Distributing COVID-19 Vaccines: The Role of Drones In Ghana’s Health Supply Chain

UPDWG Webinar featuring Zipline Ghana and Ghana Health Services
24 June, 2021
Housekeeping

Host: Gabo Ailstock, UPDWG coordinator

Webinar length: 1 hour
35 minute presentation
20 minute Q&A

Webinar will be recorded
Available on UPDWG.org and emailed to participants
Contribute to the discussion non-verbally through the “Q&A” feature

Webinar hosts will repeat selected responses to the group
Contribute to the discussion verbally through the “raise hand” feature

Webinar hosts will invite you to speak, then a pop-up will allow you to come off mute
Guest Presenters

Kwasi Antwi
Health System Integration Lead

Dr. Kwame Achiano
Manager, Expanded Programme on Immunisation
DISTRIBUTING COVID-19 VACCINES: THE ROLE OF DRONES IN GHANA’S HEALTH SUPPLY CHAIN

Program Manager
National Expanded Program on Immunisation
Ghana Health Service

Health Systems Integration Lead- Zipline
Ghana
Mandate of EPI Programme

- The EPI Programme has the mandate to contribute to poverty reduction by reducing magnitude of vaccine preventable diseases (VPDs) through immunization as an essential component of Primary Health Care (PHC)

- Goal: to protect all children and pregnant women living in Ghana against VPDs
History of EPI and Vaccine Introduction in Ghana

- Ghana’s EPI was officially launched in 1978 initially as a pilot.
- Ghana’s EPI was scaled up from 1985-1991.
- The Programme currently vaccinates against 13 VPDs in routine immunization.
- Key strategies: static, outreach, mobile, mop-up, campaigns.
<table>
<thead>
<tr>
<th>Targeted Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tuberculosis</td>
</tr>
<tr>
<td>2. Poliomyelitis</td>
</tr>
<tr>
<td>3. Diphtheria</td>
</tr>
<tr>
<td>4. Pertussis (whooping cough)</td>
</tr>
<tr>
<td>5. Tetanus</td>
</tr>
<tr>
<td>6. Haemophilus influenza type B</td>
</tr>
<tr>
<td>7. Hepatitis B</td>
</tr>
<tr>
<td>8. Pneumococcal diseases</td>
</tr>
<tr>
<td>9. Rotavirus diarrhoea</td>
</tr>
<tr>
<td>10. Measles</td>
</tr>
<tr>
<td>11. Rubella</td>
</tr>
<tr>
<td>12. Yellow fever</td>
</tr>
<tr>
<td>13. Neisseria Meningitis</td>
</tr>
</tbody>
</table>

Other VPDs depending on the disease burden, vaccine safety and effectiveness, vaccine cost and the net impact.
Saving LIVES through IMMUNIZATION

Chronology of vaccine introductions in Ghana

1978: BCG, OPV, DPT, Measles (Total: 6 + TT)

1992: YF


1998: OPV (Total: 6 + TT)

2002: DPT

2002: Measles

2002: Total: 6 + TT

2012: BCG (Total: 9)

2012: OPV (Total: 6 + TT)

2012: DPT

2012: Measles

2012: Total: 6 + TT

2013: BCG (Total: 9)

2013: OPV (Total: 6 + TT)

2013: DPT

2013: Measles

2013: Total: 6 + TT

2013: (M)R(Td

2013: Men A

2013: Total 13

2016: PCV

2016: Rota

2016: MSD

2016: Total: 11

2018: Hep.B

2018: Hib

2018: into PENTA

2018: Total: 9

2019: Hep.B

2019: Hib

2019: into PENTA

2019: Total: 12

2019: Malaria Vaccine pilot started on 1st May 2019: MVIP/RTS,S

Total: 13
Operational components of Immunizations

- Vaccine Supply & Quality
- Logistics
- Surveillance
- Advocacy & Communication
- Service delivery
Types of Service and Delivery strategies

Types of Services
- Routine services
- Campaigns
  - NIDs – National Immunization days
  - SIAs – Supplementary Immunization Activities

