

From A to O-Positive: Blood Delivery Via Drones in Rwanda

Modestus Amaechi, Tea Cimini, Mduduzi Mhlanga, Chinedum Nwaogwugwu, Anita McGahan

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Executive Summary

Rwanda’s mountainous topography makes ground transportation of medical supplies unreliable — some roads stretching into rural areas remain uncared for and unpaved. Between 25 and 40 per cent of all temperature-sensitive medical supplies sent from urban centres to rural health clinics are wasted because of an unreliable cold-chain infrastructure. Rural clinics are also often subject to stockouts, and patients in need of specialized blood products, drugs and other supplies are unable to acquire them. Zipline, a US-based health logistics company, aims to address the issue of access to medical supplies, largely leap-frogging traditional modes of transportation and various obstacles. Zipline uses drones to deliver blood and other routine and emergency medical supplies from distribution centres to district hospitals and rural health centres.

Although the company has been celebrated in the media for its operations, there is little scholarly work on its operations and performance. This has led to some confusion over its scale. We aimed to gain insight into the details of Zipline’s business model, including the infrastructure, regulations and government support that make Zipline possible, and to understand its impact on health outcomes in Rwanda. Our work was entirely based on published materials since our research was conducted during the COVID-19 pandemic.

Healthcare Context

Renowned for its mountainous landscape, Rwanda is a relatively small country in central Africa that stretches over a surface area of 26,338 square kilometres.¹ In 1994, the genocide against the Tutsi left over a million people dead and significantly ruptured the country's civil and socioeconomic fabric. Since then, the country has worked to "promote the security, welfare and dignity of citizens," which includes boosting the capacity and reach of its healthcare system and fostering innovation.²

The healthcare system is mostly publicly funded and operated, and includes national referral hospitals, district hospitals, health centres, dispensaries, community health posts and community health workers. Many of these facilities are located in rural areas, where health centres deliver most primary care. As of 2018, there were 465 health centres in Rwanda, each serving an average catchment population of approximately 20,000 people.³ These facilities typically receive about 100 patients per day for services that include basic emergency care, antenatal care, normal delivery, postpartum care, family planning, pediatric care and nutrition and routine checkups.⁴ Health centres primarily serve outpatients, except in the case of maternity care where women and newborns typically stay 24 to 72 hours.

Health outcomes spanning numerous indicators had already dramatically improved

prior to Zipline's involvement. For example, the decrease in maternal mortality rates is a testament to Rwanda's commitment to improving its healthcare system — the country went from having 1,160 deaths per 100,000 live births in 2000 to 260 in 2016.⁵

Despite the progress, numerous challenges remain. A 2015 paper found that residences over five kilometres from health centres were more likely to experience negative health outcomes. At the time, only 43 per cent of health centres were within an hour's walking distance from health centres, highlighting that Rwanda faces issues with its transportation infrastructure and/or housing units being too far from health centres.⁶

Poor road infrastructure in the mountainous landscape and a lack of road maintenance render cold-chain delivery of medical supplies unreliable. According to the Ministry of Health, between 25 and 40 per cent of all temperature-sensitive medical supplies sent from urban centres to rural health clinics are wasted because of the unreliable cold chain.⁷ Rural clinics are often subject to stockouts, and patients in need of specialized blood, drugs and other supplies are unable to acquire these supplies.⁸ Overstocking, on the other hand, can cause wastage. In 2018, Dr. Mazarati Jean-Baptist, the head of the Biomedical Service Department, said that the country lost 6 per cent of its blood donations because of overstocking.⁹ In such cases, blood was delivered to health centres but never used.

1 "Rwanda Voluntary National Review (VNR) 2019," The Rwanda Ministry of Finance and Economic Planning, June 2019. [↗](#)

2 Ibid., 13.

3 Ulises Huerta Munoz, and Carina Källestål, "Geographical Accessibility and Spatial Coverage Modeling of the Primary Health Care Network in the Western Province of Rwanda," *International Journal of Health Geographics* 11, no. 1 (2012): 1–11.

