

# Digital Health: Driving the Use of Data to End AIDS



**Elizabeth Glaser  
Pediatric AIDS Foundation**  
Fighting for an AIDS-free generation



**The Elizabeth Glaser Pediatric AIDS Foundation (EGPAF)** is a proven leader in the global fight to end HIV and AIDS, with a footprint that spans 20 countries and an emphasis on children, youth, and families. The success of EGPAF's work has put us in reach of a finishing line where we can foresee what is referred to as *epidemic control*, whereby national health programs are able to prevent and treat HIV, and care for those affected in a sustainable manner – towards the global community goal of effectively ending AIDS by 2030.

## Why Digital Health?

- Digital health tools drive improved health outcomes and enhance efficiencies for services in resource-constrained environments.
- These tools provide a more holistic view of patient health and allow patients to have more control over the services they receive.
- Digital health tools drive better health equity by shining a light on the needs of marginalized populations and individuals who would benefit from additional support to ensure their equal access to care.

## Leveraging digital health to end HIV

National health information systems (HIS) are a primary component of country health systems managed by Ministries of Health (MOHs). HIS will be one of the most critical resources in coming years – leveraging data to drive quality patient care and improve program efficiency will be key to reaching and sustaining HIV epidemic control.

## Our approach

EGPAF proudly partners with MOHs across Africa to design, develop, deploy, and maintain national health information ecosystems, with an emphasis on our priority to achieve strategic data use. EGPAF's approach blends our technical expertise in the delivery of health services with our capabilities in digital health, to ensure that tools and approaches serve to strengthen national data systems for the improvement of patient health services. EGPAF has partnered with MOHs across sub-Saharan Africa for more than two decades to establish and optimize HIS, beginning with paper systems, and now focusing on electronic systems – to guide precision patient care and to enhance program performance.

## Principles for National EMR Implementation & Impact on quality-of-service

In our digital health strategy, we have defined three guiding principles aimed at achieving effective digitization while upholding the standards in quality-of-service delivery and data utilization.

1

At point of service level, systems designed to **STANDARDIZE** quality and patient centered care



**At Point of Service**

2

Implement a hospital-wide digitization strategy that **ALIGNS WITH PATIENT FLOW**, allowing for a comprehensive perspective on the patient's care experience.



**At Facility**

3

Establish nationally **INTEROPERABLE SERVICES THAT CENTRALIZE** and process longitudinal patient data from diverse sources, making it available for nationwide analytics and data utilization. (Single Source of Truth)

