The costs of using drones to transport vaccines to hard-to-reach areas in DRC:
Drones for Health DRC Economic Evaluation Results

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VILLAGE REACH

Our Vision

A world where everyone has the health care needed to thrive.

Our Mission

To transform health care delivery to reach everyone.

Pathways to primary health care

VillageReach builds tech-enabled pathways to PHC services increasing access for the under-reached.

Products to people

VillageReach makes health products available when and where they are needed.

Drive sustained impact

VillageReach works with governments and private sector to drive sustained impact at scale.

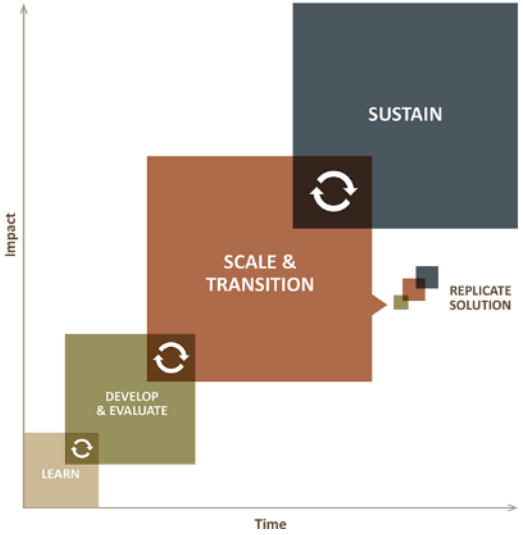
Our Impact

In 2021, VillageReach with partners:

- Helped increase access to quality health care for **58 million** people in sub-Saharan Africa.
- Supported **380,000** health workers' ability to deliver products and quality health services to the most under-reached.
- Assisted in the delivery of health products to **2,500** health facilities.

Where We Work

Our Approach



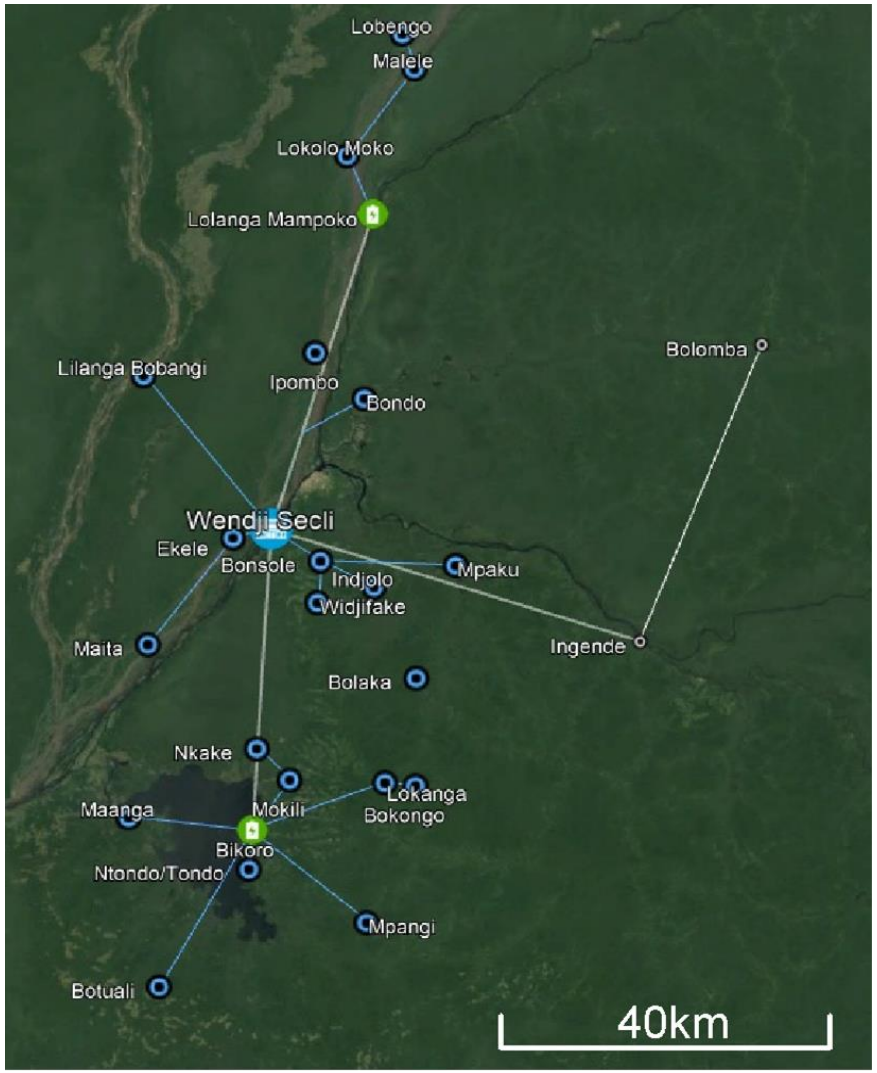
VillageReach's Drones for Health Program in the Democratic Republic of the Congo

