ECONOMICS of HIV SELF-TESTING
AN OVERVIEW OF LEARNINGS

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Background

- ECONOMICS NETWORK
- SUMMARY OF FINDINGS
  - COSTS
  - COST-EFFECTIVENESS
  - USER BEHAVIOUR:
    - PREFERENCES
    - WILLINGNESS TO ACCEPT (& PAY)
STAR Economics Network approach

- Multi-country collaboration of economists
  - Methods development
  - Joint cross country analyses and outputs
    ➢ Strong & lasting economics network, 7 PhD enrolments

Facility Costing
HIV ST Costing
Cost Effectiveness
User costs
Preferences
Equity

Malawi
Zambia
Zimbabwe
Lesotho
South Africa

Mwenge, PlosOne 2017
Mangenah, JAIS 2019
D’Elbee, AIDS 2020
Cambiano, Cambiano 2019
Eaton, JAIS 2019
Sande, AIDS Care 2018
Indravudh, AIDS 2017
D’Elbee, AIDS 2018
Sibanda, JAIS 2019

More in pipeline
Costs of HIV Testing
Costing Methods

• Models:
  • Facility Provider delivered testing;
  • HIVST: 1.community based delivery, 2.community led delivery, 3.facility-based primary and secondary; 4.workplace, 5.private sector, 6.integrated mobile testing, 7.key pops and 8.FSW.

• Full (includes above service level costs), unless stated as incremental.
• Provider’s perspective: Line-by-Line project expenditures allocated to Distribution Models and Sites
  • Allocation factors based on # staff, # kits, distance, and direct site expenditures
  • Complemented analysis with Time and motion studies and onsite observations
  • Start-up, training and other capital costs annualise 3% and local DR
Costs: Provider delivered and HIVST in communities
Mwenge 2017, Mangenah 2019

Cross country study: Malawi, Zimbabwe, Zambia

- Wide variation in unit costs by site
- Provider delivered facility testing: $5-$20
- HIV Self-Testing - Community based distribution: $8-$17
- Economies of Scale

<table>
<thead>
<tr>
<th>Country (sites)</th>
<th>Ave. cost</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malawi (11)</td>
<td>$ 8.15</td>
<td>$ 7.20</td>
<td>$ 17.04</td>
</tr>
<tr>
<td>Zambia (16)</td>
<td>$16.42</td>
<td>$ 7.03</td>
<td>$ 50.01</td>
</tr>
<tr>
<td>Zimbabwe (60)</td>
<td>$ 13.79</td>
<td>$ 7.90</td>
<td>$ 54.44</td>
</tr>
</tbody>
</table>

Cost per Kit vs Number of Kits distributed

![Graph showing cost per kit vs number of kits distributed for Malawi, Zambia, and Zimbabwe with provider delivered and community based HIVST costs.](image-url)
Primary & Secondary HIVST Delivery in Facilities, Cost per kit distributed

Sande 2020

Zambia Primary: $4.92
Zambia Secondary: $7.05
Zimbabwe Primary: $9.24
Zimbabwe Secondary: $9.05
Malawi Secondary: $8.66
South Africa Secondary: $13.40

Categories:
- mHealth
- Other recurrent
- Waste management
- Test Kits
- Transport
- Test Kits
- Supplies
- Personnel
- Sensitisation
- Training
- Equipment
HIVST distribution at transport hubs in Zimbabwe, by distribution site

Mangenah 2020

Low volume, high cost

High volume, low cost
Private sector delivery in Zambia: from small retailers, hairdressers to employer led delivery. Mwenge, 2020

Incremental Unit cost by distribution quantity

<table>
<thead>
<tr>
<th>Distribution</th>
<th>Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail (2401)</td>
<td>$7.21</td>
</tr>
<tr>
<td>Retail (2638)</td>
<td>$6.88</td>
</tr>
<tr>
<td>Retail (2642)</td>
<td>$5.75</td>
</tr>
<tr>
<td>Retail (2879)</td>
<td>$8.62</td>
</tr>
<tr>
<td>Retail (3600)</td>
<td>$7.49</td>
</tr>
<tr>
<td>Work place (1679)</td>
<td>$6.83</td>
</tr>
<tr>
<td>Work place (4558)</td>
<td>$2.97</td>
</tr>
<tr>
<td>Work place (4559)</td>
<td>$4.98</td>
</tr>
</tbody>
</table>
Costs - lessons

• As new product distribution matures, programmes learn and adapt
  -> D’elbee's presentation
  New models develop that can deliver large quantities at low costs
  -> Rath-Meyer's presentation
• But cost per kit is not the full story......

