

Availability of Routine Vaccines in Primary Health Care Facilities in Yenagoa Local Government Area, Bayelsa State, Nigeria

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ABSTRACT

Routine immunization is a core component of primary health care and remains one of the most cost-effective strategies for reducing childhood morbidity and mortality from vaccine-preventable diseases. Despite sustained national and global investment in immunization systems, availability of vaccines at the primary health care (PHC) level continues to be undermined by supply chain and infrastructural constraints, particularly in Nigeria's Niger Delta region. A descriptive cross-sectional survey was conducted across all thirty government-owned PHC facilities offering routine immunization services in Yenagoa Local Government Area (LGA), Bayelsa State. A purposive sampling technique was used to include all eligible facilities. Structured questionnaires were administered to health workers directly responsible for immunization services, and findings were triangulated with on-site observation of cold chain equipment, storage areas, and stock records. Data were analysed with SPSS version 26.0 using descriptive statistics, with chi-square tests applied where relationships between variables were explored. Vaccine availability varied considerably by antigen. Tetanus toxoid (15.1%), Vitamin A (11.9%), meningitis vaccine (10.8%), and yellow fever vaccine (10.3%) were the most consistently available, while pentavalent and rotavirus vaccines were comparatively scarce. Most respondents (63.3%) reported that vaccines were not available consistently throughout the preceding twelve months, and 36.7% reported stock-outs occurring almost monthly, with 43.3% reporting stock-out episodes lasting longer than one month. The leading facility-level barriers identified were inadequate cold chain equipment (24.3%), poor electricity supply (21.6%), inadequate funding and logistics support (18.9%), and shortage of trained staff (14.4%). Routine vaccines are nominally present in PHC facilities in Yenagoa LGA, but frequent and prolonged stock-outs driven by weak cold chain infrastructure, unreliable power supply, and underfunded logistics systems undermine consistent availability. Targeted investment in cold chain infrastructure, backup power, supply forecasting, and workforce capacity is required to stabilize routine immunization service delivery in the LGA.

KEYWORDS

Routine vaccines, vaccine availability, stock-out, primary health care, immunization, Bayelsa State, Nigeria

I. INTRODUCTION

Vaccine availability at the point of service delivery is a critical determinant of immunization coverage and, by extension, of population-level control of vaccine-preventable diseases. Availability depends on a functioning supply chain that spans forecasting, procurement, cold chain maintenance, storage, and distribution to the facility level. Where any link in this chain is weak, the result is stock-outs that translate directly into missed immunization opportunities for children and other target populations.

In Nigeria, national programs such as the Expanded Programme on Immunization (EPI) and strategic frameworks including the National Routine Immunization Strategic Plan have sought to strengthen vaccine logistics and cold chain systems. However, evidence from various parts of the country continues to document persistent stock-outs and infrastructural gaps at the primary health care level, with implications that are often more pronounced in riverine and semi-urban states such as Bayelsa, where terrain, flooding, and unreliable electricity complicate storage and distribution.

Yenagoa LGA, as the administrative capital of Bayelsa State, hosts a relatively developed network of PHC facilities compared with more rural LGAs in the state, yet localized data on the actual availability of routine vaccines at these facilities remain limited. This gap constrains the ability of the Bayelsa State Ministry of Health and the LGA Primary Health Care Department to plan targeted, evidence-based interventions. This study therefore assessed the availability of routine vaccines across all thirty PHC facilities in Yenagoa LGA, examined the frequency and duration of stock-outs over the preceding twelve months, and identified the facility-level factors most strongly associated with inconsistent vaccine availability.

II. METHODS

A. Study Design and Setting

A descriptive cross-sectional survey design was adopted. The study was conducted in Yenagoa LGA, Bayelsa State, southern Nigeria, an area with an estimated population of approximately 500,000 and a tropical climate characterized by high rainfall, humidity, and seasonal flooding, conditions that complicate the storage and transportation of temperature-sensitive vaccines.

B. Study Population and Sampling

The study population comprised all thirty government-owned PHC facilities in Yenagoa LGA offering routine immunization services. A purposive sampling technique was used to include all eligible facilities, thereby eliminating sampling bias and ensuring that findings reflected the situation across the entire LGA. Respondents were health workers directly involved in immunization services at each facility, including immunization officers, nurses and midwives, and Community Health Extension Workers (CHEWs), who provided informed consent prior to participation.