Drones for Health (D4H) in DR Congo

Location: Equateur Province (103,902 km^2)

Scope: Began in Dec 2020, now supplying 40 health facilities via 24 landing sites

- Bi-directional drone network is one of the largest in the world: 37,445 km^2
- Drone hub ~30 min by road from provincial warehouse
- BVLOS flights of 15-60 min, landing at the remote facilities
- Drone battery change (stopover) for longer distances (> 115 km)



DRC Routine Drone Transport: Primarily 20 Immunization Products & Lab Samples

Monthly & on demand transportation for 40 communities:

1. **Exclusive drone transportation for immunization products**
2. Lab samples & reports
3. Emergency orders of other products

Outsourcing drone transportation to Swoop Aero:

- Bi-directional, electric, VTOL drones
- 3 kg & 5.4 L capacity
- 90-115 km/hr, 115km range
- **Satellite connectivity and visual targets for areas without mobile access**
- Fully local drone team

Phase 2 Equateur drone program: Results

30 Dec 2020 – 30 June 2023

4,911 flights in 403 days

1,824 product deliveries both ways

2,196 flight hours

221,342 km flown (2-6 drones)

40 health facilities

supplied with immunization products

via 24 drone-landing sites

1,841 kg (volume of 7,227 L) delivered

vaccines + lab samples, reports + medicines, PPE

130,633 people directly benefitting from products flown by drone, including:

- 75,937 children < 1 year,
- 25,578 pregnant women,
- 29,100 people of all ages,
- 18 (community) health workers

343,398 vaccine doses*

118,787 diluents + 184,954 syringes + 18,034 adaptors

418 lab samples

85 test results (5 positive)

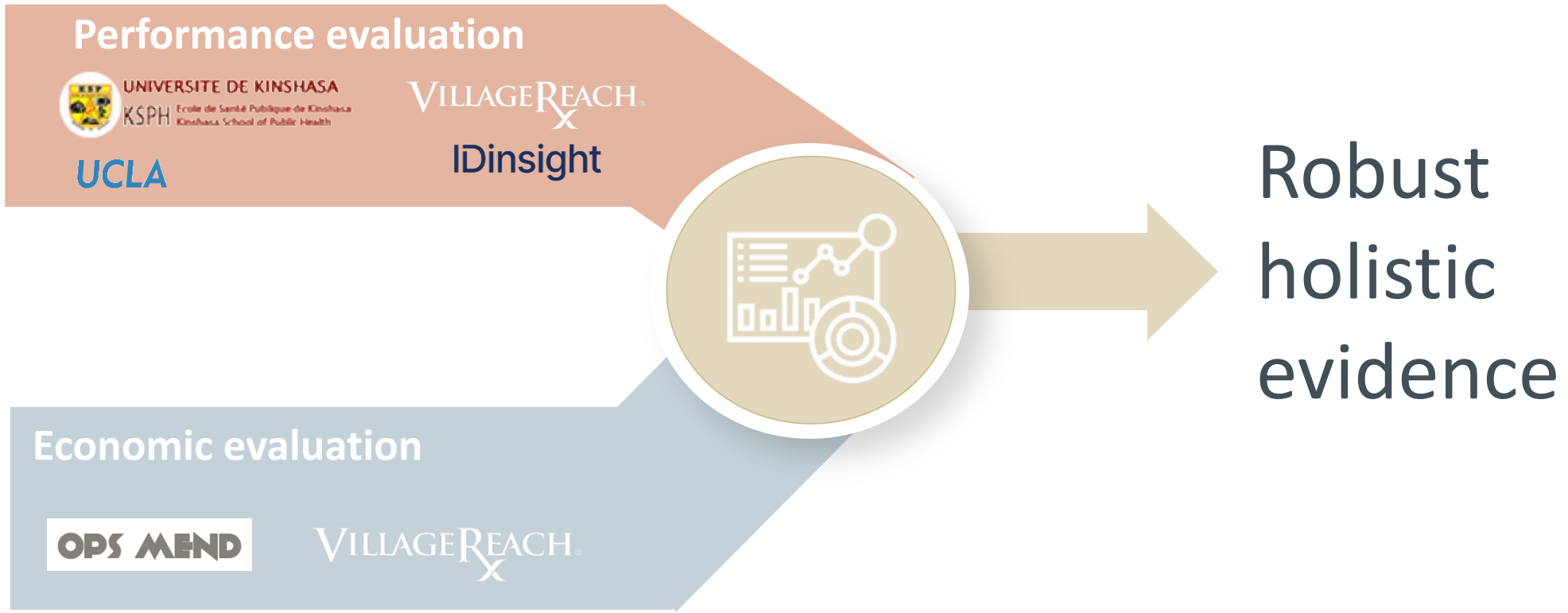
311 reports + 4 product order forms
15,328 vaccination cards + 100 tally sheets