4 "Zipline — Vital, On-Demand Delivery for the World," Zipline. [↗](#)

5 "Maternal Mortality Ratio, (Modelled Estimate per 100,000 Live Births) — Rwanda," WHO, UNICEF, UNFPA, World Bank Group, and the United Nations Population Division. *Trends in Maternal Mortality: 2000 to 2017* (Geneva: World Health Organization, 2019). [↗](#)

6 Nael Aoun, Hirotaka Matsuda, and Makiko Sekiyama, "Geographical Accessibility to Healthcare and Malnutrition in Rwanda," *Social Science and Medicine* 130 (April 2015): 135–45. [↗](#)

7 Aryn Baker, "The American Drones Saving Lives in Rwanda," *Time*. [↗](#)

8 Tom Jackson and Devin Hance, "How Delivery Drones Are Saving Lives in Rwanda," *Fortune*, January 7, 2019. [↗](#)

9 "From Muhanga to the Rest of Rwanda; How Zipline Is Providing Smarter Blood Distribution Service," DailyGuide Network, November 24, 2018. [↗](#)

The ability to transport blood quickly is critical because a patient experiencing massive blood loss can deplete the supply of a small-to-medium hospital while larger hospitals might not have enough supply of certain blood types.¹⁰ These circumstances have given rise to the interest in the distribution of blood by drone from central facilities to remote areas where emergencies have occurred.

Rwanda's Supply Chain

Rwanda's health system is characterized by a hierarchical structure. Its apex is the Ministry of Health which regulates the operations of all public and private facilities in the country. Decentralized institutions in the system include the province-, district-, sector-, cell- and village-level organizations with responsibility for the provision of health services.¹¹ Citizens also

