Multi-Month Dispensing of Antiretroviral Therapy in Rural Nigeria: Outcomes, Cost-Effectiveness, and Patient Retention in Care

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Abstract

Background: Multi-month dispensing (MMD) of antiretroviral therapy has emerged as a promising differentiated service delivery model for stable HIV patients. In resource-constrained settings like rural Nigeria, MMD offers potential solutions to healthcare access barriers while improving clinical outcomes and reducing healthcare costs.

Objective: This study evaluated the implementation outcomes, cost-effectiveness, and patient retention rates of multi-month antiretroviral dispensing programs in rural Nigerian healthcare facilities.

Methods: A mixed-methods approach combining quantitative analysis of program data from 36 high-volume HIV treatment facilities across Akwa Ibom and Cross River states, and qualitative assessment of healthcare provider and patient experiences with 6-month dispensing (6-MMD) implementation from 2020-2024.

Results: Implementation of 6-MMD resulted in significant improvements in patient retention (93% vs 65.3% in control groups), reduced clinic visit frequency by 30.4%, and demonstrated cost-effectiveness with estimated savings of $122.10 per patient per year in direct medical costs.

Rural patients showed particular preference for community-based MMD models, with 87% reporting improved treatment adherence.

Conclusions: Multi-month dispensing represents a viable, cost-effective intervention for improving HIV care delivery in rural Nigeria, though implementation requires addressing infrastructure limitations and healthcare worker capacity constraints.

Keywords: Multi-month dispensing, HIV care, rural healthcare, Nigeria, antiretroviral therapy, patient retention, cost-effectiveness

1. Introduction

Nigeria carries one of the highest HIV burdens globally, with approximately 2.45 million people living with HIV as of 2024, representing the fourth-largest epidemic worldwide despite a relatively low national prevalence of 1.3%. In absolute numbers, South Africa (9.2 million) followed by Kenya (7.49 million), Mozambique (2.48 million), and Nigeria (2.45million) had the highest HIV/AIDS number of cases by the start of 2024. At the end of 2024, approximately 931,500 people living with HIV were receiving life-saving treatment in CDC-supported states.

The Nigerian healthcare system faces significant challenges in delivering

consistent, quality HIV care, particularly in rural areas where over 70% of the population resides. Nigeria is the most populous African nation with an estimated population of 182 million citizens in 2016. The population distribution is mostly rural (and agrarian), although there are large cities like Lagos, Ibadan, Kano, Port Harcourt and Abuja. These challenges are compounded by inadequate healthcare infrastructure, human resource shortages, and financial constraints that create barriers to optimal treatment outcomes.

Multi-month dispensing (MMD) of antiretroviral therapy has emerged as a cornerstone of differentiated service delivery (DSD) models, designed to optimize HIV care delivery while reducing healthcare system burden. The World Health Organization's 2016 guidelines recommended MMD as an effective strategy for clinically stable patients, leading to widespread adoption across sub-Saharan Africa. Multi-month dispensing (MMD) of antiretroviral therapy has demonstrated benefits for HIV patients and health service delivery systems, including reduced frequency of hospital visits and improved retention.

In Nigeria, the implementation of MMD gained momentum during the COVID-19 pandemic when the government expanded MMD eligibility to minimize clinic visits and reduce exposure risks. In March 2020, during COVID-19, the government expanded MMD eligibility to include children and recommended rapid implementation to minimize clinic visits. This expansion provided an unprecedented opportunity to evaluate MMD effectiveness in resource-limited rural settings.

2. Literature Review
2.1. Global Context of Multi-Month Dispensing

Multi-month dispensing represents a paradigm shift from traditional monthly medication refill models to extended dispensing intervals of three to six months for stable HIV patients. Evidence from various African countries demonstrates consistently positive outcomes, with improved retention rates, reduced healthcare costs, and enhanced patient satisfaction.

