ORIGINAL ARTICLE

https://dx.doi.org/10.4314/joma.v8i2.4

ROUTINE CHILDHOOD IMMUNISATION COVERAGE AND DROPOUT RATES AT A TERTIARY HOSPITAL IN SOUTH-SOUTH NIGERIA: A FOUR-YEAR RETROSPECTIVE REVIEW (2022–2025)

Nwadiaru CB[1], Anika IE[1], Asamudo LU[1], Ukwu CA[1]

Family Health Unit, Department of Community Medicine,

University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State, Nigeria.[1]

ABSTRACT

BACKGROUND:

Routine childhood immunisation is central to child survival in Nigeria, yet coverage and completion vary across settings and over time. Facility-level evidence is needed to assess programme performance during disruption and recovery.

OBJECTIVES:

This study reviewed routine childhood immunisation coverage and dropout rates at the University of Port Harcourt Teaching Hospital (UPTH), a tertiary hospital in South-South Nigeria, from 2022 to 2025, identified vaccines with consistently high uptake, and assessed schedule completion between Penta1-Penta3 and BCG-measles.

METHODS:

A retrospective descriptive analysis was conducted using routine immunisation registers from the Family Health Clinic, UPTH. All children aged 0-23 months vaccinated between January 2022 and December 2025 were included. Administrative coverage rates were calculated for each antigen, and monthly dropout rates were estimated for Penta1-Penta3 and BCG-measles.

RESULTS

A total of 37,685 immunisation visit records were reviewed. Male children accounted for 17,570 (46.6%) visit records, while female children accounted for 20,115 (53.4%). Administrative coverage estimates were generally high but varied over time, with a decline in 2023, an increase in 2024, and a subsequent reduction in 2025. Vaccines administered at birth and at 6 weeks of age, including BCG, OPV0, HBV0, Penta1, and PCV1, consistently had the highest uptake. In contrast, vaccines administered later in infancy, including rotavirus vaccine, inactivated polio vaccine (IPV), measles vaccine, yellow fever vaccine, and meningococcal A conjugate vaccine (MenA), showed greater variability. Penta1–Penta3 dropout rates were slightly above the recommended threshold in 2022, improved in 2023, and increased in 2024, while BCG–measles dropout rates remained high and fluctuated throughout the study period.

CONCLUSION

Facility administrative immunisation coverage estimates at UPTH remained generally high, although completion across the schedule was inconsistent, particularly for rotavirus, inactivated polio, measles, yellow fever, and meningococcal A conjugate vaccines. Strengthening follow-up systems and defaulter-tracking may improve completion rates.

KEYWORDS

Routine immunisation; vaccine coverage; immunisation dropout; pentavalent vaccine; facility-based study; Nigeria

CORRESPONDING AUTHOR

Anika, IE

Family Health Unit, Department of Community Medicine, University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State,

ifeomacanika@gmail.com

+234 803 936 7566

INTRODUCTION

Immunization remains one of the most cost-effective public health interventions, preventing approximately 4 million deaths globally each year.1 Despite these achievements, vaccine-preventable diseases continue to account for an estimated 1.5 million deaths annually, particularly in low- and lower-middle-income

countries where access to and completion of vaccination schedules remain uneven.[2,3]

Nigeria continues to bear a substantial burden of under-immunised children despite improvements in child survival. Although under-five mortality declined from 193 deaths per 1,000 live births in 1990 to 110 per 1,000 live births in 2023–24, vaccine-preventable diseases such as diarrhoea, pneumonia, and measles remain important contributors to childhood morbidity and mortality. [4-6]

Routine childhood immunisation (RI) protects against vaccine-preventable diseases through scheduled vaccination contacts beginning at birth and continuing through infancy and early childhood. Nigeria's immunisation programme is coordinated by the National Primary Health Care Development Agency (NPHCDA), which oversees vaccine supply and implementation nationwide.6-10 Nigeria set a target of achieving at least 90% routine immunisation coverage for all antigens by 2024.[11]

Coverage and dropout rates are important indicators of immunisation programme performance. Coverage reflects the proportion of the target population receiving specific vaccines, while dropout rates measure the proportion of children who initiate but fail to complete recommended vaccination schedules.[12-14] A dropout rate above 10% is considered a concern and may indicate challenges related to access, service delivery, or caregiver follow-up. [15]

High dropout rates undermine the effectiveness of routine immunisation programmes by leaving children only partially protected against vaccine-preventable diseases. Children who fail to complete recommended vaccination schedules remain at increased risk of infection, outbreaks, severe illness, disability, and death. In addition, high dropout rates may indicate weaknesses in service delivery, caregiver follow-up, access to health facilities, or vaccine availability. Previous Nigerian studies have reported substantial variation in dropout rates, ranging from 6.3% for Penta1–Penta3 and 19.8% for BCG–MCV1 in Ogun State to 54.1% for pentavalent vaccines in Kwara State, highlighting persistent challenges in achieving full vaccination coverage.[3,19]

Globally, coverage for key antigens such as DTP3 countries where access to and completion of DTP3 and MCV1 was estimated at approximately 85% and 84%, respectively, in 2024, while lower coverage was reported for PCV3 (67%) and rotavirus vaccine (59%). Despite these achievements, approximately 14.3 million children remained zero-dose, having received no routine vaccines.[16]

