

**Improving Immunization Data
Management in Northwest Syria:
The Role of DHIS2 e-Tracker**





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1- Executive Summary

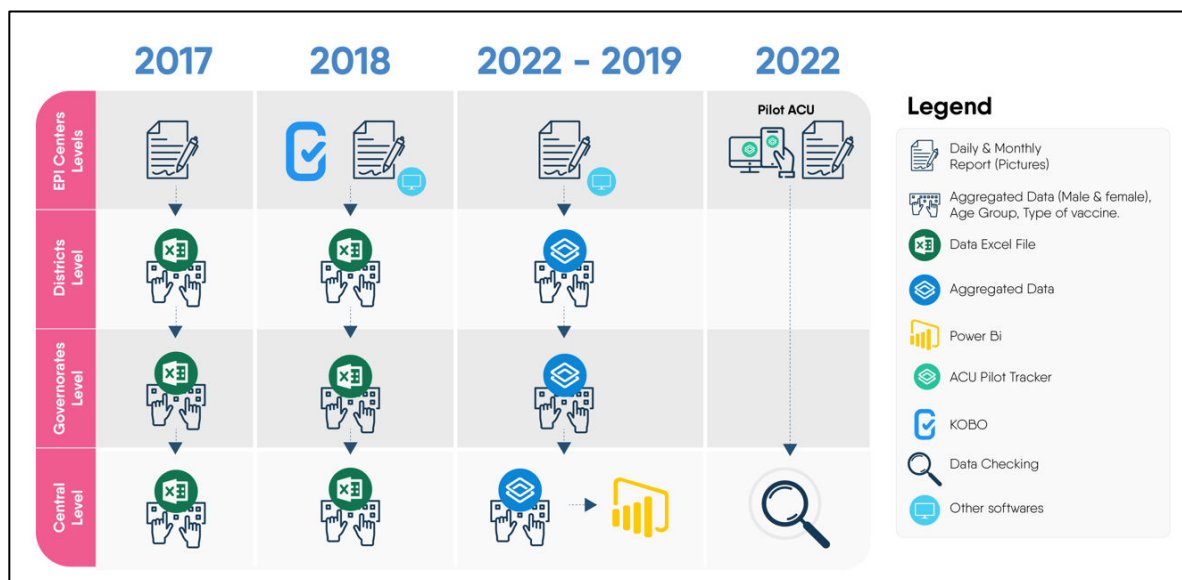
This report details the implementation and impact of the DHIS2 Tracker program in improving data management for the expanded immunization program in Northern Syria. The approach involved integrating the DHIS2 e-tracker with existing paper-based immunization records, emphasizing training, system setup, and data migration. Key findings show marked improvements in the efficiency of data processing, accuracy, and immunization tracking. Recommendations highlight the need for continuous training, system upgrades, and scalability. The DHIS2 e-tracker proves to be highly beneficial in optimizing immunization data management in challenging and conflict-affected environments.

2- Leverage DHIS2 for immunization in Northwest Syria

In northern Syria, EPI centers have been using DHIS2 for aggregated data since 2019, with support from WHO. After each vaccination session, teams send their data to district data officers for entry into DHIS2, and the central level utilizes immunization dashboards to display data on various indicators.

Since mid-2022, ACU-EPI centers have implemented the e-Tracker at the EPI team level for over nine months. Each team now enters individual child data directly into DHIS2, allowing all levels to access the data in real-time.

Currently, two systems are used for immunization data collection through DHIS2 in northern Syria: the first, used in all EPI centers, is based on aggregated data, while the second, implemented exclusively in ACU-EPI centers, employs the e-Tracker to capture individual-level data for each child.



The objectives of implementing the DHIS2 Tracker in ACU's vaccination centers were:

1. To improve data accuracy and reduce errors in immunization records.
2. To enhance routine data collection and analysis, increasing immunization coverage and reducing the number of unimmunized or under-immunized children.
3. To enable real-time tracking and management of individual vaccination records.
4. To enhance data timeliness and accuracy, while expanding coverage, efficiency, and effectiveness through the Expanded Program on Immunization (EPI).
5. To support better monitoring, supervision, and evaluation of the vaccination program's performance.
6. To provide healthcare providers with clinical guidance on immunization schedules and contraindications based on global standards and resource allocation.
7. To facilitate integration with other health information systems like EWARN and HIS data, which ACU already supports, providing a comprehensive view of immunization efforts and epidemiological trends, aiding informed decision-making and effective public health interventions.
8. Keeping electronic copies of all documents and records.
9. Use the new software and applications to inform the parents automatically of their children's vaccination dates and send reminders to follow up with the defaulters.

