Leveraging investments in Diagnostic Networks Optimisation to expedite planning and implementation of SARS CoV-2 laboratory testing - Zimbabwe country experience
Agenda

- Background to Diagnostic Networks Optimization (DNO) in Zimbabwe
- How DNO has helped in expanding SARS CoV-2 testing
- Waste Management
- Lessons Learnt
Zimbabwe has >1500 Health Facilities spread across the length and breadth of the country.

Source: Ministry of Health and Child Care (Zimbabwe)
Zimbabwe’s Health Facilities fall under the 4 broad categories of “Clinics”, “District”, “Provincial” and “Central”

### National Breakdown of Healthcare facilities

<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>Clinic</th>
<th>District</th>
<th>Provincial</th>
<th>Central</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1,553</td>
<td>1,437</td>
<td>99</td>
<td>437</td>
<td>1</td>
</tr>
<tr>
<td><strong>Clinics</strong></td>
<td></td>
<td>13%</td>
<td>15%</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td><strong>District</strong></td>
<td></td>
<td>16%</td>
<td>15%</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Provincial</strong></td>
<td></td>
<td>10%</td>
<td>8%</td>
<td>8%</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Central</strong></td>
<td></td>
<td>8%</td>
<td>8%</td>
<td>3%</td>
<td>2%</td>
</tr>
</tbody>
</table>

### Healthcare facilities: Clinics

- Total: 1,437
- Manicaland: 157
- Midlands: 212
- Mashonaland East: 177
- Mashonaland West: 271
- Masvingo: 377
- Mashonaland Central: 437
- Matebeleland North: 377
- Matebeleland South: 377
- Harare: 27
- Bulawayo: 25

### Healthcare facilities: District

- Total: 99
- Mashonaland East: 16
- Midlands: 15
- Manicaland: 15
- Masvingo: 43
- Mashonaland West: 32
- Mashonaland Central: 31
- Matebeleland South: 3
- Matebeleland North: 3
- Harare: 3
- Bulawayo: 0

### Healthcare facilities: Provincial

- Total: 10
- Bulawayo: 9
- Harare: 1
- Manicaland: 1
- Mashonaland Central: 1
- Mashonaland East: 1
- Mashonaland West: 1
- Masvingo: 4
- Matebeleland North: 2
- Matebeleland South: 2
- Midlands: 1

### Healthcare facilities: Central

- Total: 7
- Bulawayo: 4
- Harare: 2
- Manicaland: 1
- Mashonaland Central: 1
- Mashonaland East: 1
- Mashonaland West: 1
- Masvingo: 4
- Matebeleland North: 2
- Matebeleland South: 2
- Midlands: 1

Source: Ministry of Health and Child Care (Zimbabwe)
Zimbabwe’s Health Facilities are located in 10 provinces/cities

### National Breakdown of Healthcare facilities

- **Total**: 1,553
- **Clinic**: 1,437
- **District**: 99
- **Provincial Central**: 10

#### Healthcare facilities: Bulawayo
- Total: 28
- Clinic: 25
- Provincial: 2

#### Healthcare facilities: Harare
- Total: 43
- Clinic: 37
- Provincial: 4

#### Healthcare facilities: Manicaland
- Total: 272
- Clinic: 257
- Provincial: 1

#### Healthcare facilities: Mashonaland Central
- Total: 149
- Clinic: 137
- Provincial: 1

#### Healthcare facilities: Mashonaland East
- Total: 217
- Clinic: 199
- Provincial: 1

#### Healthcare facilities: Mashonaland West
- Total: 190
- Clinic: 177
- Provincial: 1

#### Healthcare facilities: Masvingo
- Total: 185
- Clinic: 171
- Provincial: 1

#### Healthcare facilities: Matebeleland North
- Total: 121
- Clinic: 112
- Provincial: 1

#### Healthcare facilities: Matebeleland South
- Total: 120
- Clinic: 110
- Provincial: 1

#### Healthcare facilities: Midlands
- Total: 228
- Clinic: 212
- Provincial: 1

Source: Ministry of Health and Child Care (Zimbabwe)
ZIMBABWE has >300 testing site locations that utilise various test equipment