In Nigeria, routine immunisation coverage has improved over time, but substantial regional disparities remain. Full immunisation coverage among children aged 12–23 months increased from 13% in 2003 to 39% in 2023–24.[11,17,18] Coverage remains higher in southern regions than in northern regions, with approximately 57% and 50% of children fully immunised in the Southeast and Southwest, respectively, compared with about 24% and 25% in the Northeast and Northwest. [11]

Facility-based studies across Nigeria further demonstrate variations in coverage and completion rates. In Ogun State, BCG, Penta1, and Penta3 coverage rates of 74.9%, 61.5%, and 57.6%, respectively, were reported, with Penta1–Penta3 and BCG–MCV1 dropout rates of 6.3% and 19.8%.3 Similarly, studies from Kwara State reported BCG and OPV coverage rates of 84.1% and 86.9%, respectively, but measles coverage of only 13.1%, full immunisation of 19.6%, and pentavalent dropout of 54.1%.19 Community-based studies from southeastern Nigeria have reported substantially higher full immunisation coverage of 78.9%.[20] These findings highlight persistent inequities in immunisation access and continuity of care across the country.

Although several Nigerian studies have examined immunisation coverage and determinants of incomplete vaccination, relatively few have explored temporal patterns of vaccine uptake and dropout using routine facility data over multiple years. Assessing temporal trends is important because it enables programme managers to identify changes in service utilisation, detect periods of declining performance, monitor recovery following disruptions, and evaluate continuity of care over time. Monitoring vaccine coverage and dropout rates also provides important information on programme performance, service continuity, and follow-up effectiveness. It can guide targeted interventions to improve vaccination completion

and reduce the risk of vaccine-preventable diseases.[13,15] Understanding these patterns is particularly important in settings where health service disruptions, population mobility, and access barriers may affect vaccine uptake over time.

This study therefore evaluated routine childhood immunisation coverage and dropout rates among children aged 0–23 months attending the Family Health Unit of the University of Port Harcourt Teaching Hospital between 2022 and 2025, and identified vaccines with consistently high uptake.

METHODOLOGY

Study Setting

The study was conducted at the Family Health Clinic, a unit of the Department of Community Medicine at the University of Port Harcourt Teaching Hospital (UPTH). The facility serves five communities located within Obio/Akpor and Ikwerre Local Government Areas of Rivers State. The estimated catchment population for 2022, 2023, 2024, and 2025 was 10,496, 10,496, 10,025, and 10,364, respectively. Based on the National Primary Health Care Development Agency's target population projection of children aged less than one year, which constitutes approximately 4% of the total population, the estimated under-one population was 420 in 2022 and 2023, 401 in 2024, and 415 in 2025. Corresponding monthly immunisation targets were estimated at 35 children in 2022 and 2023, 33 children in 2024, and 35 children in 2025.

The clinic provides maternal, newborn, and child health services, including routine immunisation, nutritional counselling, growth monitoring, and health education. Immunisation services are provided from Monday to Friday, with administration of both birth-dose and scheduled vaccines in accordance with the National Programme on Immunisation schedule. The facility maintains standard cold-chain equipment for vaccine storage and uses paper-based immunisation registers for routine documentation.

Study Design

This study was a retrospective descriptive review of immunisation records maintained at the Family Health Clinic, University of Port Harcourt Teaching Hospital, between January 2022 and December 2025.

Study Population

The study population comprised all children aged 0-23 months who received at least one routine vaccine at the Family Health Clinic, University of Port Harcourt Teaching Hospital, between January 2022 and December 2025.

Sample Size and Sampling Technique

A census of all eligible immunisation records documented at the Family Health Clinic, University of Port Harcourt Teaching Hospital, between January 2022 and December 2025 was conducted. A total of 37,685 immunisation visits were analysed.

Data Source and Data Collection

Data were extracted from the National Immunisation Register maintained by the Family Health Unit, University of Port Harcourt Teaching Hospital (UPTH). The register contains records of vaccines administered, including demographic information, vaccine type, and vaccination dates. The dataset comprised immunisation visit records and did not represent unique children, as individual children could contribute multiple vaccination visits during the study period.

The review covered vaccines included in the national immunisation schedule, including Bacillus Calmette-Guérin (BCG), Oral Polio Vaccine (OPV), Hepatitis B birth dose (HBV0), Pentavalent vaccine (Penta1–Penta3), Pneumococcal Conjugate Vaccine (PCV), Rotavirus vaccine, Inactivated Polio Vaccine (IPV), Measles vaccine, Yellow Fever vaccine, and Meningococcal A vaccine.

Data were extracted manually by trained Family Health Unit staff using a structured data extraction form to ensure consistency and minimise errors. The extracted data were entered into Microsoft Excel 365 and subsequently checked for completeness and internal consistency. Duplicate and incomplete records were excluded where identified.

Data Analysis

Data were cleaned and analysed using Microsoft Excel 365. Descriptive statistics such as frequencies and percentages were used to summarise immunisation coverage rates for each vaccine and year.

Administrative coverage was calculated using the projected target population of children under 1 year in the catchment area.

Although the study population included children aged 0–23 months, the under-one population was used as the denominator for administrative coverage calculations in accordance with routine immunisation programme practice. Children older than 12 months were included because the review also assessed uptake of the measles booster dose, which is administered at 15 months of age.

