Strengthening Health Supply Chain Data in Zambia: Consumption Anomalies Detection (CAD) Tool

Africa Supply Chain Excellence Awards Submission

Agenda/Summary

- *About Chemonics*
- *Definition of specific Problems / Challenges in achieving Goal*
- *Solution*
- *Implementation*
- *Results*
- *Scaling and Sustainability*
- *The team involved*

WHO WE ARE

Worldwide, more than **90 PERCENT OF OUR EMPLOYEES ARE FROM THE COMMUNITIES WHERE WE WORK.** And with project offices in **100 COUNTRIES,** we are all driven by our commitment to help people live healthier, more independent, and more productive lives — in our own countries or in others.

6,000
total staff

90%
staff based in local communities

1,350
projects since 1975

188
countries aided since 1975

100
countries with current projects

Chemonics Supply Chain Work

90+

COUNTRIES SUPPORTED

50+

COUNTRIES HAVE RECEIVED TECHNICAL ASSISTANCE

$5B+

VALUE OF COMMODITIES PROCURED

$850M

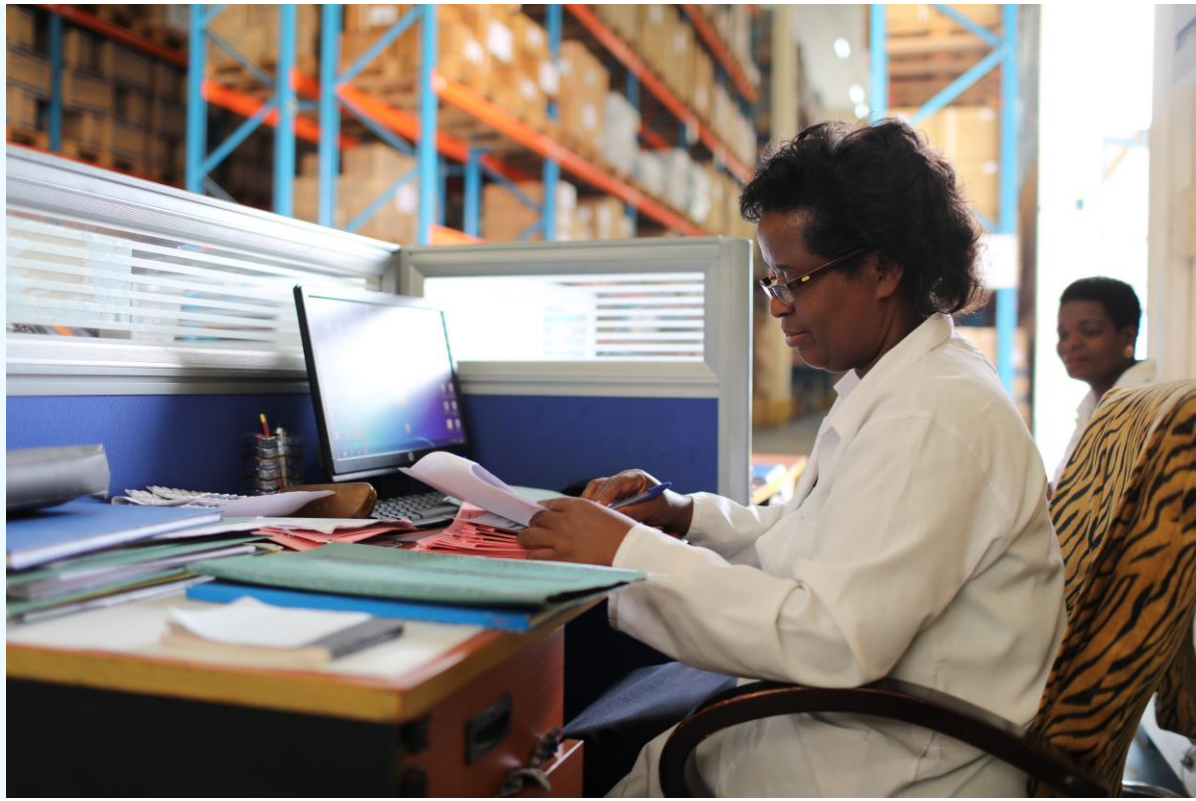
COST SAVINGS

The USAID Global Health Supply Chain-Procurement and Supply Management (GHSC-PSM) project

Challenge/ Problem

Challenges with Data Visibility in LMICs

- Data visibility assures the availability of critical health commodities at the right place and right time, leading to better health outcomes.
- In many low- and middle- income countries (LMICs), the absence of reliable digital infrastructure means fragmented data systems, lack of standardized identification methods, and continued reliance on paper-based data processes.
- Additionally, the minimally-trained supply chain and health facility personnel encounter challenges inputting data into complex systems.



