

Sustaining Public Sector Supply Chain During Disruptions:

Leveraging the Integrated Medical Drone Delivery System for COVID-19 Response in Malawi

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KEY MESSAGES

- Early investments and learnings in innovative delivery approaches are pivotal for successful response to disruptions in the health supply chain.
- Applying a framework to prepare for disruptions and to analyze success and failures creates a feedback loop that strengthens the supply chain.
- Integration of tested innovations into existing supply chain systems is necessary for a seamless adoption into the supply chain ecosystem.
- Continuous stakeholder collaboration and clearly-defined roles catalyze acceptance of innovation for emerging use case scenarios, including in emergencies/disruptions.

Supply Chain Agility During Disruptions

Epidemics and natural disasters are widespread and frequent in Africa. Nearly 90% of countries experienced an epidemic and nearly half endured a humanitarian crisis between 2016 and 2018 (Talisuna et. al, 2020). Unforeseen shocks strain public health supply chains, hindering their ability to deliver necessities. Building supply chain resiliency to enable readiness, response and recovery when disruptions occur is critical to long-term and sustainable supply chain success (Scholten et. al, 2014).

In supply chains, resilience represents the adaptive capacity to prepare, respond and recover from unexpected events while maintaining continuity of operations and adapting to emerging needs.

VillageReach, with support from the Bill & Melinda Gates Foundation, has developed a [supply chain resilience framework](#) for public health supply chains of low- and middle-income countries. Several key elements have been identified along three distinct phases:

- Pre-disruption: introduce promising solutions
- During disruption: adapt and scale to meet needs
- Post-disruption: evaluate, analyze, reconfigure

One hallmark of resiliency is allowing innovation to improve supply chain agility and performance during the three phases.

This case study demonstrates improvements in the supply chain through a solution developed by VillageReach, the government of Malawi, and Swoop Aero—an Australian drone logistics company. These partners nimbly adapted and scaled up the use of drones during the Covid-19 pandemic to make them an integral part of the public health supply chain.

Pre-disruption phase: introduce promising solutions

2016-2019

VillageReach, in partnership with the Malawi Ministry of Health, Department of Civil Aviation (DCA), two drone operators and other partners, including UNICEF, started to explore the feasibility of using drones in the health sector in 2016.

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Initial feasibility assessments looked at transporting blood products and emergency obstetric medicines. The products and health facilities chosen were informed by an in-depth consultation process with experts and local communities that ensured the program was both people-centered and based on the needs of the districts in question.

The early-stage technology was deemed unfeasible in Malawi. However, that pilot experience illuminated key lessons to advance understanding of the capabilities and limitations of the technology. For instance, frequency signal interference from telecommunication tower signals often led to unsuccessful flights.

In 2019, the USAID supported Global Health Supply Chain Procurement and Supply Management project in Malawi provided support for the operation of drones to transport laboratory samples and results to and from the Lakeshore district of Nkhatabay and the islands of Likoma and Chizumulu and other hard-to-reach health facilities. This project saw success as drones cut turnaround times in half for laboratory results transported to these facilities.

The drone network design in Malawi is a complementary layer to the other existing means of transportation. For most laboratory samples, motorcycles transport them from peripheral health facilities to the district laboratories. For vaccines and other essential medicines, vehicles are primarily used to transport them to the health facilities, especially for routine orders. Drones, on the other hand, are used for responding to emergency orders and emergency products. This request-based system supplements routine procedures and ensures continuity of service.

ESTABLISH AN ENABLING ENVIRONMENT

Significant effort was put in place to facilitate multi-stakeholder collaboration through Malawi’s remotely-piloted aircrafts technical working group (RPA TWG).

The RPA TWG, chaired by Malawi’s Department of Civil Aviation with VillageReach as secretariat, convened regularly before the Covid-19 pandemic. It provided a platform for regulators, donors, implementers and drone service providers to align on who should be involved in the drone services. It also provided a platform for sharing effective drone operations, as well as guidance on standard operation procedures to implement.

During disruption: adapt and scale to meet needs

2020-2022

In early 2020, the United Kingdom’s Foreign, Commonwealth and Development Office and UNICEF collaborated with Swoop Aero to investigate the feasibility of introducing multi-purpose drone operations, over a longer period (6+ months) in two districts south of Malawi, along the Shire Valley, which are mostly flood-prone.

From January to October 2020, during the onset of the Covid-19 pandemic, the drone network scaled up to serve 13 health facilities in Nsanje and eight in Chikwawa districts. Drones were used to deliver Covid-19 products to many

health care facilities including some hard-to-reach facilities. A number of factors made this possible. When the Covid-19 disruption surfaced in 2020, the drone network had already proven its efficiency in transporting laboratory samples and vaccines for routine immunizations. Now it was needed to transport massive hauls of Personal Protective Equipment (PPE), essential medicines and other products.