Coverage (%) = (Number of doses administered / target population) × 100

Coverage estimates were interpreted cautiously, as they were based on facility-level administrative data and could exceed 100% due to cross-facility utilisation and mismatches between catchment population estimates and actual service utilisation. Dropout rates were calculated as:

- Penta dropout = (Penta1 − Penta3) / Penta1 × 100
- BCG-measles dropout = (BCG − Measles) / BCG × 100

Analysis was descriptive, and no inferential statistical tests were applied.

ETHICAL CONSIDERATIONS

Ethical approval for this review was obtained from the University of Port Harcourt Teaching Hospital Research and Ethics Committee. (Approval number: UPTH/ADM/90/S.11/VOL.XI/2075). Permission to access the immunisation registers was sought from the Heads of the Community Medicine Department and Family Health Unit. All data were anonymised and used strictly for academic purposes, ensuring confidentiality and compliance with institutional ethical standards.

RESULTS

The analysis included all eligible immunisation visit records for children aged 0–23 months who received at least one routine vaccine at the Family Health Clinic, University of Port Harcourt Teaching Hospital, between January 2022 and December 2025. Over the four years studied, a total of 37,685 immunisation visits were recorded, comprising 8,042 visits in 2022, 10,528 in 2023, 10,160 in 2024, and 8,955 in 2025.

Across the study period, the sex distribution remained fairly balanced, with a slight predominance of female children. Overall, males accounted for 17,570 (46.6%) of visits, while females accounted for 20,115 (53.4%), as presented in Table 1.

Table 1. Sex distribution of immunisation visit records.

Sex	2022 n (%)	2023 n (%)	2024 n (%)	2025 n (%)	Total n (%)
Male	3,687 (45.8)	5,057 (48.0)	4,753 (46.8)	4,073 (45.5)	17,570 (46.6)
Female	4,355 (54.2)	5,471 (52.0)	5,407 (53.2)	4,882 (54.5)	20,115 (53.4)
Total	8,042 (100.0)	10,528 (100.0)	10,160 (100.0)	8,955 (100)	37,685 (100.0)

Administrative Vaccine Coverage Estimates (2022–2025)

Administrative coverage estimates are presented in Table 2. Coverage levels varied across antigens and over time. A general pattern was observed. The coverage declined in 2023 relative to 2022, increased in 2024, and subsequently decreased in 2025, although values for most antigens remained higher than those recorded in 2023.

This pattern was evident among vaccines administered at birth and during early infancy. BCG coverage declined from 173% in 2022 to 133% in 2023, increased to 159% in 2024, and decreased to 121% in 2025. Similar trends were observed for OPV0 and HBV0. Penta1 coverage followed a comparable pattern, declining from 162% in 2022 to 118% in 2023, increasing to 147% in 2024, and falling to 120% in 2025.

Greater fluctuations were observed among some vaccines introduced later in infancy. Rota1 coverage increased markedly from 43% in both 2022 and 2023 to 117% in 2024 before declining slightly to 118% in 2025. Similarly, IPV1 administrative coverage estimates increased from 69% in 2022 and 47% in 2023 to 145% in 2024, before declining to 97% in 2025.

For vaccines administered at nine months, changes were less pronounced. Measles coverage declined from 129% in 2022 to 99% in 2023, increased to 100% in 2024, and decreased slightly to 95% in 2025.

Yellow fever vaccination followed a similar pattern. Coverage for the CSM (MenA) vaccine declined from 128% in 2022 to 81% in 2024, then increased modestly to 90% in 2025.

Overall, the findings indicate reduced coverage in 2023, improvement across most antigens in 2024, and a subsequent decline in 2025.

Table 2: Annual administrative immunisation coverage estimates by antigen

Vaccine	2022 n (%)	2023 n (%)	2024 n (%)	2025 n (%)
BCG	727 (173)	559 (133)	637 (159)	501 (121)
OPV0	585 (139)	559 (133)	637 (159)	501 (121)
HBV0	727 (173)	559 (133)	589 (147)	452 (109)
Penta1	679 (162)	497 (118)	589 (147)	488 (120)
OPV1	527 (125)	497 (118)	649 (162)	507 (122)
Rota1	180 (43)	180 (43)	469 (117)	488 (118)
PCV1	679 (162)	497 (118)	591 (147)	487 (117)
IPV1	290 (69)	197 (47)	581 (145)	401 (97)
Penta2	554 (132)	428 (102)	431 (107)	405 (98)
OPV2	445 (106)	428 (102)	492 (123)	423 (102)
PCV2	421 (100)	295 (70)	441 (110)	405 (98)
Rota2	28 (7)	28 (7)	407 (101)	339 (82)
Penta3	608 (145)	456 (109)	445 (111)	445 (107)
OPV3	475 (113)	456 (109)	489 (122)	451 (109)
PCV3	608 (145)	456 (109)	446 (111)	444 (107)
IPV2	335 (80)	249 (59)	447 (111)	358 (86)
Rota3	40 (10)	40 (10)	361 (90)	451 (109)
Measles	540 (129)	416 (99)	399 (100)	396 (95)
Yellow fever	538 (128)	416 (99)	394 (98)	390 (94)
CSM (MenA)	538 (128)	416 (99)	326 (81)	372 (90)
Measles booster	305 (73)	240 (57)	312 (78)	241 (58)

Note: Values represent administrative coverage estimates based on projected target populations of children aged <1 year. Coverage may exceed 100% due to cross-facility utilisation and discrepancies between target population estimates and actual service utilisation.

