

Effect of Individualized Assessment on Adherence for Viremic Children Living with HIV in Kiambu County

Naomi Nduta Muchina^{1*}, Eunice Muthoni Mwangi¹, Lilian Muiruri¹

Department of Health Systems Management, Kenya Methodist University, Kenya

*Corresponding Author's E-mail: mtmmanagement2016@gmail.com

Accepted: 14 July 2026 || Published: 08 August 2026

Abstract

The purpose of the study was to examine the effect of individualized assessment on adherence for viremic children living with HIV in Kiambu County. A descriptive survey research design was used on a target population of all viremic HIV-infected children aged 0-14 in Kiambu County. The study also gathered insights from healthcare professionals working in the HIV/AIDS departments of various hospitals, with a target population of 339 respondents. The research focused specifically on several health facilities, including Ruiru Sub-County Hospital, Igeganja Level 4 Hospital, Githunguri Health Center, Langata Health Center, Ngenda Health Center, Juja Farm Health Center, and Makongeni Level 4 Hospital. The stratified sampling approach and the Yamane (1967) formula were used to select 184 respondents. A structured questionnaire was used to collect data from caregivers, while healthcare providers participated in the interview guide. Cronbach's alpha was used to measure reliability. The pretest was conducted on 20 respondents drawn from the Gachororo Health Center in Juja Sub-County. Quantitative data were analyzed using Chi-square, while qualitative data were analyzed thematically. This study found a strong correlation between individualized assessments, particularly medical history reviews, and improved adherence (74.6% adherence among those who agreed with medical history reviews compared to 46.8% among those who disagreed, $p=0.0001$). The study concluded that individualized assessment emerges as a critical intervention strategy for improving HIV treatment adherence among viremic children, with multifaceted approaches demonstrating statistically significant potential to address complex challenges such as stigma, mental health, and personal treatment needs. The study recommends that the county government, healthcare workers, the Ministry of Health, and other stakeholders should develop a comprehensive, integrated adherence support program that combines technological interventions (such as mobile text message reminders), peer support groups, and tailored healthcare provider counseling.

Keywords: *Individualized Assessment, Adherence, Viremic Children living with HIV, Kiambu County.*

How to Cite: Muchina, N. N., Mwangi, E. M., & Muiruri, L. (2026). Effect of Individualized Assessment on Adherence for Viremic Children Living with HIV in Kiambu County. *Journal of Medicine, Nursing and Public Health*, 6(7), 1-11.

1. Introduction

Individualized case management for Viremic children living with HIV significantly contributes to the service delivery pillar of the health system in several ways. First, it enhances patient-centered care by tailoring healthcare services to each child's unique needs, supporting personalized healthcare delivery. Secondly, the focus on medication adherence is crucial for effective healthcare services, with individualized case management identifying and addressing adherence barriers, thereby improving overall effectiveness.

The World Health Organization (WHO) recommends providing individualized case management for children and adolescents with detectable viral loads, which has been shown to improve viral suppression by up to 70% (World Health Organization, 2021). In Europe, case management services for children with HIV are offered through both government-funded and private organizations (Arias-Casais et al., 2020).

In West Africa, access to case management services can be limited, particularly in rural areas. However, organizations such as Médecins Sans Frontières (MSF) and UNAIDS are working to improve access to ART and case management, including for children, in countries like Nigeria, Ghana, and Senegal (Conan et al., 2021; Parmley et al., 2021). In East Africa, challenges such as low resilience among adolescents with HIV are linked to poorer health outcomes. For instance, in Tanzania, many adolescents are reluctant to transition to adult care clinics due to unmet health needs, stigma, and financial barriers (Masese et al., 2019).

Approximately 150,000 children in Kenya are HIV-positive, and 60,000 of them require antiretroviral therapy (ART) immediately. Approximately 20,000 of them are presently receiving therapy, while the remaining 40,000 do not have access to the medications and will soon pass away if they do not (Apondi et al., 2019). Currently, adults with HIV are roughly twice as likely as children to receive antiretroviral therapy. Meanwhile, new infections occur daily. Although Kenya has made strides in growing PMTCT programs, over 40% of expectant mothers still give birth without participating in these programs, some of which result in infants with HIV (Hershey, 2019). The Kenyan government is required to gradually fulfill children's right to health under international law. The government must take action to lower child mortality in particular.

Case management is one of the approaches adopted by different governments and organizations providing care for children and adolescents affected by HIV to address barriers that hinder them from achieving their goals. Case Management aims to help children and families achieve a state of well-being where they can meet their health, school, stability, and safety needs and become resilient enough to withstand modest shocks (Dai et al., 2020).

