

## Protecting Vaccines During Transport

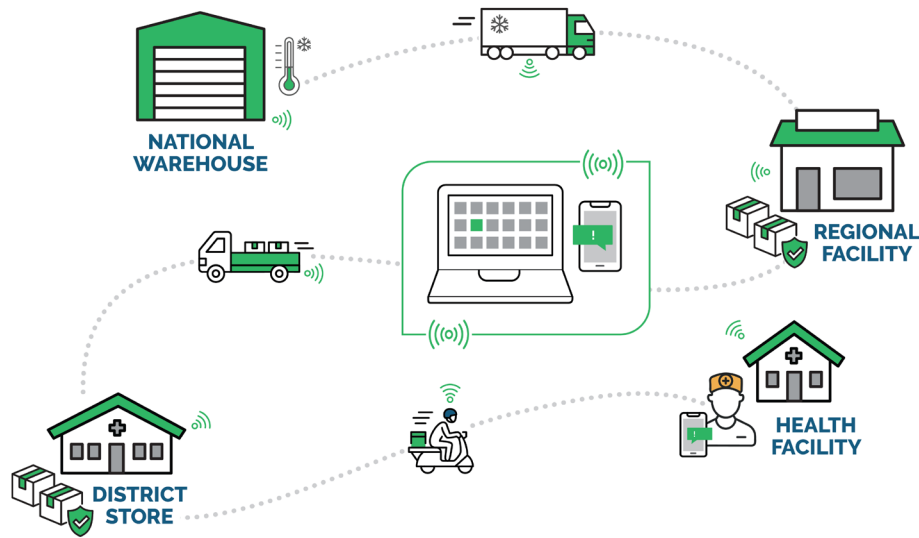
Tanzania, inSupply Health & Nexleaf Analytics see fast results with innovative tech to safeguard vaccines on the move.



### Executive Summary

- Countries are required to monitor the temperature of vaccine cold chain equipment (CCE), but most countries have no visibility into the temperature conditions vaccines experience during **transport**.
- Tanzania and Nexleaf Analytics piloted ColdTrace Transport, mobilizing over 500 hours of temperature data from 146 trips covering 9,450 kilometers.
- Temperature excursions were observed on 82% of trips, including 4 trips with WHO freeze alarm events.
- Real-time alerts from ColdTrace Transport led to **85 actions** by health workers to safeguard vaccines or improve the accuracy of the sensors.
- **ColdTrace Transport is now scaling nationwide in Tanzania**, and this pilot led to the development of a new national **Standard Operating Procedure (SOP) for Vaccine Packing**.

Real-time temperature alerts during transport prompt immediate action by health workers to preserve vaccine potency. Transport data leads to simple yet impactful process improvements, and users see value from the technology, trainings, and collaborative tools.



## Improving Protection for Vaccines During Transportation

The journey of a vaccine to reach a recipient in a low- or middle-income country (LMIC) is often long and complex, with multiple points of potential risk and failure.



Delivering potent vaccines requires coordination among many health workers and the continuous management of a long cold chain. Temperature monitoring is required for storage points along the cold chain, but there is no visibility into the temperature conditions of vaccines during transport in most countries.

Remote temperature monitoring (RTM) designed for the vaccine transport context can fill this information gap, ensuring vaccines are safe through the last mile. Implementing a vaccine cold chain data system enables improved management of CCE, continuous refinement of transport processes, and real-time responsiveness to temperature problems as they occur.

“ Often you just touch the ice packs and feel like ‘they are not so cold, let me exchange with others,’ or you may say ‘let me just check my vaccines.’ That’s it. That’s what we were doing. We were just assuming.

— ColdTrace Transport User

Nexleaf’s ColdTrace remote temperature monitoring devices (RTMDs) have been mobilizing data at nationwide scale across Tanzania since 2017, enabling RIVOs and DIVOs to detect and respond to vaccine storage problems at vaccine stores and health facilities. But, as in much of the world, temperatures during vaccine transport have not been monitored systematically in Tanzania.

