

Gavi's Zero-Dose Learning Hub IRMMA Aligned Interventions: Semiannual Update — Mali

October 2025

Gavi Zero-Dose Learning Hub (ZDLH)

Funded by [Gavi](#), the Zero-Dose Learning Hub (ZDLH) serves as the global learning partner and is led by [JSI Research & Training Institute, Inc.](#) with two consortium partners, [The Geneva Learning Foundation](#) and the [International Institute of Health Management Research](#). Together, the consortium enables sharing and learning across four Country Learning Hubs in Bangladesh, Mali, Nigeria, and Uganda to advance the uptake of evidence by synthesizing and disseminating key learnings. The ZDLH also focuses on improving immunization equity and reducing the number of zero-dose and under-immunized children globally by facilitating high-quality evidence generation and uptake.

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ACRONYMS

BeSD	behavioral and social drivers of vaccination
C2P	Coach2PEV
CAPEV	<i>Centre d’Apprentissage pour l’Equité en Vaccination</i> (Country Learning Hub)
CCEOP	Cold Chain Equipment Optimization Platform
CIP	Collaborative Intelligence Platform
CNI	<i>Centre national d’immunisation</i> (National Immunization Center)
CSCom	<i>Centre de Santé Communautaire</i> (Community Health Center)
CSO	civil society organization
DISC	Digitalisation de la Santé Communautaire
DHS	Demographic and Health Survey
EAF	Equity Accelerator Fund
eLMIS	electronic logistics management system
EPI	Expanded Program on Immunization
IHME	Institute for Health Metrics and Evaluation
IR	implementation research
JSI	JSI Research & Training Institute, Inc.
KT	knowledge translation
LQAS	lot quality assurance sampling
MEL	monitoring, evaluation, and learning
MOH	Ministry of Health
SNIS	<i>Système National d’Information Sanitaire</i> (National Health Information System)
TOC	theory of change
UI	under-immunized
UNICEF	United Nations Children’s Fund
USTTB	University of Science, Technique and Technologies of Bamako
WUENIC	WHO and UNICEF estimates of national immunization coverage
ZD	zero-dose
ZDLH	Zero-Dose Learning Hub

EXECUTIVE SUMMARY

Between January–June 2025, the Mali Learning Hub, known in French as *Centre d’Apprentissage pour l’équité en vaccination* (CAPEV), advanced efforts to generate actionable evidence, strengthen data systems, and build momentum for integrating innovations into Mali’s immunization program. Phase 1 implementation research (IR) confirmed both the persistence of zero-dose (ZD) and under-immunized (UI) children and the structural, sociocultural, and systemic barriers that perpetuate them. Although surveyed districts showed relatively high Penta 1¹ (81–88%) and Penta 3 (75–77%) coverage, 12.6 percent of children experienced delayed Penta 1 and 4.2 percent remained ZD, highlighting persistent service and access gaps. Qualitative findings underscored the influence of vaccine stockouts, distance from health facilities, financial barriers, and sociocultural dynamics, especially gender and decision-making constraints. Insecurity prevented data collection in Yorosso, emphasizing limitations in traditional survey methods and the likelihood that the true ZD burden is higher in fragile areas.

The Learning Hub’s IR on digital tools progressed, though delays constrained timely learning. Coach2PEV (C2P) pilots produced positive usability feedback and early evidence of adaptation into local coaching and supervision practices, while the rollout of MEDEXIS, Mali’s first electronic logistics management information system (eLMIS) for vaccines, was delayed. A national workshop convened the Ministry of Health (MOH), *Centre national d’immunisation* (CNI), and partners to validate findings and refine recommendations, and a digital ecosystem assessment confirmed persistent challenges with connectivity, equipment, and offline functionality.

The Learning Hub launched an exploratory hybrid-estimation study to strengthen data use and refine targeting of ZD children. Combining DHIS2, Institute for Health Metrics and Evaluation (IHME), WorldPop, lot quality assurance sampling (LQAS), and primary qualitative research, this study is shaping monitoring tools and informing differentiated strategies for diverse district typologies (urban, rural, conflict-affected, nomadic/migrant). It also revealed denominator inconsistencies, data fragmentation across systems, and the absence of predictive analytics, reinforcing the urgency of systemic data improvements. Catch-up strategies remained an important complement to routine services. The October 2024 *Grand Rattrapage* campaign reduced ZD prevalence from ~23 percent to 19 percent in Ségou and ~14 percent to 12 percent in Sikasso. Yet gaps in Penta 1 to Penta 3 continuity exposed enduring risks of dropout and stockouts, underscoring the need to embed campaign lessons into routine planning and monitoring systems.

Knowledge translation (KT) advanced across dissemination, transmission, acquisition, and application stages. Evidence briefs, technical sheets, and Collaborative Intelligence Platform (CIP)-hosted products informed planning and supervision in Kayes, Sikasso, and Ségou, and engagement expanded through national workshops, newsletters, and civil society collaboration. Evidence influenced the MOH and CNI’s allocation of Equity Accelerator Fund (EAF) resources, the approval of Mali’s Cold Chain Equipment Optimization Platform (CCEOP) application, and steps to integrate C2P and MEDEXIS into national policy

¹ In Mali, the pentavalent vaccine (Penta)—which includes protection against diphtheria, tetanus, and pertussis (DTP) and hepatitis B and *Haemophilus influenzae* type b (Hib)—is commonly used in place of the standalone DTP vaccine and is the standard reference in national immunization data.

frameworks. Early institutionalization is visible through the development of a Gender and Equity Scorecard; updates to the monitoring, evaluation, and learning (MEL) framework; and reallocation of funds to conflict-affected areas based on Learning Hub evidence.