Distribution of Administered Vaccine Doses by Antigen and Year, UPTH (2022–2025)

As shown in Table 3 and Figure 1, vaccines administered at birth and in early infancy accounted for the largest proportion of immunisation visits throughout the study period. BCG remained the most frequently administered vaccine, accounting for 727 doses (9.0%) in 2022, 559 (5.3%) in 2023, 637 (6.3%) in 2024, and 501 (5.6%) in 2025.

OPV0 and HBV0 followed similar patterns, each contributing approximately 5% to 9% of total vaccinations across the study years. First doses of Penta, OPV, and PCV also recorded relatively high uptake. For example, Penta1 accounted for 679 doses (8.4%) in 2022 and 488 doses (5.5%) in 2025, with intermediate values observed in 2023 and 2024.

In contrast, vaccines administered later in infancy accounted for a smaller proportion of total vaccine doses. Measles and yellow fever vaccines each accounted for approximately 4% to 7% of administered doses annually, while the measles booster consistently contributed the smallest proportion, ranging from 2.3% to 3.8%.

The findings indicate that vaccines administered at birth and during early infancy consistently accounted for the largest share of immunisation visits throughout the study period.

Table 3: Distribution of Administered Vaccine Doses by Antigen and Year (2022–2025)

Vaccine	2022 n (%)	2023 n (%)	2024 n (%)	2025 n (%)
BCG	727 (9.0)	559 (5.3)	637 (6.3)	501 (5.6)
OPV0	585 (7.3)	559 (5.3)	637 (6.3)	501 (5.6)
HBV0	727 (9.0)	559 (5.3)	589 (5.8)	452 (5.0)
Penta1	679 (8.4)	497 (4.7)	589 (5.8)	488 (5.5)
OPV1	527 (6.6)	497 (4.7)	649 (6.4)	507 (5.8)
Rota1	180 (2.2)	180 (1.7)	469 (4.6)	488 (5.5)
PCV1	679 (8.4)	497 (4.7)	591 (5.8)	487 (5.4)
IPV1	290 (3.6)	197 (1.9)	581 (5.7)	401 (4.5)
Penta2	554 (6.9)	428 (4.1)	431 (4.2)	405 (4.5)
OPV2	445 (5.5)	428 (4.1)	492 (4.8)	423 (4.7)
PCV2	421 (5.2)	295 (2.8)	441 (4.3)	405 (4.5)
Rota2	28 (0.3)	28 (0.3)	407 (4.0)	339 (3.8)
Penta3	608 (7.6)	456 (4.3)	445 (4.4)	445 (5.0)
OPV3	475 (5.9)	456 (4.3)	489 (4.8)	451 (5.0)
PCV3	608 (7.6)	456 (4.3)	446 (4.4)	444 (5.0)
IPV2	335 (4.2)	249 (2.4)	447 (4.4)	358 (4.0)
Rota3	40 (0.5)	40 (0.4)	361 (3.6)	451 (5.0)
Measles vaccine	540 (6.7)	416 (4.0)	399 (3.9)	396 (4.4)
Yellow fever vaccine	538 (6.7)	416 (4.0)	394 (3.9)	390 (4.4)
CSM (MenA) vaccine	538 (6.7)	416 (4.0)	326 (3.2)	372 (4.2)
Measles booster	305 (3.8)	240 (2.3)	312 (3.1)	241 (2.7)

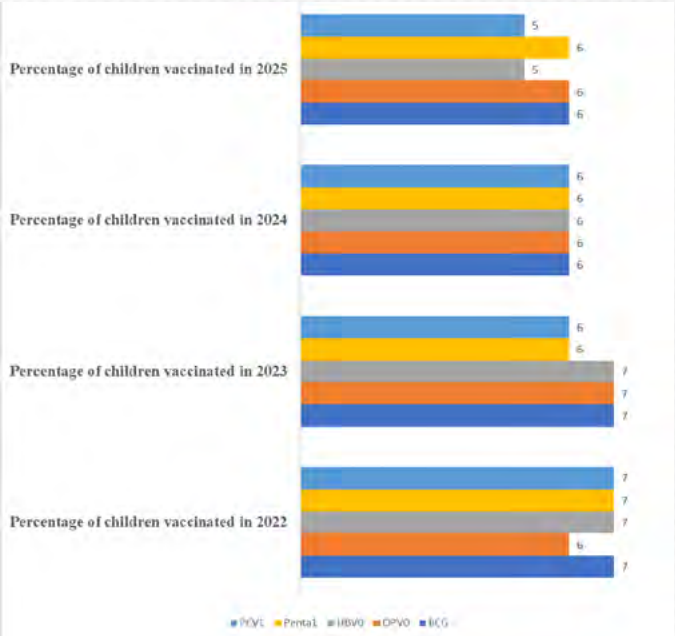

Figure 1. Vaccines accounting for the highest proportions of administered doses by antigen, UPTH (2022–2025).

PENTA1-PENTA3 dropout rates

Monthly dropout rates between Penta1 and Penta3 are presented in Figure 2 and varied across the study period.

In 2022, dropouts ranged from 4% to 26%, with lower values early in the year and intermittent increases around mid-year. In 2023, rates were generally lower and more stable, ranging from 5% to 15%, with most months clustering between 6% and 8%.

