Introduction

Drones on Demand: A Top-Up Mechanism for Urgent Transport of Health Products in Malawi (Process & Outcome Evaluation Results)
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• Program Approach & Results
• Preliminary Findings
  – Community Perceptions
  – Health Systems Outcomes
• Next Steps
Program Approach & Results to Date
Bi-directional drone program in Malawi

70+

HEALTH FACILITIES

District Hospital >> Health Facilities

Medicines, vaccines, blood, medical supplies, lab results

Drones meant to fulfill emergency orders in between monthly deliveries

Health Facilities >> District Hospital

Lab samples, pharmacy & medical reports

Delivery within 24 hours

@ghcs_summit; #globalhealth; #globalhealthsupplychain; #GHSCS
Malawi Drones for Health Program

May 2021 – September 2023

7,914 flights in 501 days
3,707 product deliveries both ways

2,453 flight hours
235,102 km flown (4-10 drones)

71 health facilities
supplied with health products ON DEMAND
in 7 districts of the Southern region

2,091 kg delivered (vol 18,535 liters)
Medicines, vaccines, PPE, test kits + lab samples

195,925+ people directly
benefitting from products flown by drone

98,056 vaccine doses
(66,378 routine + 31,628 COVID + 50 emergency vaccines)

6,127 lab samples (+ test results)
(HIV, TB, Polio, COVID and Cholera samples)

Medical, pharmacy & other reports
> 100+ other types of products

All new health facilities trained before flights
Community sensitizations at all new sites
On-demand product trends: How was the drone delivery system used?

Types of products transported on-demand

- Most frequent type of item transported by drones (35%) was **health system documentation**, including LMIS reports, orders, and patient reports
  - Documents are light, compact, easy to transport
  - Multiple documents are regularly sent between the levels of the health system
  - After receiving a product delivery, the drone was available for return flight; opportunistic
- Despite frequent stockouts at the health facility level, essential medicines and supplies (e.g., antibiotics) were not transported frequently
  - Stockouts persisted at the district level
  - Essential medicines are in large packages and ordered in large quantities; not conducive to drone transport
Evaluation Questions & Methodology

1. How does drone delivery contribute to enhancing availability, quality, and equitable access to health products and diagnostics?

2. In what ways does drone delivery contribute to the efficiency of lab test turnaround times for detecting infectious diseases?

3. How does drone delivery contribute to enhancing the resilience of the supply chain in responding to shocks and emergencies?

4. In what ways does drone delivery influence the productivity of health facility staff?

5. How does drone delivery contribute to the timeliness of health supply chain data for informed decision-making?

6. How is drone delivery perceived by community members?

Methods

• **39 health facilities** (with longest drone experience in the country: 2-3 years) in 3 Districts
• 146 health facility personnel (22% female) and 9 district personnel (2 female) interviews
• 76 community member participants in **focus group discussions** (45% female)
• 138 **patient exit interviews** (64% female)
Preliminary Findings
Summary of key findings

• Drone service contributes to resilience of public health supply chains through
  • Ability to reach areas with limited or compromised road infrastructure
  • Reducing lead times for emergency product orders and turnaround times for lab results
• Drone transportation has potential for improving healthcare worker productivity by reducing travel to the District Health Office
• Drone transportation is perceived positively by all stakeholders due to its reliability and efficiency
1. Supply chain resilience

Photo: Enroute from Masenjere Health Centre, Nsanje—VillageReach Malawi

Photo: Enroute to Masenjere Health Centre, Nsanje—VillageReach Malawi

Photo: Masenjere Health Centre, Nsanje—VillageReach Malawi
Supply chain resilience: Speed & timeliness

Average decrease in turnaround times: **7 days**

“Faster turnaround time for lab results ... is facilitating quicker diagnosis and treatment.... We used to hear that my sample has been rejected because the deliveries did not reach the lab in good time.”

– Community leader FGD

"There have been so much improvement. For example, HIV EID is an emergency sample, where we need to know the status of the child born to the mother. Drone [transport] has really made this possible."

– Lab Manager

“We have been able to send some vaccines to [health facilities about 217km from here] who had no vaccines at all for their session today.”

– District supervisor, EPI
Most respondents found drones to be helpful in reaching areas with limited or damaged infrastructure

Are drones as helpful as you thought they might be during the RAINY season? Why or why not?

