
- **15 to 24**: 7,697 (13.6%)
- **25 to 34**: 15,285 (26.9%)
- **35 to 44**: 13,090 (23.1%)
- **45 to 54**: 9,114 (16.0%)
- **55 to 64**: 4,216 (7.4%)
- **> 65**: 1,839 (3.2%)

#### Sex

- **Females**: 24,273 (42.7%)
- **Males**: 32,363 (57.3%)

#### HIV status

- **HIV Positive**: 23,653 (41.7%)
- **Started ART**: 20,111 (35.0%)
- **Pre TB**: 12,032 (64.3%)
- **Post TB**: 7,179 (35.7%)

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Courtesy Alexa Heekes, new Sharepoint report
Approach

- Mortality surveillance
- Morbidity surveillance
- Health service associations with outcomes
- Routine data / indicators

Triangulation
Rich picture

Health service implications
Summary

- In spite of treatment, there is an ongoing or possibly even increasing burden of advanced HIV disease due to:
  - Doubling of HIV population, with patients deteriorating quickly if stopping treatment
  - Poor retention in care of those who do start treatment

- Evidenced by ongoing or increasing:
  - HIV mortality
  - Admission to medical wards that is HIV-associated
  - Presentation with low CD4 counts
  - Cryptococcal meningitis
  - HIV-associated tuberculosis

- For each of the above, data clearly show that the majority of affected patients had previously accessed treatment
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Health service implications
Summary

- From a morbidity and mortality perspective, re-engaging those previously started on ART and initiating those known to the service likely the most impactful approach.
- 2nd generation routine data systems which are actionable at person-level should be pursued.
- New approaches to long term care focussed on supported self-management – move beyond HIV clubs and CCMDD to patient driven vs. system driven differentiated care.
- Identify where in the system the responsibility lies for worrying about the people who are not in care but should be.
Acknowledgements

- Leigh Johnson
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