Country example of quantification and forecasting of HIV diagnostics: methodology, scenario and assumptions

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Geneva

Acknowledgements: Gesine Meyer-Rath, Naseem Cassim, Oriel Mahlatsi Somayya Sarang and the NPP staff.
Overview

- Background
- Methodologies
- Scenario and assumptions (the investment case SA)
- Conclusion
In South Africa what do we need forecasting for?

- To identify the purpose of the quantification and how it will address the program’s needs.
- To provide data on specific commodity requirements and costs for the government’s annual budget allocations.
- To inform donors about funding requirements and advocate for resource mobilization for commodity procurement.
- To estimate commodity needs and assess stock status of the in-country supply pipeline to identify and correct supply imbalances.
- To support an estimate of commodity procurement, storage, and distribution costs.

Source: QUANTIFICATION OF HEALTH COMMODITIES A GUIDE TO FORECASTING AND SUPPLY PLANNING FOR PROCUREMENT, March 2009
The success of accurate Forecasting depends on good quality data

1. **Consumption data**: quantity of each product dispensed or consumed over the past 12-month period

2. **Services data**: number of visits, number of services provided, lab tests conducted, treatment episodes, or number of patients on treatment over the past 12-month period

3. **Morbidity data**: incidence and prevalence of specific diseases/health conditions (may be available by population group or through surveillance or research study group, and extrapolated to estimate national-level incidence and prevalence of specific diseases/health conditions)

4. **Demographic and population data**: population numbers and growth, demographic trends

5. **Information** on current program performance, plans, strategies, and priorities, including specific program targets for each year of the quantification.

Source: QUANTIFICATION OF HEALTH COMMODITIES A GUIDE TO FORECASTING AND SUPPLY PLANNING FOR PROCUREMENT, March 2009
The steps in forecasting

Source: QUANTIFICATION OF HEALTH COMMODITIES A GUIDE TO FORECASTING AND SUPPLY PLANNING FOR PROCUREMENT, March 2009
There are in essence 2 forecasting methods used: i) the Consumption method ii) the Morbidity method

- The consumption method estimates the number of products expected to be consumed.
- The morbidity method estimates the number of people or episodes of a disease that are expected to be treated, and then translates these into the number of products expected to be consumed.
The consumption method

In commemoration of World AIDS Day 2014, South Africa launched an HTC campaign in six sites in Gauteng and KwaZulu-Natal, including the Union Building in Pretoria, South Africa, 29 November 2014.

Source: UNIAIDS
The total number of persons living with HIV in South Africa increased from an estimated 4,09 million in 2002 to 5,51 million by 2014.

HIV prevalence by district, South Africa 2012

For 2014 an estimated 10,2% of the total population is HIV positive.

Shisana, et al. (2012) estimated the HIV prevalence for 2012 at 12,2%.

Approximately one-fifth of South African women in their reproductive ages are HIV positive.

UNAIDS estimates 6.3M PLWH in South Africa

UNAIDS HIV and AIDS estimates (2013)

- Number of people living with HIV: 6,300,000 [6,000,000 - 6,500,000]
- Adults aged 15 to 49 prevalence rate: 19.1% [18.1% - 19.9%]
- Adults aged 15 and up living with HIV: 5,900,000 [5,700,000 - 6,200,000]
- Women aged 15 and up living with HIV: 3,500,000 [3,300,000 - 3,700,000]
In 2014, ± 2,6 million HIV viral loads were performed in South Africa through a network of centralised 17 labs distributed throughout the country using either Abbott or Roche platforms.
Continuous monitoring of VL consumption or utilisation (e.g. data from a period in 2014)
A consumption method of forecasting: Viral Load Test Volumes by Province (Millions of Tests)


Source: NHLS, NPP & CHAI SA
However, the adherence to guidelines and demand for VL monitoring varies within the country. This is monitored through a national dashboard.

Would POCT change this?
What would be the best model of placement POCT / centralised lab be?
What would the impact be on accurate forecasting?
Three forecast figures from South Africa

Source: NHLS, NPP, & CHAI SA
A morbidity based method

Source: SOUTH AFRICA INVESTMENT CASE
What is the Investment Approach?

The HIV strategic investment approach was developed in 2011 by an international group of experts, including from UNAIDS, the Global Fund, the Bill & Melinda Gates Foundation, civil society organizations (CSOs), the World Bank, the WHO, UNICEF and PEPFAR to increase the impact of HIV funding and to assist countries in planning and prioritizing different elements of an effective, efficient and sustainable AIDS response.
The investment case: framework and investment required

### Investment framework

- **For whom?** Explicitly identify and prioritise populations on the basis of the epidemic profile
- **How?** Use the human rights approach to achieve dignity and security