In contrast, 2024 showed greater variability, with dropout ranging from 3% to 44%, including notable peaks in April and December. In 2025, rates ranged from approximately 6% to 27%, indicating some improvement compared with 2024, although variability remained higher than in 2023. Overall, retention between Penta1 and Penta3 appeared acceptable but inconsistent over time.

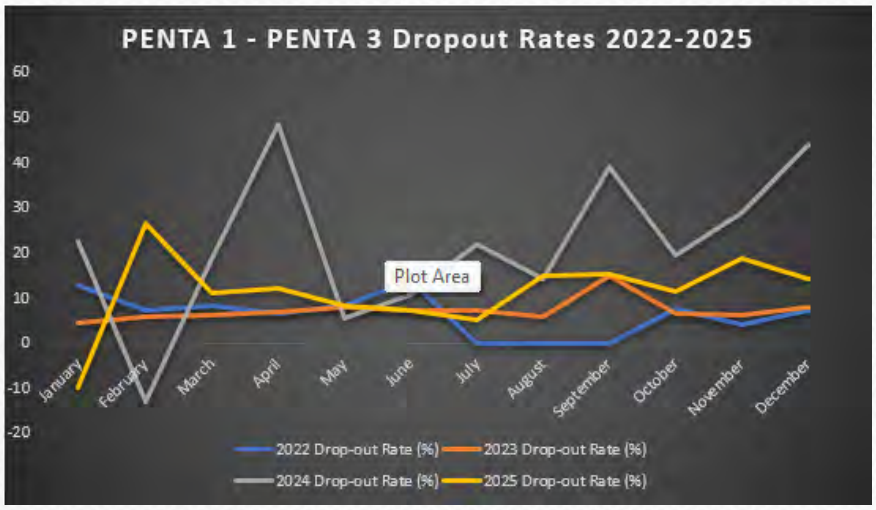

Figure 2: Monthly Penta1–Penta3 administrative dropout estimates

BCG-measles dropout rates

Figure 3 presents the monthly dropout between BCG and measles vaccination. Compared with Penta dropout, values were higher and more variable across all years.

In 2022, dropouts ranged from -8% to 54%, with several months exceeding 40%. In 2023, variability persisted, with values ranging from -34% to 61%. Similarly, in 2024, dropout remained elevated, ranging from -6% to 62%.

In 2025, wider extremes were observed, with values ranging from -93% to 61%. Negative dropout values were recorded in several months, indicating higher measles vaccination rates than BCG vaccination rates during those periods. Overall, dropout between BCG and measles remained unstable throughout the study period.

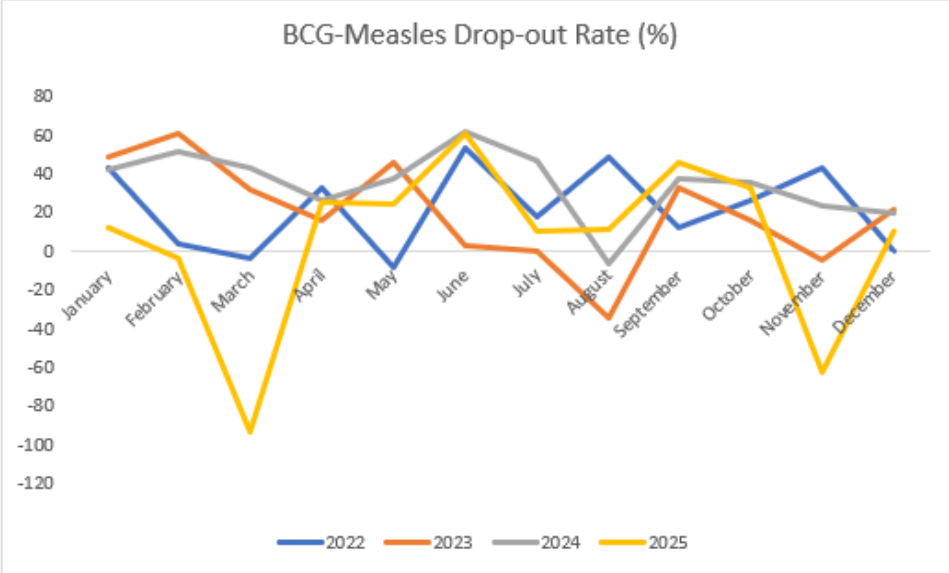

Figure 3: Monthly BCG–Measles administrative dropout estimates

DISCUSSION

This study aimed to review routine childhood immunisation coverage and dropout rates among children aged 0-23 months who received vaccines at the Family Health Unit of the University of Port Harcourt Teaching Hospital (UPTH) between 2022 and 2025.

Administrative coverage remained high across the study period, although fluctuations were evident. Coverage declined in 2023, levels increased in 2024 and remained higher than in 2023, then decreased in 2025, suggesting some instability in service utilisation over time.

While these shifts may indicate temporary disruptions or changes in access, they do not appear to reflect a sustained decline in demand. Coverage levels exceeded national targets and are broadly aligned with ongoing efforts to improve immunisation uptake across sub-Saharan Africa.[11,21]

Vaccines administered early in life, including BCG, OPV0, OPV1, HBV0, and Penta1, consistently recorded high uptake, despite year-to-year variation. Although administrative coverage estimates declined in 2023, levels increased in 2024 and remained higher than 2023 values in 2025. In contrast, vaccines administered later in infancy, particularly rotavirus and inactivated polio vaccines, showed greater variability. However, this recovery was not fully sustained in 2025, as declines in administrative coverage estimates were observed across several antigens. These declines may reflect the influence of contextual factors affecting access to immunisation services during the period, including ongoing road construction and other operational challenges.

