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Research Article

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Assessment of Essential Medicines Affordability in Primary Health Care Facilities in Southern Nigeria: "Effect of Drug Revolving Fund Performance

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Abstract

Background: *Essential medicines save lives and improve health when available, affordable, of assured quality, and used rationally. However, high medical costs remain a barrier to access and better health outcomes. This study assessed the effect of Drug Revolving Fund (DRF) performance on the affordability of essential medicines in primary health care facilities in Esan Southeast Local Government Area, Edo State, Nigeria.*

Methods: *A descriptive cross-sectional study was conducted using quantitative and qualitative approaches, following the World Health Organization/Health Action International (WHO/HAI) methodology. Prices of 27 essential medicines for common diseases and 12 key reproductive health medicines were assessed in 22 primary health care facilities. DRF operations were evaluated using a researcher-administered questionnaire. Affordability was measured against the daily wage of the lowest-paid unskilled government worker.*

Results: *The lowest-paid worker required 0.34 of a day's wage for adult malaria treatment with Artemisinin-Based Combination Therapy (ACT), compared with 0.50 for quinine. Childhood malaria treatment required 0.07 of a day's wage with ACT versus 0.43 with quinine. Only one comprehensive health center (33.3%) and two primary health centers (11.8%) had good Drug Revolving Fund (DRF) performance, while none of the health posts had a functional DRF. Facilities with better DRF performance showed greater affordability. However, currency devaluation reduced purchasing power, further constraining medicine affordability.*

Conclusion: *Essential medicines were generally affordable when measured against local wage benchmarks; however, affordability was undermined by currency devaluation and weak Drug Revolving Fund (DRF) performance. Sustaining equitable access will require strengthening DRF schemes, expanding local pharmaceutical production, and adopting financing and procurement policies that protect medicine supply from exchange rate volatility.*

Keywords: Essential Medicines, Affordability, Primary Health Care Facilities, Drug Revolving Fund

1. Introduction

Affordability is a critical determinant of access to essential medicines in primary health care, particularly in low- and middle-income countries like Nigeria [1,2]. Although the WHO's essential medicines framework emphasizes availability at a price individuals and communities can afford, Millions still face financial barriers to accessing needed drugs [1]. In Nigeria, weak public financing for health, high out-of-pocket payments, and the absence of functional health insurance for the poor have made medicines financially inaccessible for large segments of the population [3]. The Drug

Revolving Fund (DRF) was introduced through the Bamako Initiative as a sustainability mechanism to address this challenge, but it has faced criticism for placing the cost burden disproportionately on low-income patients [4-6]. Budgetary constraints, inflation-adjusted declines in drug funding, and procurement corruption have further worsened affordability [7,8]. Additionally, drug diversion and poor value-for-money procurement practices have inflated prices at the point of care, limiting the ability of PHC users to consistently access affordable treatment [9,10]. Without reforms to improve funding transparency, pricing regulation, and accountability, the financial accessibility of essential medicines in Nigeria remains severely compromised.

1.1. Statement of the Problem

In developing countries, medicines account for 25-70% of overall health care expenditure, compared to less than 10% in high-income countries. Moreover, up to 90% of the population in low- and middle-income countries pay for medicines out of pocket. Therefore, medicines are unaffordable for large sectors of the global population and major burden on the government [11].

Medicines are integral to effective health service delivery; however, when public health facilities experience stock-outs, patients are often forced to purchase their medications at significantly higher prices from community pharmacies. This situation exacerbates financial barriers and undermines equitable access to essential medicines, particularly for vulnerable populations [1].

1.2. Justification for the Study

Access to medicines to combat HIV/AIDS, malaria, and tuberculosis has improved worldwide. However, the availability of affordable essential medicines is still inadequate in both public and private sectors in Nigeria [12]. Currently, in Nigeria, there are large gaps in the availability of medicines in both public and private sectors, as well as wide variation in prices, which render essential medicines unaffordable to poor people. In the public sector, generic medicines are only available in 38.1% of facilities, and the average cost is 250% more than the international reference price. Similarly, these medicines are available in 38.1% of private sector facilities and cost on average about 610% more than the international reference price [12]. The affordability of essential medicines and supplies at every Primary Health Care system in Nigeria is critical in the nation's health care development [13]. This study looked at the affordability of essential medicines, the impact of the drug revolving fund on affordability, as it relates to the PHC essential drug service delivery to the inhabitants of Esan Southeast Local Government. This will serve as a baseline for further evaluation of the programme. Findings from this study would serve as a guide to essential drug programme managers in the local government and state, on access to essential medicines in primary health care. It will also help to draw conclusions and make recommendations to the local government health department for further health planning and intervention.