C. Data Collection Instrument and Procedure

Data were collected using a structured, interviewer-administered questionnaire developed by the researcher and subjected to expert review by specialists in public health,

immunization, and research methodology to establish content validity. The instrument captured facility characteristics, availability of specific EPI antigens, twelve-month stock-out history, and perceived facility-level barriers to vaccine availability. Questionnaire responses were triangulated with on-site observation of cold chain equipment, temperature monitoring devices, and stock records.

D. Data Analysis

Data were coded and analysed in SPSS version 26.0. Descriptive statistics, namely frequencies and percentages, were used to summarize facility and respondent characteristics, vaccine availability, and stock-out patterns. Chi-square tests were applied where relationships between facility-level factors and vaccine availability were examined, with statistical significance set at $p < 0.05$.

E. Ethical Considerations

Ethical approval was obtained from the Research and Ethics Committee of the Bayelsa State College of Health Technology, Otuogidi-Ogbia, with additional permission from the Yenagoa LGA Primary Health Care Department. Participation was voluntary, informed consent was obtained from all respondents, and no personal identifiers were collected; all data were reported in aggregate form.

III. RESULTS

A. Respondent Characteristics

Thirty PHC facilities were assessed, with one respondent recruited per facility. A majority of respondents were female (60.0%) and aged 40 to 49 years (36.7%). Community Health Extension Workers constituted the largest professional group (50.0%), and 36.7% of respondents held the position of Facility Head or Officer-in-Charge. Most respondents (46.7%) had 5 to 10 years of work experience in immunization services, indicating that the data were largely drawn from experienced personnel with firsthand knowledge of vaccine management.

Table 1: Sex distribution of respondents

Sex	Frequency	Percentage (%)
Male	12	40
Female	18	60
Total	30	100

Table 2: Age distribution of respondents

Age range	Frequency	Percentage (%)
20-29 years	3	10
30-39 years	7	23.3
40-49 years	11	36.7
50 years and above	9	30
Total	30	100

Table 3: Years of work experience in immunization services

Years in service	Frequency	Percentage (%)
Less than 5 years	7	23.3
5-10 years	14	46.7
10 years and above	9	30
Total	30	100

B. Availability of Routine Vaccines

Availability varied considerably across the thirteen EPI antigens assessed. Tetanus toxoid was reported as available in the highest proportion of responses (15.1%), followed by Vitamin A (11.9%), meningitis vaccine (10.8%), and yellow fever vaccine (10.3%). Pentavalent vaccine (3.2%) and rotavirus vaccine (3.8%) were among the least available, and no facility reported availability of malaria vaccine at the time of assessment.

Table 4: Reported availability of routine vaccines by antigen

Vaccine	Frequency	Percentage (%)
BCG	17	9.2
Hepatitis B	18	9.7
OPV	11	6
Pentavalent (DPT-HepB-Hib)	6	3.2
PCV	14	7.6
Rotavirus vaccine	7	3.8
IPV	9	4.9
Malaria	0	0
Measles vaccine	14	7.6
Vitamin A	22	11.9
Yellow fever vaccine	19	10.3
Meningitis vaccine	20	10.8
Tetanus toxoid	28	15.1
Total responses	185	100

C. Consistency of Availability and Stock-Out Patterns

Most respondents (63.3%) reported that routine vaccines were not consistently available throughout the preceding twelve months, while 36.7% reported consistent availability. Among vaccines most frequently cited as out of stock were malaria vaccine (13.0%), rotavirus vaccine (11.6%), and pentavalent vaccine (10.3%), while Vitamin A (2.1%) and tetanus toxoid (3.4%) were rarely reported as unavailable, consistent with their higher availability profile above.