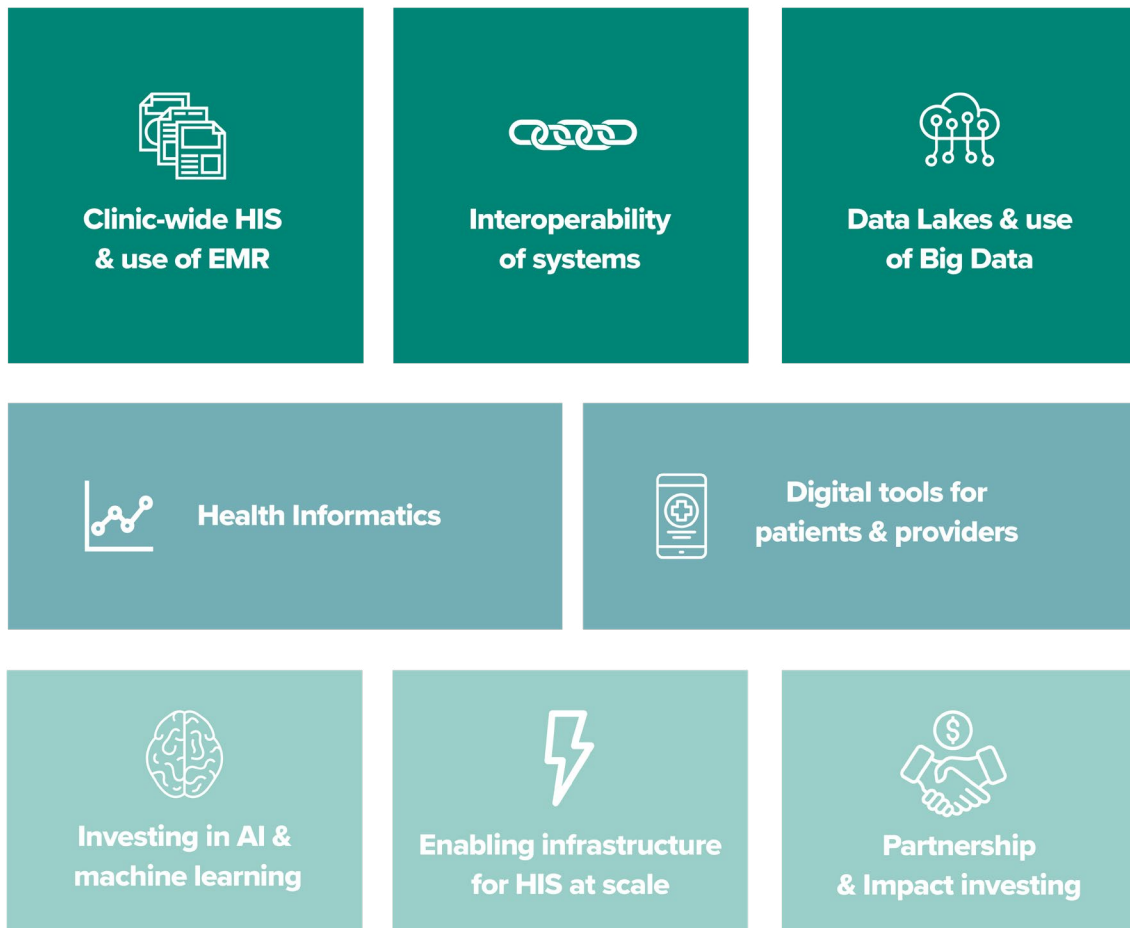


**At National**

## Advancing Digital Health: Towards “Precision Health Care”

- Use of digital health tools within HIS improves patient care by supporting clinical decision-making and advances health outcomes by ensuring access to longitudinal data across geography and time.
- Smart guidelines and support for clinical decision-making within HIS allow for the provision of “precision health care” – quality, patient-centered health care delivered in resource constrained contexts.
- Use of digital health tools aid in the integration of services, ensuring the clinician has immediate access to a range of information to provide required care. By linking laboratories, facility health personnel, and care providers in the community, patients are provided the right care, at the right time, in the right place.
- Digital health tools foster clinical efficiency and convenience for patients. When digital health tools support access to patient data in facilities and communities, teams of health care providers are better able to assist patients in a coordinated manner.
- HIS allow for the management of diseases through surveillance systems that bring multiple data sources together – to predict, track, and manage outbreaks.

## EGPAF Support Framework to Improve National Health Information Systems



## **EGPAF's capabilities in the Digital Health space**

### **Systems**

- Design, develop, and deploy health information systems at national scale, using a point-of-care methodology. These include Electronic Medical Record Systems (EMRS), hospital/clinic-wide information systems, lab information systems, and birth and death registration systems.
- Develop and manage data warehouses and Central Data Repositories (CDRs) for large patient data sets.
- Digital health tools for patient care, including mobile case management for healthcare providers, communication to clients, and engagement among client advocates.
- Ensuring the interoperability of multiple systems.

### **Informatics**

- Design of health informatics products, including intuitive data visualizations with smart alert technology and active generation of insights.
- Use of Artificial Intelligence (AI) / Machine Learning (ML) to process large volumes of complex patient data, leading to quicker and more accurate clinical and programmatic insights.

### **Data Use**

- Leveraging patient data for monitoring and evaluation, analysis, and planning, including data integration with national systems and data quality assurance.

### **Infrastructure**

- Identifying and deploying fit-for-purpose national IT infrastructure, including end-user technologies, connectivity, and power solutions.

### **Impact Investment and Partnerships**

- Partnering with technology companies to leverage resources and promote health equity.

## I. Clinic-wide HIS and use of Electronic Medical Record (EMR) systems

EGPAF develops and supports clinic- and hospital-wide information systems linked to electronic medical records (EMR) that are integrated and interoperable across health programs, labs, pharmacies, and payment systems. EGPAF has deployed systems nationally, accelerating improved use of data and optimizing service delivery: including in Malawi, Kenya, and Cameroon; and with pilots initiated in Democratic Republic of Congo, Nigeria, and Tanzania.