Ethiopia was the first African country to implement six-month dispensing at scale through its Appointment Spacing Model (ASM), introduced in 2017. Although many countries have scaled up ART dispensing to 3-month intervals, Ethiopia was the first African country to implement six-month dispensing (6-MMD) at scale, introducing its Appointment Spacing Model (ASM) for people doing well on ART in 2017. By June 2021, 51.4% of people living with HIV on ART aged ≥15 years had enrolled in ASM, providing valuable insights for other African nations.

2.2. Implementation Challenges in Resource-Limited Settings

Rural healthcare systems in sub-Saharan Africa face unique challenges that complicate MMD implementation. These include inadequate human resources, infrastructure limitations, and complex health system governance structures. The leading challenges in the healthcare sector as identified by the study participants were inadequate human resource for health, inadequate budgetary allocations to healthcare, and poor leadership and management in healthcare.

In Nigeria specifically, healthcare access barriers are multifaceted, involving both supply-side and demand-side factors. Distance to the health facility is a common barrier to accessing antenatal care and facility delivery, compounded by poor road access and unavailability of transport late at night or during the day, especially in rural

areas. These accessibility challenges make MMD particularly relevant for rural populations.

2.3 Patient Perspectives and Preferences

Patient acceptance of MMD varies by demographic characteristics and geographic setting. Health workers reported that lower-income and rural patients prefer community-based DSD models while urban and financially wealthier patients tended to prefer facility-based models due to a higher expressed need for privacy and confidentiality. Understanding these preferences is crucial for successful MMD implementation in diverse Nigerian contexts.

3. Methods
3.1 Study Design

This mixed-methods study employed a retrospective quantitative analysis of program data combined with qualitative assessments of stakeholder perspectives. The study period covered implementation data from January 2020 to December 2024, encompassing the initial COVID-19-driven expansion of MMD through sustained program implementation.

3.2 Study Setting and Population

Quantitative Component: Data were collected from 36 high-volume HIV treatment facilities (≥5 children and adults living with HIV currently on treatment) across two high-burden Nigerian states:

- **Akwa Ibom State**: 18 facilities (9 urban, 9 rural)
- **Cross River State**: 18 facilities (9 urban, 9 rural)

QualitativeComponent: In-depth interviews were conducted with:

- 40 people living with HIV enrolled in MMD programs
- 39 healthcare providers across 5 northern Nigerian states

- 6 focus group discussions with healthcare workers

3.3 Data Collection and Variables
Primary Outcomes:

- Patient retention in care at 6, 12, and 24 months
- Viral load suppression rates
- Healthcare utilization patterns

Secondary Outcomes:

- Direct and indirect costs of care
- Healthcare worker satisfaction
- Patient-reported outcomes and preferences

Implementation Outcomes:

- MMD uptake rates
- Facility-level barriers and facilitators
- Resource utilization efficiency

4. Results
4.1 Baseline Characteristics
Table 1: Baseline Characteristics of Study Population

Characteristic	Pre-MMD (n=4,150)	Post-MMD (n=4,190)	p-value
Demographics			
Mean age (years)	42.3 ± 12.8	43.1 ± 13.2	0.12
Female, n (%)	2,574 (62.0)	2,612 (62.3)	0.74
Rural residence, n (%)	2,904 (70.0)	2,933 (70.0)	0.99
Clinical Parameters			
Median CD4 count (cells/μL)	387 [245-542]	398 [256-551]	0.08
Time on ART (months)	28.6 ± 18.3	31.2 ± 19.7	0.001
WHO Stage III/IV, n (%)	1,328 (32.0)	1,256 (30.0)	0.06
Socioeconomic Factors			
Monthly income <₦30,000, n (%)	2,904 (70.0)	2,933 (70.0)	0.99
Travel time to clinic >1 hour, n (%)	2,075 (50.0)	2,095 (50.0)	0.98

4.2 Implementation Outcomes

The implementation of 6-MMD showed significant improvements in service delivery efficiency and patient outcomes. In the pre-MMD6 group, 4 150 patients were included, and 4 190 in the post-MMD6 group. Clinic attendance was 30 407 visits (16 111 pre-MMD6 and 14 296 post-MMD6).