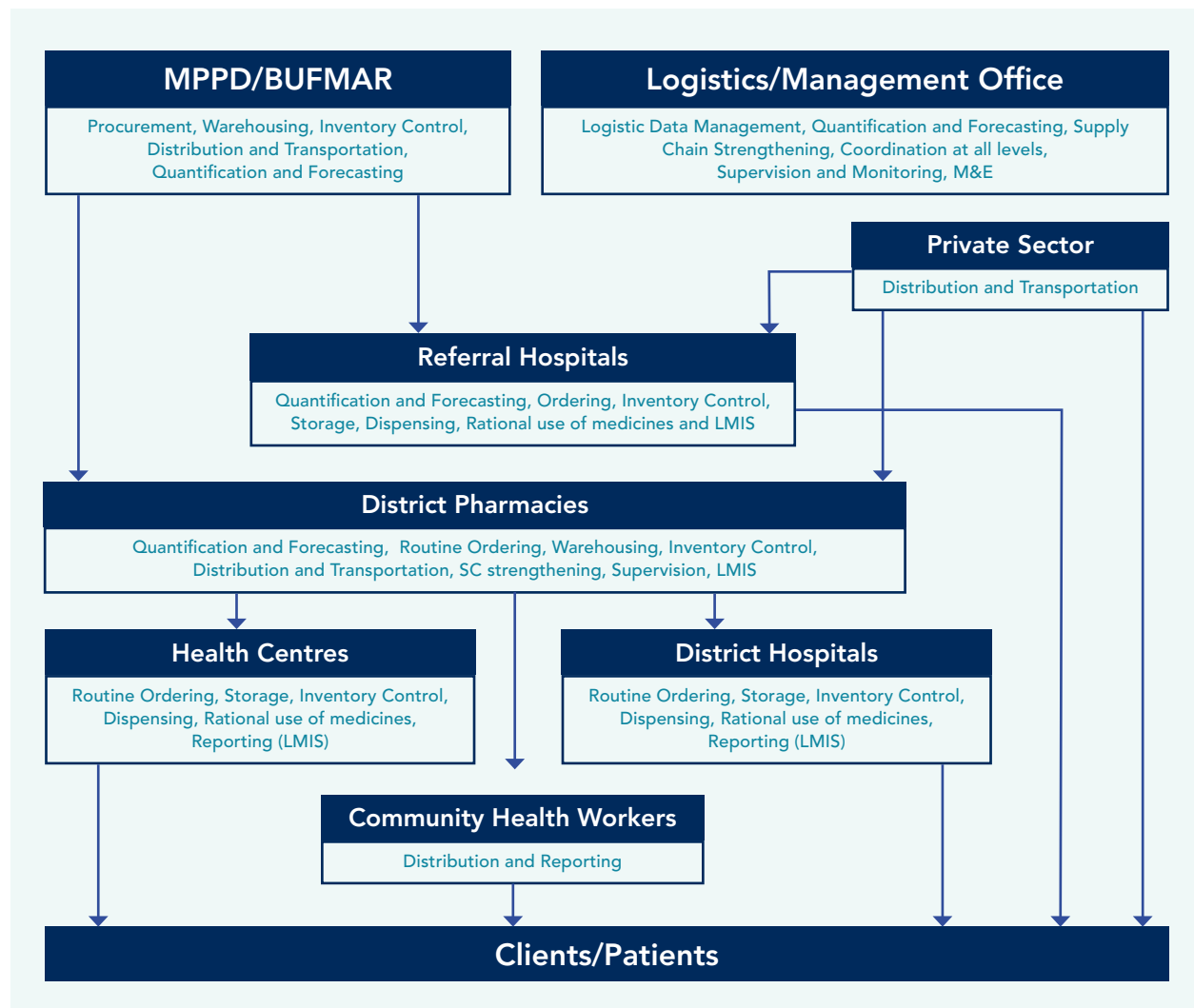


Figure 1. Rwanda's Supply Chain Network. Arrows represent commodity flows. (Source: "Rwanda NSCA and Pharmaceutical Supply Chain Strategic Plan Technical Report PDF Free Download.") [↗](#)

10 Manohari Balasingam, "Drones in Medicine — The Rise of the Machines," *International Journal of Clinical Practice* 71, no. 9 (September 2017): e12989. [↗](#)

11 "WHO Country Cooperation Strategy 2014-2018: Rwanda," World Health Organization (2015): 21.

rely on faith-based organizations, for-profit organizations, nongovernmental organizations and traditional medicine suppliers to meet their health needs.

The Medicine Procurement and Production Division (MPPD) of the Ministry of Health manages the procurement, forecasting and distribution of medical supplies. Serving as a warehouse, the MPPD supplies medical products to district pharmacies and referral hospitals. District pharmacies, in turn, distribute products to health centres and district hospitals. Patients access medical services from health centres, district hospitals, community health workers, private hospitals or referral hospitals, depending on the level of care they require. The Logistics Management Office (LMO) works with the MPPD to direct supply chain functions. The Ministry of Health oversees and supervises all activities. (See Figure 1 for details.) Zipline, as a healthcare logistics company, is situated between the MPPD (i.e., the supplier) and health facilities (i.e., health centres, district hospitals, health posts and community health workers), acting as a bridge between both parties.

Drones in Medicine

In recent years, drones have emerged as a popular solution to development and humanitarian challenges. Drones can deliver goods in four broad categories: retail goods, food, medical and industrial goods, each with its own unique social, legal and regulatory challenges at different stages. The most popular uses are in agriculture, the environment, conservation and medicine.

In the medical field, drones are considered an effective solution to deliver goods in relatively small quantities during emergency situations. For example, a study examining their use in delivering defibrillators found that delivery with drones, instead of ambulances, could increase patients' survival rates by 72 per cent.¹² Similarly, drones can be instrumental in reducing delivery costs, though the evidence on this point is mixed. A study from Johns Hopkins found that during vaccination campaigns, drones could decrease costs by USD 0.21 per dose compared to traditional modes of delivery.¹³ Several countries have begun experimenting with drones for medical service. In Papua New Guinea, Doctors Without Borders has used them to transport tuberculosis test samples from remote villages. In Malawi, drones increase access to HIV testing kits in rural areas.¹⁴

Reaching Rural People

In 2019, Rwandans residing in rural areas accounted for 82.69 per cent of the total population, and some have struggled to maintain constant and reliable access to vital medical supplies.¹⁵ Of the approximately 14,000 kilometres of roads in Rwanda, only 2,600 kilometres are paved, making vehicular deliveries burdensome and time consuming.¹⁶ Bad weather conditions also exacerbate transportation problems. According to a study on road and public transport accessibility in Rwanda, 63 per cent of the rural population lives two kilometres away from an all-season road.¹⁷ Consequently, the average delivery time for urgently needed medical supplies such as blood is up to five hours for the harder-to-reach areas.