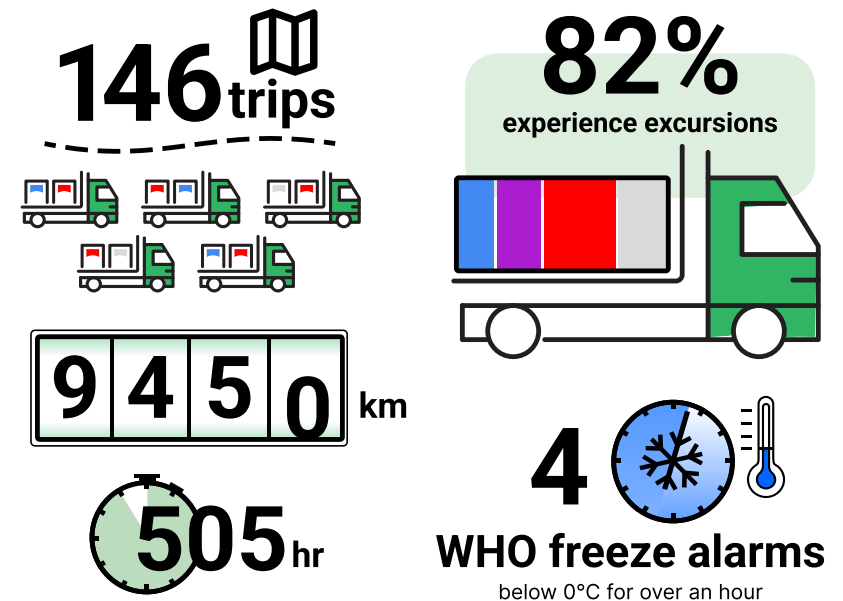
	 <b>RIVO</b> Regional Immunization & Vaccines Officer	 <b>DIVO</b> District Immunization & Vaccines Officer
<b>Orders vaccines</b>	from Central (National) Vaccine Store	from Regional Vaccine Store
<b>Plans &amp; oversees vaccine distribution</b>	to District Vaccine Stores	to health facilities
<b>Daily temperature monitoring</b>	at Regional Vaccine Store	at District Vaccine Store
<b>Supervises &amp; mentors</b>	DIVOs, health facility workers (HFWs)	HFWs

## Launch of ColdTrace Transport

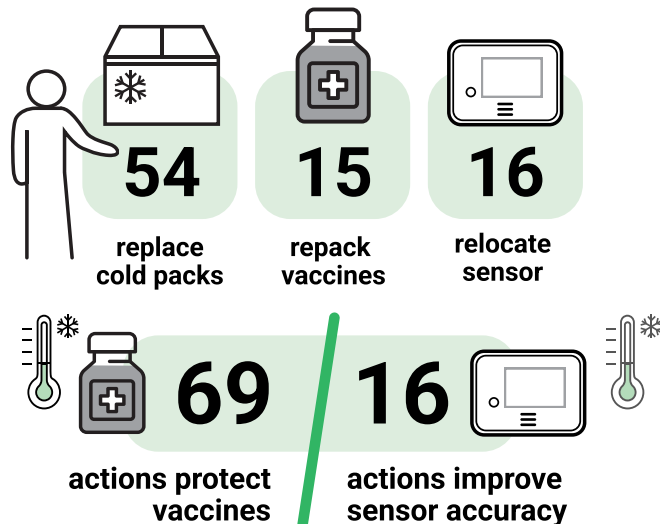
In 2022, the Tanzania Immunization & Vaccines Development program (IVD), inSupply Health, and Nexleaf Analytics deployed ColdTrace Transport in two regions of Tanzania: Mwanza and Geita.