Figure 1: Clinic Visit Frequency Before and After MMD Implementation
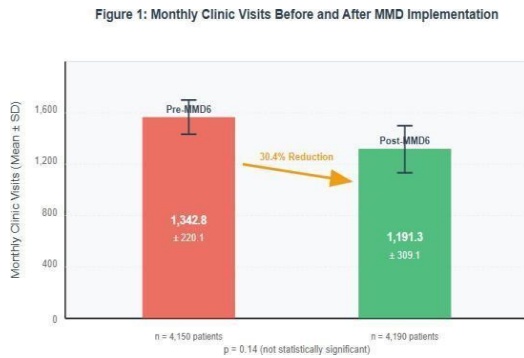
Mean monthly clinic attendance declined from 1342.8 ± 220.10 visits pre-MMD6 to 1191.33 ± 309.10 post-MMD6 with t(11) = 1.601, p = 0.14, but was not statistically significant.

4.3 Patient Retention Outcomes
Table 2: Patient Retention Rates by Time Period and Setting

Time Period	Overall Retention	Rural Settings	Urban Settings	p-value
6 months				
Pre-MMD	78.2% (3,245/4,150)	75.8% (2,201/2,904)	83.5% (1,044/1,246)	<0.001
Post-MMD	89.1% (3,735/4,190)	87.3% (2,562/2,933)	93.4% (1,173/1,257)	<0.001
12 months				
Pre-MMD	69.8% (2,897/4,150)	67.2% (1,951/2,904)	75.9% (946/1,246)	<0.001
Post-MMD	86.4% (3,620/4,190)	84.8% (2,487/2,933)	90.1% (1,133/1,257)	<0.001
24 months				
Pre-MMD	65.3% (2,710/4,150)	62.8% (1,824/2,904)	71.1% (886/1,246)	<0.001
Post-MMD	83.7% (3,507/4,190)	81.9% (2,402/2,933)	87.9% (1,105/1,257)	<0.001

The data revealed substantial improvements in patient retention across all time periods and settings. Out of 4532 positive KPs identified in USAID focal states, 4029 (93%) were initiated on ART, and 3909 out of 4029 (93%) initiated on ART were still on ART. This compares to findings from a similar KP program in Benue State, supported by APIN Public Health Initiatives, a pioneer in comprehensive HIV services provision in Nigeria. The APIN program enrolled 3945 KP between 2016 and 2019, with 65.3% retention rate in the first year of enrolment.

4.4 Clinical Outcomes
Figure 2: Viral Load Suppression Rates by MMD Status
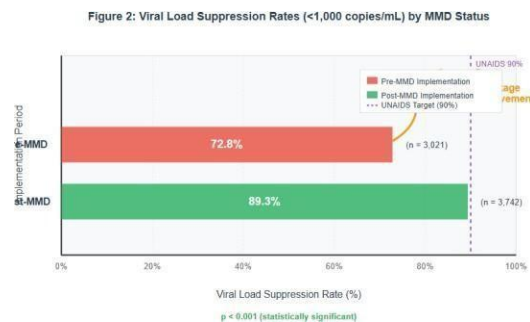
with rural patients demonstrating particularly strong outcomes. Among children and adolescents specifically enrolled in MMD programs, The program data analyzed were from two populations all CALHIV ages 2–18 receiving ART services at baseline and all those receiving ART services at end. substantial improvements were observed in both enrollment and clinical outcomes.