Challenges with Commodity Security in LMICs

- Commodities face many possible threats in warehousing and transportation such as shortages/ stockouts, leakages, damage and pilferages
- Pharmaceuticals are subject to significant degree of regulations to protect human life and public health
  - Wherever regulations are weak attracts opportunistic dealers
- Health Commodities supply chain is complex
  - Involves many parties before the products reaches the end user
  - Difficult to distinguish between authentic and counterfeit or sub-standards drugs — **fake medicines kill almost 500,000 sub-Saharan Africans a year** *(2023 United Nations Office on Drugs and Crime (UNODC) Transnational Organized Crime Threat Assessment)*

Zambia Overview

- Zambia has approximately 3000+ health care facilities, including health posts, hospitals and clinics. These facilities are located in almost all 72 districts of the country but are clustered primarily in Copperbelt Province
- About 50% still rely on paper based data
- Limited logistics capabilities, including warehousing and distribution networks, can hinder the efficient flow of goods within Zambia. Inadequate storage facilities can lead to spoilage of perishable goods and contribute to shortages of essential commodities.
- Roads can be inadequate or poorly maintained. This can lead to delays and inefficiencies in the movement of goods throughout the supply chain, especially in rural areas where road and rail infrastructure may be lacking.
- GHSC-PSM provides TA to MOH

Solution

Consumption Anomaly Detection Tool

Methodology

- The CAD tool detects anomalies -- **observations or trends that fall outside the normal patterns or trends -- by facility and product.** These anomalies may have reasonable explanations, be due to data entry errors, or indicate potential fraud; further investigation is needed to determine root causes
- The tool utilizes the last 2 years of historical consumption and stock on hand data to run statistical process control (SPC) methodology to detect anomalous activity in consumption patterns

Consumption Anomaly Detection Tool

Design and Development

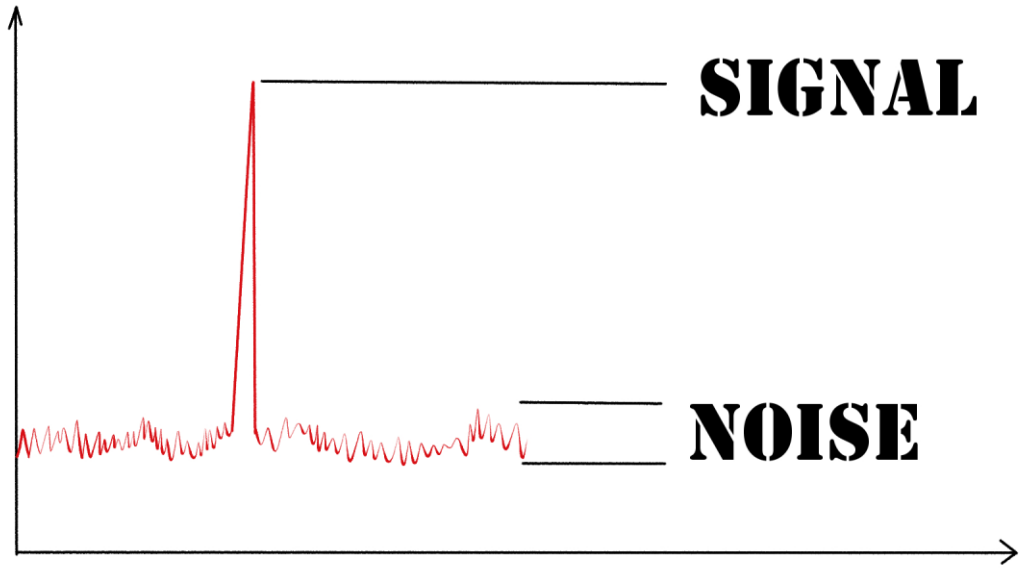
- CAD tool was developed using Python on the back end for data cleaning/processing and Excel to display the dashboard in a software familiar to most users
- Co-created alongside users in Malawi and Liberia to ensure that the dashboard was user-friendly and provided the most important information for decision making across multiple country contexts