Looking ahead, the Learning Hub will prioritize completing Phase 2 of IR, advancing predictive modeling, embedding gender and equity indicators into dashboards, and consolidating KT processes to ensure that evidence informs both routine decision-making and long-term immunization system resilience.

KEY LEARNINGS & RECOMMENDATIONS

IDENTIFY: UNDERSTANDING THE ZERO-DOSE BURDEN

Key Learnings

- **ZD burden persists despite relatively high coverage of Penta 1 in Learning Hub study districts.** The IR baseline (probability household survey using LQAS) in six selected catchment areas in the Learning Hub study districts found relatively high coverage (Penta 1 at 81–88% and Penta 3 at 75–77%), yet 12.6 percent of children 18 weeks–11 months were missing the first Penta dose indicated delayed vaccination and 4.2 percent of children 12–23 months remained ZD. Caregivers most frequently cited vaccine stock-outs (37%), difficult access to health centers (23%), and financial constraints (10%) as barriers to vaccination.
- **The true ZD burden is likely higher in more vulnerable communities in Mali.** Because the Learning Hub study districts were selected for their relatively stronger health system capacity and infrastructure to support digital interventions, they likely do not reflect conditions in more fragile areas. This means the actual burden of ZD children is probably higher in other subdistricts within the study districts, and also in districts across the country with fewer resources than those in the study area.
- **District targeting is insufficient to reach ZD children because it masks the variation at the subdistrict level.** Even in high-priority districts, heterogeneity is the norm; funding and resources often go to better-off areas that have the capacity to manage investments. Districts with even more critical needs are often overlooked, as the data used for prioritization are imperfect and district-level estimates of unimmunized children remain highly uncertain.
- **Better methods are needed for identifying sub-district pockets of under-immunized or unimmunized children.** The Mali Learning Hub’s experience with LQAS as a targeted survey approach is a promising example. By using LQAS to pinpoint high-priority areas within a district, resources can be more effectively and equitably targeted to reach the most vulnerable populations.
- **The Learning Hub’s Phase 1 IR provided an enhanced understanding of Mali’s ZD burden.** While the Phase 1 research found relatively high existing coverage of Penta 1 (81–88%) and Penta 3 (75–77%) in selected catchment areas of the study districts, 12.6 percent of children were delayed for Penta 1, and 4.2 percent remained ZD. The Learning Hub recognizes that these pilot districts have relatively strong health systems; therefore, the actual ZD burden is likely higher in more fragile districts. Additionally, even within fragile districts, there is likely variation in the reach of immunization services, creating hotspots of ZD pockets. A hybrid-estimation exploratory study launched in June 2025 combines DHIS2, WorldPop geospatial data, IHME, and LQAS data with qualitative interviews among stakeholders involved in Expanded Program on Immunization (EPI) data analysis and decision-making. The aim is to refine denominators for triangulating sources of existing data in Mali that can be used to identify sub-district hotspots; findings will guide future targeting.

- **System-level barriers undermine continuity of vaccination services.** Frequent stockouts (reported by 37% of caregivers surveyed through the Learning Hub IR), inadequate cold chain, poor internet connectivity, and limited digital equipment hinder continuity of vaccination services. A 2025 digital ecosystem assessment that reviewed equipment, internet, electricity, and user training confirmed that technical and logistical constraints persist, even though human resources are generally available.
- **Gender and sociocultural barriers drive ZD prevalence.** Among surveyed caregivers of ZD children, 86 percent required permission to vaccinate, compared to 75 percent among vaccinated peers. Fear of side effects was nearly twice as high (69% vs. 40%), compounded by misinformation, family influence, and cultural or religious hesitation.

Recommendations

- **Use geo-targeted mapping and predictive modeling to refine microplanning.** Explore the potential to apply high-resolution geospatial mapping (DHIS2, WorldPop, and community data) and predictive modeling (planned for Q3 2025) to anticipate ZD hotspots, while expanding monitoring tools to capture catch-up campaigns and mobile outreach data.
- **Accelerate the expansion of LQAS in targeted areas for monitoring service delivery, including routine services, catch-up campaigns, and mobile outreaches.** Expanding LQAS as a targeted survey method supports the data strategies already in the government plan.
- **Adopt typology-based district planning to tailor strategies while also recognizing that important variation exists at subdistrict levels.** Classify districts by type (urban informal, remote rural, conflict-affected, and nomadic/migrant) to guide differentiated approaches, and integrate ZD equity metrics into DHIS2 dashboards and coordination reviews at district and regional levels. Planning must also recognize and account for significant variations (in typology) that exist within each district at the subdistrict level.
- **Address gender and sociocultural barriers through tailored engagement.** Develop culturally-adapted communication with local leaders and religious figures; integrate male engagement into outreach; and train vaccinators on gender-sensitive delivery, supported by the inclusion of perception-based indicators (fear, trust, and decision-making power) in monitoring.

