

Brief: Impact Evaluation of Zipline Ghana April 2022

Measuring Zipline's Impact on Health Access, Availability



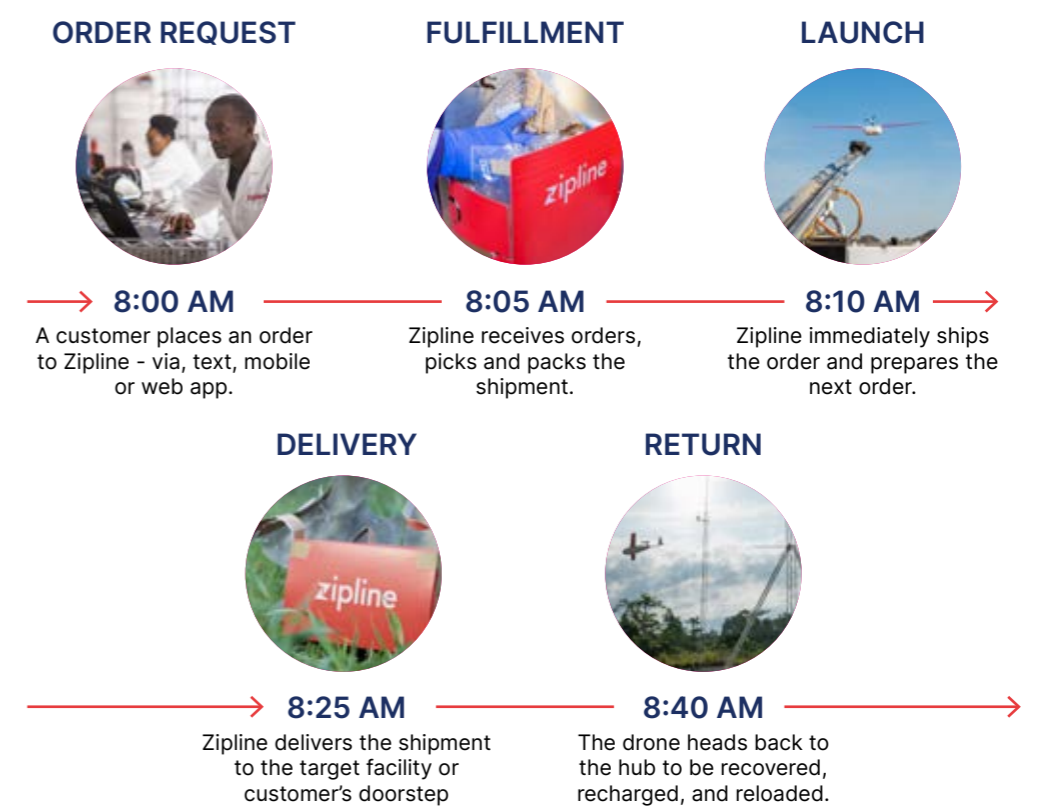
Context

Currently, nearly two billion people across the world lack reliable access to quality essential medical products such as blood and vaccines due to gaps in supply chains and poor infrastructure (WHO 2017). Drones, or unmanned aerial vehicles (UAV), are one promising option for medical product and vaccine delivery. Drones are increasingly used globally as a means to transport products including drugs, vaccines, blood, and diagnostic specimens between health facilities (Ling & Draghic 2019; Scott & Scott 2017; Würbel 2017; Hiebert et al 2020).

Zipline is the first medical drone delivery service to launch in Sub-Saharan Africa (SSA). Headquartered in the United States, the company's mission is to provide every human on earth with instant access to vital medical supplies. Since 2016, Zipline has had successful operations delivering blood, vaccines, medicines and other medical supplies to health facilities through a network of distribution centers in partner countries. The medical commodities delivered by Zipline in Ghana - vaccines, medicines and blood - are procured through the government supply chain and distributed via Zipline's warehouses. This enables facilities to receive products within 45 minutes, rather than several days when using traditional complex procurement systems – the turnaround time of the Ghanaian Regional Medical Stores (RMS) in supply ranges from 8-21 days, depending on the facility type (USAID 2020).