- Yes 83%
- No 17%

"Absolutely. During the rainy season we have issues with roads, bridges, and in emergencies the drones help to deliver most needed supplies." - District Lab Technician, Mangochi

“Makhanga [health centre] is a very hard to reach facility with traditional means of transport....we ordered a drone to transport blood from another facility and it was delivered in good time.” - Lab Manager, Chikwawa
Drones are recognized for their efficiency in facilitating timely and life-saving deliveries in critical situations

- During a **blood emergency** at Chapananga, a drone was deployed to ensure that the required blood reached the patient without delay

- A **sample that needed urgent testing** for platelets was sent to Ngabu when the local testing machine at the District Health Office (DHO) was down

- On the day of data collection, **two cholera samples** were sent from Tengani Health Centre to Nsanje DHO for urgent testing

- A community member was able to **receive anti-rabies vaccine** in time after a dog bite. Usually, such cases are either sent to the District Hospital or to the nearest rural hospital on patient’s cost

- A patient being able to receive STI treatment within one day for a prescription that was out of stock at the time of the visit
However, the impact of the drone delivery system on supply chain indicators has been limited by fluctuating drone utilization rates

- Internet connectivity issues affecting product orders
- Trained staff not available
- Drone technology repairs
- Inclement weather
- Fluctuations in supply of medicines
- Lack of follow-up on lab test results

![Graph showing unique products moved to or from health facilities from Jan'22 to Aug'23. The graph shows peaks and troughs indicating variability in product movement.](image-url)
Productivity of health facility staff
Productivity of health facility staff

- The impact of drone service on time spent with patients is inconclusive
  
  33%: no change; 39%: decreased; 28% increased

- However, ~90% of facility staff believe drone service has improved their job because

When unable to use drones, what does typically happen when you place an emergency order; do you pick the products from the DHO or does the DHO deliver them to your facility?

- 20% of respondents pick the products from the DHO
- 80% of respondents the DHO deliver them to your facility

If you travel to pick the products from the DHO, who pays for the transport?

- The person collecting the medicines: 40%
- The facility pays for transport: 60%
- Riders for Health: 0%
- Partners In Hope: 0%
- DHO provides fuel: 0%
- DHO provides ambulance: 0%

Sample size: 39 respondents
Drone Perception

Photo: Masenjere Health Centre FGD, Nsanje—VillageReach Malawi
There is generally a positive perception of drones and the services they provide among all stakeholders. Drones are liked for their speed, reliability in emergencies and efficiency.

**What do you like most about drone deliveries?**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Percentage of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Useful in Emergencies</td>
<td>80%</td>
</tr>
<tr>
<td>Saves Time</td>
<td>60%</td>
</tr>
<tr>
<td>Reliable</td>
<td>40%</td>
</tr>
<tr>
<td>High Fill Rate</td>
<td>20%</td>
</tr>
<tr>
<td>Good Communication</td>
<td>0%</td>
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<tr>
<td>Fast</td>
<td>100%</td>
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<tr>
<td>Exciting</td>
<td>100%</td>
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<tr>
<td>Efficient</td>
<td>100%</td>
</tr>
<tr>
<td>Easy</td>
<td>100%</td>
</tr>
</tbody>
</table>

Sample size: 39 respondents

“A journey from Mangochi DHO to Makanjira health centre takes 4 hours by road one way, but takes just 1 hour when using drones.” District Lab Technician

“Perfect in terms of time, and also reduces sample rejection and damage during transportation. There are no any issues with sample contamination compared to other means of transportation.” –Lab Technician

“There is nothing I don’t like about drones. However, there are facilities where drones do not reach. We would really want the drones to reach these facilities.” District Lab Technician

“It’s a good development as it’s able to bring medicines in good time. Also, being a hard-to-reach area, it is very hard to rely on vehicles as the roads are bad, and drones are fast and reliable in times of emergency.” (Female FGD)
What is Next?

- Complete data analysis for **process evaluation**, to inform the first-ever **randomised controlled trial (RCT)** of medical drones which is underway (Swoop Aero & USAID Development Innovation Ventures)
  - Rigorous assessment of the impact of **on-demand bi-directional** drone transportation on supply chain and proxy health outcomes
  - **209** rural, hard-to-reach health facilities across **23** districts, with **99** facilities randomly selected to access drones in addition to traditional transportation methods, while **110** facilities serve as the control group
  - Baseline survey conducted between Dec 2022 & Mar 2023: findings highlight several supply chain issues related to the hard-to-reach facilities, including transportation, stock management practices and medical supplies availability
  - RCT results will inform current drone operations in Malawi and provide input for future strategic positioning of drone services for remote and hard-to-reach areas

- **Cost-effectiveness analysis** of on-demand drone transportation
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