Source: Ministry of Health and Child Care (Zimbabwe)

*6 Abbott m2000sp Locations & 10 machines total
** 23 Samba II Locations & 4 machines at each site
Progress of DNO\(^1\) work in Zimbabwe: Preliminary costing of IST\(^2\) was performed, Provinces were established as “the most important testing centres” and MoHCC’s IST funding application was approved by UNDP

- First DNO meeting was held – it was attended by MoHCC and all key stakeholders
- Outcomes:
  - Preliminary costing of Integrated Sample Transportation (IST) was done
  - DNO established that the most important testing centre is the Province where samples will move from “Health Facility” to the “District Referral Centre”, and then to “Provincial Testing Lab”

- MoHCC made an application to UNDP for IST funding.
- UNDP Funding application was approved and now awaits implementation

Source: Ministry of Health and Child Care (Zimbabwe)  
1. DNO: Diagnostic Network Optimization  
2. IST: Integrated Sample Transportation
Diagnostic Network Optimization (DNO) has resulted in decentralization of testing across the 10 provinces, which are in turn supported by District Referral Centres and Health Facilities.  

<table>
<thead>
<tr>
<th>Marker</th>
<th>Facility Type</th>
<th>Total #</th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
<td>Provincial Hub</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Health Facilities</td>
<td>1553</td>
</tr>
</tbody>
</table>

*Scaled by VL Provincial Test Demand

<table>
<thead>
<tr>
<th>Marker</th>
<th>Test Equipment</th>
<th>Total #</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Abbott m 2000sp</td>
<td>10*</td>
</tr>
<tr>
<td></td>
<td>BioMerieux NucliSENS</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Hologic Panther</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Roche CAP/CTM 48</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Roche CAP/CTM 96</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Samba II</td>
<td>92**</td>
</tr>
</tbody>
</table>

*4 Machines Per Site

1. Implementation of DNO decentralised testing model still needs to be fine tuned via equipment reallocation and sample transportation re-assignment

Source: Ministry of Health and Child Care (Zimbabwe)
• Background to Diagnostic Networks Optimization (DNO) in Zimbabwe

• **How DNO has helped in expanding SARS CoV-2 testing**

• Waste Management

• Lessons Learnt
Investments in Diagnostic Networks Optimisation (DNO) have expedited planning and implementation of SARS CoV-2 laboratory testing by focussing on 4 key elements:

<table>
<thead>
<tr>
<th>Key Element / Sources of Advantage arising from DNO that have positively impacted SARS COV-2 testing efforts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Decentralization of testing from one testing site to multiple centres</td>
</tr>
<tr>
<td>2. Pre-existing Lab-based and POC equipment distributed across Zimbabwe</td>
</tr>
<tr>
<td>3. Ongoing sample transportation system integration efforts</td>
</tr>
<tr>
<td>4. The Zimbabwe Laboratory Commodity Distribution System (ZILACODS) for commodity distribution</td>
</tr>
</tbody>
</table>

Source: Ministry of Health and Child Care (Zimbabwe)
The Diagnostic Networks Optimisation (DNO) programme championed decentralization of testing from one testing site to multiple centres, and has been instrumental in increasing Zimbabwe’s capacity for SARS COV-2 testing.