485 PPEs for COVID-19
14 blisters + 16 vials of medicines
102 collection kits + 23 other products

* Additional products moved by road

In addition to supplying the full monthly quantities of Routine Immunization products needed in 40 communities, drones delivered yellow fever vaccines on-demand during a mass vaccination campaign & picked-up samples during Ebola outbreak

Our Approach to Evaluate our Solution



Performance Evaluation Results

Results: Higher EPI product availability & faster transport, but vaccinations depend on many other factors

KEY INDICATORS Hard-to-reach health facilities (drone landing sites)	Baseline Apr – Sep 2020	Endline Jan – Jun 2022	Trend
Vaccine availability *(last 3 months)*	65%	98%	↑
% facilities with stockouts *(last 3 months)* • Pentavalent • Measles • Yellow fever	 6% 12% 18%	 0% 4% 0%	↓
% facilities taking 2+ days to get vaccines	65%	0%	↓
% of vaccination sessions conducted according to plan	85%	85%	–
Vaccine coverage	94.2%	92.3%	–

Key challenge: 6-month health worker strike (Aug 2021-Jan 2022) meant fewer vaccinations happening, even though products were available.

Economic Evaluation Results

UNICEF/UN0642668/Mulala

Economic evaluation methodology

1

Start-up costs

Secondary analysis of VillageReach financial records to identify costs of introducing the D4H intervention uncaptured in iSC costing

2

iSC Costing

Adapted USAID | DELIVER activity-based supply chain costing methodology of the D4H network pre and post intervention

3

Cost-effectiveness Analysis (CEA)

Cost-effectiveness analysis conducted utilizing a multi-component performance metric, weighted based off DRC stakeholder preferences

Most start-up costs were found to be recurring, but will be reduced after initial start-up

Cost Categories	Cost type		
	One time	Recurring	Recurring but reduced
Advocacy & stakeholder engagement			✓
Community sensitization	✓		
Site selection	✓		
Network design	✓		
Regulatory management		✓	
Infrastructure investments			✓ (only asset replacement)
Asset Shipping & Importation			✓ (only asset replacement)
Recruitment			✓ (only turn over)
Training			✓ (only turn over)
Data systems & management			✓
Project management			✓
Evaluations	✓		

Start-up costs were highest during pre-implementation, but steady state costs are more reflective of future recurring costs

Average monthly cost	Pre-implementation 12 months	Scale-up Jan 2021 – Jan 2022	Steady state Feb 2022 – June 2022
		-31%	
Excluding evaluation	$13,375	$11,460	$9,172
Including evaluation (consultants & data collection)	$16,010	$17,726	$22,208

Total iSC cost increased but drone transportation introduced cost savings at the Zones (Districts) and Health Centers

2 iSC Costing

iSC Cost Comparison – Traditional vs. Complementary Drone Transport (pre vs. post)

Cost and Performance Summary

	Baseline	Endline	Trend
Total annual cost	$150,368	$481,982	⇧
Cost/dose	$0.58	$1.84	⇧
Vx availability	65%	98%	⇧

Annual Transportation Costs

Total iSC cost increased but drone transportation introduced cost savings at the Zones (Districts) and Health Centers