REACH: ENSURING ACCESS TO IMMUNIZATION SERVICES

Key Learnings

- **Catch-up campaigns can temporarily reduce ZD prevalence but highlight persistent challenges.** The October 2024 *Grand Rattrapage* campaign contributed to reductions in ZD prevalence in some subdistricts, dropping from ~23 percent to 19 percent in Ségou and ~14 percent to 12 percent in Sikasso. However, gaps in Penta 1–Penta 3 completion and declines in Penta 3 coverage underscored persistent issues of dropout, stockouts, mobility, and socio-cultural barriers.
- **Digital innovation shows potential in ongoing pilots but faces operational challenges.** Pilot testing of the C2P coaching app across 12 health facilities in Bamako’s Commune VI generated positive feedback from health workers but also revealed significant barriers, including overly

complex supervision grids, limited digital literacy, and a lack of user differentiation. Participants requested broader user access—including all *Centre de Santé Communautaire* (Community Health Centers) (CSCoMs) within pilot districts—provision of tablets and solar chargers, offline functionality, and formal data use and confidentiality agreements. Broader systemic challenges included overburdened staff in rural areas, lower engagement in urban contexts, and insecurity in conflict zones, restricting rollout and the need to prioritize areas where infrastructure may still be absent. Operational challenges, including limited devices, unreliable internet, and uneven digital literacy, must be addressed before scaling. The Learning Hub will refine supervision tools and provide targeted digital-literacy training, with expansion contingent on evidence from subsequent research phases.

- **Delays in piloting digital interventions limit learning through the Learning Hub’s IR.** Significant delays in the implementation of the C2P and MEDEXIS pilots in Learning Hub districts constrain the Learning Hub’s ability to capture timely lessons, limiting opportunities to assess, adapt, and refine these digital tools based on real-world implementation experience. For this reason, the Learning Hub opted to focus only on the C2P intervention for their ongoing IR.

Recommendations

- **Conduct further research and refinement before scaling digital innovations.** Prioritize rigorous evaluation of the effectiveness, usability, and cost-effectiveness of the C2P and MEDEXIS pilots before institutionalizing or expanding them nationally. Use pilot findings to adapt platform content, workflows, and user roles to local contexts and address implementation challenges. Once evidence supports their impact, invest EAF and other resources in equipment such as tablets, solar chargers, and smartphones; enable offline functionality; and provide digital literacy training to ensure effective use of C2P and MEDEXIS, particularly in rural and low-connectivity areas.
- **Address demand-side and sociocultural barriers directly.** Strengthen community engagement through locally adapted communication with leaders and radio programs, introduce male engagement into outreach, and train vaccinators in gender-sensitive approaches to reduce fear and overcome household-level barriers.
- **Leverage catch-up campaign results to strengthen routine and monitoring systems.** Use insights from the October 2024 *Grand Rattrapage* to refine microplans for high-burden districts, ensure continuity between supplemental and routine services, and expand monitoring tools to capture children reached through both channels. Introduce a standard flag in DHIS2 and district review tools to mark doses delivered via routine services versus catch-up/outreach, enabling clearer evaluation of equity-focused interventions.
- **Embed learning, equity, and sustainability into national systems.** Integrate gender and equity indicators (including the Gender and Equity Scorecard) into monitoring frameworks, ensure interoperability across systems, and secure national and donor financing to sustain digital innovations.

MONITOR AND MEASURE: IMPROVING DATA SYSTEMS AND TRACKING IMMUNIZATION COVERAGE

Key Learnings

- **Data quality gaps and system fragmentation undermine effective targeting and planning.** Routine DHIS2 data is aggregated at the district level, obscuring subdistrict and community-level patterns and limiting the identification of ZD hotspots. Discrepancies across population denominators [DHIS2, Digitalisation de la Santé Communautaire (DISC-Mali), Demographic and Health Survey (DHS), IHME, and World Health Organization and United Nations Children’s Fund (UNICEF) estimates of national immunization coverage (WUENIC)] produce inconsistent coverage estimates, weakening the accuracy of planning efforts. Fragmentation of data sources across platforms, including C2P, MEDEXIS, DHIS2, DISC-Mali, and paper-based systems, prevents interoperability and real-time decision-making, while predictive analytics remain absent. Furthermore, digital literacy gaps among health workers constrain the adoption and effective use of these tools, and routine systems lack indicators for gender dynamics and trust, preventing the early detection of demand-side barriers.
- **Efforts to strengthen data quality and integrate equity-focused monitoring tools are improving routine reporting while also revealing persistent gaps in the data system.** The CNI’s Data Quality Group organized two workshops in January and April 2025, focused on producing monthly immunization bulletins. These sessions reviewed the completeness, consistency, and discrepancies of DHIS2 data; investigated unexplained stock-outs; and assessed regional performance. The workshops documented notable improvements in reporting completeness (ranging from 81–100%) and reductions in dropout rates, but also highlighted persistent challenges such as underestimated target populations, poor data quality in hard-to-reach areas, and discrepancies between DHIS2 and DISC-Mali. Participants recommended convening a brainstorming session on population estimates and updating DHIS2 bulletins to automate analysis and flag outliers. The Learning Hub has begun developing an Executive Dashboard and a Gender and Equity Scorecard to embed equity indicators, such as decision-making roles, vaccine hesitancy, and trust, into routine monitoring and district review meetings.
- **Learning products are starting to inform decisions.** Learning Hub evidence briefs influenced sub-national planning: MEDEXIS briefs in Kayes improved inventory supervision and triggered cold chain retraining, while C2P briefs in Ségou reprioritized coaching visits. At the national level, evidence-guided EAF allocation to digital infrastructure supported Gavi’s approval of Mali’s CCEOP application and spurred the development of a Gender and Equity Scorecard.