12 Judy E. Scott and Carlton H. Scott, "Drone Delivery Models for Healthcare," *Proceedings of the 50th Hawaii International Conference on Social Sciences*, 2017.

13 Geoffrey Ling and Nicole Draghic, "Aerial Drones for Blood Delivery," *Transfusion* 59, no. S2 (2019): 1608–11. [↗](#)

14 Balasingam, "Drones in Medicine — The Rise of the Machines."

15 "Rural Population (% of total population) — Rwanda," The World Bank Group.

16 Jackson and Hance, "How Delivery Drones Are Saving Lives in Rwanda." [↗](#)

17 Baker, "The American Drones Saving Lives in Rwanda."

Examining vaccination campaigns, Sachiko Ozawa and colleagues define hard-to-reach populations as “those facing supply-side barriers ... due to geography by distance or terrain, transient or nomadic movement, healthcare provider discrimination, lack of healthcare provider recommendations, inadequate vaccination systems, war and conflict, home births, or other home-bound mobility limitations, or legal restrictions.”¹⁸ While immunization campaigns are not the only issue in Rwanda, the definition captures similar challenges in the supply chain. In emergency situations, which Zipline partially operates in, hard-to-reach populations are people who cannot obtain timely access to care and essential medical products. Cost of healthcare services is an additional barrier for hard-to-reach populations.

About Zipline

In Rwanda, Zipline’s primary activity is the fast delivery of blood and other emergency medical supplies via drones. Cooperating with the Civil Aviation Authority, the company has a unique ability to complement or replace existing delivery networks. Zipline also has expertise in product handling and management. It offers solutions for emergency response and on-demand delivery for medical supplies. It has also played a role in responding to COVID-19 health needs.¹⁹ In addition to its work in Rwanda, the company has expanded to Ghana, the Philippines, India and parts of the United States. It also recently signed a new contract with Nigeria to deliver COVID-19 vaccines.²⁰ Keller Rinaudo, the company’s CEO, says the goal is to have Zipline serve 700 million people across Africa, India and the US. In the short term, Zipline aims to serve 140 million people.²¹



Governance and Stakeholders

Zipline has partnerships with key players in the regulation and medical-procurement space in Rwanda. The National Centre for Blood Transfusion (NCBT), a division of the Rwanda Biomedical Centre (RBC), collects blood from volunteers through regional centres for blood transfusion. The NCBT has 568 collection sites and five regional distribution sites across the country, all located in administrative provinces and in Kigali. By 2018, the NCBT was collecting approximately 60,000 blood units each year.²² Since 1985, Rwanda’s policy for blood collection requires that blood must be collected by unpaid volunteers and distributed for free.

Once it has collected donations of blood, the NCBT transports the blood products to Zipline by truck. The NCBT is the key contributor to Zipline’s blood supply as well as other medical products. According to Dr. Jean-Baptist Mazarati, the head of the Department of Biomedical Services (including the NCBT), Zipline also acquired land for its distribution centres as well as government assistance with the required technology to operate the distribution centres. The Rwandan government pays Zipline a fixed

18 Sachiko Ozawa, Tatenda T. Yemeke, Daniel R. Evans, et al., “Defining Hard-to-Reach Populations for Vaccination,” *Vaccine* 37, no. 37 (September 2019): 5527. [↗](#)

19 Miriam McNabb, “Zipline: Drones Could Begin Helping US Hospitals Respond to COVID-19 Now,” *Drone Life* (blog), March 30, 2020. [↗](#)

20 Libby George, “Nigeria’s Kaduna Pairs with Zipline for Drone-delivered COVID Vaccines,” *Reuters*, February 3, 2021. [↗](#)

21 Will Grahame-Clarke, “Saving Lives One Drone at a Time,” *London Business School*, February 10, 2021. [↗](#)

22 National Centre for Blood Transfusion. Rwanda Biomedical Centre. [↗](#)



Figure 2. Medical supplies delivered by drone. (Photo courtesy of Paul Kagame).

price per delivery, with a minimum volume guarantee. However, the specifics of this arrangement have not been disclosed.