### Features of EGPAF Clinic-wide Information Systems

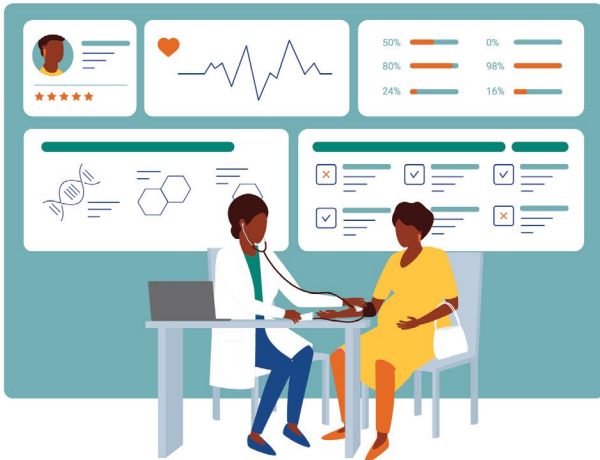
#### Our systems:

- Leverage electronic medical records systems (EMRS) for patient data collection, storage, and use – for improved patient care and program management.
- Embed clinical decision support at every point of care, to improve patient outcomes.
- Use Point-of-Service interfaces – simple touchscreen monitors to help providers manage the patient queue, reducing wait-time and improving clinical care quality.
- Deploy OpenMRS-aligned software ensuring a pathway for digital public good.
- Enable unique patient identification: Demographic Data Exchange, use of barcodes, use of biometrics, integration with national ID systems.
- Ensure multi-level security, confidentiality, and privacy of patient data and system security.
- Allow for hospital- and clinic-wide interoperable systems, including lab, pharmacy, and payment systems.
- Offer tailor-made analytic platforms that enable use of EMR data for clinical and programmatic decision-making at all levels of care provision.
- Include tools for data validation to support reporting needs – Validation Box (V-Box).
- Provide nationwide system coverage.

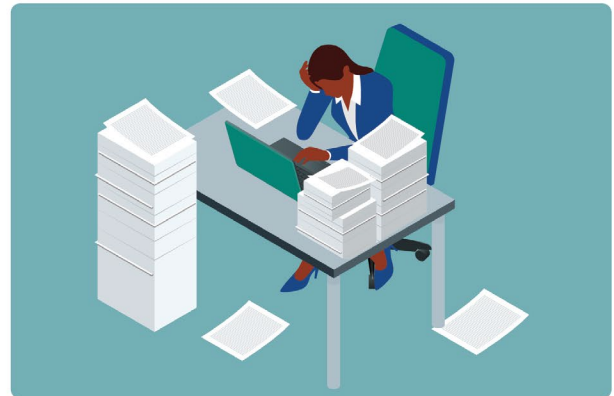
## Differentiating Features of EGPAF-supported EMRS

EGPAF-supported EMR systems offer nation-wide coverage, clinical decision support, multi-disease and clinic/hospital-wide points-of-contact coverage, unique patient identification, data quality assurance applications, data transmission and aggregation at comprehensive central data repositories, and a one-stop-shop data analytic platform.

✓ EGPAF's EMRS are designed to assist clinician decision-making

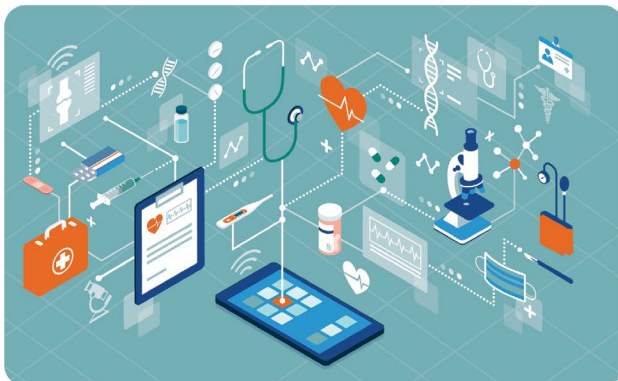


✗ Most EMR systems are designed only as data collection tools

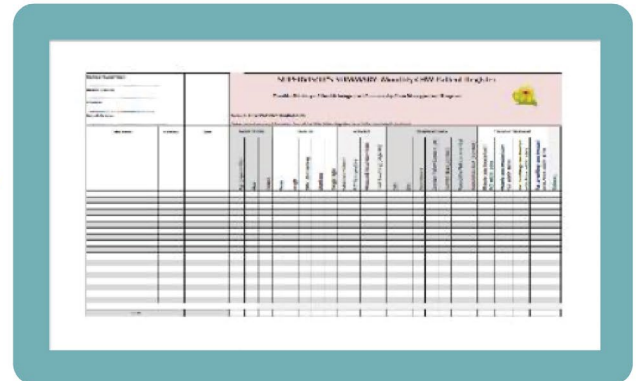


VS

✓ Our EMR is based on clinical guidelines and algorithms



✗ Other EMRs mimic a register or “mastercard” and are simply an e-replication of paper forms