When considered alongside findings from other parts of Nigeria, uptake at UPTH appeared comparatively higher. In Ogun State, BCG, Penta1, and Penta3 coverage rates of 74.9%, 61.5%, and 57.6%, respectively, were reported, with Penta1–Penta3 and BCG–MCV1 dropout rates of 6.3% and 19.8%. Similarly, a study in Kwara State reported BCG and OPV coverage rates of 84.1% and 86.9%, respectively, while measles coverage was 13.1%, and pentavalent dropout reached 54.1%.3,19 Although direct comparisons should be interpreted cautiously because of differences in study settings and denominator estimation, these findings support the observation that uptake of early vaccines is generally higher than completion of later scheduled doses. In contrast, community-based data from Enugu reported full immunisation coverage of 78.9%, which may reflect differences in study design, population characteristics, and access to services.[20]
At the national level, full immunisation coverage among Nigerian children aged 12–23 months increased from 13% in 2003 to 39% in 2023–2024, although substantial regional disparities remain.11,17,18 Coverage is considerably higher in the Southeast and Southwest, where approximately 57% and 50% of children are fully the Northeast and Northwest, respectively.[11] The administrative coverage estimates observed in this study were higher than many population-based estimates and should therefore be interpreted cautiously. Unlike survey-based measures of full immunisation coverage, these estimates reflect facility-level service utilisation. They may have been influenced by factors such as cross-facility utilisation, denominator estimation, and the characteristics of a tertiary urban facility with relatively consistent service availability. Within the wider sub-Saharan African context, where approximately 14.3 million children remain unvaccinated, and coverage for key antigens remains uneven, facility-level performance may not necessarily mirror population-level trends.16 The UPTH's high coverage may reflect characteristics of this tertiary facility setting, where higher and more consistent service availability may support sustained immunisation uptake even after temporary disruptions.[11,13,16-18]

Globally, recovery of routine immunisation services following the COVID-19 pandemic has been uneven, with slower progress reported in many low-income settings.16,21 The rebound in immunisation coverage observed at UPTH between 2023 and 2024, therefore, represents a meaningful local contribution to efforts to restore and strengthen routine immunisation services. However, this recovery was not fully sustained in 2025, as declines in administrative coverage estimates were observed across several antigens. Programmatically, the finding that overall coverage remained high despite antigen-specific fluctuations highlights the potential importance of reliable vaccine supply chains, effective appointment tracking, and defaulter tracing within tertiary health facilities. These findings provide context for examining patterns of vaccine completion and dropout among children who initiate immunisation at UPTH.

Vaccines administered at birth and during early infancy accounted for the largest proportion of immunisation visits throughout the study period. This pattern has been reported in other Nigerian settings and is often associated with higher rates of facility-based delivery, improved caregiver awareness, and more consistent access to services. This concentration indicates sustained utilisation of immediate postnatal immunisation

services and suggests that most newborns presenting to the facility received timely birth doses.[3,18,19]. These findings contrast with reports from northern Nigeria, where early vaccine uptake remains lower due to insecurity, structural barriers, and lower rates of institutional delivery. [11]

By contrast, vaccines scheduled later in infancy and early childhood accounted for a smaller share, suggesting challenges in maintaining sustained engagement over time. Similar declines in uptake with increasing intervals between vaccine doses have been documented in other sub-Saharan African and global settings.[13,16]

The consistently high uptake of birth-dose vaccines underscores a key strength of service delivery at UPTH, specifically the effective integration of immunisation into childbirth and early postnatal care. The practice of administering vaccines in postnatal wards by Family Health Unit nurses reduces barriers related to postpartum discomfort and mobility, thereby minimising delays in birth-dose vaccination that might otherwise occur if mothers were required to attend the immunisation clinic separately.

Dropout between Penta1 and Penta3 was slightly above the recommended 10% threshold in 2022, but improved in 2023, then increased again in 2024 and showed some improvement in 2025. This pattern may indicate that while initial access to vaccination services was maintained, continuity of care was less consistent during certain periods. The occurrence of negative dropout values in some months likely reflects children completing vaccination at the facility after initiating elsewhere, a phenomenon observed in similar settings. [3]

Several contextual factors could plausibly have influenced these patterns. Constraints related to physical access, including increased transport costs and other barriers, may have affected caregivers' ability to return for subsequent visits. In addition, seasonal factors, such as rainfall and population movements during holiday periods, may have contributed to fluctuations in attendance.
This pattern may reflect flexible service access, in which caregivers complete vaccination schedules at different health facilities. Such cross-facility utilisation may help to sustain coverage, particularly during periods of service disruption.

Comparable associations between access barriers and immunisation dropout have been reported in other Nigerian, sub-Saharan African, and global studies.[11,16, 19]

These findings highlight the need to strengthen continuity of care by better integrating immunisation tracking with birth registration systems, alongside improved appointment reminders and defaulter tracing. Targeted catch-up sessions and outreach services for children facing access constraints are also essential to ensure completion of multi-dose vaccine schedules.