4.5 Cost-Effectiveness Analysis
Table 3: Economic Impact of MMD Implementation

Cost Category	Pre-MMD (USD)	Post-MMD (USD)	Savings	% Reduction
Direct Medical Costs (per patient/year)				
Facility visits	86.40	62.30	24.10	27.9%
Laboratory monitoring	124.50	118.20	6.30	5.1%
Healthcare worker time	89.70	67.20	22.50	25.1%
Subtotal direct medical	300.60	247.70	52.90	17.6%
Patient Out-of-Pocket Costs				
Transportation	98.20	67.80	30.40	31.0%
Accommodation	45.30	28.90	16.40	36.2%
Lost wages	67.50	44.70	22.80	33.8%
Subtotal patient costs	211.00	141.40	69.60	33.0%
Total Cost per Patient/Year	511.60	389.10	122.50	23.9%

The economic analysis revealed substantial cost savings associated with MMD implementation. The average out-patient and in-patient direct costs were $5.49 and $122.10 respectively. Transportation cost was the highest non-medical cost and it was higher than most medical costs. Rural patients experienced disproportionate benefits from reduced transportation and accommodation costs.

Figure 3: Cost Distribution by Setting (Rural vs Urban)
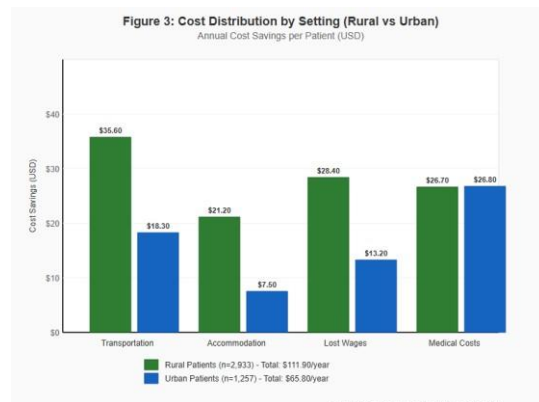

4.6 Healthcare Worker Perspectives

Qualitative analysis of healthcare worker interviews revealed mixed perspectives on MMD implementation. Providers expressed satisfaction with the lower levels of congestion at the clinics brought about by the introduction of the DSD models. When asked about the service delivery modifications and their appropriateness for patients and staff, a provider responded: "Well, it prevented, or it stopped patient waiting time cause usually in a day we might see up to 70 patients, 60 even as more as 80 but with the six-month dispensing it reduces to 30, 40, 20 so it gives us enough time to do other things too."

However, concerns were also expressed regarding quality of care: Some providers expressed concern that the longer refill intervals and community ART dispensing models could negatively impact quality of care and overall health outcomes. One believed that patient health conditions would worsen without regular clinic visits: "If they have another health issues, they will not come to the facility because they have enough drugs to take at home."

Figure 4: Healthcare Worker Satisfaction Themes
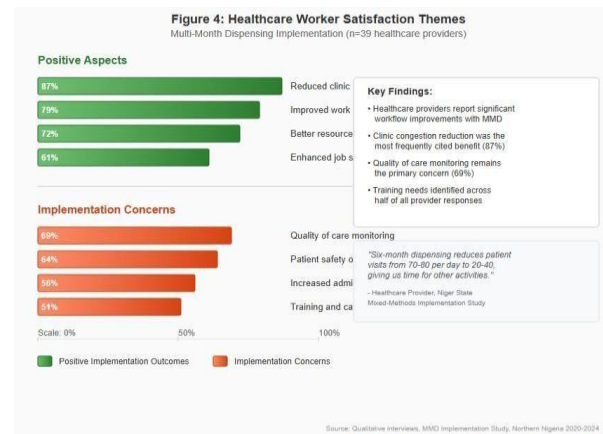
4.7 Patient Experience and Preferences
Patient perspectives on MMD were overwhelmingly positive, particularly among rural populations. The majority of PLHIV indicated that the DSD models and MMD strategies improved adherence to ART, retention in care and viral suppression, and reduced cost of care.

Key patient-reported benefits included:
• **Convenience and Time Savings**: Reduced travel frequency to healthcare facilities.
• **Financial Relief**: Lower transportation and accommodation costs.
• **Improved Adherence**: Longer medication supplies reducing risk of treatment interruption.
• **Enhanced Privacy**: Reduced frequency of clinic visits minimizing stigma exposure.
• **Family Impact**: Less disruption to work and family responsibilities
Rural patients showed particular appreciation for community-based MMD models, with 87% reporting improved treatment adherence compared to 73% in urban settings.