VS

It is essential to have the means to uniquely identify clients within a health system to ensure high-quality, continuous care. To enable unique patient identification, EGPAF has developed a *Data Demographics Exchange* (DDE), a service which operates at the national level functioning as a client registry – a key component for the Open-HIE Global framework. DDE is integrated within the EMRS allowing patients to be uniquely identified across multiple service points within a clinic and across sites nationally. EGPAF designs DDE with a transport layer service which replicates the data in all its proxy services to have a single patient identifier used across facilities. This is an important feature, particularly in the absence of other identifiers such as national IDs or use of biometrics. EGPAF also offers built-in biometric functionalities to further support unique patient identification.

EGPAF also uses our unique *V-Box* application (Validation Box) to support data quality assurance. The *V-Box* supports data verification and report validation at multiple levels of the system (facility, sub-national level, and national level) to improve data quality and data use. The *V-Box* can be used to track and validate large data sets from thousands of health facilities, and to submit them through appropriate MOH structures. For example, the *V-Box* configured for the PEPFAR program in Malawi supports generation, validation, and transmission of over 15,000 reports every quarter for the program and has eliminated data anomalies.

These and other EGPAF innovations in the digital health space are a result of our deep relationships with MOHs, our intimate understanding of national health information systems, and our understanding of clinical service provision.

### Our vanguard HIS in Malawi

As HIS partner for the Ministry of Health, EGPAF developed and deployed at scale an integrated, easy-to-use electronic medical record system with reliable interoperable modules, automating clinic services and allowing for real-time patient data. EGPAF has integrated the EMR system within the broader HIS infrastructure to enable better use of data with the goal of optimizing service delivery. The EMR system is implemented in 770 facilities nationwide – reaching over 925,000 clients.

The Malawi EMR system utilizes an OpenMRS model, which implements HL7 messaging, among other *representational state transfer* (REST) web services, such as application programming interfaces (APIs) to send and receive data. EGPAF implements internationally accepted interoperability standards like FHIR (*Fast Health Interoperability Resources, Health Level 7*) to build underlying back-end systems that align with semantic-level standards, coding vocabularies, and incorporates these standards into the EMR architecture to allow for seamless data exchange. The EMR system feeds into a National Central Data Repository (CDR) as described (right) configured using Data Lake architecture where data can be extracted, transformed, and loaded into an intermediate data store for analysis. The CDR serves as a shared health record – a key component for the Open-HIE Global framework.

### Kenya Cloud EMR Hosting

- The hosting of EMRS on the cloud overcomes challenges of on-premise system deployment and provides great benefits to the health system, including rapid scale up.
- In Kenya, EGPAF implemented Cloud EMR in 370 facilities in Homa Bay, Murang'a and Kiambu Counties.
- Kenya Cloud EMR ensures that all decision-support capabilities are located at the point of care.
- Kenya Cloud EMR aligns seamlessly with the national health digitization agenda that requires all EMRs to communicate and exchange data with the National Digital Superhighway to facilitate effective and efficient health service delivery.

### Advancement in HIS, through EGPAF support of Malawi MOH

- Developed and deployed at scale an integrated, easy-to-use **electronic medical record system (EMRS)** with reliable, interoperable modules, automating clinic services, and allowing for real-time patient data.
- **Automated reporting from site EMRS:** Currently generating 14,000 reports quarterly, covering 928,995 people living with HIV across 770 clinics.
- **Integrated lab information systems** to work across clinic systems, sample transportation, and return of test results, reducing turn-around time from 52 days to 5 days.
- Modernized a **birth and death registration system** to link with the National ID system.
- **Established the Central Data Repository (CDR)** that receives, stores, and transforms data from multiple sources, including patient-level data from ART, outpatient department, antenatal care, TB, and HIV testing modules, as well as other clinical, lab systems, and birth/death registration data.
- **Created the Malawi Analytics Platform (MAP),** a web-based platform that provides end-users with reports, data analytics, and dashboards for program decision-making.