ColdTrace Transport sensors tracked the temperatures of cold boxes across 9,450 kilometers of urban and rural transit routes during 146 trips. Each device was paired with a smartphone app that alerted drivers of temperature excursions in real time and collected trip data.

RIVOs, DIVOs, and assistants were shown how to use the ColdTrace Transport sensor device and smartphone app, and a WhatsApp group was created to facilitate knowledge exchange and encourage group troubleshooting and problem-solving.



## 85 actions



## Real-time Temperature Alerts Prompt Action

ColdTrace Transport recorded temperature excursions during 82% of monitored trips. Data from the 146 total trips revealed 4 WHO freeze alarms, meaning vaccine storage temperatures stayed below -0.5°C for more than an hour. Freezing events like this can effectively destroy the most freeze-sensitive vaccines.

“ So, there are alarms that we get during vaccine transportation that help us take action to make sure that we are distributing safe vaccines.

— ColdTrace Transport User

In many cases, users were able to intervene and take action to safeguard vaccines when temperature excursions occurred. Based on survey responses, users took at least 85 actions in response to alerts.



Data from the trip visualized below provides an example of how ColdTrace Transport can lead to immediate user actions. From the map, it is clear that this trip included multiple distribution stops, and the time data shows that the whole trip lasted over four hours.

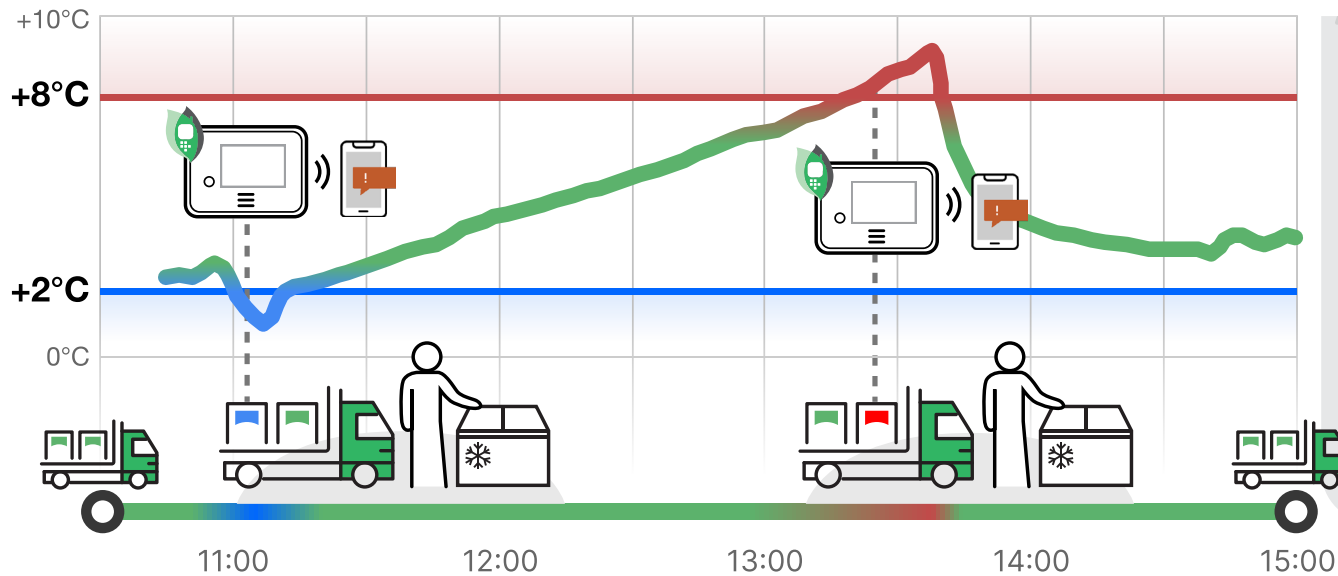
During this trip, ColdTrace Transport recorded one cold excursion and one heat excursion, prompting alerts to the driver via smartphone app. In each case, the excursions were resolved quickly, and most of the trip saw readings in the safe range.