How Zipline Works

Zipline hub deliver hundreds of shipments to thousands of delivery points every day. This is what a typical order looks like:



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Zipline is an end-to-end supply chain solution, currently operating in Rwanda, Ghana, Japan, and the United States. Zipline's innovative drone delivery model, together with government partnership, has the potential to strengthen public supply chains and save lives.



Evaluation

In 2019, Zipline partnered with the Government of Ghana to launch operations in the country, with a plan to introduce drone delivery services in Ahafo, Ashanti, Bono East, Central, Eastern, Northern, North East, Upper East, and Volta Regions, covering approximately 2,000 health facilities. This created an opportunity to generate rigorous evidence on the impact of Zipline services to tailor Zipline's operational approach, to provide the Ghana Health Service (GHS) with insights into the impacts of Zipline's services on the health system, and to contribute evidence to the larger drone delivery and supply chain intervention space.



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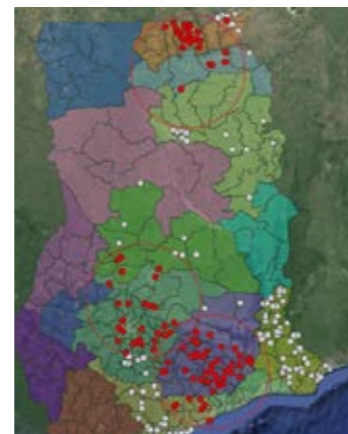
Evaluation Overview

IDinsight conducted a quasi-experimental impact evaluation, using a matching design. IDinsight collected baseline data from health facilities in-person in October 2019 – February 2020. Endline data was collected in two rounds that were initiated three months apart between June 2021 - October 2021. Endline data was collected using phone surveys with various health facility personnel due to the COVID-19 pandemic. To identify the causal effect of access to Zipline, IDinsight compared outcomes between treatment facilities (those within Zipline service zones with access to Zipline) with matched control sites (health facilities that were outside of Zipline service zones that did not have access to Zipline services). IDinsight applied coarsened exact matching based on key baseline characteristics to identify the final sample of facilities.



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The final sample was composed of 107 treatment and 112 control facilities from 238 and 184, respectively. The sample was selected at an early stage of Zipline operations. Compared to Zipline's footprint today, the study sample includes more facilities in peri-urban areas and few facilities where Zipline is the sole provider of supplies. As a result, the sample (and therefore impact results) may differ from Zipline's broader operations in Ghana today and in the future. However, similar Zipline ordering behavior was found when comparing in-sample facilities to out-of-sample facilities.



Map of Study Sites. Red circles indicate Zip-zones, red dots are Zipline facilities included in the treatment sample, white dots are selected control facilities.

The impacts are summarized and aggregated spanning 18 medical products, 8 health conditions, and 10 vaccines, which were selected before the start of the study based on Zipline's and donors' interest in the product and demand by health facilities.



18 medical products



8 health conditions



10 vaccines

Key Results

1. Zipline increased the diversity of health facility-stocked medical products:

- Medical Product Stocking:** Zipline facilities¹ stocked 1 more product on average (p-value² =0.05), compared to control facilities which stocked 10.24 products (out of 18 products in scope), representing a 9.4% increase.

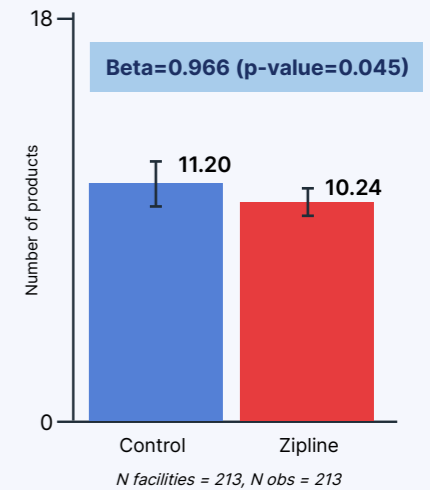
2. Zipline reduced the number of days without medical products and vaccines.³