The Ministry of Health (MoH) is involved with Zipline on a broad administrative level. In addition to being responsible for the NCBT, the MoH was closely involved with the negotiations and the development of the contract between Zipline and the Government of Rwanda.

According to a student interview reported in a Harvard Business School case, Nicholas Hu, a managing director at Zipline in California stated that the MoH also helps establish the products and product quantities that the company needs to deliver.²³ The MoH also sets general targets on where Zipline can deliver.

The next major stakeholder is the Rwandan Civil Aviation Authority (RCAA), which takes on the management, operation and maintenance of airport infrastructure. Before medical products are launched, Zipline performs a pre-flight quality assurance on the drone, confirms its flight plan with the RCAA and requests flight clearance. Once the drone is catapulted, it is fully autonomous. Both Zipline and the RCAA track the drone's path and can redirect it through the country's wireless network.

Zipline benefits from having many donors including the UPS Foundation and the GAVI vaccine alliance. The company aims to eventually add donors such as the Bill and Melinda Gates Foundation, Goldman Sachs, Toyota Tsusho Corp and more. In 2018 and 2019, donors helped Zipline raise USD 190 million in new financing which boosted its valuation past USD 1 billion.²⁴

How It Works

Zipline operates from two distribution centres located in Muhanga and Kayonza, cities located west and east of Kigali respectively. The layout facilitates the work that goes into delivering medical supplies. For example, inside the Kayonza-based distribution centre, there are three main operating rooms: a control tower where drone movement is monitored for safety reasons, a warehouse where blood stocks are kept, and a flight operations centre. These operating rooms work in tandem to store medical supplies, prepare supplies for delivery and execute delivery as fast as possible.

Blood is centrally collected in Kigali in partnership with the NCBT and delivered to

23 "Zipline: Drones That Can Save Lives and Revolutionize Supply Chains," Digital Initiative, Harvard Business School. [↗](#)

24 Jonathan Shieber, "Zipline's New \$190 Million Funding Means It's the Newest Billion Dollar Contender in the Game of Drones," TechCrunch, May 17, 2019. [↗](#)

Zipline's distribution centres in refrigerated vehicles. The products then become available for distribution to district hospitals and other community-level health centres. Prior to accepting orders for medical supplies from physicians, Zipline forms relationships with health centres and hospitals within its service radius. Zipline's community outreach staff create awareness about Zipline's operations in communities that need and are eligible for the delivery service.

The delivery process involves several steps. First, health personnel at clinics and hospitals submit orders to Zipline for the medical products they need via SMS, WhatsApp or phone call. Medical products, which are centrally stored at the Zipline distribution centres in ultra-cold storage, are packaged and prepared for flight, maintaining cold-chain and product integrity. Once Zipline packages the order, they catapult the products on a cargo drone that travels up to 160 kilometres per hour once in the air. Drones fly rain or shine over mountains, bodies of water and washed-out roads. Within minutes of the drone's departure, health workers receive confirmation that their order has launched. Upon arrival at their destination, medical products are delivered gently by parachute into a pre-designated area the size of a few parking spaces. Hospital staff are notified via text message of the delivery.

Zipline uses what is called a fixed-wing drone model, which is best for covering longer distances and carrying heavier loads.²⁵ These models generally use predetermined flight paths uploaded ahead of takeoff. Zipline periodically upgrades these drones, referred to as "zips." In 2018, Zipline developed a new zip that could cruise 21 kilometres per hour faster than the previous model with a round trip average of

160 kilometres and able to carry 1.75 kilograms of cargo.²⁶ The control tower at the Zipline distribution centre communicates with the RCAA before launching any drones to prevent the drones from colliding with commercial aircraft or other aerial vehicles.