Recommendations

- **Strengthen sub-national visibility, data triangulation, and interoperability.** Operationalize geo-targeted ZD mapping using DHIS2, WorldPop, and community data; complete predictive modeling to anticipate future hotspots; and expand monitoring to include catch-up and mobile outreach activities. Validate LQAS and IR findings against DHIS2, DHS, and facility registers to improve accuracy. Strengthen frontline digital literacy to ensure that data informs timely and actionable decisions.

- **Integrate equity and gender metrics into monitoring frameworks.** Add indicators on gender decision-making, hesitancy, and trust into DHIS2 dashboards, and pilot the Gender and Equity Scorecard to routinely track sociocultural and access-related barriers in hard-to-reach areas.
- **Enhance data use for adaptive action at the district level.** Simplify dashboards and learning summaries for EPI teams.
- **Invest in infrastructure and capacity for monitoring systems.** Provide digital equipment with offline functionality in rural and low-connectivity areas, and train supervisors and district managers in interpreting data, visual analysis, and performance monitoring.

ADVOCATE: STRENGTHENING POLICIES, STAKEHOLDER ENGAGEMENT, AND FINANCING

Key Learnings

- **Identified barriers provide targeted entry points for advocacy.** Supply shortages, vaccine stockouts, inadequate strategies, sociocultural constraints, misinformation, and gender barriers were highlighted, alongside high vaccination card retention among ZD children, underscoring the need to address dropout and incomplete coverage as policy priorities.
- **Learning Hub research is influencing national policies and resource allocation.** Findings are currently informing MOH and CNI planning for remaining EAF investments in digital infrastructure and workforce capacity. Learning Hub evidence also guided discussions on reallocating funds to conflict-affected areas. District typologies and priority lists developed by the Learning Hub were adopted for national use. This allows Mali to classify districts into archetypes like urban, rural, and conflict zones to guide differentiated strategies for vaccination programs and target high-burden districts with over 2,000 ZD children for resource reallocation and specific interventions.
- **Knowledge translation and collaborative platforms strengthened advocacy reach; however, advocacy efforts faced operational challenges.** The Learning Hub produced briefs, infographics, and technical notes tailored to national leaders, using the Collaborative Intelligence Platform (CIP) to disseminate evidence and track decisions. However, gaps in partner collaboration for product development, slow validation of learning products, limited civil society organization (CSO) participation, and resource constraints for local dissemination hindered timely and inclusive advocacy at sub-national and community levels.
- **Accelerated validation and partner engagement mechanisms are fast-tracking evidence use and improving accountability within Mali's immunization program.** The Learning Hub introduced a two-tiered validation process to accelerate the use of evidence amongst key stakeholders in Mali: one CNI focal point reviews the Learning Hub's learning products, while another oversees IR validation. A quarterly validation calendar aligns reviews with national coordination meetings to ensure timely feedback is provided to the team. The Learning Hub also launched a partner-engagement tracking tool and the CNI newsletter to document who is engaged, how often, and for what purpose, thereby enhancing accountability. Collaboration with Gavi's CSO Fund Manager is expanding the role of civil society beyond service delivery to include evidence communication and advocacy.

Recommendations

- **Formalize integration of evidence into national decision-making.** Institutionalize the systematic use of learning products in ICC meetings, regional reviews, and national planning workshops. Establish a CNI-led review mechanism with clear standard operating procedures, quarterly validation calendars, and a standing review committee.
- **Strengthen local and civil society actors' engagement in advocacy.** Expand CSO involvement beyond service delivery to include evidence communication and advocacy. Localize products into regional languages and simplified formats to improve sub-national uptake and community-level impact.
- **Sustain collaboration and ensure infrastructure for effective advocacy.** Maintain continuous alignment between the MOH, CNI, and CIP administrators to keep evidence generation, dissemination, and implementation connected. Address resource gaps for local dissemination by ensuring printing capacity and reliable digital access at sub-national levels.

MALI COUNTRY LEARNING HUB

The Zero-Dose Learning Hub (ZDLH), established by Gavi, addresses immunization equity by generating data, evidence, new insights, and learning to better understand the factors influencing implementation and performance of approaches to identify and reach ZD and UI children and missed communities. The ZDLH consortium is led by [JSI Research & Training Institute, Inc. \(JSI\)](#), in collaboration with [The Geneva Learning Foundation](#) and the [International Institute of Health Management Research](#). ZDLH works to address immunization equity through the generation of evidence and learning around effective methods and approaches for identifying and reaching ZD and UI children. Four Learning Hubs in Bangladesh, Mali, Nigeria, and Uganda advance the uptake of research and evidence to improve immunization policy and programming, especially at sub-national levels. In 2023, Gavi selected [GaneshAID](#) as the country learning partner for Mali. Together with the [Center for Vaccine Development—Mali](#) and the [University of Science, Technique and Technologies of Bamako](#) (USTTB), GaneshAID established the Mali Learning Hub, known in French as *Centre d’Apprentissage pour l’équité en vaccination* (CAPEV).

