Optimizing viral load networks with LabEQIP: Maximizing laboratory capacity to achieve the third 90

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The Challenge

Countries are working hard to achieve the third "90"—90% of those receiving antiretroviral drugs will be virally suppressed—by 2020. However, governments' viral load monitoring networks (made up of national testing laboratories and referral sites) are often negatively impacted by inefficient instrument placement and movement of patient specimens. Robust, optimized lab networks working at peak efficiency are essential to meet the third "90" goal.

Solution

The Laboratory Efficiency and Quality Improvement Planning (LabEQIP) tool is a geographic information system (GIS)-based solution that helps improve laboratory network efficiency and quality by optimizing equipment placement, determining efficient usage of laboratory networks and their equipment, and minimizing distance and time traveled by specimens. Developed by USAID, Centers for Disease Control and Prevention (CDC), the Supply Chain Management System (SCMS), and Llamasoft Inc., LabEQIP helps users understand the present viral load monitoring network and helps guide its scale-up in a country. An open-source software managed by the USAID Global Health Supply Chain Program – Procurement and Supply Management (GHSC-PSM) project, LabEQIP is available for use by ministries of health, donors, and other key stakeholders who work in national laboratory health program development.

What is LabEQIP?

LabEQIP allows users to answer "what-if?" questions by creating efficient transfer-network scenarios using optimization approaches. By providing scenarios that reveal a viral load network's optimal organization, the tool informs policy and programmatic decisions that lead to greater network efficiency, better clinical outcomes, and significant cost savings. The tool can also be part of a long-term monitoring program or help plan for future network needs.

For more information: See, http://ghsupplychain.org/media/751

CASE STUDY: RWANDA

What: GHSC-PSM conducted Rwanda's first training and comprehensive laboratory network optimization exercise to support viral load scale-up with LabEQIP in June 2017.

Problem: Rwanda's referral network was not optimized and inefficient. The National Reference Laboratory was overburdened by participating referral sites.

Preparations: Partners in Rwanda collected data on patient numbers per site, equipment numbers and throughput, distances between between laboratories and testing sites, test types, health facility categories, and referral linkages. Partners aggregated, cleaned, and validated the data.

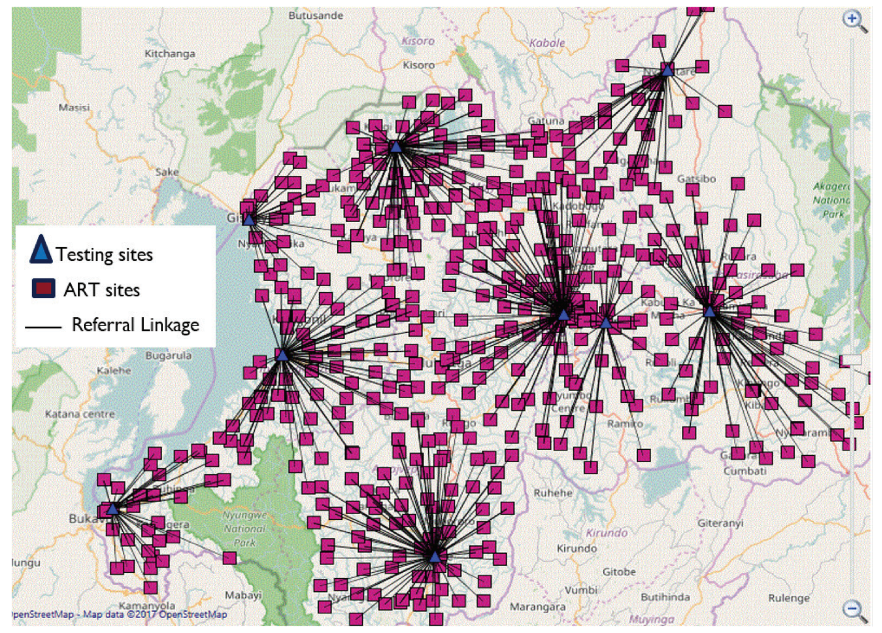
Training: Participants learned how to upload the data into LabEQIP. They learned how to create, run, and compare multiple scenarios based on different equipment platforms, which led to participants understanding the concepts of optimization.

Scenario Modeling: Participants ran various scenarios to reflect:

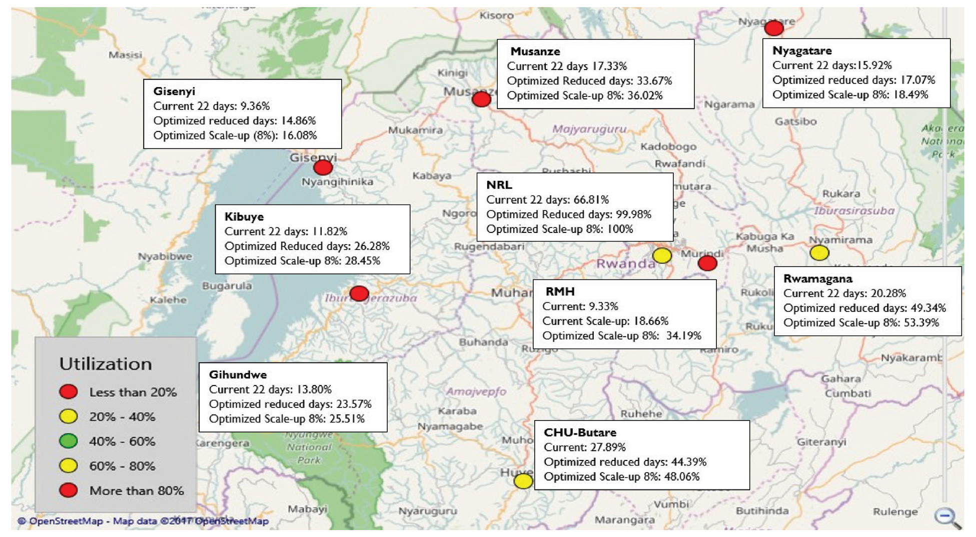
- Location of all sample collection sites
- Basic equipment characteristics of each machine for each test type
- Current and future planned sites
- Patient numbers by site location

