Promoting Immunization Equity in the Americas

Establishing an Electronic Immunization Registry

GRENADA

In 2015, the Grenada Ministry of Health (MOH) began updating its localized, paper-based immunization information system through the establishment of a nationwide electronic immunization registry (EIR), the Grenadian Immunization Information System (GIIS), made possible with support from the U.S. Centers for Disease Control and Prevention (CDC) and the Pan American Health Organization (PAHO).

Through a case study design utilizing in-depth interviews, focus groups, and site visits conducted in June 2019, this research:

1. Documents Grenada's experience planning, preparing, and implementing the GIIS;
2. Assesses the impact of GIIS implementation on immunization activities; and
3. Identifies challenges encountered, facilitating factors, and other considerations that can help optimize the process of establishing a national EIR, particularly in the context of a lower-middle income country (LMIC) like Grenada.

In doing so, this case study aligns with recommendations for the systematic monitoring and documentation of EIR implementation experiences and shares lessons learned with other countries as they seek to enhance immunization data quality and management, improve patient tracking, and advance overall immunization strategies. This research was made possible thanks to funding provided by the Bill and Melinda Gates Foundation.

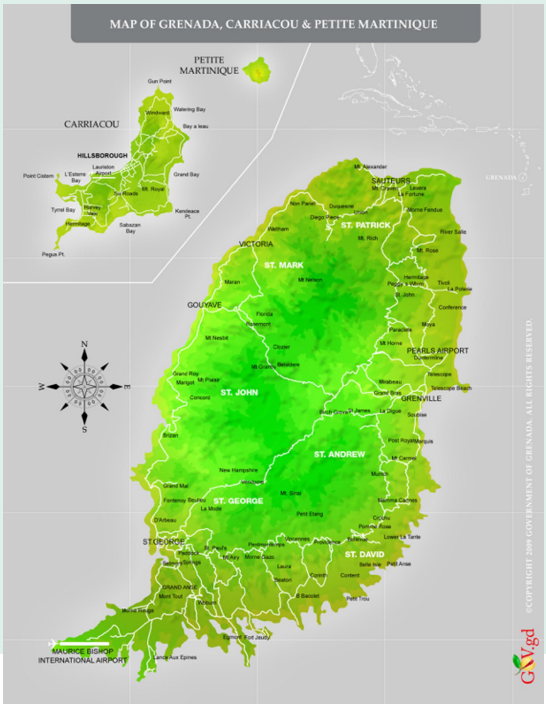
> *It was the amount of paper and the deterioration of the paper. That and the coordination between facilities was a big thing. They [nurses] were saying that we have so many different facilities all over, and not being able to share the information in real time, that was a big issue.*
>
> – MINISTRY OF HEALTH OFFICIAL

112,000
Population (2019)

1,770
Average annual birth cohort

92%
DTP3 coverage (2019)

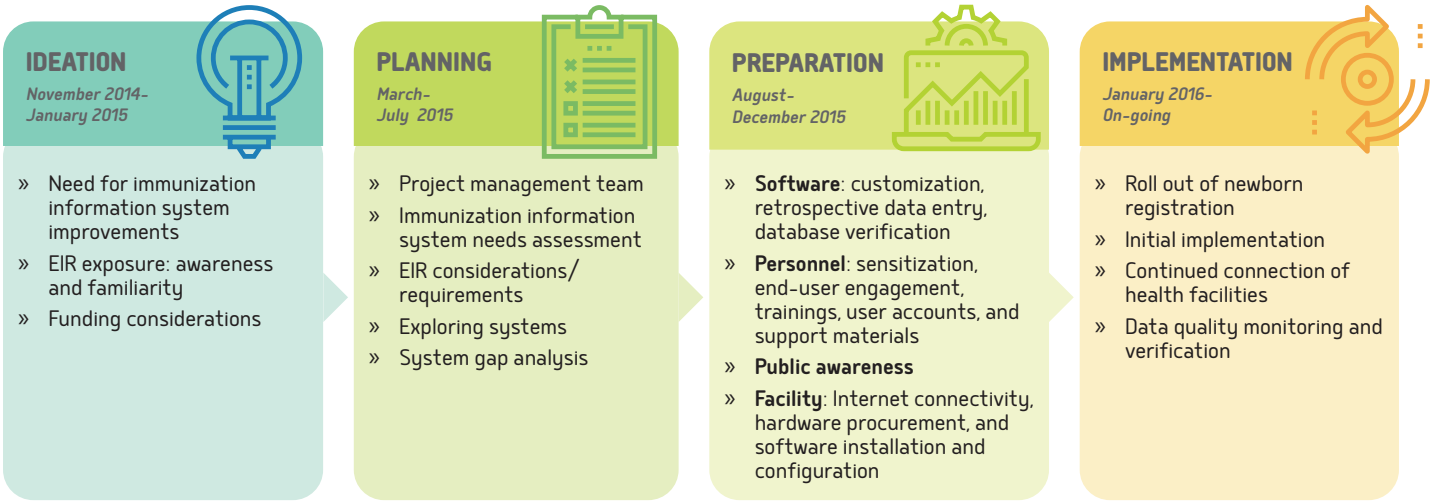
94%
MMR1 coverage (2019)