-> Cost effectiveness
RESULTS: Eswatini testing -> linkage -> treatment -> impact

McGee 2020

CASCADE RESULTS Eswatini, McGee 2020

- # kits distributed
- # clients tested
- # clients reactive
- # clients confirmatory testing
- # clients - ART initiation

DALYs averted

91%

3.62%

96%

83%
RESULTS: Cost per kit only part of the story

<table>
<thead>
<tr>
<th></th>
<th>COMMUNITY</th>
<th>WORKPLACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total HIVST costs</td>
<td>$272,684</td>
<td>$57,386</td>
</tr>
<tr>
<td># HIVST kits distributed</td>
<td>15,864</td>
<td>3,291</td>
</tr>
<tr>
<td>$/kit distributed</td>
<td>$17.19</td>
<td>$17.44</td>
</tr>
<tr>
<td>$/client tested</td>
<td>$18.77</td>
<td>$19.56</td>
</tr>
<tr>
<td>$/client reactive HIVST test</td>
<td>$526.86</td>
<td>$497.69</td>
</tr>
<tr>
<td>$/client confirmed +</td>
<td>$556.34</td>
<td>$526.10</td>
</tr>
<tr>
<td>$/client initiating ART</td>
<td>$713.54</td>
<td>$685.04</td>
</tr>
</tbody>
</table>
Cost effectiveness: how to evaluate from intermediate outcomes
Phillips & Cambiano 2019

> 50% probability of being cost effective if cost-of-testing-pre-new-HIV-diagnosis < $315; for men only $585
Cost effectiveness and health gains by different levels of undiagnosed HIV prevalence & across populations

Cambiano, 2020

Adapted using simulations from Cambiano et al. JIAS[54]
Yield declines as most PLHIV are diagnosed and on ART. At the limit, new diagnoses will represent new infections since most existing infections will already be diagnosed.

But HIV testing not only a supply side question

*Demand constraints, user preferences and behavioural nudges*
Societal costs: identifying demand constraints

Sande, Aids Care 2017

Costs of accessing HIV testing services among rural Malawi communities

Linda Sande, Hendramoorthy Maheswaran, Collin Mangenah, Lawrence

- **Community HIVST**: $8.15
- **Facility HTS**: $5.03 (Provider's Costs), $2.45 (User's Costs)

- F$1.83, M$3.81
Supporting Linkage to care after HIVST in Malawi and Zambia – Pooled data analysis Elbée, AIDS 2018

- Largely consistent preferences for testing across countries
  - Phone call preferred post test support
  - Paying for confirmatory testing and waiting times strong barrier to linkage
Influencing user behaviour: worth it?
Partner distribution in ANC in Malawi, Sande, 2020

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>SoC</th>
<th>HIVST</th>
<th>HIVST + Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>$1.14</td>
<td>$3.50</td>
<td>$4.18</td>
</tr>
<tr>
<td>Sensitisation</td>
<td>$0.39</td>
<td>$0.42</td>
<td>$0.39</td>
</tr>
<tr>
<td>Other Capital</td>
<td>$0.06</td>
<td>$0.31</td>
<td>$0.26</td>
</tr>
<tr>
<td>Management Costs</td>
<td>$2.35</td>
<td>$3.91</td>
<td>$4.74</td>
</tr>
<tr>
<td>Supplies</td>
<td>$0.33</td>
<td>$0.33</td>
<td>$0.32</td>
</tr>
<tr>
<td>Test Kits</td>
<td>$-$</td>
<td>$2.56</td>
<td>$2.56</td>
</tr>
<tr>
<td>Uptake Incentives</td>
<td>$-$</td>
<td>$-$</td>
<td>$10.00</td>
</tr>
<tr>
<td>Incentive Administration</td>
<td>$-$</td>
<td>$-$</td>
<td>$4.32</td>
</tr>
<tr>
<td>$/Partner Invite or kit distr.</td>
<td>$4.28</td>
<td>$11.02</td>
<td>$12.45 ex. Incent.</td>
</tr>
<tr>
<td>$/Partner tested</td>
<td>$9.68</td>
<td>$12.18</td>
<td>$15.85 ex. Incent.</td>
</tr>
<tr>
<td>$/Partner confirmed Positive</td>
<td>$625</td>
<td>$1,131</td>
<td>$700 w incentive</td>
</tr>
</tbody>
</table>

# positive
9 13 55
Conclusions

• Cost per kit distributed for HIVST slightly higher than conventional HTS, but potential to scale up to unreached populations.