- Medical Product Stockouts:** Zipline increased the availability of medical products by reducing the number of days without medical products in the past 3 months. On average, across all 18 products, regardless of which products facilities chose to stock, Zipline reduced the number of days without a product by 5 days (p-value <0.01), compared to 45 days in the control group, representing an 11% drop. For products that facilities chose to stock, there was a 3 day reduction (p-value=0.06) in number of days without a product, compared to 14.4 days in the control group (a reduction of 20%).

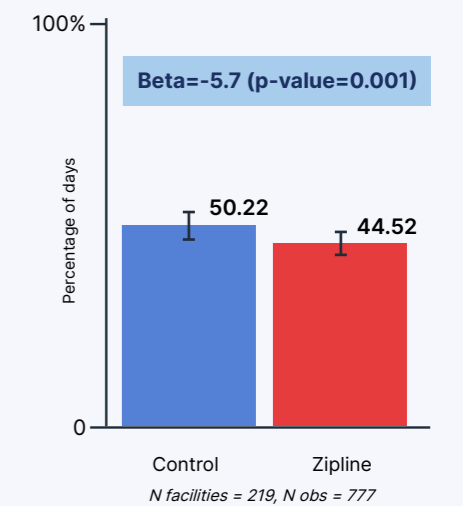
- Vaccine Stockout Duration:** There is robust evidence to conclude that for facilities that experience stockout of vaccines, the duration of vaccine stockout was reduced by 3.2 days (p-value=0.01) in Zipline facilities, compared to 5.3 days in control facilities, representing 60% drop. However, there is insufficient evidence to conclude that Zipline reduced the percentage of stockout days for vaccines since the results were not statistically significant, but the results pointed in the right direction.

1 Note that the number of observations and facilities differ because two rounds of endline data collection with the same sample of facilities were conducted.
 2 All p-values have been adjusted for multiple hypothesis testing, using false discovery rate (FDR) procedure outlined in Benjamini et al. 2006.
 3 'Medical products' refers to any medical product relevant to the evaluation (medicine and diagnostic tests) that is not considered a vaccine.

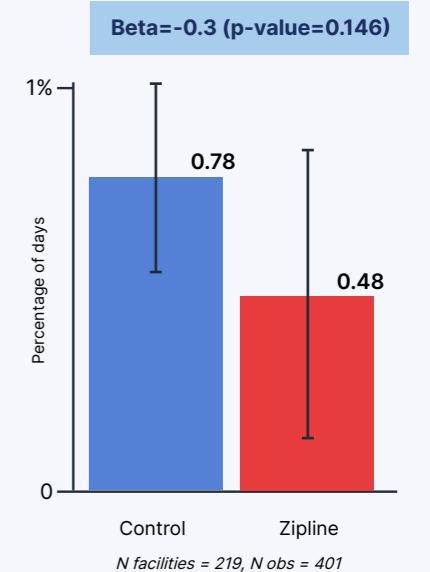
Number of unique products stocked in the past 1 year (out of 18):



Average percentage of days of stockout of medical products (3 months):



Average percentage of days stockout of vaccines (3 months):



Note: Vertical bars represent 95% confidence intervals

3. Zipline did not have a significant effect on patient referrals due to medical stockouts, but it reduced instances of patients being turned away due to vaccine stockouts.

Patient referrals due to medical stockout: Zipline had no impact on referrals to other health facilities for an average patient treated by a general healthcare worker. However, we did see evidence that Zipline facilities were more likely to have medications at the time when patients presented with severe malaria and snakebites. In the control group, the probability of having a stockout of severe malaria treatment and anti-snake serum at the time of treating a patient was 41% and 73%, respectively. This was reduced by 26 and 42 percentage points (a decrease of 37% and 56%) for Zipline facilities.

