Evaluation of the Quality of Services Provided by the Expanded Program on Immunization at the Banconi University Community Health Center in Bamako in 2025

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ABSTRACT AND KEYWORDS

Background: Vaccination is an essential public health intervention for reducing infant morbidity and mortality. The quality of service is crucial for the effectiveness of vaccination programs. This study evaluated the quality of services provided by the Expanded Program on Immunization (EPI) at the Banconi University Community Health Center (CSCOM-U) in Bamako in 2025.

Methodology: This was a cross-sectional study conducted from January 2024 to March 2025 at the Banconi Community Health Center (CSCOM-U). The study population included 586 parents/guardians of children under one year old and 6 healthcare workers. Data were collected through questionnaires, individual interviews, document reviews, and observation grids, and then analyzed using SPSS version 25.0. The quality of the Expanded Program on Immunization (EPI) services was assessed using service ratings of good, average, and poor, with scores > 80%, 60-80%, and < 60%, respectively.

Results: The majority of vaccinated children were one day old (32.4%), with a predominance of males (56%). Parental satisfaction was high in several aspects: ease of appointment scheduling (87.03%), reception (92.83%), clarity of information (99.5%), staff availability (99.3%), cleanliness of the unit (99%), comfort of the facilities (99.8%), and staff competence (99.8%). However, stockouts (BCG and polio) were noted (25%), indicating average quality in this respect. All functional requirements were met.

Conclusion: This study highlights an overall satisfactory quality of PEV at CSCOM-U Banconi, stock shortage represents a major challenge requiring special attention.

Keywords: Quality, Vaccination, PEV, CSCOM-U of Banconi, Bamako.

INTRODUCTION

Vaccination is universally recognized as one of the most effective and cost-efficient public health interventions for preventing infectious diseases and reducing child mortality (1–3). Since the launch of the Expanded Programme on Immunization (EPI) by the World Health Organization (WHO) in 1974, with the initial objective

of preventing seven serious diseases tuberculosis, diphtheria, tetanus, pertussis, poliomyelitis, measles, and hepatitis B major progress has been made globally (2). The WHO estimates that vaccination prevents approximately 2 million child deaths annually and emphasizes its crucial role in improving global health (3–5).

African countries have all followed and implemented the WHO recommendations on immunization programs. However, the quality of health services remains a general concern (6). The quality of service delivery, defined as the ability of a service to effectively meet the expressed needs of users, is a key factor in achieving the Sustainable Development Goals for health (7). This implies proper cold chain management, adequate staff training, and rigorous management of vaccine storage and transport conditions (8). Studies conducted in other developing countries, such as India, Bangladesh, Cameroon, Ghana, Kenya, and Uganda, have revealed significant shortcomings in the quality of services offered at vaccination centers, including vaccine shortages, inadequate storage capacity, and limited cold chain management (5, 9, 10).

In Mali, the Expanded Programme on Immunization (EPI) was officially launched on December 11, 1986 (11). Since then, the country has made significant progress in reducing deaths from vaccine-preventable diseases, reducing infant and child mortality by 13% between 2019 and 2023 through the vaccination of more than two million children (11–13) . A pioneer in this area, the country introduced a hybrid approach to malaria vaccination in 2025, complementing the fight against malaria, measles, and other diseases (14) . To consolidate these achievements, the country has adopted a national strategic plan for the EPI, aiming to achieve universal and equitable vaccination coverage (15) . However, the effectiveness of a vaccination program depends not only on the availability of vaccination services, but also, and perhaps more importantly, on the quality of service delivery (16,17) . Indeed, achieving these national objectives depends on the intrinsic performance of health facilities, whose quality is now managed by national evaluation grids derived from the results-based financing (RBF) manual (18) . Despite standardization efforts, disparities persist in the operational implementation of services. The Banconi Community Health Center (CSCOM-U), located in a densely populated peri-urban area of Bamako, faces complex challenges in continuity of care and traceability of services. It is in this context that the present study was initiated. It aims to assess the quality of Expanded Program on Immunization (EPI) services at the Banconi CSCOM-U by comparing the realities on the ground with the standards of the RBF manual and the requirements of the Donabedian model, in order to identify the bottlenecks that limit the impact of vaccination interventions. To scientifically analyze this quality at the community level, the theoretical framework of Avedis Donabedian is essential (19) . This model allows us to decompose the performance of the PEV into three interdependent dimensions: Structure (availability of inputs and cold chain), Process (compliance with clinical protocols and data management) and Results (vaccination coverage and user satisfaction) (19).

METHODOLOGY

Type, location and period of study

This was a descriptive cross-sectional evaluative study conducted at the Banconi University Community Health Center (CSCOM-U). The evaluation was based on Avedis Donabedian's conceptual framework, analyzing quality through three interdependent dimensions: Structure, Process, and Outcomes. It was carried out in 2025, using routine data from the CSCOM-U over a 14-month period, from January 1, 2024, to March 31, 2025. The CSCOM-U is located in Commune I of the Bamako district, and its health area covers five neighborhoods. It includes a vaccination unit, a maternity unit, a dispensary, a pharmacy, and a laboratory.