Key Design Goal: Reusable and Open-Source

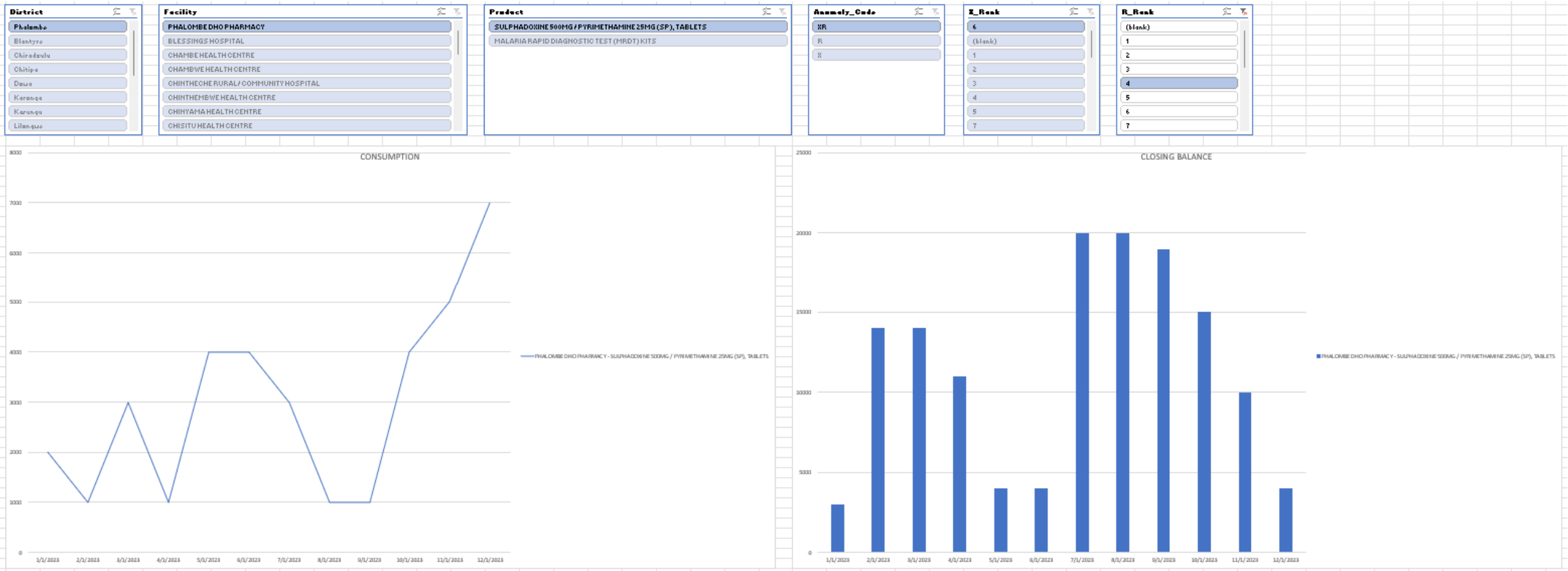
- CAD tool used for monitoring Malaria, Maternal/Child Health, Reproductive Health commodities, but could be expanded for use in any commodities, public health related or otherwise
- CAD tool code is also **publicly available via GitHub- an open-source web platform that allows developers to share code**

Why is a CAD Tool Needed?

- 3,200 health facilities countrywide. About 50% of these are connected with electronic systems but the rest still use paper-based forms
- Near impossible to track every commodity at 1000s of facilities manually and find cases worth investigating -- volume of data is too large
- Orders were not making sense (out by factor of 10 or more), creating very high risk for stockouts
- Heavy fluctuation in demand + consumption - need to be able to quickly tell which fluctuations/ anomalies are due to fraud, incursions etc. rather than just normal patterns (“signal” vs noise)