3- Gradual Deployment of the DHIS2 e-Tracker

Understanding the data needs and strategic direction of Northwest Syria was essential for ACU's decision to adopt the DHIS2 e-Tracker. The digital immunization e-Registry package was developed to address the need for enhanced data timeliness, accuracy, and expanded coverage, efficiency, and effectiveness of the Expanded Program on Immunization (EPI). The e-Registry aims to improve routine data collection and analysis, thereby increasing immunization coverage and reducing the number of unimmunized or under-immunized children. It also offers healthcare providers clinical guidance on immunization schedules and contraindications according to global standards, while generating reliable data to support informed decision-making across all health system levels.

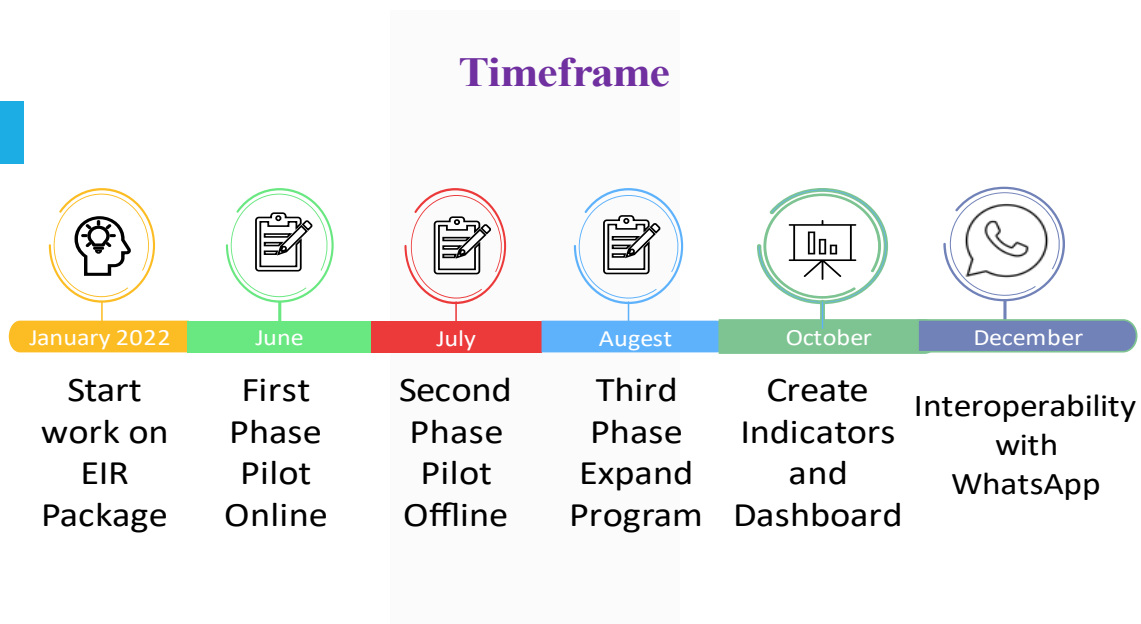
The Electronic Immunization Registry was built on the DHIS2 platform in line with WHO Position Papers on Routine Immunization Recommendations (2018) and national immunization schedules in Northwest Syria. In collaboration with engineers from the Early Warning Alert and Response Network (EWARN), ACU's immunization program launched the Electronic Immunization Registry (e-Tracker) on the DHIS2 platform to collect, manage, and analyze individual-level transactional and case-based data, with integrated reminders for tracking and following up with defaulters. This was implemented after downloading the EIR metadata package from the DHIS2 website and subscribing to the DHIS2 community to benefit from the experiences of other countries using the platform for vaccination programs. Several challenges were encountered during the development of the first version, which were resolved through modifications to ensure full compliance with the Syrian immunization schedule, enabling the system to operate both online and offline.