Study population and sampling

The study population is composed of three distinct targets to ensure data triangulation: Healthcare providers: health personnel directly involved in EPI activities (nurses, community health workers); Users: mothers or guardians of children aged 0 to 11 months present on the day of the consultation; Documentary materials: vaccination records, tally sheets, talk books and monthly reports from the national health information system (NHIS) covering the year 2025. The study used a mixed sampling approach: exhaustive for health workers involved in the provision of vaccination services and primary data collection documents/materials, and for mothers or guardians of children.

Inclusion and exclusion criteria

The selection criteria were as follows: all mothers or guardians of children aged 0 to 11 months, who received vaccinations during the data collection period and were available to answer our questions, any health worker involved in the management and provision of routine vaccination services, any usable document (notebooks, activity reports, registers) from the routine EPI of the CSCOM-U of Banconi.

Variables studied

The variables included the sociodemographic characteristics of vaccinated children (age, sex), accessibility to services and reception (ease of appointment scheduling, waiting time before vaccination, reception upon arrival at the unit), and communication/information (clarity of information provided about vaccination, staff availability, explanation before vaccination). They also covered the availability of equipment, vaccines and basic supplies, and components required for the proper functioning of the EPI unit (organization of vaccination sessions, unit ownership).

Data collection techniques and tools

The data collection was carried out by a trained investigator, using three main tools: Direct observation: Using a checklist to assess the structure (cold chain, availability of the 11 antigens) and the process (injection techniques, reception, compliance with the cold chain); Document review: Analysis of management materials to assess traceability (completeness of registers) and continuity (stockouts); Structured interviews: Interviews with mothers to measure user satisfaction and the quality of the counseling received (talks).

Data analysis plan

The analysis was conducted along the following lines: Descriptive analysis focused on quantitative data (dropout rates, registry completeness rates, coverage rates), presented as frequencies and proportions. Quality analysis (Donabedian) examined the structure through the resource availability score (human, material, and vaccine resources), the process through the score of compliance with national Expanded Program on Immunization (EPI) procedures (quality of action and information) and the Functional Results Framework (FRB), and the outcomes, including impact assessment (dropout rates) and satisfaction. Data were entered into Excel and statistically analyzed using SPSS version 25.0 for data cleaning and dashboard presentation.

Ethical considerations

Ethical approval

The agreement of the management committee of the center health The Banconi Institute **(ASACOBA)** and the mothers' verbal consent were obtained before the interviews. The protocol was approved by the FMOS/USTTB scientific committee. The researchers ensured strict confidentiality and obtained the free, informed, and voluntary consent of the participants. There was no risk to the participants. No information collected allowed for linking the study to the mothers or guardians of the children.

Conflict of interest

The authors declare no conflict of interest in this work.

RESULTS

Sociodemographic characteristics of the children surveyed

Of the children surveyed, 32.42% were one day old, and males accounted for 56.48% of cases. Regarding visit frequency, 32.42% of the children were attending their first visit, and 2.73% their sixth. Regular visits were noted in 80.03% of cases**.**

Table 1 : Distribution of children surveyed according to sociodemographic characteristics, frequency and regularity of visits to the PEV unit.

Sociodemographic characteristics of the children surveyed	**n = 586**	**%**
Distribution of surveyed children by age		
One (01) day	190	32.42
Six (06) weeks	165	28.16
Ten (10) weeks	81	13.82
Fourteen (14) weeks	76	12.97
Nine (09) months	58	09.90
Fifteen (15) months	16	02.73
Distribution of surveyed children by sex		
Male	331	56.48
Female	255	43.51
Frequency of visits		
First visit	190	32.42
Second visit	165	28.15
Third visit	81	13.82
Fourth visit	76	12.97
Fifth visit	58	9.90
Sixth visit	16	2.73
Distribution of surveyed children according to visitor frequency		
Yes	469	80.03
No	117	19.97

Sociodemographic characteristics of PEV unit staff

Females comprised 83.33% of the unit's staff. Regarding age, 66.67% of staff were over 25 years old. The mean age was 27.16 ± 2.78 years, ranging from 24 to 31 years**.** The mean number of years of work experience was 3.33 ± 1.75 years, ranging from 1 to 6 years, with an equal distribution of 50% of staff having ≤ 3 years of experience and 50% having > 3 years of experience. All staff surveyed (100%) had received training on the Expanded Program on Immunization.

Table 2 : Distribution of PEV unit staff surveyed according to socio-demographic characteristics (sex, age and year of service experience in the PEV unit).