**In many additional countries,** EGPAF is leading introduction of EMR or modernizing existing systems for improved operability. Where EGPAF is introducing a state-of-the-art prototype, we tailor systems to country guidelines, user needs, and clinic operating procedures, install systems in demonstration sites, design the CDR architecture, and develop and ensure easy access to analytic products. To support HIS systems, EGPAF works with MOHs to design, assess, plan, procure, and deliver end user technologies, as well as to deploy the necessary power, connectivity,



and networking infrastructure. Where EGPAF is enhancing existing systems, EGPAF offers critical modifications to the system, including cloud hosting, adaptation of patient interfaces for a “point of care” approach, support for interoperability needs with other national data systems, and design of analytic platforms that allow for better data use.

For all country situations, our partnerships with the public and private sectors bring critical expertise and resources. For example, our relationship with OpenMRS allows for coordination with a global interconnected community that creates a robust, scalable, user-driven, and open-source medical record platforms (see text box).

### **OpenMRS: Use of Open-source Solutions**

- EGPAF leverages a combination of enterprise and open-source solutions, such as OpenMRS, to ensure interoperability with current CDRs and to create long-term sustainability for governments.
- By partnering with the OpenMRS community and organization, we are ensuring that we follow accepted community standards for data architecture and data governance wherever we implement EMR systems, contributing our unique codes to the community.
- For countries, use of open-source technologies, when possible, serves to reduce costs and to limit licensing requirements, as well as to foster innovation and promote the free exchange of ideas that drive creative, scientific, and technological advancement.

## **II. Interoperable Systems**

Integration of disease management with emphasis on patient-centered care is of utmost importance to meet client needs for HIV, related comorbidities, and other health needs. With multiple systems or modules for various health program areas, the interoperability of systems is critical. Ensuring integration and interoperability of systems and modules allows for improved patient care, and seamless exchange of information from the patient, community, and facility.

For example, EGPAF has integrated and made interoperable country systems based on multiple platforms to support the turnaround of viral load results (see text box). This integration allows clinicians to place an order for a test; order and track transport of the sample; enable labs to receive and analyze results; and ensure transmission of results back to the clinic and the patient for follow-up. Through this integration effort, turnaround time for viral load results was reduced from 52 days to 5 days. EGPAF also supports birth registration systems to be interoperable with maternity modules, allowing the new mother to leave the clinic with a birth certificate. This is a process that before the intervention would have taken months. These are but two examples showcasing the importance of interoperability among systems.

### **Laboratory System Integration**

EGPAF supports laboratory machine integration and interfacing with lab information systems to:

- Reduce turnaround time for lab results,
- Improve real-time accessibility of results to clinicians, and
- Increase the availability of high-quality data for management of labs and patient services.

### III. Data Lakes and use of Big Data

Responsible use of comprehensive patient-level data can facilitate targeted responses to micro-epidemics and can improve access to marginalized populations that have been left behind. EGPAF supports Ministries in the design, development, management, and maintenance of Central Data Repositories (CDRs), that store patient data coming in through HIS, including through EMR systems. A CDR is often referred to as a Data Lake – a centralized interoperable data hub for health program and patient data. EGPAF prioritizes multi-level security, confidentiality, and privacy measures for all patient electronic health data. Our methodology ensures the security of all data using consistently updated standards (see text box).

EGPAF-managed Data Lakes aggregate and manage data, including collection, consolidation, processing, storage, modelling, and data visualization, enabling MOH program managers to discover useful insights to guide decision-making. For example, EGPAF designed the Malawi CDR is designed to receive data from multiple sources from across the country. It receives, stores, and transforms data (including patient-level data) from HIV and TB testing and treatment services, antenatal clinics, laboratory information systems, cervical cancer programs, outpatient departments, other clinical services, lab systems and birth and death registration.

The Data Lake allows data to be extracted, transformed, and loaded into an intermediate data store for analysis. This is an analytic zone where data marts are created to guide informed decision-making. The CDR Data Lake enables and supports business intelligence activities such as descriptive analytics/reporting, better clinical decisions, case-based surveillance, enhanced strategic planning, artificial intelligence insights, de-duplication of data, alerts for treatment continuation, and improved patient experience and outcomes.

EGPAF-tailored solutions address the spectrum of users' technical skills, data needs, and access points. Within the CDR, EGPAF has created customized data marts. Data marts are subsets of data within the CDR focused on particular technical areas for a defined group of users, allowing these users to quickly access critical insights. EGPAF has also developed a web application module to enable users to explore the CDR with a graphical user interface (GUI) without requiring Structured Query Language (SQL) programming knowledge or database-level access to the IDS schema. The system facilitates the creation of sandboxes – allowing users to manipulate and analyze data using their preferred software. All CDR aggregated data sets and dashboards are also made available at one-stop-shop analytic platforms (described in below section).