The Electronic Immunization Registry aims to address various challenges in the field, including:

- Creating a unified database for all EPI centers.
- Identifying the exact target population for each community.
- Ensuring high immunization coverage while minimizing dropouts and missed opportunities.
- Improving follow-up of individual child data.
- Enhancing control over immunization activities across all EPI teams.
- Increasing data quality through effective supervision and monitoring.
- Maintaining electronic copies of all records and documents.
- Utilizing new software and applications to automatically notify parents of their child's vaccination dates and send reminders for follow-up with defaulters.

The following tasks were carried out in several phases to effectively manage the transition:

1. Developed the Electronic Immunization Registry (EIR) Package tailored to the Syrian context and immunization schedule, while participating in multiple events to learn from the experiences of other countries (January 2022).
2. First Pilot Phase: Trained 11 EPI teams on online data entry (June 2022).
3. Second Pilot Phase: Trained 18 EPI teams on offline data entry (July 2022).
4. Third Pilot Phase: Trained the remaining EPI teams on both online and offline data entry (August 2022). Following this phase, a total of 59 vaccination teams began using DHIS2.
5. The EPI team established a set of approved indicators for tracking, with data parameters officially incorporated into the immunization register. Over 270 indicators and rules were created for the EIR Program, along with a dashboard that effectively displays the tracked indicators.
6. Extracted lists of eligible children and those who missed vaccinations, implementing Python code to enable interoperability between DHIS2 and WhatsApp for automatic notifications regarding overdue and upcoming vaccination events for children (December 2022).
7. Currently reviewing data to identify service data for reports from paper-based immunization registers and DHIS2.
8. Developed datasets to capture logistics data between central cold chain stores and district cold chain stores, allowing for validation of reported facility logistics data.
9. Conducted orientation meetings at the field, district, and national levels.
10. Technical teams at both the national and district levels provide regular on-site support to ensure that health workers at health facilities capture data accurately, timely, and of high quality.



4- DHIS2 Immunization Data Flow

At the health facility level, EPI teams use paper-based immunization registers and ACU-provided tablets for data capture. Initially, they fill out the paper-based register and then enter this data into the e-Tracker application, which can be used online or offline on their tablets. This dual approach ensures all data parameters are accurately recorded before being entered electronically. If discrepancies are found in the submitted data, teams can refer to the paper registers to correct errors.

Due to internet connectivity challenges, especially during mobile vaccination sessions, some teams cannot immediately submit their data via the e-Tracker. They often need to locate "network spots" or wait until they return to EPI centers with internet access to synchronize the data. Once synchronized, the data quality field officers team reviews and verifies the data daily for accuracy and completeness. If errors are identified, the registrar at the EPI level is promptly notified for corrections and re-submission.

After verification, immunization reports are generated, with final approval by the central Information Officer at the end of each month. This ensures that the data is ready for use at national, governorate, district, and EPI center levels. Generally, data quality is good, though some facilities still report issues with completeness and accuracy.

By implementing the DHIS2 tracker form for case-based data collection, the data flow has transitioned to a fully electronic process. The data entry clerk registers the child directly into the DHIS2 electronic form and then synchronizes it with the ACU DHIS2 server. The tracker form contains detailed information about the child and supports two scenarios:

- **New Enrollment:** When a child visits the vaccination center for the first time, comprehensive information is collected, and DHIS2 automatically generates a unique code, which is added to the child's vaccination card for easy reference. After gathering basic details, data for the administered vaccine during the session is recorded, along with the date for the next session.
- **Subsequent Visits:** For children returning for follow-up visits, a quick assessment of the child's health and nutritional status is conducted. The tracker form is then used to open a vaccination session, where the administered vaccine and the next session date are recorded.