Evaluating Success

Although a comprehensive and authoritative review of Zipline's impact on health outcomes in Rwanda is not currently available, numerous sources have corroborated the information that the company showcased, focusing on its success in reaching hard-to-reach communities and increasing access to blood products for all Rwandans.

At the beginning of 2020, Zipline was delivering over 75 per cent of Rwanda's blood supply outside of the capital, Kigali.²⁷ The Kayonza distribution centre is providing better access to medical supplies to some major hospitals in the area such as Ngarama, Gahini, Rwinkwavu, Kirehe and Kibungo public hospitals. At the Rwinkwavu hospital, average delivery time has been slashed from two hours to just 15 minutes.²⁸ By March 2019, over 300 deliveries of at least 550 units of blood had been successfully made by the Kayonza centre. In 2019, together with the Muhanga distribution centre, Zipline had made over 11,000 deliveries of more than 20,000 blood units of which 30 per cent were emergency deliveries.²⁹

Anecdotal evidence points to the fact that the reduction in delivery times can have tremendous impact on health outcomes, especially in emergency situations. For example, having access to blood in maternity wards can

25 "Drones in Humanitarian Action: A Guide to the Use of Airborne Systems in Humanitarian Crises," Swiss Foundation for Mine Action (SDF, February 12, 2016).

26 Evan Ackerman, "Zipline's Bigger, Faster Drones Will Deliver Blood in the United States This Year," IEEE Spectrum, March 4, 2018. [↗](#)

27 Will Grahame-Clarke, "Saving Lives One Drone at a Time," London Business School, February 10, 2021. [↗](#)

28 "Inside Zipline's New Distribution Centre," *The New Times*, March 18, 2019. [↗](#)

29 Ibid.

dramatically increase the chances of survival for both mothers and newborns. Rwanda had already made impressive strides in decreasing maternal mortality, going from 1,160 deaths per 100,000 live births in 2000 to 260 in 2016 when Zipline began its operations.³⁰ However, Zipline has long maintained that it has played and will continue to play an essential role in reducing that number further.³¹

The company has also sought to play a role in providing remote communities with access to products with short shelf lives or storage requirements that would make them susceptible to spoilage. Other than blood, Zipline also delivers fresh plasma, cryoprecipitate and platelets, which had previously been hard to

procure and store properly and are now fully accessible to all hospitals in Zipline's radius of operations.³²

Conclusion

Lessons Learned

PARTNERSHIP WITH THE PUBLIC SECTOR

Engaging and partnering with local stakeholders via a public-private partnership has been essential to Zipline's success. The company has relied on the flexibility of the RCAA in updating its regulations to address the presence of unmanned aerial vehicles in aerial space.



Figure 3. Zipline CEO Keller Rinaudo leading the tour of the medical drone facility, Muhanga, October 14, 2016. (Photo courtesy of Paul Kagame).

30 World Bank, "Maternal Mortality Ratio, (Modelled Estimate per 100,000 Live Births)."

31 Baker, "The American Drones Saving Lives in Rwanda."

32 Jonathan W. Rosen, "Zipline's Ambitious Medical Drone Delivery in Africa," *MIT Technology Review*. [↗](#)

Similarly, the collaboration with the Rwandan Biomedical Centre ensured that Zipline is not solely responsible for procuring essential medicine and conducting quality assurance controls. This frees the company from significant logistical burdens. Without such support, Zipline's venture into Rwanda and Ghana might have been unsuccessful from lack of government buy-in.

REGULATORY AND TECHNICAL HURDLES

Zipline currently operates in Rwanda and Ghana, both relatively small countries. If the company intends to scale operations to larger countries, it will have to overcome a number of regulatory and technical hurdles. This means that drones must reach their destinations without falling, without causing harm and by landing safely in the event that they are unable to reach their destination. The drones must avoid collisions with power lines, buildings, trees and other aircraft.³³ As previously mentioned, Zipline's drones are closely monitored from takeoff to return by both the regulators (the RCAA) and by the company itself. This collaboration helps establish transparency and shares risk across actors in assuring the safety of everyday operations.