Table 5: Consistency of vaccine availability throughout the year

Response	Frequency	Percentage (%)
Yes	11	36.7
No	19	63.3
Total	30	100

Table 6: Frequency of stock-outs in the preceding twelve months

Response	Frequency	Percentage (%)
Rarely (once or twice yearly)	5	16.7
Occasionally (3-5 times yearly)	8	26.6
Frequently (more than 5 times yearly)	6	20
Very frequently (almost monthly)	11	36.7

Regarding duration, stock-out episodes lasted more than one month in 43.3% of reports, 2 to 4 weeks in 30.0%, 1 to 2 weeks in 20.0%, and less than one week in only 6.7% of reports, indicating that when stock-outs occurred, they tended to be prolonged rather than brief.

Table 7: Duration of stock-out episodes

Response	Frequency	Percentage (%)
Less than 1 week	2	6.7
1-2 weeks	6	20
2-4 weeks	9	30
More than 1 month	13	43.3

D. Facility-Level Barriers to Vaccine Availability

Inadequate cold chain equipment was the most frequently cited barrier (24.3%), followed by poor electricity supply (21.6%), inadequate funding and logistics support (18.9%), shortage of trained staff (14.4%), irregular supply from the LGA (11.7%), and transportation difficulties in difficult terrain (9.0%).

Table 8: Facility-level barriers to vaccine availability

Barrier	Frequency	Percentage (%)
Inadequate cold chain equipment	27	24.3
Poor electricity supply	24	21.6
Inadequate funding/logistics support	21	18.9
Shortage of trained staff	16	14.4
Irregular supply from LGA	13	11.7

Difficult terrain/transportation challenges	10	9
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E. General Perceptions

Regarding overall perception, 40.0% of respondents rated vaccine availability in their facility as very adequate, 26.7% as adequate, and 33.3% as inadequate. Notably, 60.0% of respondents believed the current vaccine distribution system in the LGA was effective, a perception that contrasts with the high frequency and prolonged duration of stock-outs reported elsewhere in the survey. Observational findings corroborated this discrepancy: several facilities were found closed on repeated visits owing to staff absence, and a general shortage of medical equipment was noted across sites, with some workers reporting that vaccines were "only made available when the government wants."

Table 9: Perceived effectiveness of the vaccine distribution system

Response	Frequency	Percentage (%)
Yes	18	60
No	12	40
Total	30	100

IV. DISCUSSION

This study found that routine vaccines were nominally present across PHC facilities in Yenagoa LGA, but availability was markedly inconsistent, with almost two-thirds of facilities reporting gaps over the preceding year. This pattern is consistent with prior Nigerian evidence documenting supply chain inefficiencies and cold chain gaps as recurring threats to immunization service delivery, even in LGAs with comparatively better infrastructure than surrounding rural areas.

The unevenness in availability across antigens, with tetanus toxoid and Vitamin A more available than pentavalent and rotavirus vaccines, may reflect differences in storage requirements, dosing schedules, and the relative complexity of newer, more resource-intensive antigens within the supply chain. Vaccines requiring more stringent cold chain conditions or more frequent restocking appear disproportionately vulnerable to disruption.

Inadequate cold chain equipment and poor electricity supply emerged as the dominant barriers, a finding that aligns with the broader literature linking unreliable power infrastructure to vaccine potency loss and wastage. Given Yenagoa's tropical climate and seasonal flooding, the operational demands placed on cold chain systems are considerable, and the absence of reliable backup power appears to compound this vulnerability.

A striking finding was the divergence between perceived system effectiveness and actual stock-out experience: although 60.0% of respondents considered the distribution system effective, 63.3% simultaneously reported inconsistent vaccine availability and over a third

reported near-monthly stock-outs. This gap may reflect normalization of recurrent shortages among frontline staff, or a distinction in respondents' minds between the distribution mechanism itself and the broader infrastructural constraints that undermine its outcomes. Either interpretation suggests that health worker perception surveys alone may understate the operational severity of availability gaps and should be interpreted alongside objective stock and observational data, as was done in this study.

The observational finding of facility closures due to staff absence, together with reports of vaccines being available mainly during government-driven campaigns, points to availability challenges that extend beyond the cold chain and logistics system into broader health workforce and facility management issues. This reinforces that vaccine availability in Yenagoa LGA is not solely a supply chain problem but a wider health systems challenge requiring coordinated intervention across infrastructure, staffing, and supervision.