Dropout between BCG and measles vaccination was consistently higher and more variable than that observed for Penta1-Penta3. This may reflect the longer interval between these vaccines, which can make sustained engagement more difficult. Similar findings have been reported in Nigeria and other sub-Saharan African settings, where incomplete follow-up and gaps in reminder systems contribute to incomplete vaccination schedules. [3,11,19,22-24]

Evidence from other regions, such as West Cameroon and other sub-Saharan African settings, also suggests that longer vaccination intervals are associated with increased dropout. [25,26] Globally, such patterns mirror persistent inequities in sustained engagement with routine immunisation services despite high initial contact. [16]

Collectively, these findings suggest that while initial uptake of routine immunisation services appears relatively strong in this setting, maintaining engagement across the full vaccination schedule remains a challenge.

Limitations

This study was based on facility-level routine immunisation data and may not reflect population-level immunisation coverage. Administrative coverage estimates depended on the accuracy of target population estimates and could exceed 100% because of cross-facility utilisation and differences between projected catchment populations and actual service utilisation. The dataset comprised immunisation visit records rather than unique children, as individual children could contribute multiple vaccination visits during the study period. Also, dropout estimates were derived from aggregate routine immunisation data rather than

cohort follow-up of individual children and should therefore be interpreted as administrative programme indicators. Cross-facility utilisation and population mobility may also have influenced both coverage and dropout estimates, leading to negative dropout values in some months. Information on factors that may influence immunisation uptake, such as vaccine availability, access-related challenges, transport difficulties, health system disruptions, and other contextual influences, was not available within the routine register data. Finally, the descriptive nature of the study precluded inferential analysis and limited the ability to draw causal inferences.

Conclusion

Facility administrative immunisation coverage estimates at UPTH remained generally high between 2022 and 2025, although variation was observed across years. Because several administrative coverage estimates exceeded 100%, the findings should be interpreted as indicators of facility-level service utilisation rather than true population coverage. Vaccines administered at birth and during early infancy accounted for the largest share of administered doses, whereas uptake of later vaccines and completion of multi-dose schedules were less consistent. Penta1–Penta3 dropout remained relatively low but variable, while BCG–measles dropout was generally higher. Strengthening follow-up mechanisms, defaulter tracking, and continuity of care may improve completion of routine immunisation schedules.

LIST OF ABBREVIATIONS

- BCG - Bacillus Calmette-Guérin
- CDC - Centres for Disease Control and Prevention
- CSM - Cerebrospinal Meningitis (Vaccine)
- DHS - Demographic and Health Survey
- DPT - Diphtheria, Pertussis, and Tetanus
- DTaP / DTP - Diphtheria, Tetanus, and Pertussis
- EPI - Expanded Programme on Immunization
- FMOH - Federal Ministry of Health
- FMoHSW - Federal Ministry of Health and Social Welfare
- GAVI - Global Alliance for Vaccines and Immunization
- HBV0 / HepB0 - Hepatitis B Birth Dose
- Hib - Haemophilus influenzae type b
- HPV - Human Papillomavirus
- IPV - Inactivated Polio Vaccine
- LGAs - Local Government Areas
- MCV - Measles-Containing Vaccine
- MCV1 - First Dose of Measles-Containing Vaccine
- MCV2 - Second Dose of Measles-Containing Vaccine
- MenAfriVac - Meningococcal A Conjugate Vaccine
- MMWR - Morbidity and Mortality Weekly Report
- NDHS - Nigeria Demographic and Health Survey
- NPHCDA - National Primary Health Care Development Agency
- NPI - National Programme on Immunization
- NSIPSS - Nigeria Strategy for Immunisation and PHC System Strengthening
- OPV - Oral Polio Vaccine
- OPV0 - Oral Polio Vaccine, Zero Dose
- PCV - Pneumococcal Conjugate Vaccine
- PHC - Primary Health Care
- Penta - Pentavalent Vaccine (Diphtheria, Pertussis, Tetanus, Hepatitis B, and Haemophilus influenzae type b)
- RI - Routine Immunisation
- Rota - Rotavirus Vaccine
- UPTH - University of Port Harcourt Teaching Hospital
- WHO - World Health Organization
- ZDLH - Zero-Dose Learning Hub

FUNDING

The authors received no specific grant from any funding agency in the public, commercial, or non-profit sectors.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENT

The authors acknowledge the staff of the Family Health Unit, Department of Community Medicine, University of Port Harcourt Teaching Hospital, for their support during data collection and record retrieval.

AUTHOR CONTRIBUTIONS

Conceptualization: NCB, AIE, ALU, UCA; Data collection: UCA; Data analysis: AIE; Writing: NCB, AIE, ALU; Review and Editing: NCB. All Authors approved the final draft.

REFERENCES

1. Lubanga AF, Bwanali AN, Kangoma M, Matola Y, Moyo C, Kaonga B, et al. Addressing the re-emergence and resurgence of vaccine-preventable diseases in Africa: a health equity perspective. Hum Vaccin Immunother. 2024;20(1):2375081. doi:10.1080/21645515.2024.2375081.

2. Islam MR, Rahman MM, Rahman MS, Abe SK, Akmatov MK, Hashizume M. Trends and projections of age-appropriate vaccination coverage in 41 low- and middle-income countries in Asia and sub-Saharan Africa, 2000-2030. Front Public Health. 2024; 12:1-11.