Sociodemographic characteristics of the unit's staff	**n = 6**	**%**
Distribution of unit staff by gender		
Male	01	16.67
Female	05	83.33
Distribution of unit staff by age group		
< 25 years old	02	33.33
≥ 25 years old	04	66.67
Year of experience in PEV service		
≤ 3 years	3	50.0
≤ 3 years	3	50.0

Quality of services provided by the Expanded Program on Immunization (EPI) at the Banconi Community Health Center (CSCOM-U)

Making an appointment was considered easy in 87.03% of cases. The waiting time was acceptable in 57.85% of cases. The reception was considered satisfactory by 92.83% of parents. Information about vaccination was clear to 99.49% of parents. Staff were available to answer questions in 99.32% of cases. Explanations provided before vaccination were satisfactory to 96.59% of parents. The vaccination unit was considered clean by 98.98% of parents. The facilities were considered comfortable in 99.83% of cases. A pleasant atmosphere prevailed in the unit in 98.80% of cases. Overall, 99.83% of parents expressed satisfaction with the services received from the EPI unit.

Table 3 : The opinion of parents of surveyed children on the quality of reception, accessibility, information and communication, cleanliness and comfort of the PEV unit, and the overall level of satisfaction.

Accessibility and Reception	**n = 586**	**%**
Appointment booking		
Easy	510	87.03
Difficult	76	12.97
Waiting time before vaccine administration		
Short	247	42.15
AVERAGE	339	57.85
Long	0	0.0
Welcome upon arrival at the unit		
Satisfying	544	92.83
Unsatisfactory	42	7.17
Information and Communication		
Clarity of information provided on vaccination		
Clear	583	99.49
Not clear	3	0.51
Staff availability to answer questions		
Available	582	99.32
Unavailable	4	0.68
Explanations received before vaccination		
Satisfying	566	96.59
Dissatisfied	20	3.41
Cleanliness and Comfort		
Unit cleanliness		
Own	580	98.98
Dirty	6	1.02
Comfort of the facilities		
Comfortable	585	99.83
Uncomfortable	1	0.17
General atmosphere of the unit		
Pleasant	579	98.80
Unpleasant	7	1.19
Satisfaction with the PEV unit's service		
Satisfy	585	99.83
Unsatisfactory	1	0.2

Evaluation of the quality of services of the PEV unit

The CSCOM-U of Banconi obtained a total score of 85.06% and is classified in the level of good quality of

services according to the hierarchy of our quality score (according to the rating of the national evaluation grid of the FBR).

Table 4 : Evaluation of the quality of the PEV unit in relation to the different components (cold chain, equipment, collection and monitoring materials, vaccines and accessories and emergency devices),

Elements/components needed to provide a quality PEV service at the CSCOM level	**Planned point**	**Protocol**	
		Respected	**Percentage**
1. Cold chain - Regular monitoring of the cold chain and a thermometer present in the refrigerator compartment. - Presence of a certified refrigerator - availability of a temperature log completed twice a day, including the day of the visit - Temperature remains between 2 and 8 degrees Celsius on the log - The inspector checks the functionality of the thermometer - Temperature is between 2 and 8 degrees Celsius on the thermometer.	4	4	100
2. No break Pentavalent , BCG, VAR, VAA, OPV, IPV, Td, Pneumo, ROTARIX. - Presence of up-to-date vaccine movement log - The inspector checks the physical stock in the fridge which must correspond to the theoretical stock.	2	1.46	73
3. Vaccines are correctly arranged in the refrigerator - Vaccine compartment: 1st shelf: OPV – MMR – AIV – BCG 2nd shelf: Pentavalent, Pneumo, Td 3rd shelf: Diluents Below: ice packs. - No expired vaccines or expired vaccine control stickers - Labels on vaccine vials are legible.	1	1	000
4. Cold chain status - Refrigerator in good condition - Presence of at least two insulated containers - Existence of a posted emergency plan - Existence of cold chain maintenance logs.	1	1	100
5. Cold packs - Well conditioned - At least 6.	1	1	100
6. Availability of syringes - Self-locking with up-to-date movement log - at least 30 - For dilutions with up-to-date movement log - at least 3.	1	1	100
7. Waste is collected in appropriate bins with bin bags - Safety box (receptacle) available	1	1	100
8. Stock of vaccination cards and child growth tracking sheets - at least 10 sheets and 10 vaccination cards in stock.	1	1	100
9. PEV register properly completed – or schedule sheets available PEV register correctly completed - Schedule sheets available and properly completed in the lockers.	1	0	0
10. Good waiting conditions for SPE and vaccination - With sufficient benches and/or chairs, protected from sun and rain.	1	1	100
11. Existence of a well-filled educational discussion notebook	1	0	0

12. Availability of a maintenance log for the refrigerator and accessories - With sufficient benches and/or chairs, protected from sun and rain - the inspector must use the maintenance log, examine the coal pit, the general condition of the refrigerator and solar panels.	1	1	100
13. Availability of an emergency plan	1	1	100
Total points	**17**	**14.46**	**85.06**
Score	**85.06%**		