In the past, the lack of antiretroviral medications or their exorbitant cost prevented children in Kiambu County from receiving AIDS treatment. This has since changed, and ART is now free in several African nations, including Kenya. For children, having access to these medications is a matter of life or death. However, for a variety of reasons, far too many children are still not receiving the ARV therapy. The purpose of the study was to examine the effect of individualized assessment on adherence for Viremic children living with HIV in Kiambu County.

1.1 Problem Statement

Viremic children living with HIV often struggle to adhere to their treatment regimens, resulting in suboptimal health outcomes. Standard treatment plans typically do not address the specific challenges these children face, creating obstacles to consistent medication adherence. Without a personalized approach, there is a disconnect between general treatment strategies and the unique needs of individual patients (Omoto, 2023). Tailoring interventions to each child's particular challenges is expected to improve adherence by addressing these barriers and ultimately lead to better health outcomes. Antiretroviral therapy (ART) remains the most effective method for treating HIV and reducing transmission (Dai et al., 2020), and maintaining optimal adherence to ART is crucial for treatment success. However, in Kenya, particularly in Kiambu County, reported adherence rates among children range from 50–80%, far below the 95% threshold required for effective viral suppression (Kaara, 2021).

Research on the effect of individualized case management on adherence to treatment among viremic children with HIV remains limited. Although some studies have provided valuable insights, a significant gap in understanding remains. For example, Ndungu's (2020) investigation into the determinants of adherence and retention in HIV care among adolescents at Murang'a County Hospital yielded important findings on youth adherence. Similarly, Apondi et al. (2019) explored viral suppression outcomes among HIV-positive children and their caregivers in western Kenya, highlighting challenges and strategies associated with adherence. Despite these contributions, there remains a scarcity of research specifically examining how individualized case management influences adherence among viremic children. Addressing this gap is crucial to improving treatment outcomes and overall health in this vulnerable group. Thus, the current study seeks to contribute to the body of knowledge by investigating the effect of individualized assessment on adherence for Viremic children living with HIV in Kiambu County, providing valuable insights that could guide future interventions and policy decisions.

1.2 Purpose of the Study

To examine the effect of individualized assessment on adherence for Viremic children living with

HIV in Kiambu County.

1.3 Research Questions

To what extent does individualized assessment influence adherence for Viremic children living with HIV in Kiambu County?

2. Literature Review

2.1 Theoretical Review

Social Cognitive Theory (SCT), introduced by Albert Bandura in 1991, emphasizes that learning is shaped by a combination of cognitive, behavioral, and environmental factors. This theory offers a valuable framework for understanding how personalized case management can enhance adherence among children with HIV who have detectable viral loads. According to SCT, behavior is influenced by the interplay between personal factors, environmental

conditions, and actions. It helps explain how tailored case management strategies can improve adherence among viremic children with HIV (Luszczynska & Schwarzer, 2015). SCT posits that personal factors such as knowledge, attitudes, and self-efficacy, along with environmental elements like social support and resource availability, and behavioral factors such as motivation and self-regulation, all impact behavior (Bandura, 1986).

Moreover, SCT explains how personal experiences, others' behaviors, and environmental influences interact to shape individual health behaviors. The theory underscores the significance of social support, self-efficacy, and observational learning as key drivers of behavior change. Key components of SCT related to behavior change include self-efficacy, behavioral capability, expectations, expectancies, self-control, observational learning, and reinforcement (Schunk, 2012).

2.2 Empirical Review

Nachega et al. (2015) conducted a randomized controlled trial in a resource-limited setting in South Africa, evaluating the impact of individualized adherence counseling on 120 adolescents living with HIV. The intervention group, receiving personalized counseling, demonstrated significantly higher adherence rates (83.5%) than the control group (70.7%), as measured by electronic monitoring devices and self-reports. Moreover, the intervention group exhibited higher rates of viral suppression. While the study contributes valuable evidence supporting the effectiveness of individualized adherence counseling for enhancing antiretroviral therapy adherence in adolescents with HIV, it emphasizes the need for additional interventions, especially as adherence rates remained below the optimal 95%. It's important to note the study's context-specific nature, conducted in a resource-limited setting, which suggests caution when generalizing the results to other settings. The findings from various studies emphasize the crucial importance of continuous efforts in developing and implementing effective adherence support strategies for adolescents living with HIV.