Thus, the structure of the Electronic Immunization Registry program is represented as shown in the image:

Electronic Immunization Registry Program Structure

Enrollment		
Program	Immunization	
Program stages	Beneficiary assessment Not Repeatable	Immunizations Repeatable
Program stages sections	<ul style="list-style-type: none"> • Birth details • Assessment of the child's vaccination status • Previous vaccination status of the woman 	<ul style="list-style-type: none"> ▪ Assessment of the health and nutritional status of the child ▪ Assessing The Woman's Pregnancy and Nutritional Status ▪ Immunization - Routine ▪ Immunization Schedule Override
Notifications	Send a message with the date of the next session via WhatsApp message	

We have also integrated the tetanus vaccination program for women with the routine vaccination program for children. As a result, when a female aged 15 to 49 years is registered, the sections related to tetanus vaccination (previous vaccination status of the woman, Assessing the Woman's Pregnancy and Nutritional Status) appear in the program structure in red color, while the sections for children's vaccinations are hidden, displaying only the relevant tetanus vaccination sections.

The tracker form includes validation rules to minimize errors and enhance data quality. Each child's page in the tracker form contains various indicators created by the central team, aiding field teams in tracking received vaccines, scheduling future sessions, identifying defaulters, and more. These indicators are also monitored at the central level to support improved performance monitoring.