• Cost per person diagnosed and linked crucial and not directly correlated w $/kit

• Large economies of scale and

• Changes over time: maturity ↓ but saturation ↑

• High costs associate with getting tested, particularly among adult men

• User fees and waiting time key barrier to testing : can programmes alleviate these?

• Next up cascades of care.
WEBINAR 6/6

HIV Costing, Cost-Effectiveness and Impact Modeling

Thursday 22 October 2020
9am EST/ 3pm CAT

Unitaid
HIV Self-Testing Africa Initiative

atlas
The Cost and Intermediary Cost Effectiveness of Oral HIV Self-Test Kit Distribution Across Eleven Distribution Models in South Africa

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2. London School of Hygiene and Tropical Medicine, UK
3. Wits Reproductive Health & HIV Institute, University of the Witwatersrand, South Africa
4. Ezintsha, Wits Reproductive Health and HIV Research Institute, University of the Witwatersrand, South Africa
5. Society for Family Health, South Africa
7. World Health Organization, Switzerland
8. National Department of Health, South Africa
9. Department of Global Health, Boston University, US
Background

- South Africa has reached the first UNAIDS 90-90-90 on average, but gaps among men and young people remain.
- Most testing to date is facility-based HTS.

Source: Thembisa (South African HIV transmission model)
Aim

To provide evidence for governments making decisions regarding the further scale up of self-testing after the end of the STAR initiative

→ How much does HIVST cost compared to other testing?
→ If it is more expensive, is it worth it?
→ What are the most efficient and cost effective HIVST distribution models?
Methods: Cost analysis

• Same methods as 5 other countries (STAR Phase I)

• Economic costs of distribution evaluated from the provider’s perspective from April 2018 to March 2019 (July 2018 to June 2019)

• Top-down costing plus detailed expenditure analysis and on-site time in motion analysis (in integrated models)
  • Continuous consultations with implementing staff and team managers

• Cost items categorized as:
  • *Capital cost* – start-up training, building & storage, sensitization, equipment and vehicles

  • *Recurrent items* – personnel, test kits, other supplies, transportation, building operations & maintenance and mHealth

• Excluded study costs not relevant to routine implementation
Methods: Outcomes

• Outcomes based on survey of 7% of kit recipients
  • Uptake
  • Yield (screening positivity)
  • Linkage to confirmatory testing
  • ART initiation

• Estimated intermediate cost-effectiveness:
  • total costs, cost per test kit distributed
  • cost per client with reactive HIVST test
  • cost per client confirmed positive
  • cost per client initiating ART
Models included

1. Facility distribution models:
   • **Horizontal PHC (ANC):**
     pregnant women, secondary only; clinic’s own HCT counsellors
   • **Horizontal PHC (Index):**
     known PLHIV, secondary only; clinic’s own HCT counsellors
   • **Vertical PHC:**
     any client, primary only; on-site only; stand-alone distribution agents
Models included

2. **Community distribution models:**

- **Fixed point:** busy thoroughfares, primary + secondary; on site and off; HCT on site
- **Transport hub:** busy taxi ranks etc, primary; off site only
- **Flexible community model:** all over the place, primary + secondary
Models included

2. Community distribution models:

- **Sex worker network**: to peers, secondary only; integrated into existing FSW programme
- **Key populations**: to FSW and truckers, primary + secondary; not integrated
- **Mobile integration**: alongside mobile HCT, primary + secondary; on site and off; HCT on site
Models included

3. Workplace distribution models:

• **Workplace (direct)**: large and small workplaces; primary + secondary; same distributing staff as other models

• **Workplace (third party)**: large and small workplaces; primary + secondary; third party distributors
Results: Outcomes
## Kits distributed by model