1.3. Objective of the Study

- To determine the affordability of essential medicines used in Primary Health Care facilities in Esan Southeast Local Government.
- To determine the performance of the Drug Revolving Fund in Primary Health Care Facilities in the Local Government.
- To assess the effect of Drug Revolving Fund Performance on the affordability of essential medicines.

1.4. Summary and Research Gaps

The literature indicates a growing body of evidence supporting the role of DRFs in improving access to essential medicines. However, significant gaps remain in understanding the comparative impact of DRFs on affordability across PHC levels. Further research is needed to assess long-term DRF performance in resource-constrained settings, especially regarding equity in urban-rural access and the effectiveness of pricing regulation mechanisms

2. Materials and Methods

2.1. Study Area and Population

The study was conducted in Esan Southeast Local Government Area (LGA), Edo State, southern Nigeria, which has an estimated population of 167,721 based on projections from the 2006 National Population Census [14]. The inhabitants are predominantly engaged in subsistence farming, fishing, trading, and civil service. Health services in the LGA are provided through primary and secondary health care facilities, proprietary patent medicine vendors, and traditional herbal practitioners. The primary healthcare system consists of three comprehensive health centers (≥30 beds each), 17 primary health centers (≈10 beds each), and four health posts, which provide preventive and promotive services only. Most facilities are headed by nurses/midwives, while health posts and some primary health centers are overseen by community health extension workers.

The study population included all functional primary health care facilities in the LGA. Non-functional facilities were excluded.

2.2. Study Design and Sampling

A descriptive cross-sectional design was employed. A total population survey was conducted, covering all 22 functional primary health care facilities.

2.3. Data Collection

Data was collected between 2014 and 2015 using two main tools:
1. A researcher-administered checklist to record the availability and prices of 27 tracer Essential Medicines (EMs), following the standardized World Health Organization/Health Action International (WHO/HAI) methodology [15]. Of these, 14 medicines were from the WHO/HAI core list, and the remainder were selected based on their use in the management of common diseases in the study area. For each medicine, the price of the lowest-priced generic equivalent was recorded. To measure availability, 20 priority medicines were selected from the UNICEF/Ministry of Health essential medicines list for local government drug revolving funds, grouped into those for common diseases (e.g., ACTs, salbutamol, mebendazole, amoxicillin, oral rehydration salts) and reproductive health (e.g., oxytocin, magnesium sulphate, ferrous sulphate, misoprostol).

2. A structured researcher-administered questionnaire was adapted from the national guidelines for the implementation of the drug revolving fund scheme in Nigeria to assess the management and performance of the Drug Revolving Fund (DRF) [16]. The questionnaire included items on DRF organization, committee composition, meeting frequency, supervision, drug list, procurement and monitoring systems, and reporting practices.

Affordability was assessed using the daily wage of the lowest-paid unskilled government worker, based on the prevailing minimum wage of ₦23,000 (US$116.27 at an exchange rate of ₦197.8 = US$1) per month at the time of the study. The minimum wage is now ₦70,000 (US$46.67) at an exchange rate of ₦1,500 = US$1 in 2025.

2.4. Data Analysis

Data was entered and analyzed using SPSS version 21 [17]. Continuous variables, including affordability (measured in days' wages), were tested using Analysis of Variance (ANOVA) or F-tests. Categorical variables, such as DRF performance, were assessed using Fisher's exact test. A p-value <0.05 was considered statistically significant.

2.5. Scoring of DRF Performance

Out of 21 items in the questionnaire, 15 contributed to the DRF performance score. Responses were assigned weighted scores, with a maximum possible total of 23. Facility scores were converted to percentages and categorized as poor (0–39%), fair (40–59%), or good (60–100%).