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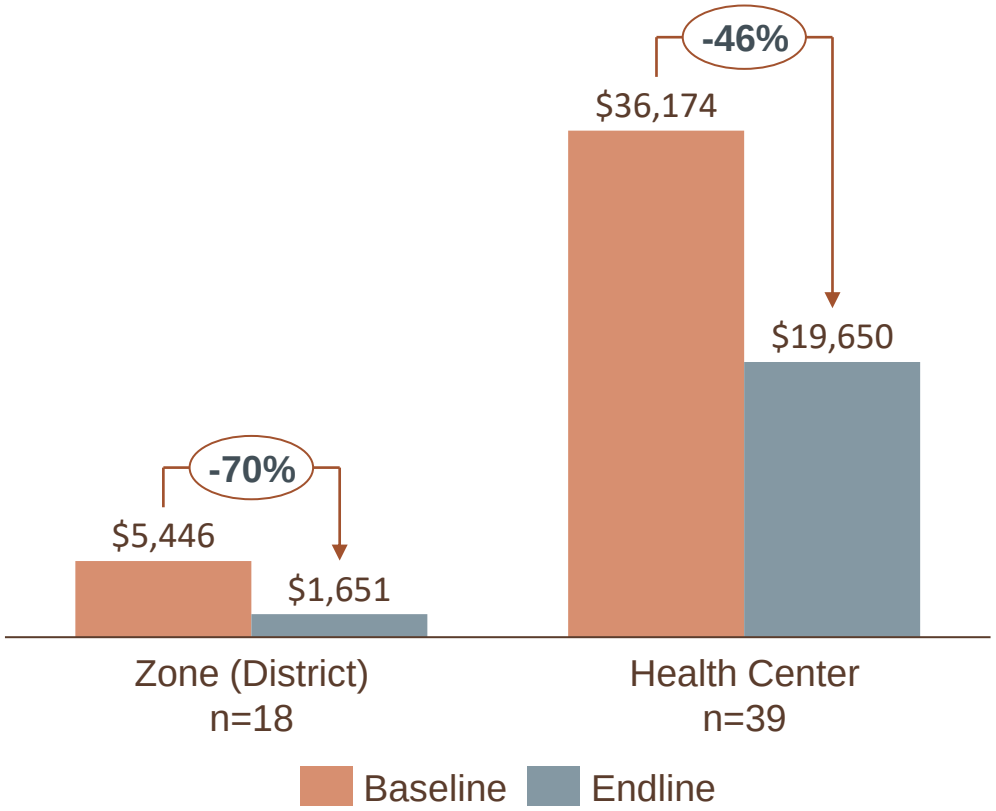
Annual Transportation Costs



The current drone iSC configuration (endline) has higher total effectiveness score but higher cost, equating to baseline being more cost-effective.

Metrics		Baseline 2020	Endline 2022
Cost	Cost per dose	$.58	$1.84
Effectiveness	Multi-metric score (%)	21%	48%
Cost-Effectiveness	Cost ($K) per % of effectiveness	**7.16**	**10.04**

If operational bottlenecks causing low asset utilization are addressed, it can provide us the flexibility to optimize the supply chain design to reduce cost, with a high potential for future cost-effectiveness.

Metrics		Baseline 2020	Endline 2022	Improved Endline
Cost	Cost per dose	$.58	$1.84	$1.19
Effectiveness	Multi-metric score (%)	21%	48%	48%
Cost-Effectiveness	Cost ($K) per % of effectiveness	**7.16**	**10.04**	**6.50**

Reaching cost-effectiveness through new market development strategies

CURRENT STATUS	Levers to unlock affordable drone logistics for the health sector in low and middle-income countries	NEW STRATEGY
Drone logistics are **not financially sustainable** for public health markets		**Cost-competitive & sustainable pricing** for the public health market
• **Public health**	 **Sector Focus**	 • **Public & Private** health, agriculture, logistics, postal, maritime, disaster response, etc.
• **Customers funding** start-up costs (MoH or donors) • **Single customer** paying for all recurring costs • **One-pricing strategy** for customers	 **Business Model**	 • Drone service providers **fund** start-up costs in new markets • **Multiple customers** to spread recurring costs amongst • **Market-driven pricing strategy** for cost-sensitive customer
• **Small scale** leading to high unit costs • No economies of scale	 **Network Scale**	 • **Large scale** leading to lower unit costs • Economies of scale

Interpretation & Conclusion

- Eliminated stockouts and ensured more consistent availability of vaccines in remote facilities
- Decreased duration of transport
- More vaccination sessions conducted
- Drones are well accepted by health workers, community members and community leaders
- Possible to achieve results in very remote areas with no communication
- Drone performance expected to continue to improve
- System not optimized for cost but large potential for reductions

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