<table>
<thead>
<tr>
<th>Phase 1: Open Platform at NMRL</th>
<th>Phase 2: Open Platform Decentralisation</th>
<th>Phase 3: Decentralisation to Provincial Sites</th>
<th>Phase 4: Decentralisation to Hot spots and selected district centres</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of Phase / Centre Selection criteria</strong></td>
<td><strong>Constraints/Outcomes</strong></td>
<td><strong>Labs/ Locations added to decentralised testing programmes</strong></td>
<td><strong>Centre selection targeted areas with high volume of human traffic, for example:</strong></td>
</tr>
<tr>
<td>At this stage all testing was performed at a central location, namely the National Microbiology Reference Lab (NMRL)</td>
<td>NMRL testing capacity was unable to handle increased testing demand after outbreak of COVID-19</td>
<td>NMRL</td>
<td>Borders offering passage to returnees from outside the country;</td>
</tr>
<tr>
<td><strong>Note:</strong> Though now in Phase 4, NMRL continues to serve as main diagnostic national referral centre for processing of COVID-19 samples</td>
<td>Decentralisation to other labs became imperative in order to create additional testing capacity</td>
<td>NVL, Mpilo, AIBst and BRTI</td>
<td>Central hospitals;</td>
</tr>
<tr>
<td></td>
<td>Open Platform Decentralisation effort was successful but was inadequate to meet increasing demand</td>
<td>Masvingo, Gweru (Midlands), Mat North, Mat South, Mash West, Mash East, Mash Central, Manicaland, Harare, Bulawayo</td>
<td>Prisons;</td>
</tr>
<tr>
<td></td>
<td>Additional laboratories were capacitated to support testing of COVID-19 samples</td>
<td></td>
<td>Military bases;</td>
</tr>
<tr>
<td></td>
<td>Lab selection targeted Provincial hospitals with GeneXpert devices in place and University Biotechnology Laboratories</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decentralisation to provincial sites assisted in addressing the testing capacity gap, but was still insufficient to meet increased demand arising from the spread of COVID-19</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased Sample testing capacity has assisted in addressing SARS COV-2 testing requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Additional centre selection is ongoing to further increase Phase 4 capacity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Ministry of Health and Child Care (Zimbabwe)
Decentralisation of testing has played a key role in increasing the number of SARS COV-2 tests per month in Zimbabwe.

<table>
<thead>
<tr>
<th></th>
<th>Total Number of SARS COV-2 tests done per month (April-June 2020)</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 2020</td>
<td>4,537</td>
</tr>
<tr>
<td>May 2020</td>
<td>11,504</td>
</tr>
<tr>
<td>June 2020</td>
<td>11,437</td>
</tr>
</tbody>
</table>

- Increase in number of SARS COV-2 tests was driven by decentralisation efforts to clear backlog at NMRL.
- Tests for June 2020 remained high but dipped slightly due to commodity availability challenges, e.g. reagents.

Source: Ministry of Health and Child Care (Zimbabwe)
Pre-existing lab-based and POC equipment distributed across Zimbabwe provides opportunities for SARS Cov-2 testing across the country.

Total Testing Landscape: Lab-Based and POC Equipment in Zimbabwe

GeneXpert Devices

- Total: 160
- Multiplexing TB, HIV and EID: 41
- Other: 119

Molecular Instruments

- Total: 29
- Abbott: 10
- Roche: 9
- Open PCR Systems: 5
- Hologic: 3
- BioMerieux NucliSENS: 2

Source: Ministry of Health and Child Care (Zimbabwe)
To address fragmented and disjointed sample transportation in Zimbabwe, MoHCC initiated a sample transportation system integration programme in 2017 that has now been leveraged for SARS COV-2 testing.

1. **Pre-2017**
   - Before 2017, Sample Transportation in Zimbabwe relied on multiple disjointed transportation mechanisms and uncoordinate service providers.

2. **2017 Integrated Sample Transportation System (ISTS) Pilot**
   - MoHCC conducted a pilot on a new Integrated Sample Transportation System (ISTS).
   - ISTS was meant to address the fragmented and disjointed sample transportation that existed before 2017.

3. **Post-pilot period before COVID-19 outbreak**
   - Pilot led to changes in the way various players run sample transportation. For example, the TB sample transportation programme now also collects samples for other disease categories such as Viral Load and EID.
   - Although the ISTS integration is yet to be fully implemented, system transportation changes to date have already resulted in significant sample transportation efficiency improvements.

   - COVID testing leveraged on existing disparate IST systems, namely the:
     - SWIFT TB Courier System
     - SWIFT National Microbiology Reference Lab system

Source: Ministry of Health and Child Care (Zimbabwe)

1. IST: Integrated Sample Transportation
The Zimbabwe Laboratory Commodity Distribution System (ZILACODS) already existed and was leveraged on for SARS-CoV2 commodity distribution.