Consumption Anomaly Analysis- Stock Out Risk Example



Consumption

Stock on Hand

Consumption Anomaly Analysis

- An example of analysis after an anomaly is detected
  - Amoxycillin125MG/5mL Suspension at Kafukule Health Facility
    - October 2021: No anomaly detected – Consumption was 110
    - November 2021: Anomaly detected – Consumption was 120
    - December 2021: No anomaly detected – Consumption was 65
  - Historically consumption near 60 units per month
  - **Indicates:** Risk of Stockout is high, as Consumption is double the expected consumption
  - **Action:** Review and adjust orders (increase) for Kafukule of Amoxycillin

Consumption Anomalies

Investigation M	Reg	District	Facility ID	Facility	Product Category	Product ID	Pack Size	Product	Anomaly_Code	Anomaly Type	Consumption Value	X Lower Limit	X Upper Limit	Anomaly Rank (
11/1/2021		Mzimba North	MZN0512	KAFUKULE HEALTH CENTRE	Essential Meds	EE002700	(blank)	AMOXYCILLIN 125MG/5ML SUSPENSION, PFR TO MAKE 100ML	X	High	120	0	114	71

Implementation and Results

Use and Impact of CAD

- Impact to both improving data quality and increasing commodity security, leading to more accurate anomaly detection
- Streamlined the process and **improved the accuracy of anomaly detection from less than 100 a month with a manual process to over 200 detections monthly, using about 25 minutes** to produce a list of all anomalies for over 3000 facilities and over 5000 health commodities
- Monthly commodity report produced by PSM, reviewed by provincial offices and used by MOH as part of intelligence data gathering by the National Drug Theft Task Force and provincial task forces as they carry out their investigations
- The CAD tool will continue to be used to decrease the risk of false or subquality drugs reaching the market, and continuation of **medicines getting to the right person, at the right place, at the right time**

Cost Savings

- On average, 30 to 50 facilities are identified annually needing additional training on appropriate logistics management to reduce emergency distributions in cases of stockout or reduce stockpiling behaviors that may lead to shortages in other facilities.
- The Zambian Taskforce ensuring commodity security estimates that per year, about 30 activities are closely monitored and warrant appropriate measures to safeguard stock integrity.
- In 2023, about 300 commodities were flagged at over 1000 health sites to prevent expiries.
- In summary, it is estimated that in a year, the tool provides cost savings between 500,000 to a million US Dollars.

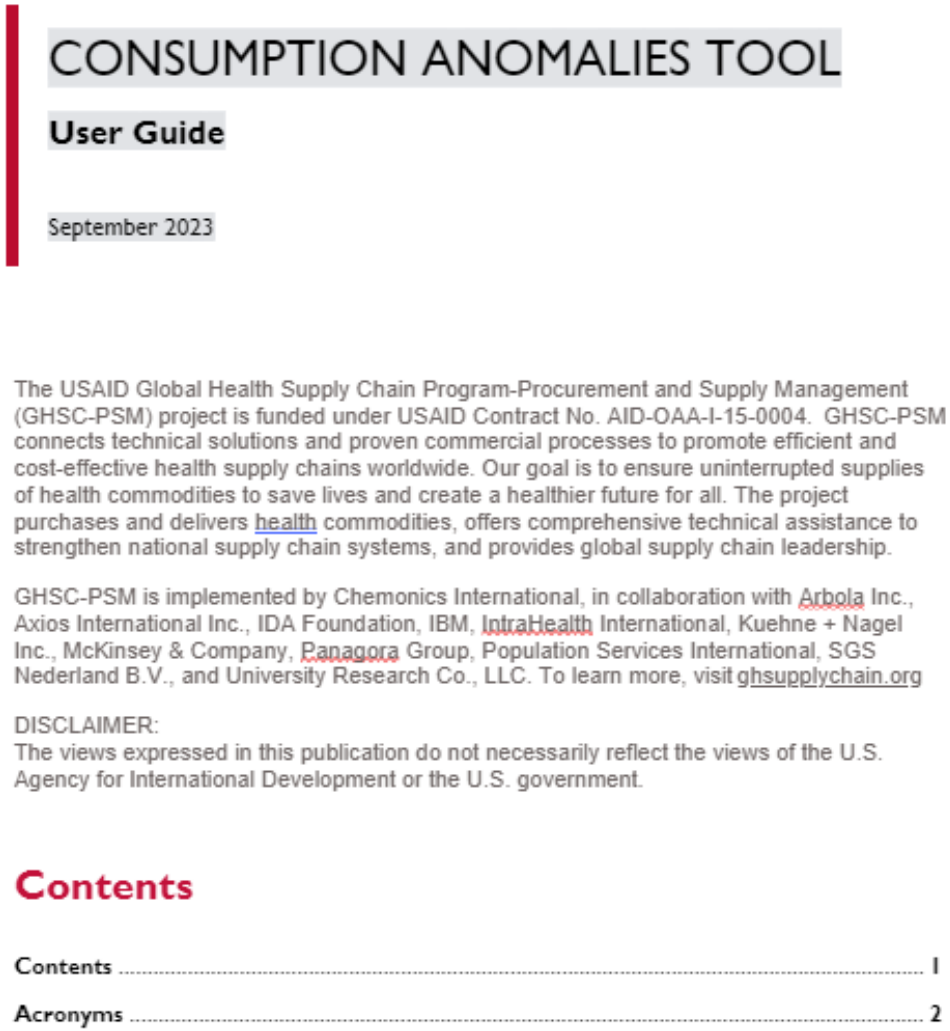
Scaling Process: Refactoring the CAD Tool