#### Critical enablers

<table>
<thead>
<tr>
<th>Social enablers</th>
<th>Programme enablers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political commitment and advocacy</td>
<td>Community-centred design and delivery</td>
</tr>
<tr>
<td>Laws, legal policies, and practices</td>
<td>Programme communication</td>
</tr>
<tr>
<td>Community mobilisation</td>
<td>Management and incentives</td>
</tr>
<tr>
<td>Stigma reduction</td>
<td>Procurement and distribution</td>
</tr>
<tr>
<td>Mass media</td>
<td>Research and innovation</td>
</tr>
<tr>
<td>Local responses to change risk environment</td>
<td></td>
</tr>
</tbody>
</table>

#### Basic programme activities

- PMTCT
- Condom promotion and distribution
- Key populations (sex work, MSM, IDU programmes)
- Treatment, care, and support to people living with HIV/AIDS (including facility-based testing)
- Male circumcision
- Behaviour change programmes

#### Objectives

- Reduce risk
- Reduce likelihood of transmission
- Reduce mortality and morbidity

#### Table 2: Resources required for the investment framework over time (billions of US$)

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic programmes (total)</td>
<td>$7.0</td>
<td>$12.9</td>
<td>$10.6</td>
</tr>
<tr>
<td>Prevention of mother-to-child transmission</td>
<td>$0.9</td>
<td>$1.5</td>
<td>$1.3</td>
</tr>
<tr>
<td>Condom promotion</td>
<td>$0.4</td>
<td>$0.5</td>
<td>$0.6</td>
</tr>
<tr>
<td>Sex work</td>
<td>$0.2</td>
<td>$0.2</td>
<td>$0.2</td>
</tr>
<tr>
<td>Men who have sex with men</td>
<td>$0.3</td>
<td>$0.7</td>
<td>$0.7</td>
</tr>
<tr>
<td>Injecting drug users</td>
<td>$0.5</td>
<td>$2.3</td>
<td>$1.5</td>
</tr>
<tr>
<td>Treatment, care, and support (including provision of provider-initiated counselling and testing)</td>
<td>$4.5</td>
<td>$6.7</td>
<td>$5.5</td>
</tr>
<tr>
<td>Male circumcision</td>
<td>$0.1</td>
<td>$0.2</td>
<td>$0.1</td>
</tr>
<tr>
<td>Behaviour change programmes</td>
<td>$0.2</td>
<td>$0.7</td>
<td>$0.7</td>
</tr>
<tr>
<td>Critical enablers</td>
<td>$5.9</td>
<td>$3.4</td>
<td>$3.7</td>
</tr>
<tr>
<td>Synergies with development sectors</td>
<td>$3.6</td>
<td>$5.8</td>
<td>$5.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$16.6</td>
<td>$22.0</td>
<td>$19.8</td>
</tr>
</tbody>
</table>
The investment case framework differs from previous approaches in 5 ways:

1. Elements are included on a graduated basis of existing evidence of what works in prevention, treatment, care and support
2. Applies a rigorous approach to the estimation of the population in which new infections occur (in country)
3. It assumes that efficiencies are gain by shifting service provisions, placing greater emphasis on community mobilisation
4. Emphasis on synergies between programme elements (attempt at quantification)
5. It attempts to close the gap between global resources estimations and large scale programming.
Forecasting new HIV infections in the general population in KwaZulu-Natal, South Africa

The baselines assume no further interventions are implemented.

The broad-shallow lines show an estimation of a wide range of interventions applied at modest scales.

The narrow-deep lines show an estimation of targeting of a small number of the most effective interventions to high scales.
Purpose of South African HIV and TB Investment Case

- Inform (change) national HIV and TB policy
- Inform relevant domestic budgets
  - National-level MTEF envelope (Phase 1)
  - HIV Conditional Grant (Phase 2 onwards)
  - Provincial Equitable Share (Phase 2 onwards)
- Inform concept note for GFATM proposal(s)
- Inform donor budgets (incl. PEPFAR)
- Audience: cabinet, national departments incl. Treasury, SANAC, premiers, provincial, district and local AIDS councils, civil society, private sector, development organisations

Acknowledgement: Gesine Meyer-Rath from He2Ro
South African HIV and TB Investment Case: Objectives and scenarios

Calculate the cost, impact on HIV and TB, and cost-effectiveness of a mix of 24 HIV interventions over 20 years under 5 scenarios, each at current and optimal levels of technical efficiency:

1. **Baseline** scenario (no change over current coverage levels)
2. **Government** scenario (current government targets) – 2014/15 to 2018/19 only
3. **Optimisation** scenarios (coverage based on optimal cost-effectiveness)
   a. **Unconstrained optimisation** (no budget constraint)
   b. **Constrained optimisation** (under currently committed HIV budget from SAG, USG and GF)
   c. **90/90/90** (optimal coverage to reach UNAIDS’ 90/90/90 targets)
   d. **90/90/90 budget** (including enablers if current government policy and suggested during evidence synthesis process)

Acknowledgement: Gesine Meyer-Rath from He2Ro
The 3rd 90% - HIV VL in SA - 2014

- <400: 74%
- >400 <= 1,000: 6%
- >1,000 <= 10,000: 9%
- >10,000 <= 100,000: 4%
- >100,000: 7%
Interventions included

