ICED OUT: Integrated Cold-Chain Eliminating Disease Outreach

Piloting a motorcycle-enabled laboratory transport system to combat visceral leishmaniasis in rural Kenya

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Introduction

Visceral leishmaniasis (VL)/Kala-azar is a vector-borne neglected tropical disease (NTD) with an unequal disease burden bore by the pastoralist **Pokot tribe of rural Baringo, Kenya.**[1-3] With diagnostics being limited to facilities of adequate laboratory capacity and staffing, those Pokot suffering from VL and its comorbidities have been restricted to a handful of healthcare facilities scattered across an area of 4,607 km^2.[4,5] We piloted a **PCM backpack cold-chain motorcycle lab sample transport system** connecting diagnostic care provided by seven healthcare centers to over **99 pastoralist Pokot villages.**

Methods

Between **September and October 2023**, a Likert scale needs analysis was conducted to assess gaps in laboratory services and vaccine outreach capacities in six isolated healthcare facilities.

Linkage routes based on both facility need and prevalence of VL were established based on survey results and annual VL distribution data via ArcGIS Pro. Boda Boda motorcyclists stationed on these routes alongside respective facility healthcare workers were trained in **effective sample delivery, patient privacy, and biosafety**.



***Figure 1**: Village sensitization program of novel PCM backpack sample delivery service within Tiaty West.*

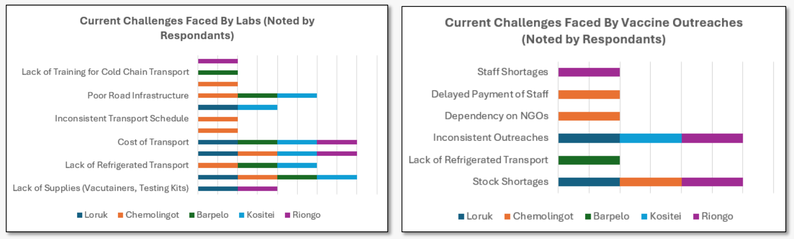
Community awareness of expanded lab services was fostered through a **sensitization campaign** within the villages surrounding each healthcare center. **Backpacks** were then adopted onto **World Vision and Kenya Red Cross** vaccine outreach campaigns. Transport logistics, including village, container temperature, diagnostic, and sample type were recorded for each participating transport.

Results

Needs Analysis:

From the initial needs assessment, ten respondents were sampled from six healthcare facilities in East Pokot.

- **80% reported struggles** with lab transport costs, interfacility distance, a lack of available Boda Bodas.
- **60% of the total facilities** faced poor road infrastructure and a lack of refrigerated transport.
- Observed trend between distance from an advanced health facility and the capacity for adequate laboratory services.



***Figures 2-3:** Barriers inhibiting adequate laboratory transport services and vaccine delivery for a sample of healthcare facilities in Tiaty West.*

Implementation:

Three routes connecting six healthcare centers were created. Underlying this system, synced sample transport days falling on village market days were instated in facilities along the same route to **decrease costs** for individual facilities, allowing for **greater frequency of transports** and community **test accessibility.**

Tiaty East

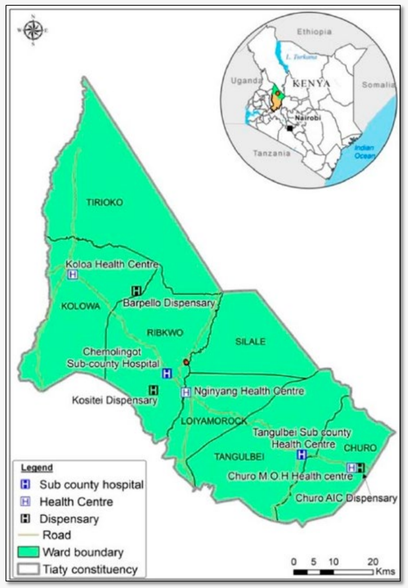


***Figure 4:** Healthcare facilities identified in Tiaty East with recognized ward demarcations.*

ICED OUT Transportation Route System

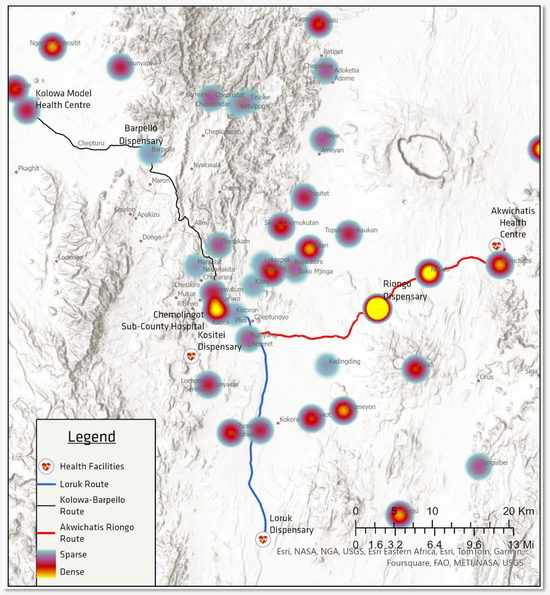


***Figure 5:** Heat map of VL cases from November 2022-2023 overlayed upon implemented laboratory transport routes. 'Sparse' and 'Dense' refer to disease prevalence. Three routes (as denoted by the bolded lines) were designed based on disease prevalence among villages in East Pokot to connect Level II health facilities with the only Level IV health facility in the region, Chemolingot Sub-County Hospital.*

Lessons Learned

The 3-pronged paradigm of culture, security, and medical utilization underlying barriers to Pokot health-seeking behavior:

- **Culture:** Pokot spiritualism and a preference for traditional healing over less-trusted Western medicine acts as a barrier to conventional health-seeking behaviors, including blood tests.[6]
- **Security:** Tribal conflicts between the Pokot and neighboring tribes, intensified by pastoralist practices of cattle rustling and augmented by the growth of small arms, limit intraregional access to healthcare resources.[7,8]
- **Medical Utilization**: Medical utilization among agro-pastoralists is hindered by their mobile lifestyle combined with language barriers, poor infrastructure, long distances to clinics, and economic challenges.



***Figure 6**: A Boda-Boda transporting samples in a program PCM backpack.*



***Figure 7**: A World Vision volunteer obtains vaccines from the PCM-cooled backpack during a vaccination outreach campaign.*

Recommendations:

- **Culture:** Culturally sensitive interventions necessitate the preservation of societal norms and expectations. Partnerships with village elders in sensitization may foster community acceptance of our healthcare delivery model.
- **Security:** It is highly advised to seek partnerships with international aid groups, such as local divisions of the Red Cross or World Vision, as their status of protected neutrality may help to overcome security challenges.
- **Medical Utilization:** Culturally sensitive health education should address misconceptions and build trust, while offering subsidies and incentives can reduce financial barriers. Investing in infrastructure road infrastructure can also improve access to healthcare facilities.

Conclusion

We developed a pilot program offering a motorcycle-based laboratory sample delivery service enabled by novel PCM technology in the Pokot healthcare environment. This model finds its potential in its replicability, value efficiency, and low barrier for integration into existing community healthcare frameworks. Our findings represent an approach that strives to augment healthcare delivery with respect to existing institutions of culture and healthcare, which can find promise in contexts of conflict and healthcare fragility.

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