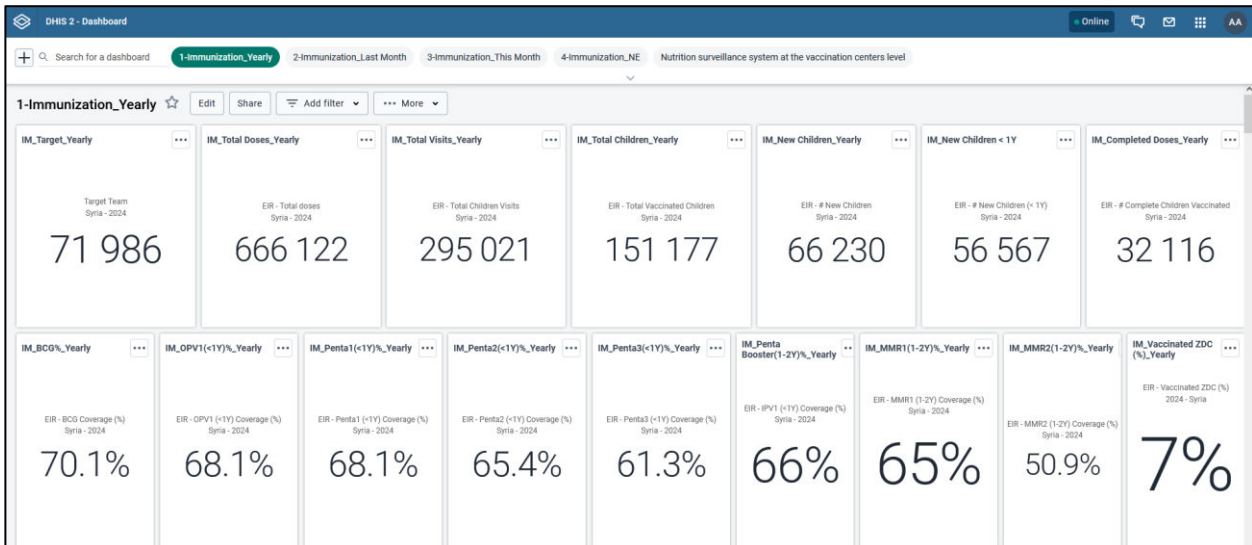
5- DHIS2 Immunization Dashboards

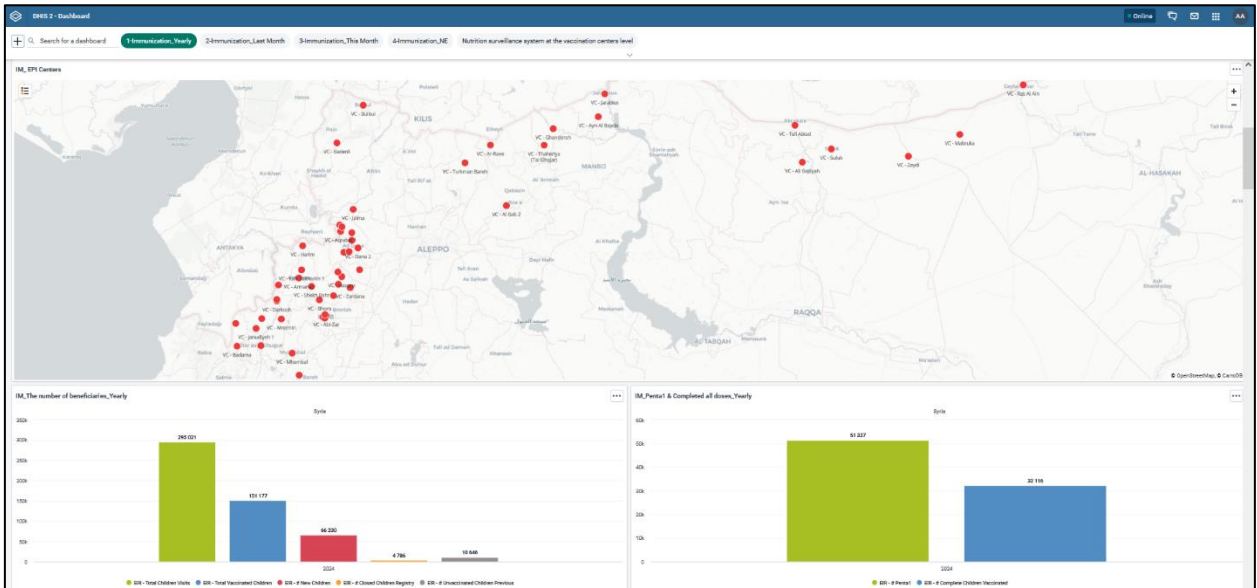
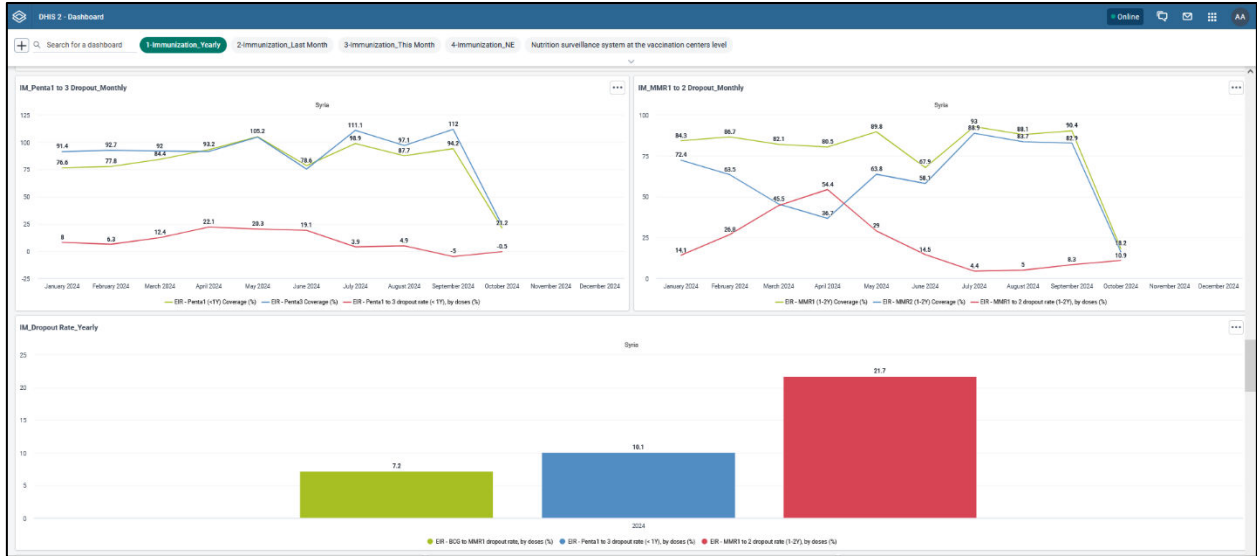
The ACU utilizes DHIS2 Immunization Dashboards at all levels—national, district, EPI center, and EPI teams—to efficiently monitor and manage vaccination data. These dashboards are highly valuable for displaying key indicators, such as coverage rates, dropout rates, and zero-dose cases, in real-time.