The drones' capacity to transport routine immunization vaccines, lab samples and other key priority health products in the pre-Covid era laid a solid foundation for leveraging this platform during the pandemic. It was then simple to integrate Covid-19 transport needs into the ongoing, successful operations.

Seamless integration is critical during pandemics since it not only fosters supply chain flexibility, but also enhances resiliency by providing adaptability and agility to meet rapidly emerging needs. For example, the vaccines for routine immunizations have the same cold chain requirements as AstraZeneca's Covid-19 vaccine.

Applying the established processes produced successful results during the Covid-19 pandemic. From May 2021 to May 2022, more than 16,000 routine vaccine doses and Covid-19 vaccine doses were transported using drones. During the same period, more than 900kg of medicines, vaccines, PPE, test kits and lab samples were transported via drones.

DISRUPTIONS BEYOND COVID-19

Cyclone Ana hit Madagascar, Malawi and Mozambique in January 2022. In its wake, drones continued to operate in Malawi's lower Shire districts of Chikwawa and Nsanje, transporting multiple emergency products while most health facilities remained inaccessible due to poor road conditions.

Health workers were also sufficiently trained on requesting drone services. There was compelling evidence that drones in the network were used during disruptions with no additional costs and contracts incurred. This facilitated a mutual understanding between stakeholders that mitigation of disruptions was critical to ensure a steady return to normalcy as well as the critical need to help government and the communities to effectively respond to their emerging challenges.

Post-disruption: evaluate, analyze and reconfigure

As Malawi and the world move past the Covid-19 emergency, it is a perfect time to reflect on how the drone network as an innovation was set-up for success and how it could be further improved, scaled and leveraged for future.

ENSURE CONTINUOUS VISIBILITY IN SUPPLY CHAIN STATUS

Visibility is central to the responsiveness of any given supply chain (Williams et. al, 2013). During a pandemic, reliable data on commodity availability, such as what items are on hand or out-of-stock, is critical as needs are continually shifting and resupply decisions must be informed by the current demand.

To ensure timely updates, social media channels (WhatsApp groups) were created for health facilities, operators and MOH departmental representatives. These WhatsApp groups provided real-time visibility on requests. District Health Management Teams were also included for their oversight. On the national level, there was a mandatory platform that the DCA instituted to share plans and operations.

One crucial success stemmed from a deliberate move to ensure that reporting systems for the drones program were integrated into the accountability and documentation requirements for the public sector supply chain, i.e. the logistics management information system that is used for decision-making. Health facilities often struggle to send

paper-based reports on time, but the drone network helped expedite their transportation and prompt entry into the system. It allowed officials to direct supplies to facilities that were running low on particular items.

BROADEN THE NETWORK OF PLAYERS

Some key players that were critical to the operations during emergencies in the health sector were inadvertently left out of the RPA TWG. The absence of these important stakeholders meant lost opportunities and an inability to fully utilize the drones during disruptions. For example, the health cluster coordinator and other logistics cluster members in the health sector were unintentionally excluded.

The accidental oversight was discovered when they were pulled into drone conversations after Malawi experienced a cyclone. To prevent future mistakes like this, a stakeholder mapping exercise was created to ensure a comprehensive capturing of what resource and capabilities are available during disruptions.

What is next?

A growing body of evidence shows that efficient drone networks allow for a swift response to emergencies. The framework used in Malawi allows for responsive learning. The lessons learned after each disruption usher in an informed adaptation that improves and strengthens the supply chain. Just as the drone network pivoted to deliver PPE and vaccines during Covid-19, it has adapted to respond to subsequent disruptions, including cyclone Ana, other tropical storms, as well as the polio response in Malawi.

Multiple conversations with the World Food Programme, one of the key health cluster stakeholders in Malawi, and other partners have taken place to elevate the role drones play in an efficient and prompt response during an emergency situation when roads may be impassible.

Drones provide enough flexibility to transport a wide range of health care related products. Diversifying what drones transport adds value to their role in the supply chain. This a crucial prerequisite to expanding the use of drone delivery beyond healthcare, which will increase their cost-efficiency. These future outlooks are an important consideration for drone operations since cost is often a barrier to an investment in innovation.

When governments create enabling environments for innovations, they can quickly pivot during an emergency. This case study presented evidence from successful drones operations in Malawi and demonstrated the value of pursuing innovations as part of preparedness strategies for future crises. It also demonstrated the application of the Supply Chain Resilience Framework as part of emergency preparedness.

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