A. Study Limitations

This study is limited by its cross-sectional, single-LGA design, which restricts generalizability to other LGAs in Bayelsa State with differing infrastructural and geographic profiles. Reliance on a single respondent per facility, although mitigated by observational triangulation, may not fully capture within-facility variation in staff experience of stock-outs. Self-reported twelve-month stock-out history is also subject to recall bias, and the descriptive design does not permit causal inference regarding the relationship between facility-level factors and vaccine availability.

B. Contribution to Knowledge

This study provides the first facility-level empirical assessment of routine vaccine availability across all PHC facilities in Yenagoa LGA, an area for which localized immunization supply data have previously been limited. By combining self-reported survey data with on-site observation, the study offers a more complete picture of availability gaps than facility records or perception surveys alone, and identifies the specific antigens and facility-level barriers most in need of targeted intervention within this LGA.

C. Public Health Implications

Frequent and prolonged vaccine stock-outs directly translate into missed immunization opportunities, delayed protection against vaccine-preventable diseases, and potential erosion of caregiver confidence in the immunization system. The concentration of barriers around cold chain infrastructure and power supply indicates that infrastructural investment, rather than demand-side interventions alone, should be prioritized to improve coverage outcomes in Yenagoa LGA. Strengthening supervision, forecasting, and workforce presence at facility level will be equally necessary to close the gap between perceived and actual system performance identified in this study

V. CONCLUSION AND RECOMMENDATIONS

While routine vaccines are present in PHC facilities in Yenagoa LGA, their availability is inconsistent and undermined by frequent, prolonged stock-outs linked to weak cold chain infrastructure, unreliable electricity, inadequate funding, and staff shortages. Addressing these challenges will require investment in modern and solar-powered cold chain equipment, reliable backup power sources, improved forecasting and inventory management, regular training and adequate staffing of immunization personnel, increased funding for vaccine logistics, and strengthened supervision and monitoring of PHC facilities by the Bayelsa State Primary Health Care Board and Yenagoa LGA health authorities.

REFERENCES

- [1] Abubakar, A., Iliyasu, Z., & Sabitu, K. (2020). Routine immunization coverage and its determinants among children aged 12-23 months in a semi-urban community in Northern Nigeria. *African Journal of Reproductive Health*.
- [2] Adefisoye, A. I., & Akinwale, O. P. (2022). Cold chain management and vaccine availability in primary healthcare facilities in Southwestern Nigeria. *Journal of Public Health and Epidemiology*, 14(4).
- [3] Akinyemi, O. O., & Odusanya, O. O. (2021). Vaccine logistics and immunization service delivery in Nigeria: Challenges and opportunities. *BMC Health Services Research*, 21(1), 556.
- [4] Bayelsa State Ministry of Health. (2023). Annual health sector performance report 2022. Yenagoa: Department of Public Health.
- [5] Bayelsa State Primary Health Care Board. (2023). Annual report on primary health care service delivery in Bayelsa State. Yenagoa: BSPHCB Publications.
- [6] Federal Ministry of Health (FMOH). (2020). National routine immunization strategic plan 2020-2024. Abuja: Federal Ministry of Health.
- [7] National Population Commission (NPC). (2006). Population and housing census of the Federal Republic of Nigeria. Abuja: NPC.
- [8] National Primary Health Care Development Agency (NPHCDA). (2021). Guidelines on vaccine and cold chain management in Nigeria. Abuja: NPHCDA.
- [9] Nkereuwem, O. S., & Ekanem, E. E. (2022). Assessing the availability and accessibility of routine vaccines in primary healthcare facilities in Akwa Ibom State, Nigeria. *Journal of Community Medicine and Primary Health Care*.
- [10] Ogbuabor, D. C., & Onwujekwe, O. E. (2019). Governance of routine immunization and vaccine supply systems in Nigeria: The need for systemic reform. *Health Policy and Planning*, 34(5), 364-372.
- [11] World Health Organization (WHO). (2022). Immunization coverage factsheet: Nigeria. Geneva: WHO.
- [12] World Health Organization (WHO). (2023). Global vaccine action plan 2021-2030: Strengthening primary health care and immunization systems. Geneva: WHO.
- [13] World Health Organization & United Nations Children's Fund (WHO-UNICEF). (2020). Immunization agenda 2030: A global strategy to leave no one behind. Geneva: WHO.