<table>
<thead>
<tr>
<th>What is ZILACODS?</th>
<th>What have the benefits of ZILACODS been to date?</th>
<th>MoHCC has leveraged the pre-existing ZILACODS system to expedite SARS CoV-2 commodity distribution</th>
</tr>
</thead>
</table>
| • It is a system used by MoHCC for distribution of laboratory commodities across Zimbabwe | • Since its introduction, ZILACODS has greatly reduced product stock-outs and downtime while improving service delivery in the country | • SARS-CoV2 Testing was urgent given the nature and scale of the COVID-19 pandemic  
• Recreating a new commodity distribution system to cater for COVID-19 commodity movement would have been time consuming and inefficient  
• MoHCC decided to leverage the existing system, namely ZILACOD to speed up movement of COVID19 commodities across the country  
• Use of ZILACOD has significantly expedited SARS COV2 commodity distribution |

Source: Ministry of Health and Child Care (Zimbabwe)
<table>
<thead>
<tr>
<th>Agenda</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Background to Diagnostic Networks Optimization (DNO) in Zimbabwe</td>
</tr>
<tr>
<td>• How DNO has helped in expanding SARS CoV-2 testing</td>
</tr>
<tr>
<td>• <strong>Waste Management</strong></td>
</tr>
<tr>
<td>• Lessons Learnt</td>
</tr>
</tbody>
</table>
Waste Management is a critical element in sample handling and remains a challenge, however, MoHCC is taking active steps to resolve it.

<table>
<thead>
<tr>
<th>Guanidinium Thiocyanate (GTC)</th>
<th><strong>Current Situation</strong></th>
<th><strong>Challenge</strong></th>
<th><strong>Proposed Solutions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Guanidinium Thiocyanate (GTC) is produced by SARS COV-2 testing at GeneXpert sites</td>
<td>• GTC is a toxic compound that is harmful to human and aquatic life</td>
<td>• Recommended disposal of GTC is high temperature incineration at a minimum of 1000 °C</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liquid Waste</th>
<th><strong>Current Situation</strong></th>
<th><strong>Challenge</strong></th>
<th><strong>Proposed Solutions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid waste is currently not being disposed</td>
<td>• Zimbabwe made a bold decision in 2019 to halt disposing liquid waste in sewer drainage. Consequently, liquid waste is currently accumulating in storage, pending implementation of an effective solution</td>
<td>• MOHCC is currently in communication with cement manufacturers and mining companies for them to assist with incineration of liquid waste</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Xpert cartridges</th>
<th><strong>Current Situation</strong></th>
<th><strong>Challenge</strong></th>
<th><strong>Proposed Solutions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>All Xpert Cartridges need to be carefully disposed of once utilised</td>
<td>• Current processes are not adequate to ensure timely disposal of all cartridges once these are utilised</td>
<td>• To augment current efforts, MOHCC is currently in communication with cement manufacturers and mining companies for them to assist with incineration of Xpert cartridges</td>
<td></td>
</tr>
</tbody>
</table>

For HIV VL/EID/SARS CoV-2: cartridges are collected by MoHCC and transported to a private incinerator.

Source: Ministry of Health and Child Care (Zimbabwe)
Agenda

• Background to Diagnostic Networks Optimization (DNO) in Zimbabwe
• How DNO has helped in expanding SARS CoV-2 testing
• Waste Management

• Lessons Learnt
## Lessons Learned

<table>
<thead>
<tr>
<th>Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Coordination and confidence</td>
</tr>
<tr>
<td>2. Operational Efficiencies</td>
</tr>
<tr>
<td>3. Cost optimisation from integration</td>
</tr>
<tr>
<td>4. Integrity and Quality of Samples maintained</td>
</tr>
<tr>
<td>5. Well established results relay due to observing timeliness</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Coordination and confidence in sample transportation with minimal loss</td>
</tr>
<tr>
<td>• Route planning and dedicated system deliver much-needed operational efficiencies</td>
</tr>
<tr>
<td>• The cost of transporting samples in an integrated way is greatly reduced compared to parallel uncoordinated systems (Case of TB challenge and APHL)</td>
</tr>
<tr>
<td>• Samples spend minimal time between collection and testing hence increased surety on quality of results</td>
</tr>
<tr>
<td>• Results will always be put to good use as they will be returned to their respective destinations</td>
</tr>
</tbody>
</table>

Source: Ministry of Health and Child Care (Zimbabwe)