This semiannual update for the Gavi Board and other stakeholders highlights the ZDLH consortium’s efforts to generate and share evidence for a deeper understanding of the factors that affect the implementation and performance of strategies to identify and reach ZD and UI children and missed communities. It synthesizes findings, challenges, and recommendations across Gavi’s Identify, Reach, Monitor and Measure, and Advocate (IRMMA) framework emerging from the Learning Hubs.

ZERO-DOSE LEARNING HUB TECHNICAL ASSISTANCE

During January–June 2025, JSI, as the global learning partner, continued to provide intensive technical assistance to the Mali Learning Hub, helping refine the Phase 1 research report and develop a six-step KT cycle. This cycle—identify, collect, translate, disseminate, document impact, and monitor use—ensures that research generates tailored products for decision makers (policy briefs and briefing notes), practitioners (technical sheets, supervision guides, and training modules), and communities (infographics, posters, and radio spots). Support included detailed feedback on the first draft of the IR baseline report, with recommendations to consolidate quantitative results for greater clarity and conciseness, followed by a working session with the Mali team to review feedback and determine next steps. JSI also reviewed the Learning Hub’s protocol for improving vaccine delivery through better use of existing data sources and provided input on the Mali quarterly report, encouraging a shift from process-heavy descriptions to a more strategic narrative linking activities to the overarching goal of generating and synthesizing evidence to identify and reach ZD children in Mali. JSI provided technical guidance on refining and advancing the IR on the rollout of the C2P and MEDEXIS applications, including a detailed review of the draft theory of change (TOC). Recommendations focused on adding greater detail to intermediate outcomes, limiting the IR to focus on the C2P intervention, clarifying causal pathways, and explicitly linking program activities to behavioral, system, and immunization outcomes. Technical assistance also included two rounds of feedback on qualitative data collection tools for the C2P rollout, ensuring alignment with the revised TOC and capacity to capture meaningful, actionable insights. Key improvements included tailoring tools for different respondent groups; rephrasing leading questions to be more open-ended; adding questions on preparation, training, supervision, and feedback mechanisms; and incorporating exploration of contextual factors such as overlapping projects and

sociocultural or political influences. JSI also reviewed the second draft of the IR report, noting streamlining, consolidation, and overall readability improvements. The collaborative approach has improved the clarity of research findings and strengthened the capacity of national and regional actors to use evidence in planning and decision-making.

RELATED RESOURCES

- [Gavi's Zero-Dose Learning Hub IRMMA Aligned Interventions: Semiannual Update—Mali \(April 2025\)](#) | [Mali Data Dashboard \(April 2025\)](#)
- [Evaluation Rapide Situation des Enfants Zéro-Dose et Sous-Vaccinés au Mali](#) (October 2024)
- [Identification des enfants zéro dose et sous-vaccinés au Mali en 2023](#) (October 2024)
- [Obstacles courants et spécifiques à la vaccination au Mali en 2023](#) (October 2024)
- [Gavi's Zero-Dose Learning Hub IRMMA Aligned Interventions: Semiannual Update—Mali \(October 2024\)](#) | [Mali Data Dashboard \(January-June 2024\)](#)
- [Gavi's Zero-Dose Learning Hub IRMMA Aligned Interventions: Semiannual Update—Mali \(May 2024\)](#)

KEY ACTIVITIES & IMPLEMENTATION RESEARCH

IMPLEMENTATION RESEARCH

During this reporting period, data from Phase 1 of the Learning Hub’s IR were analyzed to generate local estimates of vaccination status for antigens administered during the first and second years of life, assess behavioral and social drivers (BeSD) of vaccination, and explore barriers to and acceptability of the C2P and MEDEXIS interventions.

C2P is a digital coaching and performance management application that empowers health workers by transforming traditional top-down supervision into a supportive, peer-led, data-driven process that improves motivation, accountability, service delivery, and the capacity to reach ZD children. MEDEXIS is Mali’s first eLMIS tailored for vaccines. It is designed to digitize stock management, enhance real-time visibility, reduce wastage, prevent stockouts, and strengthen transparency and reliability in vaccine supply data.

The IR adopted a mixed-methods design combining a cross-sectional household survey using LQAS and qualitative inquiry. Four districts were purposively selected to capture varied typologies and challenges: Ségou (urban/peri-urban), Bougouni (hosting internally displaced persons, refugees, nomadic groups, and gold-mining communities), Niono (rural/remote), and Yorosso (conflict-affected). Within each district, two CSCom were identified based on low Penta 1 coverage. The LQAS household survey was conducted from November–December 2024 in six CSComs: Pelengana Nord, Cinzana Gare, Bougouni Est, Kologo, Niono Central, and Ndebougou. Yorosso’s two CSComs were excluded from the quantitative data collection due to security concerns.

The LQAS survey interviewed 1,146 caregivers of children aged 18 weeks to 23 months across the selected sites. The structured questionnaire collected data on demographic and socio-economic characteristics, vaccination status (verified via vaccination cards or caregiver recall), and BeSD in four domains: thinking and feeling about vaccines, social processes, motivation or hesitancy, and practical barriers to accessing services. This design allowed for granular local estimates of coverage and a nuanced understanding of demand-side drivers alongside service access issues.