THE ESTABLISHMENT PROCESS

The following presents the main phases and key activities leading to Grenada's implementation of the GIIS (see Figure 1 for overview).

Figure 1: Overview of GIIS Establishment Process



IDEATION. Interest in establishing the GIIS arose from various **evaluations of the paper-based immunization information system**, which identified challenges to efficient data flow, timely data analysis, data quality verification, and safe and sufficient storage, alongside **increasing exposure to EIRs and their benefits**. Grenada's EPI Manager **incorporated the idea into the 2015 Plan of Action** and **explored external funding opportunities**. In collaboration with the MOH's Information and Technology (IT) Office and Planning Unit, the EPI Manager applied for a CDC Small Grant for Immunizations, seeking feedback from the PAHO regional and sub-regional office for the Eastern Caribbean Countries (ECC) prior to submission in January 2015.

PLANNING. In February 2015, the EPI was notified that their proposal had been selected for funding (March to December) and would be administered through PAHO-ECC, who provided on-going technical insight and support. Strategic planning began with the **establishment of a Steering Committee** to manage and oversee the project. Key planning activities included a comprehensive **immunization information system needs assessment** and detailed **definition of system requirements** to inform the **exploration of potential EIRs**, and a weeklong **System Gap Analysis (SGA)**, conducted in collaboration with PAHO, to **assess country readiness**.

An open-source, web-based EIR developed by AIRIS Solutions was decided upon as it met technical and financial requirements, could be customized to Grenada's context, and was deemed 'user-friendly' by the Lead IT Officer. The primary gaps identified during the SGA were insufficient health facility hardware and internet access, both of which were programmatically outside of the MOH's control. In light of this gap, gradual GIIS roll out was decided upon and a contingency plan was developed for electronic data entry by health facilities pending system implementation.

PREPARATION. Integrating **software customization** with **personnel sensitization**, the Lead IT Officer conducted **system demonstrations with end-users** and elicited feedback to inform customization, which was completed remotely by the software developers. Due to the iterative nature of the customization process, database population with 2012-2014 immunization records was delayed by a month. To compensate, additional personnel were hired for **retrospective data entry** and the process was eventually centralized in the capital. Subsequent **data quality verification** of all retrospective data was completed by the IT Office, who provided printouts of the GIIS registers to the associated health facility, and nurses, who compared the GIIS data against original paper-based registers, identifying errors for correction.

> *It's good to deal with those who may not be confident in terms of using an information system, computerized systems. … Once we identified those persons, we would work closer with them. During the sessions, we would slow down and do more practicing and pair them with somebody better [with computers].*
>
> – IT OFFICER

Following the completion of retrospective data entry, four one-day, hands-on GIIS **training workshops** took place. Led by the IT Office, trainings were composed of **live demonstrations** of the system's essential functions and basic data entry procedures followed by **group-based practice sessions** and **role-playing activities**. Nurses were invited to bring 2015 immunization records with which to practice data entry, allowing users to experience the GIIS with real data. Software developers observed trainings and conducted **additional software refinement** as users provided live feedback. Concurrently, radio and television public service announcements and the distribution of educational and promotional materials focused on **raising public awareness** of the forthcoming GIIS.