The dashboards offer a comprehensive overview using various visual tools, including numerical data, percentages, graphs, and coverage maps. Several specialized dashboards are available, each serving a distinct purpose:

- **Current Month Dashboard:** Tracks ongoing activities and monitors daily progress.
- **Previous Month Dashboard:** Analyzes data from the previous reporting period to identify trends and areas for improvement.
- **Eastern Region Dashboard:** Focuses on specific indicators and performance metrics in eastern areas to enable targeted interventions.
- **Nutritional Surveillance Dashboard:** Monitors nutritional data alongside immunization metrics for a holistic view of child health.
- **Vaccination Delay Reasons Dashboard:** Examines the causes of vaccination delays, providing insights for corrective measures.
- **Zero-Dose Reasons Dashboard:** Identifies and categorizes reasons why children have not received any vaccinations, helping address coverage gaps.

These dashboards are crucial in creating a detailed understanding of the immunization landscape in Northern Syria, facilitating data-driven decision-making and timely interventions to improve vaccination outcomes. The flexibility and depth of the DHIS2 platform allow health workers to respond swiftly to emerging challenges, ensuring vaccination efforts are both effective and efficient.





6- Achievements

The implementation of DHIS2 for immunization in ACU-EPI centers has led to significant achievements across all levels. Until August 12, 2024, the system has registered 242,432 new children, with data from 59 EPI teams reaching a total size of 10 GB. Access to individual child data at the EPI center level has been crucial for identifying and following up with defaulters, planning logistics and supplies, and organizing targeted outreach and immunization events. The system's data has played a key role in performance reviews, decision-making processes, and enhancing the technology skills of health workers.

The most important of these achievements:

- **Performance Review and Improvement:** Central supervisors use e-Tracker data to monitor health facility reporting, identify non-reporting facilities, and ensure data accuracy. They contact registrars to cross-check with paper-based records when errors are identified. National supervisors utilize this data to monitor regional immunization outcomes and provide technical guidance.
- **Decision-Making:** Immunization reports generated from DHIS2 data guide decisions by the Syria Immunization Group (SIG) and the Early Warning Alert and Response Network (EWARN). These reports help prioritize key targets, identify gaps, and track progress toward quarterly immunization targets at district and EPI center levels. At the national level, the data supports monthly feedback on immunization indicators and enables senior managers, including the Director General, to review and compare performance indicators through an executive DHIS2 dashboard.
- **Planning:** DHIS2 data informs planning for vaccines and logistical supplies by providing accurate figures on children reached and those still needing immunization. The e-Tracker data also helps estimate the necessary vaccines and personnel for upcoming immunization events, making planning more efficient.
- **Enhancing Technology Skills:** Immunization officers have gained valuable skills in using computers, tablets, and immunization applications, improving their ability to manage data online.
- **Data-Driven Outreach Strategies:** Using DHIS2 data has enabled more targeted outreach strategies, ensuring that high-risk areas and populations with low coverage are prioritized.
- **Enhanced Accountability:** The transparency and accessibility of DHIS2 data have increased accountability at all levels, allowing for easy tracking and evaluation of performance.
- **Capacity Building:** Training and the consistent use of DHIS2 have not only improved technology skills but also enhanced overall data management capabilities among health workers, leading to better data quality and more effective service delivery.

7- Challenges

Despite the significant achievements from implementing DHIS2 immunization applications, ACU has encountered several challenges during the system rollout. These challenges include issues with internet connectivity, inconsistencies in data completeness and accuracy, staffing pressures, and broader infrastructure weaknesses in northern Syria. Many of these challenges are like those faced by other countries using DHIS2 for immunization.

- **Internet Connectivity:** This is particularly challenging for mobile teams during outreach vaccination sessions, where consistent internet access is often unavailable. To address this, subsidizing the cost of internet connections and mobile SIM cards is necessary to ensure timely data submission.