3. Temitayo-Oboh AO, Adegbola AA, Dedeke IOF, Adeniyi MA, Soyannwo T, Ajewole GA, et al. Immunization coverage among children aged 0-23 months at a tertiary hospital in southwestern Nigeria: a retrospective study. Babcock Univ Med J. 2023;6(1):1-8.

4. Federal Ministry of Health. Nigeria Strategy for Immunisation and PHC System Strengthening (NSIPSS). Abuja: FMOH; 2018.

5. World Health Organization. Immunization Agenda 2030. Geneva: WHO; 2022. Available from: https://www.who.int/immunization/ia2030. Accessed 2026 Jun 29.

6. Montin D, Santilli V, Beni A, Costagliola G, Martire B, Mastrototaro MF, et al. Towards personalized vaccines. Front Immunol. 2024; 15:1-11.

7. Obionu C. Guide to tropical public health and community medicine. Enugu: Ezu Books Limited; 2018.

8. Oladepo O, Dipeolu IO, Oladunni O. Outcome of reminder text message intervention on completion of routine immunization in rural Nigeria. Health Promot Int. 2021;36(3):765-773.

9. World Health Organization. Summary of WHO position papers: recommended routine immunizations for children. Geneva: WHO; 2025. Available from: https://cdn.who.int/media/docs. Accessed 2026 Jun 29.

10. World Health Organization. Essential Programme on Immunization. Geneva: WHO; 2025. Available from: https://www.who.int/teams/immunization-vaccines-and-biologicals/essential-programme-on-immunization. Accessed 2026 Jun 29.

11. Gavi. Nigeria zero-dose situation analysis. Geneva: Gavi; 2023. Available from: https://zdlh.gavi.org. Accessed 2026 Jun 29.

12. Abhay BM. Immunization dropout rates: some issues. Ann Med Health Sci Res. 2015;5(2):153-154.

13. Jones CE, Danovaro-Holliday MC, Mwinnyaa G, Gacic-Dobo M, Francis L, Grevendonk J, et al. Routine vaccination coverage worldwide, 2023. MMWR Morb Mortal Wkly Rep. 2024;73(43):978-984.

14. Kuuyi A, Kogi R. Factors contributing to immunization coverage among children under five years in Ghana. PLOS Glob Public Health. 2024;4(8): e0002881.

15. Shiferie F, Gebremedhin S, Andargie G, Tsegaye DA, Alemayehu WA, Mekuria LA, et al. Vaccination dropout and wealth-related inequality among children aged 12-35 months in Ethiopia. Front Pediatr. 2023; 11:1-11.

16. World Health Organization. Immunization coverage: key facts. Geneva: WHO; 2025. Available from: https://www.who.int/news-room/fact-sheets/detail/immunization-coverage. Accessed 2026 Jun 29.

17. National Bureau of Statistics. Integrated post-campaign coverage survey 2024. Abuja: NBS; 2025. Available from: https://microdata.nigerianstat.gov.ng. Accessed 2026 Jun 29.

18. National Population Commission (NPC) [Nigeria], Federal Ministry of Health, and ICF. Nigeria Demographic and Health Survey 2023–24: Key Indicators Report. Abuja, Nigeria, and Rockville, Maryland, USA: NPC, FMOH, and ICF; 2024. Available from: https://www.dhsprogram.com. Accessed 2026 Jun 29.

19. Olakunmi OO, Shola AI. Assessment of zero-dose, under-immunized, and dropout children in

Ifelodun LGA, Kwara State, Nigeria. Texila Int J Acad Res. 2025;12(2).

20. Eze P, Agu UJ, Aniebo CL, Agu SA, Lawani LO, Acharya Y. Factors associated with incomplete immunisation in children aged 12-23 months in Nigeria. BMJ Open. 2021;11(6): e047512.

21. Simon DJ, et al. Regional, subregional, and country-level full vaccination coverage in sub-Saharan Africa. BMJ Glob Health. 2025;10(3):e018333. doi:10.1136/bmjgh-2024-018333.

22. Fajola AO, Ekanem EE, Ande BA, Usman RS, Umejiego CN. Immunization completion rates in a cottage hospital in the Niger Delta. Ann Med Health Sci Res. 2017;7(1):51-56.

23. Fatiregun AA, Nic Lochlainn L, Kaboré L, Dosumu M, Isere E, Olaoye I, et al. Missed opportunities for vaccination among children in Nigeria. PLOS ONE. 2021;16(8):e0252798.

24. Kehinde OA, Kuyinu YA, Odusanya OO. Missed opportunities for vaccination among children in Lagos. Ann Health Res. 2020;6(3). doi:10.30442/ahr. 0603-05-91.

25. Ateudjieu J, Yakum MN, Goura AP, Tembei AM, Ingrid DK, Landry BB, et al. Immunization coverage and dropout in Cameroon. BMC Public Health. 2020; 20:228.

26. Kayembe-Ntumba HC, Vangola F, Ansobi P, Kapour G, Bokabo E, Mandja BA, et al. Vaccination dropout in the Democratic Republic of Congo. Arch Public Health. 2022;80(1):10.

Figure Legends

Figure 1: Vaccines accounting for the highest proportions of administered doses by antigen, UPTH (2022–2025).

Figure 2: Monthly Penta1–Penta3 administrative dropout estimates, 2022–2025.

Figure 3: Monthly BCG–Measles administrative dropout estimates, 2022–2025.

Tables

Table 1: Sex distribution of immunisation visit records.