Analysis of discrepancies/malfunctions

The evaluation highlights three critical gaps that compromise the performance of the Expanded Program on Immunization (EPI): (a) the continuity gap (a shortage of 3 out of 11 antigens), which, according to Donabedian's dimension, corresponds to a dysfunction in the structure (inputs). A shortage of nearly 27% of the vaccine range (3/11) disrupts the continuity of care. This will create missed appointments. A mother who goes to the Banconi Community Health Center (CSCOM-U) and finds an antigen out of stock is likely to not return for subsequent doses due to a loss of confidence, thus reducing complete vaccination coverage. (b) the traceability gap (incomplete vaccination records) is a process issue (information management). Incomplete records make individual follow-up of children impossible. Without reliable data, the CSCOM-U cannot identify "zero-dose children" or those lost to follow-up. This skews official statistics and prevents any effective follow-up action, thus lowering the program's success rate. (c) The gap in social mobilization (outdated discussion log) also corresponds to the Information, Education, Communication (IEC) process. The lack of follow-up to discussions indicates a neglect of group communication. The discussion is the key moment to address concerns and explain side effects. If this space is neglected, rumors or fears about post-vaccination effects take hold, mechanically increasing the dropout rate.

At the Banconi Community Health Center (CSCOM-U), gap analysis shows that the performance of the Patient Education Program (PEV) depends not only on "availability" (structure) but also on the "quality of interaction" (process). To improve results, the focus should not be on purchasing new refrigerators, but on training staff in interpersonal communication and patient flow management.

Table 5: Evaluation of the quality of EPI services at CSCOM-U of Banconi (Donabedian Model)

Dimensions	**Components evaluated (Criteria)**	**Performance Indicators / Observations**	**Observations**
STRUCTURE *(Resources)*	Human Resources	Number of qualified staff (Nurses, ASCs), staff/target population ratios.	4 to 5 staff members / Vaccination session: compliant with WHO standards
	Cold chain	Condition of refrigerators, daily temperature monitoring, energy autonomy (solar/electric).	Perfect (100%), as described
	Logistics and Inputs	Availability of vaccines (BCG, Penta, VAR), syringes, booklets and management materials.	Three out of eleven antigens (3/11) are out of stock for the time being.
	Physical environment	Cleanliness of the premises, geographical accessibility of the CSCOM-U, signage.	Perfect (100%)
PROCESS *(Activities)*	Compliance with protocols	Appropriateness of vaccination schedule, adherence to injection techniques and safety protocols.	Perfect (100%), as described
	Home and Communication	Quality of counseling, waiting time, clarity of instructions on appointments.	Perfect (100%), as described

	Data management	Correct completion of registers, maintenance of timesheets, monthly reports.	Perfect (90%), compliant, incomplete completion of registers and discussion log
	Research strategies	Organization of advanced and mobile strategies in the Banconi sectors.	Perfect (100%) achieved
RESULTS *(Impacts)*	Vaccination Coverage	Percentages of children who received all the planned doses	BCG: 81.52% POLIO3: 88.58% PENTA3: 88.58% VAR1: 85% Dose loss 8.7 < 10%
	Loss to Follow-Up Rate	Difference between the 1st and last dose (*Drop-out rate*) and the 3rd dose	Dropout rate : 9.3%
	User Satisfaction	Percentage of mothers satisfied with the overall care provided.	Overall satisfaction 99.8%
	Vaccine Safety	Absence of avoidable adverse events following immunization (AEFI).	Notification of manifest case (0%)

DISCUSSION

This cross-sectional study provided a comprehensive assessment of the quality of services delivered by the Expanded Programme on Immunization (EPI) at the Banconi Community Health Center (CSCOM-U) in Bamako in 2025, based on beneficiary perceptions and an evaluation of resources and practices. The results offer a valuable overview of strengths and areas for improvement.

Strengths and Limitations of the Study

Strengths: Obtaining accurate and reliable information on vaccination practices, stock management, and beneficiary satisfaction. The results can serve as a solid basis for identifying specific areas for improvement and implementing practical examples to optimize the quality of vaccination services. The study helps raise staff awareness of quality standards and the importance of their role in user satisfaction.

Limitations: The self-reported nature of mothers'/guardians' responses regarding satisfaction may lead to an overestimation or underestimation of effects, as respondents may be influenced by the desire to give socially acceptable answers. The lack of similar research specifically in Mali on the quality of vaccination services has limited the possibility of direct and in-depth comparisons with similar local contexts. There is also an absence of inferential statistical analysis to identify the determinants of satisfaction or service quality.

Sociodemographic characteristics of the children, parents of children and healthcare personnel surveyed

The predominance of one-day-old infants (32.4%) is explained by the systematic BCG vaccination at birth in Mali, thus facilitating early initial contact with vaccination services. This result is consistent with national public health strategies. The slight male predominance (56%) among vaccinated children is similar to some studies in Africa (20), although others show a female predominance (21). The regularity of visits (80% regular visits) demonstrates good parental adherence to the vaccination schedule, linked to awareness and trust in the service.

Regarding staff, the high proportion of women (83%) is typical of maternal and child health services. The young average age (27.16 years) and the balanced distribution between staff with less than or more than 3 years of experience (50% each) reveal a dynamic team, but one that still needs continuous skills development through experience. The fact that 100% of staff have been trained on the Expanded Program on Immunization (EPI) is a major asset, ensuring an adequate level of theoretical knowledge.