INTEGRATION INTO SUPPLY CHAIN

Zipline's service was well integrated into the medical supply chain. The company filled a substantial gap in Rwanda's health care logistics. It did not create a parallel delivery structure through which blood and other medical products can be delivered; rather, it supplemented and strengthened the government's existing capabilities to reach its citizens.

SCALE IS ESSENTIAL TO KEEP COST LOW

The costs of purchasing, building and maintaining infrastructure, as well as of operating drones, can be substantial. One of Zipline's founders declared

in 2017 that Zipline drones could reduce net cost in emergencies but were more expensive than traditional methods when used for restocking purposes.³⁴ However, there is some indication that, if done at scale, the delivery operations could increase medical products' availability and reduce the average cost per delivery.³⁵

COMPARING INVESTMENT FOR LONG-TERM IMPACT

Prior to committing to setting up a drone delivery system that is both complementary and potentially disruptive to traditional alternatives, it is important to consider the opportunity cost of sidelining traditional alternatives. Foregoing investments in roads could have an impact on other important social and economic indicators. Matternet, a California-based drone company, estimated the costs of building 50 base stations and operating 150 drones at USD 0.24 per flight throughout the city of Maseru in Lesotho. A back-of-the-envelope analysis suggests that drone delivery would be more cost-effective than the USD 1 million it would take to build a two-kilometre one-lane road.³⁶ Of course, roads can be used for more purposes than only blood delivery. Nonetheless, the comparison indicates the kinds of economic trade-offs involved in assessing the construction and set-up of drone delivery systems.

UNDERSTANDING RURAL NEEDS

Zipline appears effective in increasing access to medical supplies. However, improving health outcomes goes beyond access. To determine impact, we must better understand the needs of patients in rural communities and the implications for health system development, including the availability of trained medical personnel and technical equipment. In short, while Zipline can guarantee that blood can be made available, it is unclear whether trained physicians and

33 "Can Drones Deliver the Goods?" *The Economist*, June 8, 2017. [↗](#)

34 Rosen, "Zipline's Ambitious Medical Drone Delivery in Africa."

35 Leila A. Haidari et al., "The Economic and Operational Value of Using Drones to Transport Vaccines," *Vaccine* 34, no. 34 (July 2016): 4062–67. [↗](#)

36 Michelle Sing Yee Hii, Patrick Courtney, and Paul G. Royall. "An Evaluation of the Delivery of Medicines Using Drones," *Drones* 3, no. 3 (June 27, 2019): 52. [↗](#)

transfusion machines will be available to ensure the appropriate administration of blood. Therefore, to determine impact, careful consideration of the medical environment should be undertaken.

While reports indicate that the National Centre for Blood Transfusion (NCBT) provides access to blood through Zipline, an outstanding question arises regarding whether district hospitals offer blood transfusion services. In 2005, we learned from Rwanda's Service Availability Mapping survey that 12 districts had reported not offering these services. Of those that did offer these services, 28 per cent reported interruptions in their blood supply.³⁷ A survey on activity and outcomes following Zipline's implementation would generate critical insights about the company's impact on Rwandan health outcomes.

Limitations to Research

Our team originally planned to travel to Rwanda to obtain evidence on Zipline's impact from pharmacists, physicians and administrators. We also planned to visit the company's distribution site in Muhanga. However, because of the COVID-19 pandemic, the Rwandan government closed its borders to foreigners to curb the spread of the virus and prioritized COVID-related projects for consideration under its Institutional Review Boards for Research Ethics Approval. We therefore had to find a different approach.

Our first instinct was to conduct interviews with

Rwandan personnel in Zipline, the Ministry of Health and other organizations, but we had to abandon this approach because we were unable to apply for the required local Research Ethics Board approval from each of the three ethics boards in Rwanda: National Council of Science and Technology (NCST), National Ethics Committee (NEC) and the National Health Research Committee (NHRC) due to complications from the COVID-19 pandemic.