2.6. Ethical Considerations

Ethical approval was obtained from the Research Ethics Committee of Irua Specialist Teaching Hospital. Permission to conduct the study was granted by the Head of Local Government Administration and the Local Government Medical Officer of Health. Written consent was obtained from facility heads and study participants. Confidentiality of information was assured, and data was used solely for research purposes.

2.7. Limitations

The study was limited to tracer and priority essential medicines; other important medicines may have been missed. Affordability was assessed using wages from the formal sector, although many residents are engaged in informal employment. In addition, some responses may have been influenced by self-reporting bias, although facility records were checked for verification

3. Results

The assessment examined the availability, affordability, and performance of the Drug Revolving Fund (DRF) in primary health care facilities in Esan Southeast Local Government Area. Findings are summarized in the tables and figures presented below.

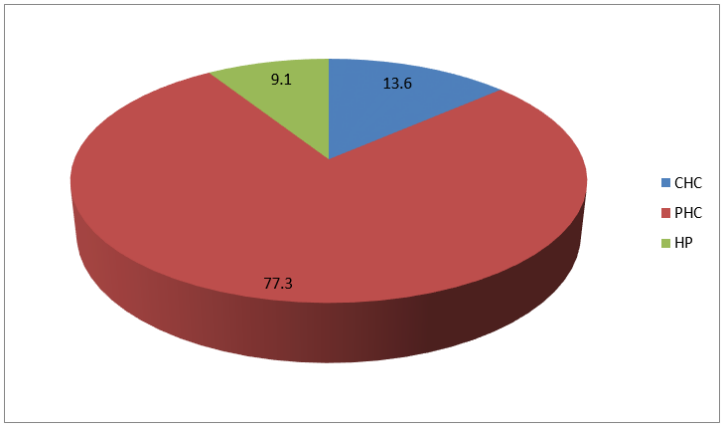

Figure: Percentage distribution of types of Primary HealthCare Facilities in Esan Southeast LGA

There were twenty-two primary healthcare facilities included in the study. Of these, 13.6% are Comprehensive Health Care (CHC), 77.3% are Primary Health Centre (PHC), and 9.1% are health post (HP), as shown in the Figure.

3.1. Affordability of Essential Medicines

	CHC	PHC	HP	F-test	p-value
SP	0.87±0.045	0.099±0.04	0.13±0.0	0.81	0.46
ACT	0 .303±0.15	0.34±0.10	0.39±0.0	0.41	0.67
Quinine	0.44±0.09	0.54±0.21	0.31`±0.25	1.29	0.30

Table 1: Cost of Treatment for Malaria in Adults

It was cheaper to treat malaria using ACT than Quinine across the health facility, though SP was more affordable compared to ACT and Quinine. The day's wages required for each treatment option, according to facility type, vary only marginally except for treatment with SP, where it was lower at the PHC.

Drug	CHC	PHC	HP	F-test	p-value
Cap Amoxicillin 500mg	0.20±0.07	0.24±0.14	0.27±0.00	0.218	0.806
Tab Erythromycin 500mg	0 .50±0.10	0.75±0.24	0.78±0.00	1.716	0.206

Table 2: Cost of Treatment for Pneumonia in Adults

Treatment of pneumonia was more affordable using amoxicillin than erythromycin, but it was more affordable at the CHC than at the PHC and HP.

	CHC	PHC	HP	F-test	p-value
Tab Metronidazole 200mg	0.07±0.012	0.09±0.026	0.11±0.00	1.471	0.255
Cap Tetracycline 250mg	0 .10±0.04	0.12±0.03	0.16±0.00	2.188	0.140

Table 3: Cost of Treatment for Diarrhoea in Adults

Treatment with Tetracycline and Metronidazole vary only marginally according to type of facility being more affordable at the CHC, followed by PHC then the HP. Also, it was cheaper to treat diarrhoea with Metronidazole200mg than with tetracycline 250mg.