Quality of services provided by the Expanded Program on Immunization (EPI) at the Banconi Community Health Center (CSCOM-U)

The results show very high parental satisfaction with the reception (92.83%) and the ease of making appointments (87.03%). Waiting times, deemed acceptable in 57.8% of cases and reasonable in 42.2%, are also a positive indicator. These figures are higher than those reported by Salah et al. (9) in Ethiopia (96% satisfaction with the reception). The speed of service, particularly for neonatal vaccination, where parents do not necessarily have appointments, contributes to this satisfaction. Short waiting times are a key factor in maternal satisfaction (10.22). This suggests that the Banconi Community Health Center (CSCOM) is able to effectively manage patient flow, a crucial point for adherence to the Expanded Program on Immunization (EPI).

The clarity of the information provided about the vaccine (99.5% clear) and the availability of staff to answer questions (99.3% available) are areas of excellence. These results are very positive and surpass those of other studies, such as that by Salah et al. (9) (69.6% satisfaction with the information) or Tesfaye et al. (10), where information on vaccine types increased satisfaction by 1.54 times. The quality of the explanations before vaccination (96.6% satisfactory) demonstrates the providers' commitment to building a relationship of trust and adequately informing parents, which is fundamental for vaccine acceptance (23, 24).

The cleanliness of the unit (99% clean), the comfort of the facilities (99.8% comfortable), and the pleasant overall atmosphere (98.8%) are very positive indicators. These aspects, although sometimes underestimated, contribute significantly to a positive user experience and satisfaction (23,25). A clean and comfortable unit strengthens parents' confidence in the quality of care provided. These figures are also higher than those found by Tesfaye et al. (61.2% satisfaction for cleanliness) (10) and Lafore et al. (64% for comfort) (24).

Evaluation of the quality of services provided by the PEV unit in relation to the various essential components

The availability of essential equipment is a major asset for the Banconi Community Health Center (CSCOM-U), ensuring optimal conditions for vaccine administration. The presence of functional refrigerators and freezers, thermometers, and continuous temperature monitoring devices is fundamental for maintaining the cold chain, thus ensuring vaccine viability and efficacy (26–28).

Access to electricity is a critical factor for the cold chain, the irregularity of which is a major cause of vaccine inefficiency in other settings (29). Similarly, the availability of recommended vaccines and basic supplies is an indicator of good stock and supply chain management, a finding similar to that of Hussien (30) in Ethiopia (94% availability).

However, the presence of stockouts for 27% of supplies (BCG and polio) over the past six months, although limited to two vaccines, reveals a weakness in stock management. This observation is concerning because shortages of certain vaccines are a recurring problem in many developing countries (31, 32). Stockouts can lead to missed vaccination opportunities, a loss of public confidence, and a waste of resources (32). They underscore the need to improve planning, forecasting of needs, and supply chain logistics to ensure consistent availability.

The score indicating good operational quality of the EPI (all conditions met) is a very positive indicator of the CSCOM's compliance with national quality standards.

This includes proper vaccine management (no damaged vials, consistent stock levels), refrigerator cleanliness, orderly scheduling of sessions, and accurate temperature recording. These elements are essential for the safety and efficacy of vaccination. This result is comparable to moderately high scores found in other studies on the functional requirements of vaccination centers (33).

In summary, the Banconi Community Health Center (CSCOM-U) demonstrates remarkable performance across most indicators of vaccination service quality, particularly in terms of user satisfaction, staff availability, infrastructure, and services. The main challenge identified lies in managing stock shortages, which requires particular attention to consolidate achievements and ensure optimal vaccination coverage, as well as the correct

and complete filling of primary collection materials.

Analysis of malfunction discrepancies

The Disruption of Continuity: A Structural Failure with Behavioral Consequences. The discontinuity observed at the Banconi Community Health Center (CSCOM-U) (a 27% shortage of antigens) far exceeds the tolerance thresholds set by the National Strategic Plan for the Expanded Program on Immunization (EPI) in Mali, which aims for 100% availability of supplies at the point of delivery. This structural dysfunction is not limited to a simple lack of product; it undermines the trust between the health system and the community. A study by Rainey et al. (2011) on the determinants of vaccination in low-income countries highlights that stockouts are one of the main predictors of vaccination abandonment (34). In Banconi, each missing antigen generates a "missed vaccination opportunity," which, according to the WHO, is the main obstacle to achieving universal vaccination coverage (35, 36). International literature confirms that mothers' disappointment with stock shortages reduces the likelihood of return by 15 to 20% at subsequent appointments, transforming a logistical problem into a sustainable health behavior problem (37,38) .

Traceability and data quality: The "black hole" in data management, the incomplete completion of registers in Banconi, reveals a major flaw in the process. According to Donabedian's framework, without rigorous information management, results management becomes blind. These results corroborate the work of Lafond et al. (2015), who demonstrate that the weakness of health information systems (HIS) at the peripheral level is often correlated with an excessive workload for staff (39). In Mali, the FBR Manual places data completeness and consistency at the heart of performance (18). The inability to identify "zero-dose" children in Banconi creates an invisible population that escapes official statistics. This situation is described by Chen et al. (2022) as "information inequality": the most vulnerable children are those whose data is least complete, rendering any recovery strategy ineffective (40).