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of HIVST kits distributed</th>
<th>% of total HIVST kits distributed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal PHC (ANC)</td>
<td>5,452</td>
<td>0.9%</td>
</tr>
<tr>
<td>Horizontal PHC (Index)</td>
<td>3,830</td>
<td>0.6%</td>
</tr>
<tr>
<td>Vertical PHC</td>
<td>6,549</td>
<td>1.1%</td>
</tr>
<tr>
<td>Fixed point</td>
<td>103,120</td>
<td>17%</td>
</tr>
<tr>
<td>Mobile integration</td>
<td>2,173</td>
<td>0.4%</td>
</tr>
<tr>
<td>Transport hubs</td>
<td>163,404</td>
<td>27%</td>
</tr>
<tr>
<td>Flexible community</td>
<td>43,034</td>
<td>7%</td>
</tr>
<tr>
<td>Key populations</td>
<td>16,069</td>
<td>3%</td>
</tr>
<tr>
<td>Sex worker</td>
<td>12,218</td>
<td>2%</td>
</tr>
<tr>
<td>Workplace (Third party)</td>
<td>211,453</td>
<td>35%</td>
</tr>
<tr>
<td>Workplace (Direct)</td>
<td>44,032</td>
<td>7%</td>
</tr>
</tbody>
</table>
Care cascade by model

Horizontal PHC (ANC) | Horizontal PHC (Index) | Vertical PHC | Fixed point | Mobile integration* | Transport hubs | Flexible community | Key populations | Sex worker (Third-party) | Workplace (Direct)

% screening positive  | % presenting for confirmatory testing  | % initiated ART  | % initiated ART among screened positive

92%  | 72%  | 94%  | 100%  | 68%  | 48%  | 93%  | 86%  | 93%  | 77%  | 95%
23%  | 24%  | 24%  | 5%  | 4%  | 2%  | 19%  | 34%  | 49%  | 51%  | 32%
78%  | 76%  | 71%  | 5%  | 9%  | 8%  | 34%  | 52%  | 17%  | 7%  | 30%
5%  | 5%  | 6%  | 5%  | 9%  | 8%  | 34%  | 17%  | 17%  | 4%  | 7%
Care cascade by model

- **Horizontal PHC (ANC):** % screening positive 78%, % presenting for confirmatory testing 72%, % initiated ART 92%.
- **Horizontal PHC (Index):** % screening positive 76%, % presenting for confirmatory testing 71%, % initiated ART 94%.
- **Vertical PHC:** % screening positive 68%, % presenting for confirmatory testing 24%, % initiated ART 5%.
- **Fixed point:** % screening positive 9%, % presenting for confirmatory testing 5%, % initiated ART 4%.
- **Mobile integration*:** % screening positive 48%, % presenting for confirmatory testing 9%, % initiated ART 19%.
- **Transport hubs:** % screening positive 66%, % presenting for confirmatory testing 8%, % initiated ART 52%.
- **Flexible community:** % screening positive 34%, % presenting for confirmatory testing 38%, % initiated ART 40%.
- **Key populations:** % screening positive 86%, % presenting for confirmatory testing 17%, % initiated ART 17%.
- **Sex worker (Third-party):** % screening positive 52%, % presenting for confirmatory testing 49%, % initiated ART 51%.
- **Workplace (Direct):** % screening positive 40%, % presenting for confirmatory testing 40%, % initiated ART 77%.
- **Workplace (Direct):** % screening positive 32%, % presenting for confirmatory testing 32%, % initiated ART 30%.

Key populations: Sex worker (Third-party), Workplace (Direct).

Legend:
- % screening positive
- % presenting for confirmatory testing
- % initiated ART
- % initiated ART among screened positive
### Care cascade by model

<table>
<thead>
<tr>
<th>Model</th>
<th>% screening positive</th>
<th>% presenting for confirmatory testing</th>
<th>% initiated ART</th>
<th>% initiated ART among screened positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal PHC (ANC)</td>
<td>92%</td>
<td>78%</td>
<td>94%</td>
<td>72%</td>
</tr>
<tr>
<td>Horizontal PHC (Index)</td>
<td>76%</td>
<td>72%</td>
<td>71%</td>
<td>68%</td>
</tr>
<tr>
<td>Vertical PHC</td>
<td>78%</td>
<td>72%</td>
<td>71%</td>
<td>68%</td>
</tr>
<tr>
<td>Fixed point</td>
<td>6%</td>
<td>5%</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>Mobile integration*</td>
<td>5%</td>
<td>9%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>Transport hubs</td>
<td>8%</td>
<td>9%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>Flexible community</td>
<td>40%</td>
<td>48%</td>
<td>52%</td>
<td>48%</td>
</tr>
<tr>
<td>Key populations</td>
<td>38%</td>
<td>66%</td>
<td>66%</td>
<td>66%</td>
</tr>
<tr>
<td>Sex worker (Third-party)</td>
<td>17%</td>
<td>19%</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>Workplace (Direct)</td>
<td>40%</td>
<td>52%</td>
<td>52%</td>
<td>49%</td>
</tr>
<tr>
<td>Workplace (Direct)</td>
<td>32%</td>
<td>40%</td>
<td>52%</td>
<td>49%</td>
</tr>
</tbody>
</table>

