Research And Development Solutions

MAPPING PROGRESS: USING HEATMAPS TO SHOW VACCINE PATTERNS

Introduction

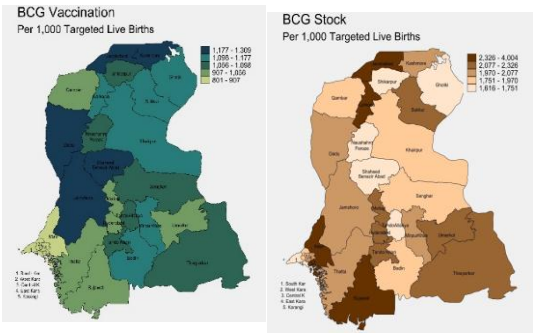
Pakistan's immunization program generates large volumes of data through the Vaccine Logistics Management Information System (vLMIS), but these data are usually presented in aggregated tables that limit their usefulness for timely decision-making. As a result, oversupply, underuse, and wastage persist alongside shortages in high-need areas—despite adequate overall vaccine availability. **Heat maps close this gap by converting routine data into clear visual summaries that allow managers to quickly identify problems, compare districts fairly, and take targeted action, with different types of maps facilitating different management decisions.**

Findings

1. Univariate maps show where supply or use is uneven

Univariate heat maps present one indicator at a time—such as vaccine stock levels or consumption—across districts. These maps clearly highlight where vaccines are overstocked, understocked, or underutilized. When adjusted for population (for example, per 1,000 live births), they allow fair comparison across districts of different sizes and help distinguish true supply problems from differences driven simply by population scale. This enables rapid identification of districts at risk of stockouts or wastage.

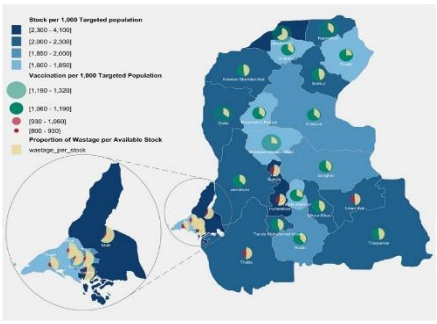
Figure 1: Univariate maps for Consumption and Stock in Sindh in 2022 (adjusted for 1, 000 Live Births)



2. Bivariate maps reveal mismatches between supply and performance

Bivariate heat maps display two indicators together, such as vaccine stock and coverage. These maps make it easy to identify districts with adequate supplies but poor coverage—signaling service delivery or governance gaps—as well as districts achieving good coverage despite limited stock. By showing where supply and performance are misaligned, these maps help managers focus on fixing system weaknesses rather than increasing procurement.

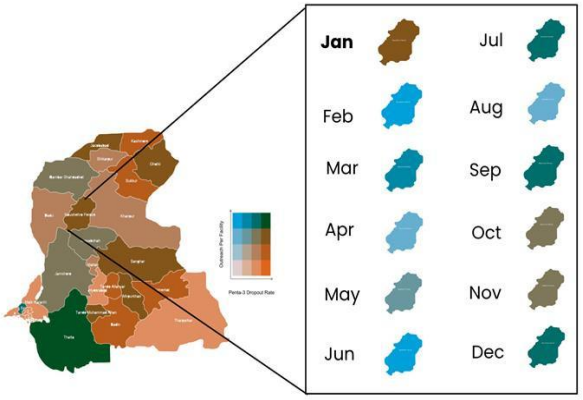
Figure 2: Geospatial mapping for BCG Vaccine Uptake



3. Multi-indicator and time-based maps expose deeper system inefficiencies

Trivariate and spatial-temporal maps combine stock, consumption, wastage, and time trends in a single view. These maps show how high wastage can undermine availability even in well-supplied districts and how outreach and coverage fluctuate seasonally, often declining during winter months. Visualizing these patterns helps planners anticipate disruptions, adjust distribution schedules, and protect coverage throughout the year.

Figure 3: Spatial-Temporal Trends: Vaccine Vaccinator Visits, Coverage & Seasonal Variation in Noushero Feroze



KEY MESSAGES

Adopt real-time dashboards that integrate heat maps into existing vaccine management systems, giving district and provincial managers instant visibility without requiring specialized analysts.

Use heat maps routinely to align supply with demand, enabling timely redistribution and reducing both shortages and wastage.

Include wastage and seasonality as standard indicators in review meetings to improve accountability and anticipate disruptions.

Scale heat map use nationally as a core component of immunization governance across all provinces.

This report was made possible with support from Gates Foundation (GF). The contents are the responsibility of Research and Development Solutions, Private Limited and do not necessarily reflect the opinion of GF.

For more information, please contact
Dr. Adnan Khan, MBBS, MS.
adnan@resdev.org