Social Mobilization and Dropout: The importance of interaction, coupled with the observed gap in social mobilization (outdated discussion logs), confirms that the technical act of vaccination is prioritized over counseling. In Banconi, the neglect of this space for dialogue leads to misinformation. A systematic review by Brown et al. (2010) shows that interpersonal communication is the most influential factor in parents' decisions to complete the vaccination schedule (41). If the communication process is flawed, the fear of adverse events following immunization (AEFI) is not addressed, mechanically increasing the dropout rate. This finding aligns with the national conclusions of Mali (EDSM-VI), where mothers' lack of information is regularly cited as the second leading cause of dropout after geographical remoteness (42).

Summary of the gap analysis: Comparison with the literature highlights that the Banconi CSCOM-U suffers from a classic paradox in urban areas: a structure in place but a sacrificed quality of interaction (process). The improvement effort must focus on "rehumanizing" the service and increasing administrative rigor.

CONCLUSION

The quality assessment of services provided by the Expanded Program on Immunization (EPI) at the Banconi Community Health Center (CSCOM-U), structured around the Donabedian model, reveals a two-tiered healthcare system. While the facility possesses the necessary foundations for vaccination, the observed deficiencies in the process hinder the achievement of optimal and sustainable results.

The study highlights a critical "performance gap": the physical presence of vaccines and staff is insufficient to guarantee complete immunization of the Banconi population. The gaps in the supply of 3 out of 11 antigens (a structural weakness), combined with incomplete record-keeping and neglect of educational talks (process weaknesses), constitute the main bottlenecks. These shortcomings directly explain the dropout rate and the risk of preventable diseases resurfacing despite public health efforts.

To transform these observations into levers for change, it is imperative to move towards a culture of total quality. The recommended solutions, including the transition to inventory management based on alert thresholds, the systematization of formative supervision of records, and the reactivation of interpersonal communication, will

aim to restore the fluidity of the continuum of care.

Ultimately, improving vaccination coverage in Banconi depends less on increased resources than on rigorously optimizing clinical and administrative processes. Only a synergy between resilient logistics and documented community engagement will enable the CSCOM-U to meet the challenges of the epidemiological transition and guarantee equitable protection for every child.

It is imperative to initiate an in-depth study by performing inferential statistical analysis to identify the determinants of satisfaction or service quality.

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REFERENCES

1. Ehreth J. The global value of vaccination. Vaccinated. 30 Jan 2003;Vaccines and Immunization 2003. Based on the Third World Congress on Vaccines and Immunization21(7):596-600. doi:10.1016/S0264-410X(02)00623-0
2. Ateudjieu J, Kenfack B, Nkontchou BW, Demanou M. Program on immunization and cold chain monitoring: the status in eight health districts in Cameroon. BMC Res Notes. March 16, 2013;6(1):101. doi:10.1186/1756-0500-6-101
3. CDC. MMWR [Internet]. 2006 [cited 27 Feb 2026]. Vaccine-Preventable Deaths and Global Immunization Vision and Strategy, 2006-2015. Available from: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5518a4.htm
4. Montgomery JP, Ganguly P, Carlson BF, Shrivastwa N, Boulton ML. An evaluation of immunization services, using the reaching every district criteria, in two districts of Gujarat, India. Global Health Res Policy. 2018;3:5. doi:10.1186/s41256-018-0060-4 PubMed PMID: 29445774; PubMed Central PMCID: PMC5803910.
5. Luthi JC, Kessler W, Boelaert M. A vaccine efficacy survey in the city of Bongor (Chad) and its operational implications for the vaccination program. Bull World Health Organ [Internet]. 1997 [cited 27 Feb 2026];75(5):427-33. Available from: https://www.lissa.fr/rep/articles/9480198
6. World Health Organization. Declaration of Alma-Ata: International Conference on Primary Health Care, [Internet]. Alma-Ata; 1978 [cited 20 June 2025]. Available from: https://www.who.int/teams/social-determinants-of-health/declaration-of-alma-ata
7. Gazmararian JA, Oster NV, Green DC, Schuessler L, Howell K, Davis J, et al. Vaccine storage practices in primary care physician offices: assessment and intervention. Am J Prev Med. Nov 2002;23(4):246-53. doi:10.1016/s0749-3797(02)00512-3 PubMed PMID: 12406478.
8. Streefland PH, Chowdhury AM, Ramos-Jimenez P. Quality of vaccination services and social demand for vaccinations in Africa and Asia. Bull World Health Organ. 1999;77(9):722-30. PubMed PMID: 10534895; PubMed Central PMCID: PMC2557734.
9. Salah AA, Baraki N, Egata G, Godana W. Evaluation of the Quality of Expanded Program on Immunization Service Delivery in Primary Health Care Institutions of Jigjiga Zone Somali Region, Eastern Ethiopia. Eur J Prev Med. Jul 2015;3(4):117-23. doi:10.11648/j.ejpm.20150304.14
10. Tesfaye E, Debie A, Sisay F, Tafere TZ. Maternal satisfaction on quality of childhood vaccination services and its associated factors at public health centers in Addis Ababa, Ethiopia. BMC Health Serv Res. 29 Nov 2023;23(1):1315. doi:10.1186/s12913-023-10174-7 PubMed PMID: 38031017; PubMed Central PMCID: PMC10685558.
11. Doumbia D. Surveillance of target diseases of the Expanded Program on Immunization in Mali: retrospective analysis of surveillance data from 2004 to 2014 [Internet]. 2018 [cited 27 Feb 2026].