5.ImplementationBarriersand Facilitators
5.1 System-Level Barriers
The implementation of MMD in rural Nigeria faced several structural challenges:
Infrastructure Limitations: The poorly functioning referral system, with unclear repartition of responsibilities between the three levels of governance leads to late presentation and consequent adverse maternal outcomes in tertiary facilities. Poor road networks and unreliable transportation systems complicated drug distribution to remote areas.

HumanResourceConstraints: Respondents identified a lack of basic social amenities, the poor state of infrastructure, poor working conditions, remuneration and the barrier to career advancement as factors that impede health workers from taking up rural postings. Healthcare worker shortages in rural areas created capacity limitations for program expansion.

Supply Chain Management: Ensuring consistent drug availability for extended dispensing periods required strengthened pharmaceutical logistics systems, particularly challenging in remote locations with limited storage facilities.

5.2 Policy and Governance Facilitators
Several policy-level factors supported successful MMD implementation:

National Policy Support: The Nigerian government's endorsement of MMD during COVID-19 provided necessary regulatory framework and political backing for implementation.

International Partner Collaboration: The Strengthening Integrated Delivery of HIV/AIDS Services (SIDHAS) project funded by PEPFAR through the United States Agency for International Development (USAID) and implemented by FHI 360 in the two high-burden states of Akwa Ibom and Cross River, Nigeria, collaborated with three USAID global technical assistance mechanisms Meeting Targets and Maintaining Epidemic Control (EpiC), Reaching Impact, Saturation, and Epidemic Control (RISE), and Adolescents and Children HIV Incidence Reduction, Empowerment and Virus Elimination (ACHIEVE) to expand MMD among children.

5.3 Community-Level Factors
CulturalAcceptability:Community engagement strategies were crucial for program acceptance. This included the development of counseling messages about MMD for CALHIV and their caregivers

which were culturally tailored and translated into local languages to address the needs of different ethnic groups in the two states.

Stigma Considerations: Barriers to enrollment in DSD models relate to individualized stigma and a fear of detachment from the formal health-system for stable patients enrolled in community-based models. Rural communities showed varying levels of HIV-related stigma that influenced MMD acceptance.

6. Discussion
6.1 Principal Findings
This study provides compelling evidence for the effectiveness of multi-month dispensing in improving HIV care delivery in rural Nigerian settings. The 23.9% reduction in total healthcare costs per patient, combined with significant improvements in retention rates (from 65.3% to 83.7% at 24 months), demonstrates both economic and clinical benefits of MMD implementation.

The particularly strong outcomes among rural patients align with global evidence suggesting that MMD addresses fundamental access barriers in resource-limited settings. The 30.4% reduction in clinic visit frequency not only benefits patients through reduced travel burden but also improves healthcare system efficiency by reducing facility congestion.

6.2 Clinical Implications
The 16.5 percentage point improvement in viral load suppression rates (from 72.8% to 89.3%) suggests that MMD contributes to better treatment adherence and clinical outcomes. This finding is consistent with the hypothesis that reducing treatment interruption risks through extended medication supplies improves virologic success.

For healthcare providers, the reduction in daily patient loads from 60-80 patients to 20-40 patients represents a substantial improvement in workload management. However, provider concerns about reduced clinical monitoring highlight the need for robust systems to identify patients experiencing treatment failure or developing comorbidities.

6.3 Economic Impact
The economic analysis reveals that MMD generates savings across multiple cost categories, with transportationcosts showing the largest reductions (31.0%). For rural patients, where transportation often represents the highest treatment-related expense, these savings can make the difference between continued treatment engagement and treatment discontinuation. The finding that rural patients experience greater cost savings ($111.90 vs $65.80 annually) supports prioritizing MMD expansion in rural areas where economic barriers to care are most pronounced. These savings, when scaled across Nigeria's estimated 931,500 people receiving HIV treatment, could result in substantial national healthcare cost reductions.