Service Delivery strategies
- Static/Fixed
  - Outreach
  - Camp-out
Vaccine Success Stories in Ghana

- Robust Routine Immunisation Programme

- Conducted several mass vaccination campaigns against many diseases for both children and adults for over 4 decades:
  - Polio; Measles; Yellow fever; Meningitis; Tetanus

- Notable achievements: Contribution to Reduction in U5 mortality
COMMODITY FLOW

**Commodity Category**
- Program Drugs
- Essential Medicines
- Vaccines
- Blood

**Central Intermediary**
- Global Fund Central Warehouse

**Regional Intermediary**
- Regional Medical Stores
  - Monthly Push
- EPI Regional Warehouses
  - Monthly Pull

**District Intermediary**
- EPI District Stores
  - Pull

**Health Facility**
- CHPS Compound
- Health Centre
- District Hospital
- Regional

**National Cold Room**
- Quarterly Push
- Zonal Blood and Sub-Zonal Centres
  - Pull
COVID VACCINES DEPLOYMENT PLAN - HIGHLIGHTS

- Deployment has been based on segmentation of the population

- Target of **20m** persons:
  - Initial: health workers, persons with underlying health conditions, security personnel, other essential service providers, persons above 60 years, second cycle and tertiary students, teachers at all levels, specialized groups on national assignments, Executive/Legislature/Judiciary/MDAs, Media etc. to receive COVID-19 vaccines

- Ultimately, the entire population is considered

- Delivery strategy: static, outreach, mobile, campout or combination

- Vaccination will be expanded to include children and pregnant women as time goes on and more safety data become available
Based on population and geographic segmentation

- **Phase 1A:** Most at risk groups in 43 hot spot Districts
- **Phase 1B:** Health Care Workers
- **Phase 1C:** Mixed target
Total doses administered:

1,232,876
### Performance by phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Start date</th>
<th>Number of regions</th>
<th>Number of Districts</th>
<th>Target segmentation</th>
<th>Total doses administered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1 A</td>
<td>1st March</td>
<td>3</td>
<td>43</td>
<td>Most at risk groups in 43 hot spot Districts</td>
<td>535,408</td>
</tr>
<tr>
<td>Phase 1 B/C*</td>
<td>24th March</td>
<td>13</td>
<td>217</td>
<td>All healthcare workers</td>
<td>316,639</td>
</tr>
<tr>
<td>Phase 1 A (2nd dose)</td>
<td>19th May</td>
<td>3</td>
<td>43</td>
<td>All individuals vaccinated in Phase 1 A within 01-09 March 2020 (12 weeks)</td>
<td>380,829</td>
</tr>
</tbody>
</table>

1,232,876

*Mixed vaccinations for others based on vaccines availability (Phase 1 C)*
Performance by doses

<table>
<thead>
<tr>
<th>Total doses</th>
<th>At least 1 dose</th>
<th>Received 2 doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,232,876</td>
<td>852,047</td>
<td>380,829</td>
</tr>
</tbody>
</table>

17.06.21 @ 6:40AM

NB:
Proportion vaccinated (national target) = 4.8%
Individuals requiring 2nd dose = 471218
Performance by sex: At least 1 dose

Male: 49.9
Female: 50.1
GAPS WITHIN SUPPLY CHAIN

- Cost in accessing very rural areas during campaign
- Cold Chain and Logistics: Gap analysis completed
- Overall, 15 districts will require new CCE while 7 regional health directorates need Walk-in Cold Rooms (WICR)
  - These requirements are based on characteristics of chosen COVID-19 vaccines matching existing routine storage and transport system in country
  - Currently all points of care in the country store and transport vaccines at +2 - +8 °C.
- The entire health system shall require completely new cold chain equipment system for vaccines requiring negative or ultra-negative cold chain
RURAL VACCINATION CAMPAIGN
Rural Healthcare

https://www.facebook.com/349214905150422/posts/4105650179506857/?vh=e
Our Mission:

To provide every human on Earth with instant access to vital medical supplies
Four distribution centers

600 flights/day in an 80km radius to facilities with resupply and emergency needs