Davies et al. (2018) conducted a comprehensive study within the framework of the International Epidemiology Databases to Evaluate AIDS (IeDEA) Southern Africa Collaboration to investigate the incidence and predictors of virologic failure, as well as the effectiveness of second-line ART in children with HIV in South Africa. This study followed a large cohort of 6,708 children who initiated ART over a period of up to five years. Virologic failure was defined as two consecutive viral load measurements exceeding 1,000 copies/ml, with initiation of second-line ART after confirmation of failure. The findings showed that the cumulative incidence of virologic failure over five years was 16.6%. Notably, key predictors of virologic failure included younger age at ART initiation, advanced HIV disease at the start of treatment, and the use of NNRTI-based first-line regimens. Among children who experienced virologic failure, 62.6% successfully transitioned to second-line ART and achieved viral suppression. This study provides critical insights into the substantial rates of virologic failure among children with HIV in South Africa and underscores the effectiveness of second-line ART. It also points to the necessity for improved strategies for initiating ART and maintaining adherence, along with prompt switching to second-line regimens when treatment failure occurs. However, the study did not explore long-term outcomes for children who moved to second-line ART, suggesting the need for further research on these longer-term impacts.

3. Methodology

A descriptive survey research design was used on a target population of all viremic HIV-infected children aged 0-14 in Kiambu County. The study also gathered insights from healthcare professionals working in the HIV/AIDS departments of various hospitals and the target population was 339 respondents. The research focused on several health facilities, including Ruiru Sub-County Hospital, Igeganja Level 4 Hospital, Githunguri Health Center, Langata Health Center, Ngenda Health Center, Juja Farm Health Center, and Makongeni Level 4 Hospital. A stratified sampling approach and Yamane (1967) formula were used to select 184 respondents. Qualitative and quantitative methods were used to collect primary data. A structured questionnaire was used to collect data from caregivers, while healthcare providers participated in the interview guide. Cronbach's alpha was used to measure reliability. For validity, the instruments were pretested before the actual data collection process. The pretest sample comprised 20 respondents drawn from Gachororo Health Center in Juja Sub-County. SPSS version 29 was used in the study. Chi-square was used to analyze quantitative data, while qualitative data were analyzed thematically.

4. Results

4.1 Reliability statistics

To ascertain the reliability of the data collection instruments, a pretest study was conducted, and the findings are presented in Table 1.

Table 1: Reliability Statistics

Instrument	Cronbach's Alpha
Adherence for Viremic children living with HIV	0.811
Individualized assessment	0.773
Average	0.792

The results in Table 1 demonstrate that the Cronbach's alpha coefficient for adherence for Viremic children living with HIV was 0.811, Individualized assessment was 0.773, and the average was 0.792.

4.2 Response Rate

The response rate results are provided in Table 2.

Table 2: Response Rate

Questionnaires	Sample Size	Response Rate
Complete	177	96.2%
Incomplete	7	3.8%
Total	184	100.0%

Table 2 shows that a total of 184 structured questionnaires were administered in tandem with the calculated sample size, of which 177 respondents met the inclusion criteria and questionnaires were completely filled; therefore, the response rate was 96.2% of the required sample size, which was deemed satisfactory for the purpose of obtaining dependable and adequate data. The literature suggests that a low response rate may introduce bias into survey results (Brick & Williams, 2013). Consequently, the present study posits that a high response rate indicates greater reliability of the collected data. Pike (2007) observed that survey researchers have traditionally assumed that achieving a high response rate is the most effective approach to obtaining unbiased estimates.

4.3 Adherence for Viremic Children Living with HIV

Slightly more than two-thirds (119; 67.2%) of children had adherence for viremia, as shown in Figure 1.

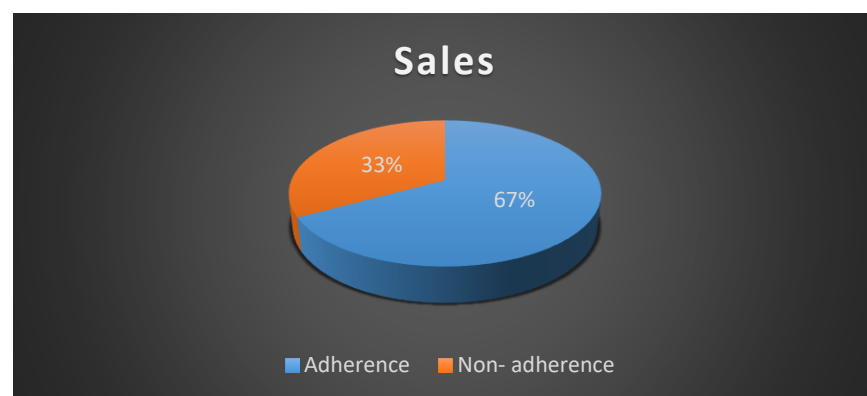


Figure 1: Adherence for Viremic Children Living with HIV

The key informants generally viewed adherence as improving, though challenges remain due to socio-economic barriers, stigma, and limited awareness, especially among certain demographics such as younger populations or those with limited access to healthcare. The informants mentioned

“Adherence among people living with HIV in Kiambu County has generally improved over the years, especially with better access to healthcare services” (KII 2).