#### Secure patient data management

We work closely with country governments and program partners to ensure security, confidentiality, and privacy of all patient electronic health data through multi-layered encryption of data, access/ authentications, and deidentification.

Our package of support ensures all national data managers are trained on protecting patient confidentiality and protecting identifiable data according to HIPAA standards and in keeping with other national policies.

#### Central Data Repository Features

- EGPAF-built CDRs are constructed with big data best practices, including Hadoop Distributed File System and MapReduce Engine
- Our CDRs comply with mature data governance and security strategies
- EGPAF ensures secure data sharing integration from the CDR to critical downstream national systems and applications, such as DHIS2
- We build capacity across the MOH in data use and analytics within CDRs, to ensure strong use for increased program efficiency

## IV. Health Informatics

Linking our focus on HIS, EMR systems, and Data Lakes – health informatics tools are important to ensure ease of data use. Dashboards, analytic platforms, and incident command structures are a few examples of these tools.

### Dashboards

Dashboards can be a simple and powerful tool to identify bottlenecks and gaps in services, and to steer corrective action their way while tracking and curtailing barriers and discrimination. EGPAF makes extensive use of multiple software tools to develop dynamic, intuitive, and insightful data dashboards. One example is Microsoft Power BI, which allows EGPAF to transform data into rich graphical reports. Such tools allow our HIV technical experts to visualize data in a fraction of the time than was possible in the past and help them explore and use the data in lightning-fast ways.

Drawing from automated data pipelines, EGPAF-built dashboards provide up-to-date performance data to aid in client care and program management. EGPAF also employs built-in alert systems using SMS/ email messaging to ensure key decision-makers are warned of emerging trends – for example EGPAF has used the *One Health System*, which is interoperable with clinic-based systems, to alert national health teams of reported cholera cases real time. EGPAF also uses geographical information system (GIS) technology to allow medical professionals to observe health trends in a region over time, tracking and monitoring infectious diseases and identifying hot spots. GIS is a key tool to help program managers identify unmet needs and emerging disease burdens in a region.

Other dashboards include EGPAF's the Global EGPAF Data Dashboard, an interactive analytic platform that pools data and summarizes real-time progress in advancing HIV prevention, care, and treatment services, 2) EGPAF's [95-95-95 dashboard](#) that allows countries to track progress against global targets of reaching 95% of people needing HIV services, 3) Results vs. Targets dashboard for the monitoring of specific projects, 4) Our [EZ-QI](#) dashboard for quality improvement and quality assessments, 5) the COVID-19 programming dashboard tracking pandemic response and other global health security interventions, and 6) individualized program dashboards in each of our country programs. These and other dashboards enable EGPAF to effectively track and convey the immense scale and impact of our lifesaving work.

### Analytic Platforms

EGPAF creates one-stop analytic platforms that allow users to access various products – dashboards, data sets, maps – drawing from multiple data sources and streamlining user access and use of information. Our analytic platforms have built-in capabilities to generate insights and alerts for users, for improved program performance and patient care.

[The Malawi Analytics Platform \(MAP\)](#) is an example of a successful analytic platform. The MAP is a web-based system that allows country program staff to easily access dashboards and visualizations to make use of data coming from the EMRS and CDR. The MAP is designed to expand the ease at which the MOH can use its data for program planning. Through easily accessible, highly intuitive, and dynamic real-time dashboards, the MAP has improved national partners' use of data trends analysis to make data-based decisions for improvement of health service delivery to patients (see text box).

#### Malawi Analytics Platform (MAP)

The MAP represents a single, centralized platform for users to access health data analytics; removes redundant systems administration and management of access permissions; and provides viewership trends to improve impactful analytics.

This web-based system hosts data sets, dashboards, and analytical workspaces from multiple EGPAF-supported HIS, including the CDR, and streamlines data access for government and other stakeholders.

Our global data warehouse, [GLASER360](#), is another example of a data analytics platform developed by EGPAF. [GLASER360](#) pools data from across all of our country programs, allowing for data queries to optimize program performance and improve patient care. This organization-wide data repository utilizes Azure Data Lake Storage Gen2 (ADLS) to house our big data analytics workloads. Further information on the [GLASER360](#) platform is provided in the Partnerships section.