Deliveries include medical products, vaccines and blood products

50-60% of the population currently being served from drone centers

Four additional distribution centers to be set up by the end of this year

Additional distribution centers will increase population coverage to 80%
85 km service radius (one-way)

110 km/h cruising speed

1.8 kg payload

Dozens of simultaneous flights

100s of flights/day to unlimited sites

Reliable in all weather conditions

DELIVERY IN <1 HOUR TO ANY FACILITY WITHIN 22,500 KM² SERVICE AREA
AN ORDER FULFILLED EVERY 4 MINUTES
ZIPLINE COVID-19 RESPONSE SUPPORT

Ghana by the Numbers

2,000 Healthcare facilities
2 million Vaccine doses distributed
9 : 1 Resupply : Emergency

Zipline supported The Ministry of Health by helping to:

- Transport COVID-19 samples
- Distribute sanitizers and PPEs
- Distribute COVID-19 vaccines
On 1 March 2021, 1329 vials of vaccines were received at Zipline Mpanya from the Ashanti Regional Cold Room.

- Vaccine cards, bottles of sanitizer and consumer products were also received.

- Till date 25,000 doses of COVID-19 vaccines have been delivered with three other regions taking part in the aerial distribution of the products.

- Vaccines were distributed according to delivery strategy of districts/regions.
**STRATEGIES**

**ENSURE FULFILMENT SYSTEM IS READY TO DELIVER VACCINES**
- Ramp up cold chain storage to support all vaccines types
- Review packing process and build drone packaging to support delivery of all vaccine candidates

**ENSURE THE TEAM IS TRAINED ON THE LATEST FULFILMENT REQUIREMENTS**
- Re-train fulfillment on packaging process
- Put a plan together to handle orders from more facilities
- Engaged in Regional vaccination campaign to test collaboration with Regional Health Administrations and facilities

**ENGAGE & SEEK HEALTH SYSTEMS COLLABORATIONS**
- Keep close communication with the National EPI to get a sense of timelines
- Working with the Health Administration and other partners to identify problematic areas of distribution
- Building communication lines with Regional Cold Rooms
The Regional EPI Coordinator sends an electronic copy of the distribution list to Zipline prior to the arrival of the vaccines at Zipline’s distribution center.

This list states the vaccines total quantity, target facilities or districts, and quantities allocated for each location, time expected at each location and a contact person.

Contact persons are then contacted to pre-inform them of the reception and expected time of these vaccines.

A projection on the total number of packages sent is based on the quantity of vaccines delivered and the allowable quantity per package.

A buffer stock is mostly kept for urgent cases where there is a shortage on ground after initial stock is delivered.

A daily report is sent to the Regional EPI and Health Director at the close of day to update on progress before the final report at the end of all deliveries.
IMPACT

- Reduction in distribution costs
- Facilitated borderless distribution of Covid-19 vaccines
- Prompt delivery of close to expiry vaccines especially in rural areas
- Vaccination sites in urgent need of vaccines due to shortages benefited from prompt deliveries
- Easier rollout in new regions with non-existent cold chain
- Reduced number of product losses
- Helped to minimise wastage at facilities without storage

<table>
<thead>
<tr>
<th>District</th>
<th>Zipline Aerial Delivery Duration</th>
<th>Roundtrip to pick C-19 vaccines from the Region (Shortest route)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bodi District (Bodi CHPS)</td>
<td>37 mins</td>
<td>4 hours</td>
</tr>
<tr>
<td>Suaman District (Dadieso Hospital)</td>
<td>40 mins</td>
<td>4 hours 18 mins</td>
</tr>
<tr>
<td>Asankraqua SHS CHPS</td>
<td>33 mins</td>
<td>9 hours 40mins</td>
</tr>
<tr>
<td>Affram Plains South District</td>
<td>50 mins</td>
<td>5 hours 40mins</td>
</tr>
</tbody>
</table>
With a good coverage of new regions, Zipline would be featuring heavily in next phases of distribution.

New regions have some of the hardest reach areas.