Not all temperature problems resulted in immediate solutions during the journey. However, evidence of these challenges can be and has been used to effect systemic change. Data from ColdTrace Transport, together with qualitative reports from users, have already prompted key changes in how Tanzania transports vaccines.

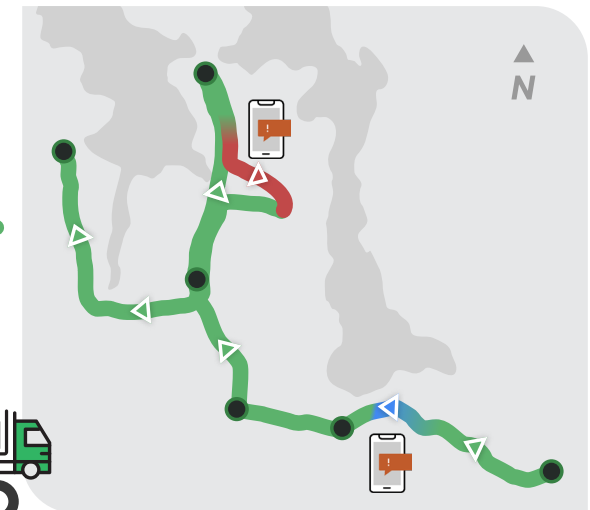
### Data → Action: One Distribution Trip

Data visualizations of a real vaccine distribution trip, Tanzania, March 2023. Trip maps in the smartphone app differ.

#### Temperature Data Across Total Trip Time



#### Trip Map: GPS + Temperature Data



## Data-Driven Decisions and a New National SOP

ColdTrace Transport data and user experiences generated actionable information on how to improve vaccine transport practices. Data from the system was shared during IMPACT Team Meetings to inform day-to-day decisions as well as processes to improve the overall system. **This work resulted in the development of a national SOP for Vaccine Packing.**

Several other process modifications came out of the transport data and discussions, including:

- Improved understanding of vaccine temperature and handling requirements.
- Streamlined distribution routes to minimize driving distance.
- Prioritization of early morning hours for distribution.
- Opting for closed-top vehicles, which limit exposure to outdoor temperatures.

“ The IMPACT meetings now have brought significant results because ... they see the presentations on the ColdTrace Transport use and so there is priority in the distribution. Now the DIVOs are given cars whilst in the past they were told to use the motorcycles to distribute vaccines.

— ColdTrace Transport User

Health workers can also use data from ColdTrace Transport to improve budgeting and administrative processes due to greater visibility on the journeys undertaken by drivers. This can help RIVOs and DIVOs forecast fuel procurement and optimize routes and scheduling for future trips.

## National Scale and Improving ColdTrace Transport

Nexleaf Analytics, inSupply, and the Tanzania IVD are currently scaling ColdTrace Transport throughout the country, which speaks to the value of the technology for driving effective vaccine transport management. Meanwhile, Nexleaf is making technical improvements to the ColdTrace Transport platform based on feedback received throughout the pilot.

*This work was conducted with support from The ELMA Vaccines and Immunization Foundation and Gavi, the Vaccine Alliance, to inform global standards and improve processes to safeguard vaccines during transport.*



## About Nexleaf Analytics

Nexleaf builds tech platforms designed for the LMIC health context, moving data from lifesaving interventions to the right people at the right time.

This work involves understanding problems, operationalizing sensor data, identifying users and use cases at every level, building analytics platforms, and partnering with governments and funders to drive innovation and scale solutions that serve country goals.

Health workers and administrators in LMICs want effective and simple tools that make their jobs easier as they work to tackle complex problems with limited resources.

Nexleaf's approach aims to maximize impact, minimize deployment costs, and ensure the data and ownership of these solutions remain in the hands of our customers – the Ministries of Health working to transform health systems and improve the lives of their constituents.

