Temptime update to DCVMN

- VVM for COVID vaccines
- Digitization of temperature sensors
  - VVM
  - PTTI (Peak Threshold Temp Indicator)

20 October 2021
• VVM for COVID vaccines
• Digitization of temperature sensors
  • VVM
  • PTTI (Peak Threshold temp. Indicator)
Good vaccine coverage in HICs, LMICs have lower coverage AND challenges in their supply chain & cold chain

- Good coverage, in HICs ~40-70%.
- Supply issues mainly in Africa with less than 2.5% (dark red)
- Red countries also have challenges in supply chain
More, different vaccines pose challenges in distribution and handling

- Huge increase in COVAX shipments in Q4-21 and Q1-22
- Incremented with donations, African Union & bi-lateral contracts
- Multiple vaccines in country creates handling and administration challenges
- Average is already at 4 and increasing, the current max. is 9

Source: Gavi Supply Forecast, WHO covid repository
Most countries handling 4 or more vaccines

**2-8°C**
- Sinovac
- Sinopharm
- AstraZeneca
- Janssen

**-20°C**
- Moderna
- Pfizer
- Sputnik

DIFFERENT HANDLING REQUIREMENTS = SIGNIFICANT COMPLEXITY
1. Frozen & ultra cold chain requirements (4)
2. Different thawing process at 2-8°C or room temp (4) re-freezing allowed (1)
3. Reconstitution step (1) dilution step (1)
4. A wide variety of storage times at 2-8°C (7)
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No matter the different handling requirements

VVM shows cumulative heat exposure for each vial
Sinopharm COVID vaccine (Covilo) has VVM for LMIC supply

- Vaccine is currently arriving in multiple LMICs with VVM on single dose vial

- Helping the supply chain managers and Healthcare workers handle & administer the vaccines
VVM fits existing SOPs, 98% of HCWs would prefer them

2 surveys: Ethiopia 2020-March, and Zambia/Kenya 2021-December

“.. VVM and expiry date must be included… to ensure that the potency and safety of the vaccine is assured”

“…having VVM is an important SOP …don’t want to go back to the old practices.”

VVM facilitates re-distribution

Dr. Seth Berkley: “When distribution problems… emerge …move those vaccines to other countries”

The New York Times
August 2021

VVM confirms that cold chain storage conditions have been maintained appropriately
VVM endorsed by US Pharmacopeia (USP)
Confronting Sub-standard (heat damage) and Falsified vaccines

Boil an empty vial in water (in a plastic bag)
if the inner square (slowly) darkens...
...the vaccine is real

White paper published 8-2021
https://www.usp.org/covid-19/vaccines
When you are considering VVM...

- VVM Production - Standard lead times

<table>
<thead>
<tr>
<th>VVM Type</th>
<th>Full Label</th>
<th>VVM Dots</th>
</tr>
</thead>
<tbody>
<tr>
<td>VVM 1 or 2</td>
<td>4 – 6 weeks</td>
<td></td>
</tr>
<tr>
<td>VVM 7</td>
<td>5 – 7 weeks</td>
<td>2 – 4 weeks</td>
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<tr>
<td>VVM 11, 14</td>
<td>6 – 8 weeks</td>
<td></td>
</tr>
<tr>
<td>VVM 30</td>
<td>8 – 10 weeks</td>
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</tbody>
</table>
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Digital & mHealth innovations are gaining momentum

- Global Health Institutions (GHI) signaling the importance
  - “technology helps to reduce inequities… instead of becoming another reason people are left behind”
  Tedros Ghebreyesus, WHO
  - “Need for phone-based solutions … as well as track and trace of vaccines”
  Seth Berkley, Gavi Alliance

- COVID pandemic has demonstrated the value & feasibility
  - Multiple Apps, QR codes, vaccination certificates, health passes

- Logistics Management Information Systems (LMIS)
  - Considerable progress & interest in implementation
**Countries getting support on LMIS implementation**

<table>
<thead>
<tr>
<th>Country</th>
<th>Supported by</th>
</tr>
</thead>
<tbody>
<tr>
<td>India, Indonesia</td>
<td>logistimo</td>
</tr>
<tr>
<td>Tanzania</td>
<td>OpenLMIS</td>
</tr>
<tr>
<td>Tanzania</td>
<td>vitalliance</td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>mSupply</td>
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<tr>
<td>Nepal</td>
<td>entution - bileeta</td>
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<tr>
<td>Burundi</td>
<td>MEDEXIS</td>
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<tr>
<td>Nigeria</td>
<td>Field Supply (FS)</td>
</tr>
</tbody>
</table>

Vitalliance is committed to maintaining OpenLMIS as an Open Source public good, as well as providing ongoing core support. Some feature expansion will be enabled through Vitalliance and its partners, so that OpenLMIS will continue to grow and respond to evolving user needs, and move away from its reliance on donor funding.

LMIS pilots going to scale in selected countries

Increasing use of Bar codes potentially at all packaging levels
Manufacturers reacting to track and trace opportunity

- Examples of DCVMN using serialized bar codes on Tertiary, secondary and primary, packaging e.g Biofarma, SII and Sinopharm on COVID and other vaccines

- UNICEF/GAVI announcement on secondary packaging bar code requirement by 31st December 2021
Digitized Temperature Sensor – VVM or “eVVM”

Vaccine will continue to have a classic VVM, visually read by user, will remain on vial

Anticipating a GS1 compliant 2D DataMatrix Bar code scanned by user

Embedded VVM chemistry – a mini VVM, reacts to heat as usual, VVM status is automatically captured
Rapid Diagnostic Test (RDT) – with PEAK THRESHOLD INDICATOR

2D DataMatrix

Embedded chemistry – reacts to heat ≥40°C, is also automatically captured in scan

5 out of 11 different RDTs degrade after 10 minutes at 37°C

Temptime’s Dynamic Sensor Barcode Value Proposition

Digitized temperature sensors will provide the following features

- temperature assurance
- linkage to LMIS / HMIS and big data
- product authentication
- serialized supply chain tracking
- additional layer of anti-counterfeiting
Zebra/Temptime expertise in barcodes and sensors supporting mHealth initiatives

“eVVM” R&D initiated
OneScan™ app developed


Proof of principle

Zebra global footprint

Leader Status

Gartner Magic Quadrant for Indoor Location Services — Global

#1 Rugged Mobile Computing
#1 Data Capture
#1 Barcode Printing
#1 Mobile RFID

Indonesia RDT field study

Pakistan eVVM Field Study

We are here
Thank You

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