Legend:
- % screening positive
- % presenting for confirmatory testing
- % initiated ART
- % initiated ART among screened positive
Care cascade by model

- Horizontal PHC (ANC): 92% screening positive, 78% initiated ART among screened positive
- Horizontal PHC (Index): 94% screening positive, 72% initiated ART among screened positive
- Vertical PHC: 100% screening positive, 100% initiated ART among screened positive
- Fixed point: 24% screening positive, 5% initiated ART among screened positive
- Mobile integration*: 48% screening positive, 19% initiated ART among screened positive
- Transport hubs: 52% screening positive, 8% initiated ART among screened positive
- Flexible community: 34% screening positive, 40% initiated ART among screened positive
- Key populations: 38% screening positive, 19% initiated ART among screened positive
- Sex worker (Third-party): 52% screening positive, 49% initiated ART among screened positive
- Workplace (Direct): 77% screening positive, 7% initiated ART among screened positive
- Workplace (Third-party): 51% screening positive, 4% initiated ART among screened positive

Key populations: Sex worker (Third-party), Workplace (Direct)

Legend:
- % screening positive
- % presenting for confirmatory testing
- % initiated ART
- % initiated ART among screened positive

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Results: Costs
Distribution of total costs into categories

- Horizontal PHC (ANC)
- Horizontal PHC (Index)
- Vertical PHC
- Fixed point integration
- Mobile hubs
- Transport community
- Flexible populations
- Key sex worker workplaces
- Workplace (Third party)
- Workplace (Direct)

- Training and sensitisation
- Equipment and vehicles
- Test kits
- Building & storage
- Vehicles
- Start-up other
- Personnel
- Other supplies
- Transportation
Distribution volume, average cost and yield

Facility models are marked blue, community models, teal, and workplace models, orange. Bubble size represents yield.
Results: Intermediary cost-effectiveness
### Ranking of models by outcome

<table>
<thead>
<tr>
<th>Number of kits distributed</th>
<th>Cost per test kit distributed</th>
<th>Cost per recipient screening positive</th>
<th>Cost per recipient confirmed positive</th>
<th>Cost per recipient initiating ART</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workplace (Third party)</td>
<td>Sex worker</td>
<td>Sex worker</td>
<td>Sex worker</td>
<td>Sex worker</td>
</tr>
<tr>
<td>Transport hubs</td>
<td>Transport hubs</td>
<td>Horizontal PHC (Index)</td>
<td>Horizontal PHC (Index)</td>
<td>Horizontal PHC (Index)</td>
</tr>
<tr>
<td>Fixed point</td>
<td>Workplace (Third party)</td>
<td>Transport hubs</td>
<td>Transport hubs</td>
<td>Transport hubs</td>
</tr>
<tr>
<td>Workplace (Direct)</td>
<td>Fixed point</td>
<td>Workplace (Direct)</td>
<td>Fixed point</td>
<td>Workplace (Direct)</td>
</tr>
<tr>
<td>Flexible community</td>
<td>Key populations</td>
<td>Fixed point</td>
<td>Workplace (Third party)</td>
<td>Horizontal PHC (ANC)</td>
</tr>
<tr>
<td>Key populations</td>
<td>Flexible community</td>
<td>Workplace (Third party)</td>
<td>Horizontal PHC (ANC)</td>
<td>Workplace (Third party)</td>
</tr>
<tr>
<td>Sex worker</td>
<td>Workplace (Direct)</td>
<td>Horizontal PHC (ANC)</td>
<td>Workplace (Direct)</td>
<td>Mobile integration</td>
</tr>
<tr>
<td>Vertical PHC</td>
<td>Horizontal PHC (Index)</td>
<td>Mobile integration</td>
<td>Mobile integration</td>
<td>Fixed point</td>
</tr>
<tr>
<td>Horizontal PHC (ANC)</td>
<td>Horizontal PHC (ANC)</td>
<td>Vertical PHC</td>
<td>Vertical PHC</td>
<td>Flexible community</td>
</tr>
<tr>
<td>Horizontal PHC (Index)</td>
<td>Mobile integration</td>
<td>Flexible community</td>
<td>Flexible community</td>
<td>Vertical PHC</td>
</tr>
<tr>
<td>Mobile integration</td>
<td>Vertical PHC</td>
<td>Key populations</td>
<td>Key populations</td>
<td>Key populations</td>
</tr>
</tbody>
</table>