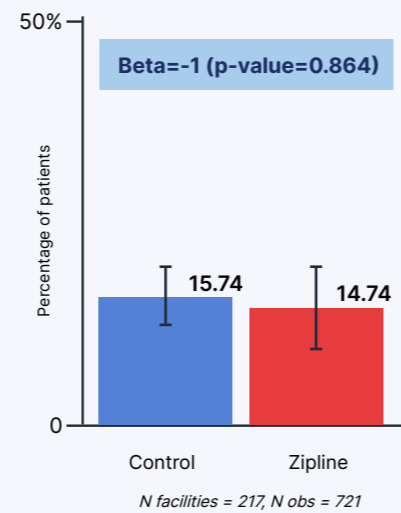
Patient referrals due to vaccine stockout: 15% of Zipline facilities had instances of sending patients seeking vaccinations away due to stockout compared to 25% in the control group, a reduction of 10 percentage points (a 41% decrease) (p-value = 0.08).

4. Demand for Zipline services has room to grow, and increased use could lead to higher impacts.

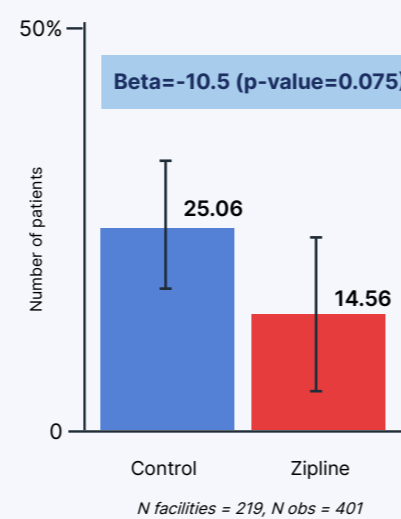
Room for more impact with greater uptake: We find suggestive evidence that Zipline’s impact may be higher in facilities in the North; those without cold storage at baseline; and those further away from Regional Medical Stores.

Correlations between number of orders placed and baseline characteristics reveal that the number of medical products ordered is higher for facilities in the North and for those that report referring patients when faced with a stockout. Vaccine orders are higher for facilities further away from the nearest RMS and are weakly positively correlated with hours of electricity outage experienced. This suggests that ordering is higher for facilities that are harder to reach through the standard supply chain and are therefore in greater need for Zipline services.

At least one patient referred due to lack of medical products (1 month):



At least one patient didn't get vaccinated due to stockout (3 months):



Note: Vertical bars represent 95% confidence intervals



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5. Health workers have a positive perception of Zipline:





Healthcare workers in Zipline facilities expressed an overall positive perception regarding Zipline, and were more satisfied with the availability of medical products than healthcare workers in control facilities. Health workers in treatment facilities had a 28% higher satisfaction score with medicine availability compared to control group health workers. Almost all Facility Heads think that Zipline is somewhat or very convenient (92%, n=86 of 93) and that they could be using Zipline more (86%, n=77 of 93). All healthcare workers reported that Zipline is convenient.

Recommendations:

1. Investigate and streamline information flow about Zipline across levels of healthcare staff.
2. Elicit regular service feedback from facility workers at various levels.
3. Increase marketing campaigns for diverse products and products with low uptake and low market availability.
4. Decrease barriers to facilities using Zipline.

Next Steps

Based on the results of the evaluation, Zipline intends to:

-  Conduct more routine surveying and elicit more customer feedback to get regular input from facilities on Zipline usage and barriers.
-  Launch a new end-to-end customer-facing mobile application. The application will enable healthcare workers to manage all interactions with Zipline in one place, allowing government partners to have real-time access to ordering data.
-  Streamline facility training and onboarding which will allow Zipline to onboard new facilities and new users more rapidly, and provide consistent refresher trainings.
-  Conduct more targeted outreach and training for low usage districts. The Zipline operations team is reviewing the data from the study in order to prioritize additional trainings in regions with low usage and/or understanding of the Zipline services.

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Acknowledgements

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