**Care and treatment:**
- Cotrimoxazole
- ART at current guidelines (eligibility at CD4 < 500 and PMTCT option B+)
- Universal test and treat

**Medical male circumcision (MMC):**
- General population MMC
- Early infant male circumcision
- MMC age targeting (10-14)
- MMC age targeting (15-19)
- MMC age targeting (20-24)
- MMC age targeting (25-49)

**HCT:**
- HCT (general population)
- Testing of pregnant women
- Testing of adolescents
- Infant testing at birth
- Infant testing at 6 weeks

**Comprehensive condom programming:**
- Condom availability
- Male and female condom education

**PMTCT** (Initiation of triple ART during pregnancy)

**Social Behaviour Change Communication (SBCC):**
- Campaign 1 *(message: adolescent testing, multiple partners)*
- Campaign 2 *(message: condom usage and self-efficacy)*
- Campaign 3 *(message: testing, condom usage and self-efficacy, MMC)*

**Other biomedical prevention:**
- PrEP for discordant couples
- PrEP for adolescents
- Microbicides

**Key populations:**
- PrEP for sex workers

Acknowledgement: Gesine Meyer-Rath from He2Ro
Cost model:
Cost over 20 years

Epidemiological models:
Life years saved over 20 years

Model suite:
Data flow between models

THEMBISA
(main analysis)

SPECTRUM
(key populations only)
- GOALS
- AIM (AIDS Impact Model)

TIME
(TB Impact Model and Estimates)

HIV COST MODEL

ART: National ART Cost Model
(NACM)
- All other HIV interventions

Stop TB Cost Model

Cost model:
Cost over 20 years

Acknowledgement: Gesine Meyer-Rath from He2Ro
Optimisation scenarios: Methods

1. Calculated incremental cost effectiveness (ICER, cost/ life year saved) for each intervention/ coverage option
   • 24 interventions x 1 to 3 coverage levels (30%, 60%, 90%) → 50 options
   • Each option includes the cost and impact of scaling one intervention up (or down) PLUS of the entire HIV programme kept constant
2. Ranked all 50 options by ICER
3. Added most cost effective intervention and re-calculated ICER of all remaining interventions based on this new baseline
4. Added next cost-effective intervention
5. Re-did until all interventions had been ranked

Acknowledgement: Gesine Meyer-Rath from He2Ro
## Optimisation scenarios

### Unconstrained optimisation

<table>
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<tr>
<th>Program Area</th>
<th>Optimisation Percentage</th>
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<tr>
<td>Condom availability</td>
<td>(90%)</td>
</tr>
<tr>
<td>MMC</td>
<td>(90%)</td>
</tr>
<tr>
<td>SBCC campaign 1</td>
<td>(90%)</td>
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<tr>
<td>MMC age group targeting (15-19)</td>
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<td>Testing at 6 weeks</td>
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</tr>
<tr>
<td>ART at current guidelines</td>
<td>(90%)</td>
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<tr>
<td>PMTCT B+</td>
<td>(60%)</td>
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<td>HCT</td>
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</tr>
<tr>
<td>SBCC campaign 3</td>
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</tr>
<tr>
<td>Universal test and treat</td>
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</tr>
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<td>Birth testing</td>
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### Constrained optimisation

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### 90/90/90

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### Budget constraint (ZAR millions)

<table>
<thead>
<tr>
<th>Source</th>
<th>2014/15</th>
<th>2015/16</th>
<th>2016/17</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG &amp; ES (SA govt)</td>
<td>14,698</td>
<td>16,425</td>
<td>18,358</td>
</tr>
<tr>
<td>PEPFAR</td>
<td>3,670</td>
<td>3,300</td>
<td>2,800</td>
</tr>
<tr>
<td>GFATM</td>
<td>1,246</td>
<td>1,400</td>
<td>541</td>
</tr>
<tr>
<td>Total funding envelope</td>
<td>19,613</td>
<td>21,125</td>
<td>21,699</td>
</tr>
</tbody>
</table>
SA investment case forecast of # people on ART

Viral Load monitoring according to current guidelines specifies 1 VL after 6 months of initiation and at 12 months.

Thereafter, yearly forecasting of VL commodities will become more complex with a mix model of lab-POCT based testing.
Conclusions:

- The science/art of forecasting has become more sophisticated and relies heavily on country data.
- Forecasting is a dynamic process that can be overtaken by guideline changes and availability of new technologies.
- The forecasting of laboratory commodities should be more closely linked to the forecasting efforts on ARVs.
- Closing the gap between forecast and real consumption requires clear understanding of in-country barriers to expand ARV coverage and diagnosis or monitoring.
- Lab versus POCT based HIV diagnostics mix still requires further modeling to find the most effective placement (impact and cost).

For further details: Gesine Meyer-Rath, gesine@bu.edu