### Other examples of EGPAF’s use of health informatics include:

#### Data for incident command

EGPAF set up an Incident Command Structure in Nigeria to track pediatric HIV, with development of pediatric HIV Dashboard indicators and data systems nationally, and in five states: Abuja, Benue, Rivers, Delta, and Lagos. Monthly data reviews gather key stakeholders and implementers across Nigeria for a collaborative approach that include community organizations and advocates to amplify messaging around service gaps for children, adolescents, and young women, with introduction of a social networking strategy model using youth-centered design.

#### Data use for decision-making in policy formulation

Using data to identify and evaluate policies needing refinement is critical, as countries approach and seek to sustain epidemic control. EGPAF dashboards help country leaders map out existing resources and gaps, to more accurately respond to client needs and to triangulate data from multiple sources to drive policy and resource allocation. For example, in Cameroon, such a process was used where analysis of data determined that the size of marginalized key population groups was much larger than what was being reported, opening the door for national change with respect to key population policies, attitudes, and resources.

## V. Digital Tools for Patients and Providers

### Patient support/empowerment applications

A wide variety of apps are available to help patients track their own healthcare, interact more seamlessly with the health system, and access information. A recent innovation is EGPAF’s *Last-Mile App* – a mobile app for clients to interact with their own health data, for use in Kenya and Malawi. EGPAF develops and adapts a wide range of SMS tools for the benefit of clients and providers. For example, in coordination with Kenya’s MOH, EGPAF piloted and scaled up a mobile- and web-based case management platform called *USHAURI* (Swahili for “advice”). This tool tracks care and sends clients SMS reminders and motivational messages. Within the first nine months of use alone, clinics in Kenya using *USHAURI* recorded a 21% jump in the number of patients re-engaged in care after a missed appointment. EGPAF programs also make extensive use of Meta’s WhatsApp tool to facilitate interaction and connectivity, for example to link beneficiaries within adolescent-focused programs and to facilitate exchange among local advocates.

### Digital tools for Quality Assurance, Mentorship, and Project management

Additionally, electronic and digital tools for providers incorporate indicators to track results and ensure projects stay on scope and on budget. EGPAF employs multiple electronic tools that can be readily adapted for different provider settings. For example, EGPAF’s *EZ-QI* app is a web and mobile application that enables personnel to conduct quality audits in key programmatic areas, such as early infant HIV diagnosis (EID), TB, and HIV care and treatment. The application generates performance charts that can be used to quickly identify program areas requiring technical assistance.

### Digital tools for Clinic Support

EGPAF created the Data-Informed Supervision and Coaching (*DISC*) digital tool to track program support and clinical supervision interventions at health clinics and district program offices. *DISC* is used to document interventions, track supervision, monitor support visits to sites, and mentor teams on follow-up of technical assistance recommendations. Additionally, *DISC* triangulates information from SIMS and site performance

indicators (Monitoring, Evaluation and Reporting – MER indicators) to pinpoint technical assistance needs for sites and to improve accountability around the response. The DISC tool is implemented in six countries – Tanzania, Kenya, Malawi, Eswatini, Lesotho and Mozambique.

## Virtual learning technologies

Distance-learning and remote networking technologies can be powerful tools to deliver highly specialized support at a low cost. For example, in Haiti EGPAF partnered with the University of Mexico to deploy their ECHO training/mentorship platform for clinical and laboratory services for support to laboratories. Through weekly connection among 150 laboratorians, practitioners presented real case studies, such as patients regressing from undetectable viral load status, and discussed corrective measures. EGPAF seconded a specialist to the MOH to support continued use of the ECHO platform, who was ultimately absorbed as MOH staff. The Echo platform continues to be used successfully long after initial roll-out – in Haiti and other countries where targeted expert support is required.

## VI. Investing in AI and Machine Learning (ML) to end HIV/AIDS

Machine learning models are well-placed to radically improve patient outcomes for HIV. EGPAF is harnessing the power of AI and machine learning to provide improved care to the people who need it most, leveraging the vast platform of data within EMR systems and national data repositories. EGPAF partners with countries to ensure that they are a part of co-creation of AI and ML tools, to ensure responsiveness to local needs.

AI and ML can improve the ability of clinics to identify – in advance – patients at risk of failing treatment regimens or dropping out of care, to better serve clients, and help countries reach epidemic control. Incorporation of predictive analytics into patient care is poised to have a groundbreaking impact on ending HIV. As programs mature, retaining individuals living with HIV in care will take center stage – patients retained in care are more likely to be prescribed antiretroviral medication and achieve HIV viral suppression, effectively eliminating the risk of transmitting HIV to others.