In parallel, the qualitative component comprised 18 in-depth individual interviews with decision-makers and health staff at central, regional, district, and facility levels and 16 focus group discussions with religious and community leaders in the same districts, including Yorosso. Individual interviews focused on the implementation process, availability of inputs, quality of services, and acceptability of C2P and MEDEXIS interventions. The focus groups explored health system readiness, community perceptions, religious and socio-cultural influences, and structural barriers to vaccination. Data were collected using semi-structured interview guides, transcribed, and analyzed thematically to triangulate and interpret the quantitative results.

The LQAS survey found that Penta 1 coverage reached 88 percent among children aged 18 weeks to 23 months and 81 percent among those aged 12 to 23 months, while Penta 3 coverage stood at 75 percent and 77 percent respectively. Measles coverage among children aged 12 to 23 months was 73 percent.

Across the surveyed CSComs, 12.6 percent of children aged 18 weeks to 23 months had not yet received Penta 1 (delayed) and 4.2 percent of children aged 12–23 months were ZD. When asked about challenges they face in vaccinating their children, caregivers most frequently cited vaccine stock-outs (37%), followed by difficulties accessing the health center (23%) and financial constraints (10%), as barriers to timely vaccination.

Key Findings

- Phase 1 of the IR confirmed that ZD and UI children are not uniformly distributed: remote, conflict-affected, and migrant/nomadic populations show a higher burden and face compounding structural, logistical, social, and attitudinal challenges.
- Study sites may not be fully representative of ZD priority areas nationally, as they were selected for having relatively stronger health system capacity and infrastructure to support digital interventions, which likely resulted in more favorable conditions and higher performance than average.
- Qualitative evidence complements the survey by illustrating why these gaps exist: beyond supply constraints, there are behavioral/social barriers (hesitancy, social norms, religious beliefs), access challenges (distance, cost, transport), and service quality issues (stock, supervision, readiness).
- The exclusion of conflict-affected aires de santé (Yorosso) from the survey strongly signals that current data may understate the ZD burden in insecure zones and that traditional survey methods may be constrained there. This is flagged in the report as a serious limitation/evidence gap.
- Early implementation of supply-side innovations (eLMIS/MEDEXIS; C2P) is promising, with potential to address stock and supervision gaps, but they are still at pilot or formative stages. Critical challenges around infrastructure, user adaptation, sustainability, and funding need attention.

To support uptake of findings, the Learning Hub convened a national workshop in Bamako with the CNI, MOH technical departments, and technical partners to present results, discuss challenges, and develop recommendations for scaling C2P and MEDEXIS. Preparations for Phase 2 progressed in parallel. Data collection tools were refined to reflect updates to the TOC and lessons learned from Phase 1.

Updated IR Timeline and Risk Mitigation

Phase 2 of the C2P IR is scheduled for August–September 2025. Phase 2 of MEDEXIS will be carried out alongside C2P Phase 3 in September–October 2025; due to delays, the originally planned MEDEXIS Phase 3 has been cancelled. To mitigate risks related to leadership availability and ecosystem constraints, the Learning Hub conducted a remote ecosystem assessment to map available equipment and connectivity and examine the conditions for C2P rollout. This assessment confirmed that while human resources were largely available, technical and logistical capacity remained constrained and limited access to equipment and internet connectivity posed persistent challenges. Investigator training and field data collection for Phase 2 are scheduled to begin later in 2025. Rollout of C2P faced delays due to conflicting schedules with the CNI and authorization challenges, and MEDEXIS deployment also advanced more slowly than anticipated. These delays required adjustments to the research timeline,

with Phase 2 now focused primarily on understanding replication barriers for C2P and Phase 3 planned to assess the impact of C2P once it is more firmly established.

IMPROVING VACCINE EQUITY THROUGH BETTER USE OF DATA: AN EXPLORATORY STUDY

The Learning Hub advanced an exploratory study, approved by the USTTB Ethics Committee in April 2025, aimed to support vaccine equity in Mali by investigating how various data sources are triangulated to overcome challenges and identify opportunities for geospatial modeling. The study applies a hybrid estimation approach that combines DHIS2, IHME, and primary field surveys, alongside routine data triangulation (DHIS2, IHME, LQAS, SNIS, WorldPop) and a typology framework (urban/peri-urban, rural/remote, conflict zones, and special populations) to guide differentiated strategies. Primary data collection for the exploratory study began in June, including an ongoing desk review, six expert interviews, two focus group discussions, and 25 of 31 planned local actor interviews. These activities integrate stakeholder perspectives to validate systemic and contextual drivers of ZD and UI children, while positioning hybrid estimation, triangulation, and typology-based targeting as practical tools for immunization planning and partner coordination. The ongoing exploratory study is a key component of the Learning Hub's broader strategy to enhance data use and address equity, directly influencing the development of monitoring tools and driving the push for more precise and responsive immunization efforts.

Key Findings

- Initial findings identified the limitations of using district-level estimates for subdistrict targeting: routine DHIS2 data is only aggregated at the district level, making it difficult to pinpoint ZD hotspots or use geocoded data for spatial risk analysis. Study findings highlight the need for better methods to identify pockets of ZD or UI children at subdistrict levels. The Learning Hub's experience with LQAS offers a promising approach. By using LQAS to pinpoint high-priority areas within a district, resources can be used more effectively to reach the most vulnerable populations
- The exploratory study highlighted denominator inconsistencies across sources such as DHIS2, DISC-Mali, DHS, and WUENIC/IHME projections. These discrepancies led to wide variations in coverage and ZD estimates, undermining planning accuracy. The absence of a standard procedure to reconcile denominators, coupled with the end of U.S. Agency for International Development support, threatens the reliability of future demographic projections.
- Data fragmentation remains a systemic issue as multiple platforms, including DHIS2, DISC-Mali, MEDEXIS, and paper-based systems, are not interoperable. This duplication and lack of coordination prevent real-time decision-making, especially in rural districts reliant on offline tools. In addition, fragmentation of reporting across programs (e.g., antenatal care, institutional deliveries, nutrition, malaria) hinders the effective integration of immunization with primary health care services.
- Routine systems fail to capture equity and sociocultural indicators, such as gender roles in health decision-making, barriers linked to misinformation, or caregiver fears of side effects. These indicators are closely tied to ZD status yet remain absent from existing data sources.