- **Data Completeness and Accuracy:** Some EPI teams struggle with ensuring complete and accurate data entry. District counterparts are working with these teams to improve data quality, but challenges persist.
- **Staffing and Workload:** Staffing shortages and heavy workloads are major issues at some EPI centers. Teams are often overwhelmed by the number of children they must serve while entering data into immunization registers. This problem is compounded by a limited number of tablets for data entry, damaged devices that go unrepaired, and staff turnover, particularly among vaccinators. Regular refresher training is needed for new staff, but limited resources hinder the ability to conduct such training.
- **Infrastructure Weaknesses in Northern Syria:** The region's underdeveloped infrastructure complicates the implementation of DHIS2 and other immunization activities. Operating in a conflict zone, with unreliable electricity and insecure transportation routes, further challenges consistent data collection and reporting.
- **Incomplete Rollout of e-Tracker:** The e-Tracker system has not been fully implemented in all vaccination centers in northern Syria, with only 44% of EPI teams using it. This partial rollout results in inconsistent data collection across regions, reducing the effectiveness of the DHIS2 system.
- **Age-Related Challenges Among Health Workers:** Some teams include older health workers who struggle to adapt to the new system, creating a generational gap in technology adoption and slowing the integration of DHIS2 into daily operations.
- **Impact of COVID-19:** The COVID-19 pandemic has strained resources and disrupted regular immunization activities, with the focus on pandemic response at times diverting attention and resources from routine immunization efforts.
- **Excessive Paperwork:** The continued use of paper-based forms alongside digital data entry has increased the workload for health workers, making the process time-consuming and raising the risk of errors.

8- Lessons Learned

The implementation of the DHIS2 Immunization e-Tracker and Dashboards in ACU has shown significant potential in improving immunization outcomes. Registrars have been diligent in recording data alongside providing immunization services, supported by the devices provided for data entry and submission. Regular training and continuous support from the district to EPI centers have ensured effective implementation. The following lessons have been learned, offering valuable insights for future scale-up within northern Syria and deployment in other regions:

- **Data Completeness and Accuracy:** While most health facilities submit high-quality data, a few still face challenges with incomplete and inconsistent submissions. Ongoing support and follow-up, including using communication platforms like WhatsApp, Skype, and Telegram, are crucial to continually improve data quality.
- **Research to Link e-Tracker Use to Immunization Outcomes:** Information officers often find it difficult to directly assess the impact of the e-Tracker on immunization outcomes. Conducting surveys or research within NWS is needed to evaluate the system's effect on immunization results and provide evidence of its effectiveness.

- **Internet Connectivity:** Although registrars have access to an offline version of the app on their tablets, finding stable internet connections to synchronize immunization data remains a significant challenge, especially in remote or underserved areas.
- **Vaccinators' Workload:** The heavy workload of vaccinators, particularly regarding data entry, needs to be addressed. ACU should consider hiring dedicated data officers within EPI teams to handle data entry, allowing nurses to focus on delivering immunization services.
- **Regular Capacity Building:** To address knowledge gaps due to staff turnover, ACU should plan regular capacity-building sessions or refresher training, particularly at the EPI center level. This will help maintain consistent and accurate data capture, entry, and reporting.
- **Training Supervisors on Data Analysis:** Training area supervisors to effectively use DHIS2 data analysis and dashboards has had a significant positive impact. By analyzing data from their respective regions, supervisors have been able to identify weaknesses, address them, and improve coverage indicators.
- **Standardizing Population Data:** Standardizing population numbers, target populations, and settlements is crucial for accurate demographic mapping. Despite challenges related to population movement, ACU has successfully used data from mobile vaccination campaigns to create a more accurate network of settlements. This is particularly important for areas with many unregistered camps, which have been included in vaccination sessions to improve the accuracy of target population estimates.
- **Developing and Updating Indicators and Rules:** Continuously developing and updating indicators, rules, and equations within the DHIS2 system has been essential. Regular software updates have resolved technical issues, improved data quality, and made it easier for field teams and supervisors to extract and work with data.
- **Dashboard Optimization:** Ongoing adjustments to the dashboards, based on feedback from field teams and supervisors, have resulted in an optimized model. These improvements have enhanced the effectiveness of the dashboards in monitoring immunization indicators.
- **Comprehensive Monthly Reporting:** The extensive data that can be extracted from the DHIS2 system has enabled the preparation of detailed monthly reports at the vaccination team level. These reports are discussed monthly by central supervisors at the national level, allowing key issues to be identified and addressed in regular supervisory visit plans.