- Part of an activity conducted by GHSC-PSM's Maternal and Child Health Task Order, containing a catalog of 40 SC tools that can be refactored, meaning they are made generalized to work with any country's data
- Designed to be Repeatable, Scalable, Country and Product agnostic and deployable in-country
- Using Python and Excel (default for dashboard)
- Designed to intake logistics data from different primary data sources
- Analysis could be incorporated into existing data systems and processes

Learnings and Sustainability

Refactoring + Scalability

- The scalability of the CAD tool has already been shown as it has been implemented in four other countries: **Burma, Burkina Faso, Malawi and Liberia**
- User guides: the installation of user guides has allowed for a “training of trainers,” individuals can be trained to further train new cohorts in the use of the tool
- MoH involvement: the engagement of government counterparts such as the Ministry of Health ensures a smooth transition for the tool to continue to be operational beyond the life of the project



CONSUMPTION ANOMALIES TOOL

User Guide

September 2023

The USAID Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM) project is funded under USAID Contract No. AID-OAA-I-15-0004. GHSC-PSM connects technical solutions and proven commercial processes to promote efficient and cost-effective health supply chains worldwide. Our goal is to ensure uninterrupted supplies of health commodities to save lives and create a healthier future for all. The project purchases and delivers health commodities, offers comprehensive technical assistance to strengthen national supply chain systems, and provides global supply chain leadership.

GHSC-PSM is implemented by Chemonics International, in collaboration with Arbola Inc., Axios International Inc., IDA Foundation, IBM, IntraHealth International, Kuehne + Nagel Inc., McKinsey & Company, Panagora Group, Population Services International, SGS Nederland B.V., and University Research Co., LLC. To learn more, visit ghsupplychain.org

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Malawi

- Problem: More than 1,000,000 records for over 400 products at 800 facilities in Malawi over two years.
- GHSC-PSM used refactored CAD tool and successfully tested it with historical data from Malawi's eLMIS.
- Currently working with the Ministry of Health (MOH) to align the refactored data analytics tools with OpenLMIS

Liberia

- More than 500,000 records for over 300 products at 564 health facilities in Liberia over two years.
- Sustainability- deployment of tool throughout the country rather than only within GHSC-PSM project-supported supply chains.
- Training workshops will be implemented in Liberia in 2024, are split into a three-session format: 1) demonstration,2) workshop with the primary users (MOH staff) 3) primary users are expected to operate the tool independently while referring to the user guide
- Training process fully transfers ownership and ensures sustainability by creating a pathway for future MOH-led trainings without the support of GHSC-PSM.

Petros Lukonde, Chief Pharmacist, Commodity Security, Zambia MoH

"*By flagging consumption anomalies, the tool has ensured more accurate and reliable data. The use of the tool has also strengthened the monitoring and supervision capabilities at both the central and provincial levels. Provincial teams are now empowered to review and address data issues within their respective districts and facilities, leading to more responsive and localized management.* ***With accurate consumption data, resources can be allocated more efficiently, ensuring that medical supplies are available where they are most needed***."

The Team

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Thank you.