- **Sex worker network model most cost-effective, key population model least cost-effective of all models**
- **Facility models**: horizontal models cheaper than vertical
- **Workplace models**: yield and ART initiation higher in direct model, testing uptake higher in third party
Limitations

• Implementation was managed by a non-governmental initiative → both costs and outcomes might change once HIVST becomes part of routine care

• Outcomes based on phone surveys of recipients subject to a number of biases, including social desirability → overestimated uptake, underestimated positivity

• Did not differentiate between primary and secondary distribution → probably offering both is the best way to fulfil demand anyway

• Used intermediary outcomes particular to HIVST only → analysis does not help with decision on whether to invest more in HIVST, only which models
Conclusions

- Distribution models varied widely along four characteristics: distribution volume; yield; linkage to care; and cost

- **Distribution volume**: highest in models that targeted public spaces with high footfall (fixed point and transport hub distribution), followed by workplace models

- **Yield**, or screening positivity, was highest in the models targeting sex worker networks and partners of known HIV positives (index testing)

- **Linkage**
  - **to confirmatory testing**: highest in models that offered HTC on site
  - **to ART initiation**: highest in models that were situated within a facility
Conclusions

• The workplace, transport hub or fixed point models are best for distributing the largest number of kits.

• The transport hubs and workplace models as well as the sex worker model distribute kits in the most efficient and least costly way.

• If the aim is to distribute kits in a way that finds the most HIV positive people most cheaply, secondary distribution via index cases at facility as well as sex worker network distribution are most efficient.

• Average costs per kit distributed comparable to cost of community-based HIVT distribution in Malawi, Zambia and Zimbabwe ($8.91 to $17.70)\textsuperscript{1,2}

• Cost per person confirmed positive ($52 to $7,345) way higher than cost per positive HIV test of rapid-test based modalities ($4.74 to $17.89 in 2016 USD) → need modelling of cost per additional PLHIV found positive\textsuperscript{3}

\textsuperscript{1} Maheswaran et al., BMC Med 2016
\textsuperscript{2} Mangenah JIAS 2019
\textsuperscript{3} Johnson et al, Sci. Rep 2019
Next steps

• Model full cost effectiveness using Thembisa
  • Replacement effects between HIVST and other testing
  • Cost per additional person found positive
  • Cost per life year saved, taking into account full impact on programme

→ allows government to compare cost-effectiveness of HST against other HTS modalities and other HIV and health interventions
Thanks to...

- National Department of Health
- staff and patients of the clinics and distribution teams involved
- staff at the Wits Reproductive Health Institute (Wits RHI), Society for Family Health, and Population Services International
- Vinolia Ntjikelane, Nonhlanhla Tshabalala and Clive Ramushu for stellar assistance with the data collection for the time and motion study and the cost analysis overall

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WEBINAR 6/6

HIV Costing, Cost-Effectiveness and Impact Modeling

Thursday 22 October 2020
9am EST/ 3pm CAT

Unitaid
HIV Self-Testing Africa Initiative
38atlas
Using HIV self-testing to increase the affordability of community-based HIV testing services: A longitudinal analysis in Lesotho

Marc d’Elbée – Research fellow
Centre for Health Economics in London
London School of Hygiene and Tropical Medicine

STAR Webinar 6/6
HIV costing, cost-effectiveness and impact modelling
Thursday 22nd October 2020
Background

- Lesotho has the second highest HIV burden in the world:
  - Prevalence of 25.6%
  - Annual incidence of 1.1% among adults (LePHIA, 2019)

- Lesotho MoH added HIV self-testing (HIVST) to the national HTS strategy in 2017

- Population Services International community-based HTS programme is the largest in Lesotho with mobile outreach and index testing activities in five priority districts (Maseru, Leribe, Berea, Mafeteng, Mohale’s Hoek)

- The objectives of this study were:
  - To estimate over two years the full costs of the HTS programme and the full and incremental costs of adding HIVST
  - To compare costs for HIV-positive case finding before and after integration of HIVST in order to investigate potential efficiency gains from the addition of self-testing and from continuous programme development
Methods

• Data collection on provider’s costs and programmatic outcomes between May 2017 and April 2019 (Figure 1).