- The study also flagged gaps in catch-up and outreach data, noting limited visibility into whether children are reached through routine services or supplemental/mobile strategies.
- A critical gap is the absence of predictive analytics: no current tools forecast increases in ZD children in response to conflict, migration, or service disruptions, though predictive modeling is planned for later in 2025.

These early findings confirm that Mali’s current data landscape is fragmented, inconsistent, and insufficient for identifying and reaching ZD children. The exploratory study is already guiding the Learning Hub’s efforts to strengthen its Monitoring, Evaluation, and Learning (MEL) framework and to develop new tools, such as a Gender and Equity Scorecard, to address systemic gaps. This work is laying the foundation for more accurate, context-sensitive, and actionable data to inform Mali’s immunization strategies.

KNOWLEDGE TRANSLATION

Knowledge translation—the systematic process of moving research into policy and practice—is central to the ZDLH approach. In Mali, the Learning Hub has embedded KT throughout its work, ensuring that evidence from IR is not only generated but also actively informs decision-making. By advancing beyond simple dissemination toward tailoring, adoption, application, and emerging institutionalization, the Learning Hub has positioned evidence as a driver of change. These efforts are shaping planning and supervision practices, strengthening policy frameworks, and supporting the scale-up of digital tools within Mali’s immunization system.

DISSEMINATION: SHARING EVIDENCE TO DRIVE CHANGE

The Mali Learning Hub actively shared evidence on ZD children and programmatic barriers across global, national, and sub-national platforms. During Gavi’s visit to Mali in February 2025, GaneshAID presented findings from the ZD rapid assessment, which highlighted barriers to immunization—including stockouts, gender-related challenges, and weak data visibility—and emphasized the need for stronger data use to reach ZD children. Dissemination also occurred through the official launch workshops for C2P and MEDEXIS. These events convened about 30 representatives from the MOH and technical and financial partners, providing opportunities to share rapid assessment findings, early IR results, and lessons on the feasibility and acceptability of these tools in four pilot districts. The CIP remained a central channel for sharing evidence and learning products. Co-designed by the Learning Hub and the MOH, the CIP is positioned as a country-led digital hub to strengthen data use and accountability. By mid-2025, it hosted more than 80 briefs, notes, and technical documents, alongside dashboards visualizing ZD prevalence, immunization coverage and dropout, vaccine stockouts, and the rollout of C2P and MEDEXIS. With 57 registered users, the CIP informed performance reviews and EPI decision-making, while preparations advanced to integrate a Gender and Equity Scorecard and contributions from CSOs. To broaden reach, the Learning Hub finalized and circulated a suite of products, including briefing notes, infographics, posters for district health offices, and a “Big Catch-Up” progress note, which were distributed through health cluster meetings, social media, and sub-national channels. Additional dissemination included technical briefs on C2P and MEDEXIS, a policy brief on malaria vaccination, and technical sheets to strengthen frontline understanding of new digital tools. Finally, with Learning Hub support, the CNI launched a newsletter to share these products with district and regional actors systematically.

TRANSMISSION: TAILORING EVIDENCE FOR DECISION-MAKERS

Building on broad dissemination, the Learning Hub worked to tailor evidence into decision-ready formats for specific actors across Mali’s immunization system. Policy briefs were prepared for national leaders, including one for the Director of CNI on strengthening coverage through integration of C2P and MEDEXIS and another for the Minister of Health on improving service delivery. A set of technical briefs delivered tailored, evidence-based recommendations to reinforce each of the CNI’s core functions: logistics, planning, data quality, service delivery, and disease surveillance. They highlighted strategies to optimize vaccine supply management, apply data-driven microplanning to reach ZD children, enhance data quality and surveillance systems, and build frontline capacity through comprehensive training,

regular supervision, and performance monitoring. Collectively, the briefs positioned C2P and MEDEXIS as potential cross-cutting enablers of systemic improvements across Mali's EPI. In parallel, four technical briefs were developed for regional health directors, district chief physicians, CSCOM technical directors, and vaccination agents, providing an evidence base to refine regional, district, and health area plans and strengthen the effectiveness of vaccination strategies to improve coverage.

Findings from Phase 1 IR were consolidated and presented during a national workshop attended by more than 30 stakeholders representing the CNI, MOH technical departments, and partners. Recommendations emphasized scaling up C2P and MEDEXIS nationally, integrating them into DHIS2 and iHRIS, and adapting supervision, communication, and microplanning approaches to diverse district typologies. Transmission efforts also oriented stakeholders toward forward-looking solutions. Evidence was translated into practical guidance on investing in digital readiness and human resource capacity; improving infrastructure such as electricity, internet connectivity, and digital equipment; strengthening community engagement through local leaders and religious figures; and addressing sociocultural and gender barriers by updating C2P content. Evidence further underscored the need to enhance subdistrict-level ZD data and dashboards through the CIP. Development began on a Gender and Equity Scorecard to monitor inclusivity in immunization, with indicators disaggregated by sex, socioeconomic status, geography, and district typology.