Available from: https://www.bibliosante.ml/handle/123456789/2056
12. Sanogo FB. Factors Contributing to the Persistence of Measles Outbreaks in Mali [Thesis] [Internet]. University of Sciences, Techniques and Technologies of Bamako; 2016 [cited 27 Feb 2026]. Available from: https://www.bibliosante.ml/handle/123456789/5262
13. ZDLH_Mali_Landscape_2023_FR.pdf [Internet]. [cited 27 Feb 2026]. Available from: https://zdlh.gavi.org/sites/default/files/2024-03/ZDLH_Mali_Landscape_2023_FR.pdf
14. Mali becomes the first country to use a new hybrid vaccination approach to fight malaria | WHO | Regional Office for Africa [Internet]. [cited 27 Feb 2026]. Available from: https://www.afro.who.int/fr/news/le-mali-devient-le-premier-pays-utiliser-une-nouvelle-approche-hybride-de-vaccination-pour
15. National Directorate of Health. National Strategic Plan for the Expanded Program on Immunization (EPI) 2021-2025. Bamako; 2021.
16. Burstein R, Dansereau E, Conner R, DeCenso B, Delwiche K, Gasasira A, et al. Assessing vaccine cold chain storage quality: a cross-sectional study of health facilities in three African countries. The Lancet. June 1, 2013;381:S25. doi:10.1016/S0140-6736(13)61279-9
17. Shawon MSR, Adhikary G, Ali MW, Shamsuzzaman M, Ahmed S, Alam N, et al. General service and child immunization-specific readiness assessment of healthcare facilities in two selected divisions in Bangladesh. BMC Health Serv Res. 25 Jan 2018;18(1):39. doi:10.1186/s12913-018-2858-7 PubMed PMID: 29370842; PubMed Central PMCID: PMC5784675.
18. Ministry of Health of Mali. National guide for the implementation of Results-Based Financing (RBF). Bamako; 2020.
19. Donabedian A. The quality of care. How can it be assessed? JAMA. 1988;260(12):1743-8.
20. Diallo M. Evaluation of EPI vaccination coverage among children aged 12 to 24 months in Commune II of the District of Bamako [Internet]. 2015 [cited 27 Feb 2026]. Available from: https://www.bibliosante.ml/handle/123456789/846
21. Tiembré I, Vroh J, Attoh-Touré H, Douba A, N'Zi E, Dagnan N, et al. Quality of vaccination services at public social centers in Abidjan, Côte d'Ivoire. Public Health. 1 Jan 2012;24:429. doi:10.3917/spub.125.0429
22. Fikadu T, Gebru Z, Abebe G, Tesfaye S, Zeleke EA. Assessment of mothers' satisfaction towards child vaccination service in South Omo zone, South Ethiopia region: a survey on clients' perspective. BMC Womens Health. May 9, 2024;24(1):272. doi:10.1186/s12905-024-03120-0 PubMed PMID: 38724930; PubMed Central PMCID: PMC11080138.
23. Espinosa A, Marti J, Calderón-Prada A, Ticliahuanca M, Lobrano J, Carreón N. Satisfaction with vaccination services and its relationship to emotional responses of service users in Lima. LEGADO's quality management model as a public solution to promote citizen emotional well-being during pandemic. Front Public Health. 2023;11:1136312. doi:10.3389/fpubh.2023.1136312 PubMed PMID: 37608977; PubMed Central PMCID: PMC10441115.
24. Terefe Lafore, Bekafe Kibamo, Kebebush Ergicho, Elias Ezo. Client Satisfaction towards Expanded Program on Immunization Service and Associated Factors in Doyogena Woreda, Southern Ethiopia. Middle East Res J Nurs. 2021;01(01):21-30. doi:10.36348/merjn.2021.v01i01.004
25. Dana E, Asefa Y, Hirigo AT, Yitbarek K. Satisfaction and its associated factors of infants' vaccination service among infant coupled mothers/caregivers at Hawassa city public health centers. Hum Vaccines Immunother. 17(3):797-804. doi:10.1080/21645515.2020.1790278 PubMed PMID: 32898441; PubMed Central PMCID: PMC7993134.
26. Hatchett R. The medicines refrigerator and the importance of the cold chain in the safe storage of medicines. Nurs Stand R Coll Nurs GB 1987. 4 Oct 2017;32(6):53-63. doi:10.7748/ns.2017.e10960 PubMed PMID: 29094526.
27. Purssell E. Reviewing the importance of the cold chain in the distribution of vaccines. Br J Community Nurses. Oct 2015;20(10):481-6. doi:10.12968/bjcn.2015.20.10.481 PubMed PMID: 26418400.
28. Ateudjieu J, Kenfack B, Nkontchou BW, Demanou M. Program on immunization and cold chain monitoring: the status in eight health districts in Cameroon. BMC Res Notes. Mar 16, 2013;6:101. doi:10.1186/1756-0500-6-101 PubMed PMID: 23497720; PubMed Central PMCID: PMC3630054.
29. Adu FD, Adedeji AA, Esan JS, Odusanya OG. Live viral vaccine potency: an index for assessing the cold chain system. Public Health. Nov 1996;110(6):325-30. doi:10.1016/s0033-3506(96)80003-5 PubMed PMID: 8979747.