	CHC	PHC	HP	F-test	p-value
Fersolate 200mg	0.12±0.00	0.14±0.06	0.12±0.00	0.251	0.780
Folic Acid 5mg	0 .04±0.00	0.04±0.01	0.04±0.00	0.135	0.875

Table 4: Cost of Treatment for Anaemia in Adults

The mean day's wage for treatment of anaemia using Fersolate vary only slightly across all the health facilities except at the HP where it was marginally higher while treatment using folic acid was the same across all the health facilities.

	CHC	PHC	HP	F-test	p-value
Methyl DOPA 250mg	0.27±0.00	0.27±0.09	0.27±0.00	0.002	0.4998
Nifedipine 20mg	0 .09±0.00	0.10±0.02	0.09±0.00	0.247	0.784

Table 5: Cost of Treatment for Hypertension in Adults

The treatment of hypertension was the same in the different types of facilities, but varied with the different treatment options. It was more affordable to manage hypertension with Nifedipine 20mg than with methyldopa 250mg.

	CHC	PHC	HP	F-test	p-value
Paracetamol 500mg	0.04±0.01	0.04±0.01	0.22±0.01	8.405	0.002
Ibuprofen 200mg	0 .07±0.06	0.04±0.01	0.04±0.00	0.457	0.640

Table 6: Cost of Treatment for Rheumatism and Joint Pains in Adults

The variation in the treatment cost using paracetamol according to the type of facility was significant (p-value<0.05), as it was far higher at the HP.

	CHC	PHC	HP	F-test	p-value
Salbutamol 4mg	0.09±0.05	0.07±0.05	0.06±0.07	0.209	0.813

Table 7: Cost of Treatment for Other ARI in Adults

The treatment of other respiratory tract infections (ARI) with Salbutamol varies only marginally and was not statistically significant.

Value*	CHC	PHC	HP	F-test	p-value
Tab Albendazole 400mg	0.06±0.00	0.06±0.00	0.06±0.00	Nil	Nil
*There was no variance between groups					

Table 8: Cost of Treatment for Helminthiasis in Adults

Value*	CHC	PHC	HP	F-test	p-value
Cap Ampiclox 500mg	0.19±0.00	0.31±0.14	0.37±0.00	1.393	0.272

Table 9: Cost of Treatment for Soft Tissue Diseases in Adults

The treatment of soft tissue diseases was more affordable in the CHC compared to PHC and HP. However, this difference was not significant (p-value=0.272).

Affordability of Treatment for Children's Disease Conditions

Value*	CHC	PHC	HP	F-test	p-value
ACT	0 .07±0.02	0.06±0.01	0.06±0.00	0.623	0.547
Quinine	0.37±0.03	0.43±0.05	0.46`±0.00	2.612	0.10

Table 10: Cost of Treatment of Malaria in Children

Treatment of malaria in children using ACT was more affordable at the health facilities compared to Quinine.

	CHC	PHC	HP	F-test	p-value
Amoxicillin 125mg/5ml	0.19±0.00	0.21±0.03	0.26±0.00	4.052	0.034
Erythromycin 125mg/5ml	0.46±0.28	0.38±0.19	0.33±0.00	0.281	0.758
P-value<0.05					

Table 11: Cost of Treatment of Pneumonia in Children

Treatment of Pneumonia in children using Amoxicillin was more affordable at the CHC and less at the HP. However, with Erythromycin, it was more affordable at the HP and less at the CHC. The variation in the cost of treatment using Amoxicillin according to facility type was significant (p<0.05) due to the higher cost recorded at the HP.

	CHC	PHC	HP	F-test	p-value
Metronidazole 200mg/5ml	0.18±0.02	0.18±0.02	0.19±0.00	0.170	0.845
ORS With Zinc	0 .28±0.08	0.28±0.09	0.33±0.00	0.304	0.742

Table 12: Cost of Treatment of Diarrhoea in Children

Treatment of childhood diarrhoea was more affordable using Metronidazole compared to ORS with zinc. Affordability of treatment according to treatment option was almost the same across facility type except with ORS and zinc was treatment was less affordable at the HP.