Finally, **preparation of the six health centers** identified for initial GIIS implementation due to their reliable internet access and hardware availability was conducted by IT personnel, including the **installation of GIIS software** and **connection to the main server**. The MOH made the relevant requests to equip the remaining 30 medical stations, mostly in rural and remote areas, with the necessary hardware and internet connectivity, but was only peripherally involved in these processes.

IMPLEMENTATION. Commencement of GIIS use was initially planned for October 2015, but due to various project delays, was rescheduled to January 2016, beginning with **newborn GIIS registration** in the country's central hospital. On March 1st, 2016, **initial implementation of the system for immunization data recording began in all six of Grenada's district health centers**, and **the previously developed contingency plan was enacted for all other health facilities**: immunization data would continue to be recorded in paper registers, and every two to four weeks, nurses would travel to their district health center to enter the data into the GIIS. Consequently, primary reliance on paper registers persisted. While parallel use of the paper and electronic registers was planned to verify data quality during GIIS implementation, in actuality, the systems were used concurrently, but inconsistently across facilities.

After all health facilities acquired the necessary hardware for GIIS use, internet access continued to be a challenge in remote and rural facilities. To alleviate infrastructural challenges, the national government decided to change internet service providers and establish a fiber-based network. While this change promises to deliver more reliable internet connectivity, the installation of new infrastructure further postponed nationwide implementation of the GIIS.

> *The problem has been the actual rollout of the internet connectivity that we don't have control over. That should have been done already. All the facilities should have been connected already, but the technology that we're using to do it, it requires line of sight with a cell tower. … So the facilities that are outside of the line of sight of cell towers, they were kept back.*
>
> – IT OFFICER

Photo credit: PAHO

IMPACTS OF THE GIIS ON IMMUNIZATION ACTIVITIES

BENEFITS. While system implementation was on-going and utilization had not yet expanded nationwide at the time of this case study, participants consistently expressed that the GIIS has made an overall positive impact on EPI immunization activities. Ministry of Health officials and healthcare personnel alike identified a variety of system benefits, including **streamlined data access and retrieval**, **improved data storage**, **simplified monthly planning and reporting**, **enhanced patient tracking**, and **a significant reduction in the burden associated with compiling, analyzing, reporting, and monitoring immunization data**.

AREAS FOR IMPROVEMENT. The main critiques of the GIIS were related to its partial implementation, not the system itself, and included **the increased burden of data entry as a result of parallel immunization information systems and associated data quality concerns**. Participants also reported initial challenges with inaccurately defined catchment area and data disaggregation at the district-level, both of which were quickly addressed through software modifications by the IT Office.

> *Instead of having to go into the [paper] register and looking for each child that did not get a vaccine, you just look at the EIR, your defaulters' list, and you'll see, 'Okay, these are the list of children I need to contact.'*
>
> – HEALTH CENTER NURSE SUPERVISOR

> *We still have that challenge though because all of the clinics are not yet on [the GIIS]. So there are children who'll be accessing care in some of these clinics, and if it [the GIIS] isn't updated on time, we're still really searching.*
>
> – MEDICAL STATION NURSE