30. Hussien A. Assessment of Maternal Satisfaction Towards Childhood Immunization and Its Associated Factors in MCH Clinic, at Kombolcha, in Amhara Regional State, Northern Ethiopia. In. 2015 [cited Feb 27, 2026]. Available at: https://www.semanticscholar.org/paper/Assessment-of-Maternal-Satisfaction-Towards-and-Its-Hussien/1f6a18157ec5ab38380d226947eb4c3090897058
31. Montgomery JP, Ganguly P, Carlson BF, Shrivastwa N, Boulton ML. An evaluation of immunization services, using the reaching every district criteria, in two districts of Gujarat, India. Global Health Res Policy. 2018;3:5. doi:10.1186/s41256-018-0060-4 PubMed PMID: 29445774; PubMed Central PMCID: PMC5803910.
32. Labama MB, Longembe EB, Likwela JL. Vaccine management effectiveness and vaccination quality at the EPI Kisangani office in the Democratic Republic of Congo. Pan Afr Med J. 2 May 2017;27(4). doi:10.11604/pamj.2017.27.4.11513
33. Siddiqi DA, Abdullah S, Dharma VK, Khamisani T, Shah MT, Setayesh H, et al. Assessment of vaccination service delivery and quality: a cross-sectional survey of over 1300 health facilities from 29 districts in Sindh, Pakistan conducted between 2017-18. BMC Health Serv Res. June 1, 2022;22(1):727. doi:10.1186/s12913-022-08098-9 PubMed PMID: 35650570; PubMed Central PMCID: PMC9157477.
34. Rainey JJ, Watkins M, Ryman TK, Sandhu A, Bootman A, Dzidoti K. Reasons for under-vaccination and missed opportunities: A review. Vaccinated. 2011;29(38):6469-78. doi:10.1016/j.vaccine.2011.07.010
35. WHO. Essential Programme on Immunization [Internet]. [cited 10 March 2026]. Reducing Missed Opportunities for Vaccination (MOV). Available from: https://www.who.int/fr/teams/immunization-vaccines-and-biologicals/essential-programme-on-immunization/implementation/reducing-missed-opportunities-for-vaccination
36. Progress made and challenges encountered in achieving universal immunization coverage [Internet]. [cited 10 March 2026]. Available from: https://www.who.int/fr/publications/m/item/progress-and-challenges
37. Rainey JJ, Watkins M, Ryman TK, Sandhu P, Bo A, Banerjee K. Reasons associated with non-vaccination and under-vaccination of children in low and middle income countries: findings from a systematic review of the published literature, 1999-2009. Vaccinated. 26 Oct 2011;29(46):8215-21. doi:10.1016/j.vaccine.2011.08.096 PubMed PMID: 21893149.
38. Kruk ME, Gage AD, Arsenault C, Jordan K, Leslie HH, Roder-DeWan S, et al. High-quality health systems in the Sustainable Development Goals era: time for a revolution. Lancet Global Health. 1 Nov 2018;6(11):e1196-252. doi:10.1016/S2214-109X(18)30386-3 PubMed PMID: 30196093.
39. Lafond AK, Kanagat N, Steinglass R, others. A theory of change for capacity building in data use in public health. Health Policy Plan. 2015;30(5):644-55. doi:10.1093/heapol/czu030
40. Hogan D, Gupta A. Why Reaching Zero-Dose Children Holds the Key to Achieving the Sustainable Development Goals. Vaccines. Mar 31, 2023;11(4):781. doi:10.3390/vaccines11040781 PubMed PMID: 37112693; PubMed Central PMCID: PMC10142906.
41. Brown D, Burton A, Gacic-Dobo M. An analysis of reported vaccination coverage. Lancet Infect Dis. 2010;10(12):822-4. doi:10.1016/S1473-3099(10)70269-0
42. National Institute of Statistics (INSTAT), ICF. Demographic and Health Survey in Mali 2018 (EDSM-VI) [Technical Report]. Bamako, Mali and Rockville, Maryland, USA: INSTAT and ICF; 2019. Report No.