“Viremia is a significant issue here; we see a reasonable number of cases, especially among children, because they are more vulnerable to not adhering to treatment regimens” (KII 1).

The role of healthcare providers in supporting adherence is critical, yet inconsistent access to resources such as transportation and counseling services remains a major barrier. Providers recognize that adherence is also influenced by individual health literacy, with some patients needing more tailored education about the importance of consistent treatment.

“In my view, adherence to HIV treatment in Kiambu is a significant challenge. Although there are some patients who adhere well to treatment, the majority of people living with HIV (PLHIV) struggle due to various factors like poverty, long travel distances to health facilities, and lack of constant follow-up. Social stigma related to HIV also remains a barrier, particularly in rural areas, where patients are often reluctant to visit healthcare facilities for fear of being discriminated against” (KII 4).

4.4 Individualized Assessment

4.4.1 Individualized Assessment on Adherence for Viremic Children Living with HIV

As indicated in Table 3, 130 (73.4%), 113 (63.8%), and 108 (61.0%) agreed that medical history promotes adherence, physical exam informs treatment decisions, and individualized assessment enables customized treatment, respectively. Additionally, 110 (63.8%) and 97 (54.8%) disagreed that individualized assessment helps fight stigma and that individualized assessment provides social support.

Table 3: Individualized Assessment on Adherence for Viremic Children Living with HIV

		Frequency	Percent
Medical history promotes adherence	Agree	130	73.4%
	Disagree	47	26.6%
Individualized assessment helps fight stigma	Agree	67	37.9%
	Disagree	110	62.1%
Mental health assessment aids medical decisions	Agree	113	63.8%
	Disagree	64	36.2%
Individualized assessment provides social support	Agree	80	45.2%
	Disagree	97	54.8%
Physical exam informs treatment decisions	Agree	113	63.8%
	Disagree	64	36.2%
Individualized assessment enables customized treatment	Agree	108	61.0%
	Disagree	69	39.0%
Patient-centered goals reflect patient's values and priorities	Agree	85	48.0%
	Disagree	92	52.0%

According to Table 3, Providers express a generally positive view of individualized assessments in Kiambu County. These assessments are seen as a valuable tool for tailoring care to the specific needs of each patient, especially children living with HIV. However, providers note that the effectiveness of assessments can be limited by resource constraints, including insufficient staff and limited access to diagnostic tools. Nonetheless, individualized assessments are seen as an important step in understanding the social, economic, and psychological factors that affect adherence, and they help in creating more targeted interventions for HIV management.

"I believe that individualized assessments are crucial to providing tailored care. They help identify specific challenges patients face, from socio-economic issues to mental health struggles, and allow for the development of more effective treatment plans. However, the assessments are only as good as the resources available to implement them. In many cases, we are constrained by staffing and logistical issues that limit the full potential of this approach" (KII 1).

4.4.2 Effect of Individualized Assessment on Adherence for Viremic Children

The findings in Table 4 demonstrate the significant impact of individualized assessment on treatment adherence among viremic children. Respondents who agreed that a thorough medical history promoted adherence showed a much higher rate of adherence (74.6%) compared to those who disagreed (46.8%), with a significant chi-square value of 12.116 ($p=0.0001$). Similarly, individualized assessments that helped fight stigma were strongly associated with adherence, with 88.1% of those who agreed showing adherence compared to just 54.5% of those who disagreed ($p=0.0001$). Mental health assessments were also crucial, as 80.5% of those who agreed experienced adherence, compared with 43.8% of those who disagreed ($p=0.021$). Social support provided through individualized assessment was associated with an adherence rate of 80% versus 56.7% among those who disagreed ($p=0.001$). Additionally, a physical exam that informed treatment decisions contributed to 79.6% adherence compared to 45.3% ($p=0.017$). Finally, individualized treatment plans tailored to specific needs showed a striking 82.4% adherence rate, with a p-value of 0.0001. These results underscore the importance of personalized care in improving treatment adherence, as patient-centered goals reflecting individual values led to higher rates of adherence (87.1% vs. 48.9%, $p=0.024$; Table 4).