CHALLENGES ENCOUNTERED

FINANCIAL CONSTRAINTS associated with lack of internal funds for an EIR, costs of necessary hardware and infrastructure not covered by funding, and other unanticipated expenses	*Strategic Responses:* Applications for external support (CDC) and supplemental funding (PAHO), selection of open-source software, refurbishment of computers and other hardware, and inter-sectorial collaboration for establishment of health facility internet infrastructure and procurement of hardware
TIME CONSTRAINTS associated with a short funding timeline, competing demands of project personnel, and the time-consuming nature of software customization	*Strategic Responses:* Reliance on a few key personnel to advance the project, adaptation of timeline based on project priorities, and modification of subsequent activities
INSUFFICIENT COMMITMENT from collaborating entities responsible for internet connectivity and hardware provision, resulting in **INADEQUATE OR ABSENT GIIS INFRASTRUCTURE** in some health facilities	*Strategic Responses:* Gradual GIIS roll-out beginning with initial implementation sites identified based on evaluation of readiness and development of a data entry contingency plan for facilities pending system implementation
UNCLEAR TIMELINE FOR DATA QUALITY MONITORING AND VERIFICATION FOR COMPLETE TRANSITION from the paper-based system to the GIIS due to delayed internet connectivity	*Strategic Responses:* Evaluation of individual health facilities for transition readiness
LOW-COMPUTER LITERACY AMONG SOME HEALTHCARE WORKERS linked with GIIS hesitance	*Strategic Responses:* Identification of 'Champions of the EIR' in each district to provide peer-to-peer guidance and strong IT support, including on-the-job training, near-constant phone availability, and regular visits to assess GIIS use and data quality.

FACILITATING FACTORS

DEDICATED PROJECT LEADERSHIP from the EPI Manager and Lead IT Officer, including continued team motivation, professional commitment, and technical knowledge, ensured advancement of project and engagement of end-users

STRONG END-USER ENGAGEMENT THROUGHOUT PLANNING AND PREPARATION fostered project buy-in, generated widespread GIIS familiarity, and ensured a user-friendly and well-customized system

EARLY INVOLVEMENT OF IT leveraged expert knowledge in the selection and customization process as well as facilitating their in-depth understanding of the GIIS, contributing to project timeliness, decreasing costs, and building local technical capacity

EXTERNAL TECHNICAL COOPERATION AND SUPPORT from PAHO provided expert insight and guidance throughout the project (i.e. grant proposal feedback, participation in SGA, etc.)

> *Some persons are resistant to change. If they feel they know about it, that they're part of the planning, they see it as being part of the whole process, and they're more receptive to those sorts of changes. … You meet them at the district level, you let them know of your plan, what you want to do, and you get ideas from them, even if you might not use some of the ideas, but you give them a chance to make their input.*
>
> – MINISTRY OF HEALTH OFFICIAL

LESSONS LEARNED

- **IMPLEMENTING A NATIONAL EIR IS A LONG-TERM, MULTI-PHASE PROCESS** that involves careful consideration of country context, information system gaps, and EIR requirements, dedicated, interdisciplinary human resources, and continual oversight and data monitoring.
- **ACCURATE PLANNING, INCLUDING COMPREHENSIVE BUDGET FORECASTING AND DETAILED TIMELINE PROJECTIONS, IS CRUCIAL** to anticipating cost constraints and spacing of project activities.
- **BROAD AND EARLY STAKEHOLDER ENGAGEMENT AT THE NATIONAL AND SUBNATIONAL LEVELS,** including the establishment of a Steering Committee and accountability procedures, is important for open communication and facilitating teamwork, task accountability, user buy-in, and political support.
- **ESTABLISHING THE TECHNOLOGICAL INFRASTRUCTURE** for nationwide implementation of a novel EIR can be time-consuming and complicated, especially in a LMIC, but is fundamental to fully leveraging online system benefits and should be considered early in the project timeline.

Photo credit: PAHO

CONCLUSION

Grenada has been a pioneer in the establishment of a national EIR in the Caribbean sub-region, achieving many successes in implementing the GIIS. Robust planning, in-depth end-user engagement, and dedicated IT involvement led to the development of a well-accepted EIR, customized to Grenada's context and needs.

Although nationwide implementation was prolonged due to external challenges, the GIIS provides many benefits to EPI immunization activities, including improved immunization data access, enhanced patient tracking, and eased reporting and planning burdens where the system is available. Grenada's establishment of a technical working group and 'Champions of the EIR' will be on-going strengths to system implementation and sustainability. Grenada's experience establishing the GIIS provides a learning opportunity for other countries seeking to enhance their immunization information systems by providing a processual roadmap of facilitating factors, potential challenges, and strategic responses to strengthen immunization data and services.

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PAHO Pan American Health Organization World Health Organization Americas

For more information, visit our website

www.paho.org/immunization