	CHC	PHC	HP	F-test	p-value
Cream clotrimazole	0.19±0.00	0.19±0.00	0.19±0.00	Nil	Nil
Povidone iodine	0.39±0.00	0.39±0.00	0.39±0.00	Nil	Nil
*There was no variance between groups					

Table 13: Cost of Treatment for Skin Disease in Children

	CHC	PHC	HP	F-test	p-value
Syrup Fersolate	0.19±0.00	0.20±0.05	0.19±0.00	0.135	0.875
Syrup Albendazole	0 .06±0.00	0.08±0.06	0.06±0.00	0.135	0.875

Table 14: Cost of Treatment for Anaemia in Children

Treatment of childhood anaemia with Fersolate and Albendazole was almost the same in all the facilities but marginally higher at the PHC.

	CHC	PHC	HP	F-test	p-value
Susp. Chloramphenicol	0.18±0.02	0.20±0.05	0.19±0.00	0.208	0.814
Susp. Co-trimoxazole	0 .18±0.02	0.17±0.04	0.19±0.00	0.238	0.791

Table 15: Cost of Treatment for Typhoid in Children

The mean day's wage for treatment of typhoid in children was 0.18 (SD±0.02) at the CHC, and 0.19 at the HP using Chloramphenicol and Co-trimoxazole. Treatment of typhoid in children was more affordable in CHC (required 0.18 day's wage) and less at the PHC (required 0.20 day's wage). Treatment with Co-trimoxazole was more affordable at the PHC (required 0.17 day's wage) and less at the HP (required 0.19 day's wage.)

Year	Exchange Rate (₦/ US$)	Monthly Minimum Wage (₦)	Monthly Minimum Wage (US$)	Daily Wage (₦)	Daily Wage (US$)
2015	197.8	23,000	116.46	770	3.89
2015	1,500.0	70,000	46.67	2,333.33	1.56

Table 16: Comparison of Minimum Wage and Dollar Value in Nigeria, 2015 Versus 2025

This table shows clearly that while the minimum wage increased more than threefold (₦23,000 → ₦70,000), the dollar value of wages dropped by more than half (US$116.46 → US$46.67). Again, daily affordability in US$ terms fell significantly (US$3.89/ day → US$1.56/day).

Type of facility	Grade of Good	DRF Fair	Poor	Total Number of Health Facilities (%)
CHC	1(33.3)	1(33.3)	1(33.3)	3(100)
PHC	2(11.8)	3(17.6)	12(70.6)	17(100)
HP	0(0)	0(0)	2(100)	2(100)
TOTAL	3(13.6)	4(18.2)	15(68.2)	22(100)
Fisher's Exact= 3.296, p-value=0.585				

Table 17: Performance of Drf According to Type of Facility

One out of the three CHC had a good DRF performance, one had a fair DRF performance, and one had a poor DRF performance. Out of the seventeen PHC studied, two had a good DRF performance, three had a fair DRF performance and twelve had a poor DRF performance. The two HP had a poor DRF performance. The performance of DRF was not dependent on the type of health facility (p-value=0.585).

4. Discussion

This study examined access to essential medicines in Esan South-east, Nigeria, with emphasis on affordability and the performance of the Drug Revolving Fund (DRF). Affordability was assessed using the WHO/HAI methodology, which measures the number of days' wages of the lowest-paid unskilled government worker required to purchase a standard course of treatment [15]. This benchmark enables comparability across contexts and has been widely applied in sub-Saharan Africa. In 2015, the lowest-paid worker earned ₦770 per day (≈US$3.89 at ₦197.8/US$1). Treatment of adult malaria with Artemisinin-Based Combination Therapy (ACT) costs 0.34 of a day's wage, while treatment with quinine requires 0.50 of a day's wage. Childhood malaria treatment required 0.07 of a day's wage with ACT and 0.43 with quinine. On average, adult and child treatments required 0.21 and 0.23 of a day's wage, respectively. These values indicate affordability within the WHO/

HAI threshold of less than one day's wage [15,18]. Comparable studies have reported less favorable findings. In Ghana, treatment of adult conditions required 1.67 days' wages and malaria treatment 1.3 days' wages 19, while in Sudan, malaria treatment required 0.62 of a day's wage [19,20]. Medicines in Esan Southeast were therefore more affordable than in these contexts, likely reflecting subsidies applied to medicines in primary health facilities.