EGPAF is developing machine learning tools that will be transformational in our fight to end HIV, including in partnership with AWS (see text box)

### EGPAF partnership with AWS

- As a recipient of a Global Health Equity Grant and using AWS software tools -- EGPAF is developing a machine learning model to create predictive analytics to improve patient retention in HIV care and to increase viral suppression of HIV.
- The ML model will perform advanced analytics of the vast set of patient-level data gathered through the EMR system in Malawi.
- EGPAF will use AWS platforms (e.g. Sagemaker pipelines, AWS Glue) to train patient level data residing in Central Data Repository.
- Results of this effort can be transformational for countries seeking an end to HIV and AIDS.

## VII. Enabling Infrastructure for HIS at Scale

Enabling health information systems in low-income countries requires creative, fit-for-purpose, durable, and cost-effective solutions for MOHs – for power, connectivity, and deployment of end-user technologies, such as touch-screen systems and tablets. All solutions must be suitable for use in remote clinics (see text box, next page).

EGPAF staffing expertise and infrastructure allow for real-time connectivity within sites, across systems, and across geographic locations. Our country offices provide a complete array of infrastructure support for power solutions, local networking, and server capabilities; connectivity to and between labs, clinics, and central repositories; and training/technical support, including to ensure data privacy and security, inventory management systems,

monitoring the stock of data collection tools, and capacity building activities for MOHs and other national program implementers.

EGPAF has highly credentialed staff managing our HIS work, including teams of full stack developers for EMR systems and CDRs. Our DevOps teams provide world-class expertise in EMR system setup, management, use, and linkage to surveillance, data analysis, and program management. DevOps teams also ensure appropriate procurement, use, and maintenance of all hardware needs, including POC terminals, servers, mobile devices, and required connectivity.

## VIII. Partnerships and Impact Investment

EGPAF partners with a variety of technology companies to promote health equity to end HIV/AIDS. In the digital health space, we seek out partners, including corporate partners, that offer solutions to advance our vision for digital health use in the HIV space, and that provide value to Ministries of Health, in keeping with their program needs.

EGPAF's above partnership with **AWS** on machine learning models is an illustration of how EGPAF is seeking to join forces with companies to advance our efforts in using digital health to achieve our mission. With **Microsoft**, EGPAF is leveraging tools and support to help us drive better patient care. As already noted, we are a heavy user of Microsoft's Power BI systems to develop dashboards.

Additionally, EGPAF uses Microsoft Azure to support our global data warehouse – *GLASER360*. This organization-wide data repository utilizes Azure Data Lake Storage Gen2 (ADLS) to house our big data analytics workloads. *GLASER360* collects aggregate data from multiple platforms across all country-based settings, including monitoring, evaluation, and research (MER) data, DATIM imports, and a dozen EGPAF country offices that use DHIS2 platforms (e.g., Kenya, Lesotho, Cote d'Ivoire, Malawi). These data are fed into an analytics platform where Power BI data models are created to enable EGPAF leadership and teams to compare program reporting across countries and projects, and to track progress toward targets at site, district, and program levels. These analyses support organizational leadership at the country and global level to rapidly identify performance gaps and to deploy rapid support for program improvement.

EGPAF maintains numerous additional partnerships with companies and organizations, both small and large, to harness the power of data. EGPAF prioritizes use of open source solutions when possible, to reduce costs, to limit licensing requirements, and to allow longer-term sustainability for governments.

### Our infrastructure solutions:

EGPAF invests in hybrid power solutions that harness solar power – ensuring power back-up systems for uninterrupted use of HIS.

EGPAF leverages technology and market enhancements to invest in site-level local area networks (LANs), wide area networks (WANs), connectivity infrastructure, and virtual private networks (VPNs) – to ensure connectivity to and between labs, clinics, and central repositories, for transmission of data in real-time.

EGPAF sets up national Help Desks that allow users to log any issue and resolve it within 24 hours.

EGPAF works closely with MOHs to train and support MOH infrastructure teams to design, deploy, and maintain all infrastructure required for National Health Information Systems.

### To Learn More

We are pleased to receive inquiries from country MOHs, global health implementers, and digital health organizations seeking to leverage commercial tools, funding, and expertise towards better patient healthcare. To work with us or to learn more about how we use Digital Health tools in the fight to end HIV, please contact:

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**Charlie Maere, PhD, MSc, Director of Digital Health and Data Analytics,** cmaere@pedaids.org



## Elizabeth Glaser Pediatric AIDS Foundation

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[www.pedaids.org](http://www.pedaids.org)     @EGPAF

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