Based on the scenarios, LabEQIP revealed several opportunities to gain efficiencies. (Map 1) Participants also ran a scenario to project lab equipment usage and network impact based on an 8% increase in patients from 2017 to 2018. (Map 2)

MAP 1.0
Scenario outcome with optimized viral load referral network



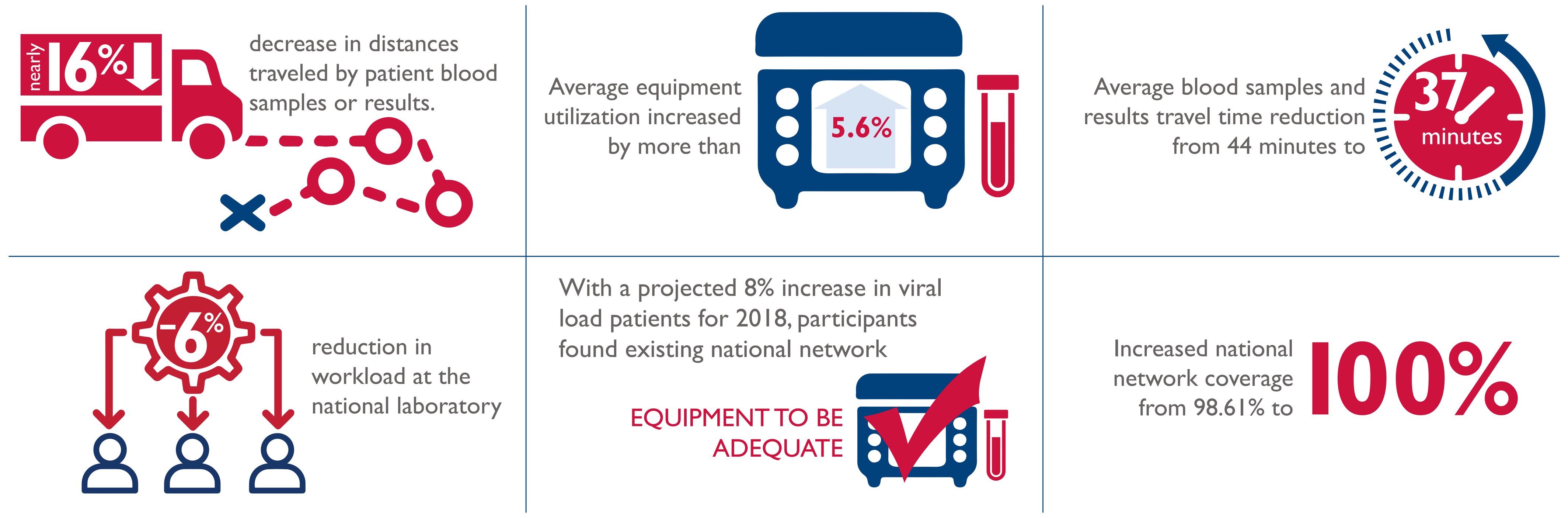
MAP 2.0
Scenario outcome with patient scale-up optimized network



Findings and Results

Some test sites were reassigned based on laboratory testing capacity, human resources, and distance to optimize the existing network. The ultimate outcome of the optimization was to reassign service delivery sites to testing laboratories to achieve an efficient laboratory network. The efficiencies gained from the optimization are as follows:

Metric	Current Referral Network	Optimization Baseline	Difference
Total Distance	17,014.33 km	14,487.60 km	-14.85%
Average Distance	29.90 km	25.15 km	-15.89%
Total Time	17d 17h 21m	15d 2h 11m	2d 15h 10m
Average Time	44m	37m	-15.91%
Utilization Range	8.28%-59.27%	9.31%-64.44%	+1.03%-5.16%
Average Utilization	21.39%	22.60%	+5.62%
Coverage	98.61%	100%	+1.41%
Unassigned Sites	7	0	-100%



Conclusions

- The tool's use optimized the network to 100% efficiency. It also helped socialize the optimization concept and the value of such an analysis.
- Optimization is not a one-time exercise. It is an iterative process that incorporates additional quantitative and qualitative information at each step, to enhance the analysis and provide a more realistic option for stakeholders.
- Optimization is not the responsibility of a single team or department. This exercise demonstrated the value of collaboration and information sharing across various organizations that together are responsible for a functional laboratory system in Rwanda.
- Using the initial set of results helped clearly identify the missing data elements since many of the stakeholders pointed out the flaws in the analysis due to the missing data. This also led to the identification of key team members who would be able to assist in that data collection.
- Examples of additional data that, if provided, would have offered a more robust analysis, include current and expected test volumes at each location; geolocations unique to each site's transport times between all locations; and plans for program scale-up.

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