However, the apparent affordability in naira terms must be interpreted with caution due to currency devaluation. By 2025, although the minimum wage had increased to ₦70,000/month (≈₦3,182/day), the exchange rate had depreciated to ₦1,500/US$1, reducing real daily wages to US$2.12. If medicine prices adjust to reflect international procurement costs pegged to the dollar, the affordability advantage would erode. For example, the 2015 cost of ACT (≈US$1.33) would translate to about ₦2,000 in 2025, representing 0.63 of a day's wage, compared with 0.34 in 2015. Thus, while nominal wage increases suggest improved affordability in naira, exchange rate volatility undermines real affordability, especially for medicines reliant on imported inputs. Similar dynamics have been reported in Ghana, Kenya, and Tanzania, where currency instability has directly reduced household purchasing power for medicines [21,22]. The weak performance of the DRF further compounds this problem. Only one of three Comprehensive Health Centers (33.3%) and two of 17 Primary Health Centers (11.8%) had functional DRFs, while none of the Health Posts operated such schemes. Overall, 68.2% of facilities had poor DRF performance due to non-operational systems. Evidence from Nigeria and other African countries indicates that well-governed DRFs help buffer against cost shocks, stabilize supply, and sustain affordability [23-25]. Conversely, weak DRFs, as observed here, increase vulnerability to exchange rate–driven price escalation and stock-outs. Together, these findings highlight the fragility of medicine affordability in Nigeria. While subsidized pricing and local wage assessments suggest treatments are affordable, the broader context of exchange rate depreciation and weak DRF systems threatens sustainability. Strengthening DRF governance, improving local pharmaceutical production, and adopting procurement policies that mitigate forex exposure will be essential to protect equitable access to essential medicines.

5. Conclusion

In Esan Southeast, essential medicines were affordable in 2015 when measured against the WHO/HAI benchmark, with all treatments costing less than one day's wage. However, by 2025, the sharp depreciation of the naira reduced real wages in dollar terms, eroding this apparent affordability and exposing Nigeria's dependence on imported medicines. Weak performance of Drug Revolving Fund schemes further limited the capacity of health facilities to buffer against foreign exchange shocks, increasing the risk of stock-outs and cost escalation. Sustaining equitable access to essential medicines will require a multipronged approach: strengthening DRF governance, expanding local pharmaceutical production, and adopting procurement and pricing policies that reduce exposure to currency volatility. Without these systemic reforms, the affordability gains observed in local wage terms will remain fragile, and access to essential medicines will continue to be jeopardized by external economic shocks.

Policy Implications

- **Mitigate Exchange Rate Impact:** Establish pricing and subsidy mechanisms that shield essential medicines from currency depreciation to protect affordability.
- **Boost Local Production:** Expand domestic manufacturing capacity for priority medicines to reduce import dependency.
- **Revitalize Drug Revolving Funds (DRFs):** Ensure functional DRFs in all primary health facilities with strong accountability and monitoring systems.
- **Align Wages with Medicine Prices:** Link minimum wage reviews to medicine affordability benchmarks to sustain access for low-income populations.
- **Subsidize Critical Medicines:** Provide targeted subsidies for antimalarials, maternal and child health medicines, and other life-saving drugs.
- **Adopt Regional Pooled Procurement:** Leverage ECOWAS or AU mechanisms to secure stable prices and supply chains for essential medicines.
- **Expand Health Financing Coverage:** Integrate essential medicines into community-based health insurance and national health financing schemes.

Declarations

Ethics Approval and Consent to Participate

Ethical approval for this study was obtained from the Irua Specialist Teaching Hospital (ISTH) ethical review committee

Ethics Approval Number: ADM/HREC/154/VOL.1/95

Availability of Data and Materials

The data supporting this study's findings is provided as an attachment to the submission.

Authors' Contributions

Ifijeh Frederick conceived the study, led the manuscript writing, and coordinated data interpretation. Bravo Otohabru contributed to the contextual interpretation of health facility operations and policy alignment. Ejiyere Harrison. O conducted the statistical analysis and contributed to the interpretation of the data. All authors read, reviewed and approved of the final manuscript.

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