As a result of these obstacles, the team continues to have unanswered questions about Zipline's activities in Rwanda. Some of the questions involve:

- **Cost:** What is the cost per delivery? How is Zipline's contract with the government of Rwanda structured and enforced?
- **Service availability:** How widely available are Zipline's services across Rwanda?
- **Data:** What kinds of data are collected? Who has access to the data?
- **Products and flexibility:** What flexibility does Zipline have in delivering medical products outside the government-mandated products?
- **Impact:** How significant has Zipline's impact been on the health of hard-to-reach populations in Rwanda?

37 Rwanda Ministry of Health and WHO, "Service Availability Mapping," World Health Organization, 2005.

Research Team

Modestus Amaechi is an undergraduate student at the University of Toronto Faculty of Engineering and Applied Science studying chemical engineering. He is currently in his Professional Experience Year (PEY) working at Independent Electricity Systems Operators (IESO) as a student intern. He is passionate about green energy production for the future to fight climate change.



Tea Cimini graduated from the Sciences Po and University of Toronto dual degree program with a Master of Public Policy and a Master of Global Affairs. Currently, she works as a consultant at the World Bank Group where she coordinates engagement with global parliamentarians and pursues research on trends in legislative bodies worldwide. She is also an external consultant at the European Bank for Reconstruction and Development where she conducts research on inclusive municipal policies. Tea is passionate about innovative, multistakeholder approaches to development.



Mduduzi Mhlanga is a Master of Global Affairs candidate at the Munk School of Global Affairs & Public Policy. He obtained his Bachelor of Arts in political science from the University of Toronto Mississauga. Beyond the Reach Alliance, Mdu has also been involved in other initiatives close to the Munk School including the Global Ideas Institute, Progress Solved, the Mosaic Institute and more. Through these he has looked to deepen his understanding of global issues pertaining to development and security. Following his master's program he aims to work in the management consulting industry to gain more private-sector experience.



Chinedum Nwaogwugwu obtained her MBA from the University of Toronto in 2020. Currently, she is a senior consultant at Deloitte Canada where she works primarily with energy and mining companies to provide cost recovery services and identify contractual process improvement opportunities. Chinedum strongly believes that critical thinking, empathy and awareness are key to understanding development issues. She writes about inequality, education and career development, and has been published by local and international platforms.



Anita M. McGahan (faculty mentor) is University Professor and George E. Connell Chair in Organizations and Society at the University of Toronto. Her primary appointments are at the Rotman School of Management and the Munk School of Global Affairs & Public Policy. She is cross appointed to the medical school and the Dalla Lana School of Public Health; is senior associate at the Institute for Strategy and Competitiveness at Harvard University; is the chief economist in the Division of Global Health Innovation at the Massachusetts General Hospital; and is a past president of the Academy of Management. From 2014 to 2019, she was a faculty member of the MacArthur Foundation Research Network on Opening Governance. McGahan's credits include four books and over 150 articles, case studies, notes and other published material on competitive advantage, industry evolution and global health. Her current research emphasizes entrepreneurship in the public interest and innovative collaboration between public and private organizations.



The Reach Alliance began in 2015 at the University of Toronto as the Reach Project, a student-led, faculty-mentored, multidisciplinary research initiative. Reach's unique approach uncovers how and why certain programs are successful in getting to some of the world's hardest-to-reach populations. Research teams, comprised of top students and faculty from across disciplines, spend twelve months investigating each case study. Once the data collection process is complete, teams write case reports that are published and disseminated across the Reach Alliance's diverse network of policymakers, practitioners, academics and business leaders.

Inspired by the United Nations' call to eliminate global poverty by 2030 as part of a set of Sustainable Development Goals (SDGs), our mission is to pursue the full achievement of the SDGs by equipping and empowering the next generation of global leaders to create knowledge and inspire action on reaching the hardest to reach.

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