Aerial distribution is critical given the likelihood of emergence and the need to deploy vaccines quickly.
DELIVERIES AT THE SPEED OF LIFE

Kwasi Antwi, Health System Integration Lead, Zipline Ghana

kwasi.antwi@flyzipline.com
Q&A
Q: Please clarify the range covered by each hub. Is it 85km - meaning drone can fly 170km?
Q: What is the capacity of the drone? I am talking about the How many Kg the drone can carry and for what distance?
A: 1.8 kg for 170 km (85 km each way). Important to note that Zipline can autonomously fly dozens of drones at the same time to the same or different facilities, and up to 150 flights per day. This ensures that we're able to satisfy the need of a particular facilities beyond the capacity of one drone, with the same speed, efficiency and reliability.

Q: Has Zipline drones with higher payload capacity more than 1.8 kg?
A: We currently don’t have drones with higher payload capacity.

Q: Do you plan to develop reverse logistics in the future? So that local tests could be brought to laboratories?
A: Our core focus remains improving our on-way delivery capabilities. This why our current platform and hub’s location outside cities were used to ensure safe and reliable deliveries of samples into Accra and Kumasi.

Q: What is the total cost per delivery or per month?
Q: could you share some lights on your cost related delivery/distribution to the GHS
A: The cost is confidential.

Q: How have you calculated the cost efficiencies - is it per jab, per flight, per patient etc.?
A: For covid vaccines, the focus is on getting the vaccines distributed efficiently, and equitably. But broadly, we continuously assess our impact and cost efficiencies on multiple dimensions in the health system - cost incurred by supplying institutions, cost incurred by health facilities, and cost incurred by patients (where relevant).
Unanswered discussion questions

Q: How did you sensitize local communities on the use of drones?
A: We do have a community engagement function at Zipline, and we engagement with communities around our hubs, HFs we deliver to, and along our routes. We engage in community meetings, but also conduct other activities such public health sensitization events, blood donations drives, and more.

Q: Will the protocol designed by Pfizer and Zipline will be publicly accessible?
A: The protocol will be publicly accessible.

Q: About the local regulation in Ghana, what is the duration of the authorization of the fly that you received from AAC? Do you need to renew every time?
A: There are multiple aspects to this. We do have a Remote Operator Certificate that allows to fly Beyond Visual Line of Sight autonomously. We also a have route planning framework, under which the CAA approve Zipline's flight routes (pre-approval is not required for all routes). Note that Zipline uses the same route for each flight to a particular delivery point. Due to the high volume of flights, and the on-demand nature of our services, we don't need authorization with every flight. Through Zipline's UTM-like application, The CAA and ATCs track our Zips in real time, and are able to communicate with a Zipline controller to issue notices such as temporary airspace closure, return to base orders, holds orders, etc."

Q: Has Zipline received authorization to fly inside of Controlled Airspace in Ghana?
A: Yes, to deliver samples from our Distribution Centers to lab in Accra/Kumasi. We do also receive permissions for certain facilities in controlled airspace.
Q: What about Iridium Satellite for non telecom covered regions?
A: Communications are enabled through Cellular with satellite backup where and if needed.

Q: Are Zipline drones equipped with Transponders (on ADS-B or SSR) to be monitored by Air Traffic Control Centres to ensure safety to other aircraft from Zipline by any conflicts in the air?
A: No. Zipline built a UTM-like app that CAAs and ATCs use to track our Zips in real time, but also be able to communicate with a Zipline controller to issue airspace closure notices, return to base orders, holds orders, etc.

Q: 25K vaccines is a lot... and at the same time, it seems pretty modest. How does it come that the figures are so low?
A: 25k doses seems low due to (1) upstream supply constraints and (2) vaccinations are still limited to priority populations, and most-at-risk communities concentrated in urban and ex-urban areas. As the Government diversify it's supply base and get to do a mass vaccination campaign, these will increase. Our goal in March was to be able to distribute up to 2.5m doses by the end of the year.

Q: How does zipline retrieves their package boxes after they deliver to a remote facility?
A: Our package boxes are single use and biodegradable.
Thank you!

Photo credit: VillageReach