ACQUISITION: STAKEHOLDERS RECOGNIZING AND ADOPTING KNOWLEDGE

Stakeholders actively engaged with and adopted the Learning Hub's evidence. Feedback from Gavi and JSI on the Phase 1 IR report led to successive revisions, making findings clearer and more actionable for field actors. At launch workshops, participants generated recommendations to expand tool access, improve data sharing, and strengthen accountability mechanisms, demonstrating recognition of the evidence's value. During the C2P launch, participants revised the supervision grid, recommended expanding user access, and emphasized the need for adequate IT equipment. At the MEDEXIS launch, stakeholders validated risk management indicators and accountability frameworks to reinforce transparency in supply chain management. Adoption was also visible at operational levels. In Kayes, MEDEXIS briefs guided improved vaccine inventory supervision and were used during performance reviews to identify supply chain bottlenecks, resulting in a recommendation to re-train cold chain officers. In Ségou, C2P briefs informed coaching priorities, helping reprioritize visits to underperforming CSCOMs. The Medical Officer of Niono confirmed that "the C2P brief helped clarify the steps needed to adapt the tool to our health area's context." Recognition extended beyond government actors. Mannion Daniels, Gavi's CSO Fund Manager, initiated collaboration to share learning products and integrate CSO reporting into the CIP. The Learning Hub also launched a system to monitor the uptake of learning products among frontline actors by collecting feedback from regional directors, district chiefs, and vaccinators to assess how products influenced planning and supervision.

APPLICATION: IMPLEMENTING RESEARCH-BASED SOLUTIONS

The Learning Hub advanced beyond recognition to the application of evidence in programmatic decision-making. The revised Phase 1 IR report was designed to be more accessible and actionable, offering field actors clear, practical recommendations. Its dissemination workshop explicitly focused on

formulating next steps for scaling up C2P and MEDEXIS, ensuring that findings translated into programmatic adjustments. C2P has advanced from concept to field deployment, with five pilot districts across Kayes, Sikasso, and Ségou selected for training and replication. Regional EPI supervisors and coaches were trained in performance coaching and the C2P digital solution, with practical sessions held directly in health facilities. In Bamako Commune VI, pilot testing across 12 CSComs (involving 62 coaches and 12 coachees) generated actionable feedback, leading to revisions that simplified the supervision grid and adapted training capsules and badges to the Malian context. In Ségou, a C2P technical brief enabled health authorities to prioritize coaching visits in low-performing health areas, revising microplanning to add coaching days where needed. MEDEXIS has entered early application, shaping stock management and accountability practices at the sub-national level. A national launch workshop helped stakeholders agree on accountability mechanisms and indicators to improve transparency and reliability in vaccine data. Recommendations from this process, such as specifying stakeholder responsibilities and accountability frequency, were incorporated into district-level stock management practices. Evidence also directly informed microplanning adjustments. In Kayes, the MEDEXIS technical sheet guided district-level discussions on supply chain bottlenecks, leading to the retraining of cold chain officers in three CSComs and improvements in real-time inventory tracking. Together, these examples demonstrate that evidence is not only being generated but is shaping day-to-day immunization planning and operational decision-making in Mali.

IMPACT: INSTITUTIONALIZING EVIDENCE-BASED PRACTICES AND STRENGTHENING IMMUNIZATION

The final stage of KT is visible in emerging signals of institutionalization of evidence-driven approaches within Mali's immunization system. The finalized Phase 1 IR report and the Learning Hub's hybrid estimation approach are beginning to inform national decision-making, including the revision of priority districts for Gavi support and the integration of typology-based strategies into full portfolio planning, health systems strengthening, and EAF frameworks. The MOH is reviewing steps to embed C2P and MEDEXIS into national immunization policy, with these tools increasingly seen as integral, rather than pilot, components of the system. The restitution workshop produced recommendations to integrate these innovations into national systems, strengthen institutional coordination, and adapt implementation to local contexts with partner support. Strengthened monitoring systems further point toward institutionalization. The Learning Hub revised its MEL plan to include specific, measurable, achievable, relevant, and time-bound indicators tracking stockout rates, policy updates, and EPI data use and is developing an executive dashboard to provide one-page snapshots of key indicators for CNI coordination meetings, donor briefings, and Gavi Joint Appraisal consultations. Early signals of impact are already evident: in early 2025, funds were reallocated to conflict-affected areas based on Learning Hub evidence, demonstrating evidence-informed policymaking in practice. The approval of Mali's CCEOP application, which addressed bottlenecks identified through MEDEXIS, is expected to enhance vaccine availability. The forthcoming piloting of the Gender and Equity Scorecard later in 2025 will add further momentum by embedding disaggregated monitoring into regional performance reviews.

Taken together, these actions suggest that the Mali Learning Hub is moving research through the KT continuum, generating typology-sensitive evidence, tailoring and transmitting it to decision-makers, ensuring recognition and adoption, supporting implementation of research-based solutions, and laying the groundwork for sustained institutionalization of innovations into national immunization policy and practice.



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