

Lessons learned in the transportation of healthcare products by drones

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VIEWPOINT

“If cost-effectiveness can be increased, this healthcare transport method could prove vital for vaccine delivery to hard-to-reach locations.”

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On January 16, 2023, Charlotte Barker, Editor, *Vaccine Insights*, spoke to Archimède Makaya, Drone Program Manager, and Louis Tshituka, Team Lead, Monitoring and Evaluation, VillageReach. This article has been written based on that interview.

Drones offer a means to transport healthcare supplies, including vaccines, to/from regions not easily accessed by road or plane. Here, we explore the benefits and limitations of drone transport, and how best to leverage this technology to achieve vaccine equity.

VillageReach is a global health organization working with governments and drone transport service providers to identify priority locations, design drone supply and collection systems of health products by drones – and ensure transportation of health products by drone in three core countries, the Democratic Republic of Congo (DRC), Malawi, and Mozambique. This coordinated effort of all stakeholders including drone transport service providers, governments, and local communities, creates an enabling environment for the business development of drone solutions in these countries.

Drones for Health (D4H) is one such collaborative program. In DRC, D4H is located in the Equateur Province and is one of the largest bi-directional (delivering and picking up) drone networks in the world, serving 40 health facilities via 24 landing sites, across an area of 37445 km².

DRONES FOR MORE EQUITABLE VACCINE DELIVERY

One of the primary problems for the healthcare supply chain in Africa, and especially in DRC, is the low availability of products in hard-to-reach locations. Traveling between locations in DRC is often challenging, due to an abundance of rivers, forested areas, and poor road infrastructure. This also creates challenges in transporting samples to laboratories for diagnostics.

By introducing a two-way drone network, the D4H program has increased access to vaccines and other medications for

hard-to-reach health facilities and allowed rapid transport of biological samples to provincial labs, despite natural barriers like the Congo River, Lake Tumba, and the Pacific Equatorial Forest. According to the Kinshasa School of Public Health's performance research on the use of drones in the delivery of health commodities, the availability of vaccines has increased from 65 to 98% in health facilities supplied by drones [1]. Similarly, the number of health facilities shipping samples in less than 3 days has increased from 10 to 69%.

Drones contribute to the goal of universal health coverage, and ensure the quality of the product transported, due to their speed, which is especially important for sensitive products such as vaccines and biological samples. Last year, D4H succeeded in transporting an Ebola lab sample 220 km in 1.5 h. Drones are also responsive and resilient, suiting them to emergency situations.

UNDERSTANDING & OVERCOMING THE LIMITATIONS OF DRONE DELIVERY

Drones are powered by rechargeable batteries and have a limited range. To allow drone transport over longer distances, battery charging sites have been established between the main hub and outlying drone sites in the D4H network.

According to a study by supply chain consultancy OPS MEND LLC, conducted by Noel Watson, doses transported by drone cost more than those transported by other modes, meaning that integration of drones into public health supply chains is not fit for every purpose [2]. Finding the most cost-effective and beneficial way to integrate drones requires planning, collaboration, and staged implementation.

To increase cost-effectiveness, transportation can be optimized in two ways. First, ensuring drones are used at maximum capacity is essential. In addition, the cost needs to be shared between more network end-users. Currently, only the vaccine program is supporting the drone's operations. If the network and products can be diversified, resources from many donors and end-users can be acquired.

The overall supply chain can be optimized by only transporting products by drone that are best suited to this mode of transport, such as vaccines, laboratory samples, and test kits for the management of diseases such as malaria, tuberculosis, and HIV/AIDS. Less time-sensitive and bulkier health products continue to be delivered by other means, such as by road or river.

FUTURE PLANS FOR D4H

In the latest phase of the D4H program, one of the objectives was to generate evidence for the use of drones in the supply chain and to create an enabling environment for drone use. The results of these performance and cost-effectiveness studies were shared with all stakeholders. This includes, for example, the establishment of the drone health commission at the national level and the drone working group at the provincial level. D4H is also organizing media reporting such as television segments and billboards.

D4H aims to continue studying the benefits of drones in terms of quality and equity. D4H will also continue exploring the product and customer diversification approach to achieve better cost-effectiveness. If cost-effectiveness can be increased, this healthcare transport method could prove vital for vaccine delivery to hard-to-reach locations.

BIOGRAPHIES

ARCHIMÈDE B MAKAYA is Drone Program Manager for VillageReach in the Democratic Republic of Congo (DRC). He is a medical doctor at the University of Lubumbashi in the DRC, and has more than 15 years of experience in public health. He is experienced in primary health care, the treatment of infectious diseases, the supply chain of health products, Drone health products supply chain system design, collaborating with Government officers and Drone providers, and the Implementing Drone Supply Chain program in hard-to-reach & remote areas.

LOUIS K TSHITUKA is Team Lead, Monitoring and Evaluation at VillageReach in the DRC. He is currently a doctoral student in health and social protection economics after having obtained a specialization in quantitative and econometric methods for health research from the Public Health Master of Aix-Marseille University in France. He has more than 10 years of experience in the field of monitoring and evaluation of public health projects and programs. His current work focuses on monitoring and evaluation, quality, demand and use of evidence for decision-making, quality of services, capacity building and research on health inequalities.

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AUTHORSHIP & CONFLICT OF INTEREST

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