• 3 periods:
  - Period 1 - HTS only (before introduction of HIVST)
  - Period 2 - HTS and HIVST
  - Period 3 - HTS and HIVST with individual HIVST booths on-site

Figure 1. Timelines of the community-based HIV testing services and major changes in strategy
Methods

HTS mobile outreach with individual self-testing booths
Maseru – Oct. 2018

• **Top-down costing** for each implementation period:
  - Full HTS costs
  - Full HIVST costs and incremental costs of adding HIVST onto HTS
  - Cost per HIV positive case identified (including both HTS and HIVST costs)

• **Bottom-up costing** through site observations and interviews with senior staff to estimate economic costs and collect allocation factors

• **A time and motion study** to observe staff providing both HTS and HIVST services:
  - Allocate personnel costs based on the daily time spent on each activity
  - Estimate provider’s indirect time i.e. staff time spent not seeing any clients (e.g. travel time and administrative work)
  - In incremental HIVST costing analysis, providers’ indirect time is allocated fully to conventional HTS, while in the full HIVST cost analysis, indirect time is shared between HTS and HIVST

• **Univariate sensitivity and scenario analyses** to assess the impact of key cost assumptions on the average incremental costs per HIVST kit distributed and costs per HIV-positive case identified for the latest costs data (period 3)
Results - HTS and HIVST outcome data May 2017 – Apr. 2019
Results – HTS and HIVST cost analysis

- Main drivers of costs are:
  - Personnel costs at headquarters & in the field,
  - Testing supplies,
  - Vehicle operation and maintenance

- Wide variation between HIVST full/increased costs

- Difference between HIVST full/increased costs is driven by indirect personnel cost allocation

Figure 3. HTS and HIVST costs drivers, average costs and volumes per analysis period (2019 US$)
Results – Cost per HIV-positive case finding

- Costs per HIV-positive case identified (Table 1):
  - Increased between period 1 (US$956) and period 2 (US$1,249)
  - Dropped in period 3 (US$813) when booths allowed onsite self-testing and immediate confirmatory testing

<table>
<thead>
<tr>
<th></th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
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<tbody>
<tr>
<td>Total costs (HTS and HIVST services)</td>
<td>$819,640</td>
<td>$1,043,448</td>
<td>$1,131,003</td>
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<tr>
<td>HIV-positive cases identified</td>
<td>858</td>
<td>836</td>
<td>1392</td>
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<tr>
<td>Yield (%)</td>
<td>3.4</td>
<td>3.1</td>
<td>5.0</td>
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<tr>
<td>Cost per HIV-positive case identified</td>
<td>$956</td>
<td>$1,249</td>
<td>$813</td>
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Table 1. Quarterly averages of costs per HIV-positive case identified by period (2019 US$)

- Increase of HIV-positive case finding, and yield is driven by an increase of index testing activities, thanks to the addition of self-testing booths in period 3, allowing more staff to conduct index testing instead of being mobilized at the mobile outreach
Results - Sensitivity and scenario analyses

Costs per HIVST kit distributed (2019 US dollars)

Costs per HIV-positive case identified (2019 US dollars)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Sensitivity</th>
<th>$7</th>
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<tr>
<td>% supervision by PSI staff for onsite self-testing (base: 90%; 100%; 50%)</td>
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<td>HIVST kit price (base:$2.71; $1)</td>
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<td>Volume of HIVST kits distributed (+/-10%)</td>
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<td>Field-based personnel costs (+/-10%)</td>
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<td>Headquarters-based personnel costs (+/-10%)</td>
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<td>Sessions average length from the time &amp; motion study (+/-20%)</td>
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<td>Life years of start-up costs (base: 2 years; 1; 3)</td>
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<td>Discount rate (base: 3%; 0%; 15%)</td>
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<td>Life year of vehicles (base: 15 years; 10; 20)</td>
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Conclusions

• Integration of HIVST improved the HTS programme efficiency as defined by increased rates of HIV positive case finding which is a great achievement in the current HIV testing landscape

• Budgeting of community-based HIVST interventions using incremental costs risks to underestimate needs if the HTS programme is not running well

• The reporting of both full and incremental cost estimates can increase transparency for use of costing data in priority setting, budgeting and financial planning for scale-up
Thank you for joining today! Any questions?