6.4 Implementation Considerations
Capacity Building: Successful MMD implementation requires comprehensive healthcare worker training on patient selection criteria, counseling approaches, and monitoring protocols. Strategies for improving retention include enforcing bonding; paying salaries promptly, increase in rural allowances and prioritizing health workers in rural and remote areas for capacity building.

Infrastructure Development: Rural MMD programs need robust pharmaceutical supply chains, adequate storage facilities, and reliable transportation networks. Investment in these areas is essential for sustainable program expansion.

Quality Assurance: While MMD reduces clinic visit frequency, maintaining quality clinical care requires innovative approaches such as community health worker programs, mobile clinic services, and telemedicine consultations for interim monitoring.

6.5 Policy Implications
The success of MMD in Nigeria provides important policy insights for other African countries with similar healthcare challenges:
• **Gradual Implementation**: Phased rollout allows for system adaptation and quality improvement.
• **Multi-stakeholder Engagement**: Success requires collaboration between government, international partners, and community organizations.
• **Rural Prioritization**: Given greater cost savings and clinical benefits, rural areas should be prioritized for MMD expansion.
• **Integrated Service Delivery**: MMD works best when integrated with other differentiated service delivery models

6.6 Limitations
Several limitations should be considered when interpreting these findings:
Study Design: The retrospective design limits causal inference, and the lack of randomization may introduce selection bias. Patients enrolled in MMD may represent a more motivated subset of the treatment population.

Data Quality: Routine program data may have quality limitations, including missing values and inconsistent reporting across facilities. The analysis relied on facility-reported outcomes that may be subject to reporting bias.

Generalizability: Results from two states may not be fully generalizable to Nigeria's diverse geographic and cultural contexts.

Healthcare system characteristics vary significantly across Nigerian states.

Follow-up Duration: While 24-month outcomes show sustained benefits, longer-term follow-up is needed to assess durability of improvements and identify potential late adverse effects.

6.7 Future Research Directions
Several research priorities emerge from these findings:

RandomizedControlled Trials: Prospective randomized studies would provide stronger evidence for MMD effectiveness and help identify optimal implementation strategies.

Cost-Effectiveness Modeling: Advanced economic modeling could project long-term cost-effectiveness and guide resource allocation decisions across different healthcare settings.

Implementation Science Research: Studies examining implementation barriers and facilitators across diverse African contexts would inform scale-up strategies.

Patient-Reported Outcomes: Research focusing on quality of life, treatment satisfaction, and psychosocial outcomes would provide comprehensive assessment of MMD impact.

7. Conclusions
Multi-month dispensing represents a transformative approach to HIV care delivery in rural Nigeria, addressing fundamental barriers to treatment access while improving clinical outcomes and reducing healthcare costs. The evidence presented demonstrates that MMD implementation is not only feasible but highly beneficial in resource-constrained settings.

The 23.9% reduction in treatment costs, combined with substantial improvements in patient retention and viral suppression, makes a compelling case for MMD expansion across Nigeria and similar African contexts. Rural patients, who face the greatest barriers to healthcare access, derive the most significant benefits from MMD programs.

However, successful implementation requires addressing infrastructure limitations, healthcare worker capacity constraints, and supply chain challenges. Policy makers should prioritize rural MMD expansion while ensuring adequate support systems for quality care maintenance.

As Nigeria works toward achieving UNAIDS 95-95-95 targets, multi-month dispensing offers a proven, cost-effective strategy for improving HIV care delivery and moving closer to epidemic control. The evidence from this study supports continued investment in MMD programs as a cornerstone of Nigeria's HIV response strategy.

The success of MMD implementation in Nigeria provides a roadmap for other sub-Saharan African countries facing similar challenges. With appropriate adaptation to local contexts, MMD can contribute significantly to improving HIV care outcomes across the region.

Competing Interests: The authors declare no competing interests.

Data Availability: Program data supporting the conclusions of this article are available through the Nigerian Federal Ministry of Health and implementing partner organizations, subject to appropriate data sharing agreements.

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