9- Recommendations

The following are key recommendations to address some of these challenges:

- **Enhance Infrastructure and Internet Connectivity:** To tackle ongoing internet connectivity issues, particularly in remote and underserved areas, investing in alternative solutions like satellite internet or mobile data hotspots is recommended. This would enable real-time data synchronization, reducing delays and improving data accuracy. Subsidizing internet costs and providing mobile SIM cards to teams could also help alleviate connectivity challenges.
- **Expand Training Programs:** Given the issues related to staff turnover and varying levels of digital literacy, ACU should establish a comprehensive and continuous training program. This

- program should include initial training for new staff and regular refresher courses for all team members. Training should cover technical skills (e.g., using tablets and e-Tracker) as well as data analysis to empower field teams and supervisors to make data-driven decisions.
- **Increase Staffing and Optimize Workflows:** To reduce the workload on registrars and vaccinators, it is recommended to increase staffing levels, especially by hiring dedicated data officers at the EPI center level. Additionally, optimizing workflows to balance data entry and immunization service delivery can help reduce bottlenecks and improve overall efficiency.
 - **Improve Data Integration Across Health Services:** ACU should further integrate the DHIS2 e-Tracker system with other health services beyond MUAC screening, such as linking immunization data with maternal health services, nutrition programs, and disease surveillance systems. This integration would support a more holistic approach to child health and enhance the ability to respond to health needs effectively.
 - **Standardize Data Collection and Reporting:** To address data completeness and accuracy, standardizing data collection and reporting processes across all EPI centers is crucial. This includes developing clear guidelines and protocols for data entry, ensuring all teams are trained on these standards, and monitoring compliance regularly.
 - **Develop a Feedback Loop for Continuous Improvement:** Establishing a robust feedback loop, where data from the DHIS2 system is regularly reviewed and discussed at all levels (national, district, and EPI center), can lead to continuous improvements. This should include regular data audits, performance reviews, and action planning based on the data collected.
 - **Strengthen Data-Driven Decision-Making:** Promote a culture of data-driven decision-making by integrating data analysis into routine operations at all levels. Supervisors and team leaders should be trained to interpret data from the DHIS2 dashboards and use this information to inform strategies, allocate resources, and guide outreach activities, ensuring immunization programs are responsive to needs on the ground.
 - **Focus on Sustainability and Long-Term Planning:** To ensure the long-term success of the DHIS2 system, it is essential to develop a sustainability plan that includes securing long-term funding, building local capacity, and forming partnerships with other health organizations and government bodies. This would reduce reliance on international donors and help maintain the system's effectiveness in the future.
 - **Regular System Updates and Technical Support:** ACU should implement a schedule for regular system updates and provide ongoing technical support to all users to ensure the smooth operation of the DHIS2 system and address any technical challenges. This includes troubleshooting issues, updating software, and refining the system based on user feedback.
 - **Expand Community Engagement and Awareness:** Efforts to engage and educate communities about the importance of immunization and the role of the e-Tracker in improving health outcomes should be increased. Community mobilizers and health workers should collaborate to ensure families understand the significance of timely vaccinations and the benefits of the services provided.

10- The Way Forward

Here are some key steps to move the work forward:

- The program will be expanded to include all vaccine teams in northwest Syria.
- The program will be expanded to include school and Covid vaccines.
- Create a form for vaccination campaigns.
- Adding forms for vaccine logistics management.
- Expand the program to include community mobilization activities for the vaccine.
- Expand the program to include adverse events following immunization.

11- Conclusion

The implementation of the e-Tracker and immunization dashboards has greatly improved the ability of ACU-EPI centers to meet their immunization targets. These tools have provided high-quality immunization data, which is essential for decision-making, planning, and performance reviews at different levels. However, to fully harness the benefits of the DHIS2 immunization applications, it is crucial to address the remaining challenges.

Internet connectivity remains a significant obstacle, causing delays in data submission and placing additional pressure on registrars to find reliable access for data synchronization. Ongoing support from district levels to EPI centers is vital for enhancing data completeness and accuracy, ensuring that immunization managers consistently demand and utilize accurate data. Regular capacity-building initiatives should be prioritized to address knowledge gaps due to staff turnover.

Furthermore, it is essential to expedite the rollout of the e-Tracker to all vaccination centers in northern Syria. This expansion will greatly improve the efficiency and quality of data usage and analysis, leading to better-informed decisions and enhanced immunization outcomes.