Acknowledgements:

- **Study co-authors**: Molemo Charles Makhetha, Makhahliso Jubilee, Matee Taole, Cyril Nkomo, Albert Machinda, Mphotleng Thomola, Linda Sande, Gabriela Gomez, Elizabeth Corbett, Cheryl Johnson, Karin Hatzold, Gesine Meyer-Rath, and Fern Terris-Prestholt
- **STAR Economics team**
- **All partners**
- **Study participants**

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WEBINAR 6/6

HIV Costing, Cost-Effectiveness and Impact Modeling

Thursday 22 October 2020
9am EST/ 3pm CAT
HIVST at what price? HIVST pricing experiment in Zimbabwe

Harsha Thirumurthy, PhD
Associate Professor of Medical Ethics and Health Policy
Associate Director, CHIBE

October 2020
Background

Demand for health products & services is highly sensitive to price in low- and middle-income countries.

Even small increases in prices lead to substantial decline in demand.
Multiple methods to assess demand for HIVST

• **Stated willingness to pay**
  • Median US$1 among pregnant women in Kisumu, Kenya following HIVST intervention (Thirumurthy *JAIDS* 2018)

• **Discrete choice experiments**
  • Price is significant predictor of (hypothetical) choice (Sibanda *JIAS* 2019)

• **Revealed preference**
  • 35% HST uptake among pharmacy clients offered self-tests for US$1; 84% among those seeking HIV testing (Mugo *PLOS One* 2017)

• **Price experiments**
Objectives

- Experimentally assess demand for oral fluid self-tests in Zimbabwe
- Examine the role of multiple factors that may influence demand
  - Price
  - Distribution strategy
  - Marketing factors (promotional messages)
- Examine demand in priority populations
Effect of Prices, Distribution Strategies, and Marketing on Demand for HIV Self-testing in Zimbabwe
A Randomized Clinical Trial

Wei Chang, MSW, MPH; Prtmrose Mtembanadzo, MPH; Albert Takuruza, BSc; Karin Hatzold, MD, MPH; Frances M. Cowan, MD; Euphemia Sibanda, PhD; Harsha Thirumurthy, PhD
Methods

• Randomized trial with factorial design
  • Conducted Feb–April 2018 in urban & rural communities near Harare
  • 4,000 randomly selected households (index participant at home)

• Randomized HIVST offer
  • Price (free, $0.50, $1, $2, $3)
  • Distribution strategy (clinics vs. pharmacies; retail stores vs. CHWs)
  • Marketing factors (messages emphasizing benefits of HIVST)

• Primary outcome: Self-test purchase (distributor records)
Results

Average age 35 years and 71% female
45% had tested in past 12 months
Effects of prices on HIVST uptake

- 32% obtained self-tests at $0
- Lower uptake in rural areas
- Compared to $0, significantly lower demand at all prices >$0 (unadjusted OR 0.05; 95% CI 0.04-0.07)
- Demand more sensitive to price in rural areas
- No difference by gender and no evidence of better targeting at higher prices
What else influences demand?

- In urban areas, significantly higher demand with distribution at pharmacies rather than clinics
- In rural areas, some evidence of lower demand at retail outlets compared to CHWs
- Promotional messages had no significant effect
Conclusions

- Free distribution is essential for achieving high testing uptake
- Limited evidence that higher prices are better at screening in non-testers
- Retail outlets important in urban areas; CHWs in rural areas
- Promoting uptake among non-testers requires additional interventions beyond free distribution alone
Acknowlegements

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Euphemia Sibanda
WEBINAR 6/6

HIV Costing, Cost-Effectiveness and Impact Modeling

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NEXT STEPS IN THE ECONOMICS OF HIVST

- Special issues on STAR Research in preparation
- ATLAS: Economic evaluation of HIVST introduction in West Africa among Key pops
- Scale up cost projections methods: for use in planning and modelling
- Lessons for Economics of Covid-19 diagnostics;
- Lessons for other Self-care diagnostics
- Remember, to reach last few cases and to have large impact, large scale screening be needed, costs will be higher but much potential for integrated screening programmes.