Table 4: Effect of Individualized Assessment on Adherence for Viremic Children

Variables		Adherence	Non-adherence	Statistics	
Medical history promotes adherence	Agree	97(74.6%)	33(25.4%)	$\chi^2=12.116$, $p=0.0001$	df=1,
	Disagree	22(46.8%)	25(53.2%)		
Individualized assessment helps fight stigma	Agree	59(88.1%)	8(11.9%)	$\chi^2=21.229$, $p=0.0001$	df=1,
	Disagree	60(54.5%)	50(45.5%)		
Mental health assessment aids medical decisions	Agree	91(80.5%)	22(19.5%)	$\chi^2=7.090$, $p=0.021$	df=1,
	Disagree	28(43.8%)	36(56.3%)		
Individualized assessment provides social support	Agree	64(80.0%)	16(20.0%)	$\chi^2=10.803$, $p=0.001$	df=1,
	Disagree	55(56.7%)	42(43.3%)		
Physical exam informs treatment decisions	Agree	90(79.6%)	23(20.4%)	$\chi^2=8.862$, $p=0.017$	df=1,
	Disagree	29(45.3%)	35(54.7%)		
Individualized assessment enables customized treatment	Agree	89(82.4%)	19(17.6%)	$\chi^2=28.961$, $p=0.0001$	df=1,
	Disagree	30(43.5%)	39(56.5%)		
Patient-centered goals reflect patient's values and priorities	Agree	74(87.1%)	11(12.9%)	$\chi^2=9.181$, $p=0.024$	df=1,
	Disagree	45(48.9%)	47(51.1%)		

Key informants believe that individualized assessments positively affect adherence for viremic children living with HIV in Kiambu County. These assessments allow providers to understand the unique challenges that children and their caregivers face, such as financial constraints, family dynamics, and mental health issues, which can directly impact adherence. With this understanding, providers can develop more appropriate, personalized interventions. However, the success of individualized assessments in improving adherence is often contingent upon the quality of follow-up care and resources available to patients, which can be inconsistent in some areas.

“.... Yes, I do think individualized assessments have a positive impact on adherence, especially for viremic children. These assessments help us identify the specific barriers that might be preventing a child from adhering to their treatment plan, such as family stress or lack of resources. By tailoring the treatment plan to each child's unique situation, we can address these issues more effectively and improve adherence rates” (KII 2).

The study is consistent with Nachega et al. (2015) and Haberer et al. (2013), which provide strong empirical support for the local study's findings, particularly in emphasizing personalized interventions. The statistical significance ($p < 0.05$) across multiple variables in the local study is consistent with the rigorous methodological approaches in published research. Haberer et al. (2013) similarly used randomized controlled trials to demonstrate the effectiveness of personalized interventions, with statistically significant improvements in adherence and viral suppression. A slight nuance emerges in the specificity of interventions.

5. Conclusion

The study found that individualized assessment emerges as a critical intervention strategy for improving HIV treatment adherence among viremic children, with multifaceted approaches demonstrating statistically significant potential to address complex challenges such as stigma, mental health, and personal treatment needs. The findings reveal that personalized care can substantially enhance treatment adherence, with some assessment dimensions showing adherence rates as high as 88.1%, highlighting the transformative power of patient-centered healthcare approaches.

6. Recommendations

The County government, healthcare workers, the Ministry of Health, and other stakeholders should develop a comprehensive, integrated adherence support program that combines technological interventions (such as mobile text message reminders), peer support groups, and tailored healthcare provider counseling. This program should be specifically designed to address the unique needs of different age groups, with particular focus on children under 5 and those in the early stages of antiretroviral therapy, who demonstrated lower adherence rates. The program should incorporate strategies to mitigate socio-economic barriers, reduce stigma, and provide ongoing education and support to both children and their caregivers to enhance treatment adherence and viral suppression.

References

- Apondi, E., Keter, A., & Wools-Kaloustian, K. (2019). Viral suppression among children and their caregivers living with HIV in western Kenya. *Journal of the International AIDS Society*, 22: e25272, 1–10. <https://doi.org/10.1186/s12889-016-2916-1>
- Arias-Casais, N., Garralda, E., Pons, J. J., Marston, J., Chambers, L., Downing, J., . . . Centeno, C. (2020). Mapping pediatric palliative care development in the WHO-European region: children living in low-to-middle-income countries are less likely to access it. *Journal of Pain and Symptom Management*, 60(4), 746-753. <https://doi.org/10.1177/0734242X13479429>
- Conan, N., Paye, C. P., Ortuno, R., Chijuwa, A., Chiwandira, B., Goemaere, E., . . . Maman, D. (2021). What gaps remain in the HIV cascade of care? Results of a population-based survey in Nsanje District, Malawi. *Plos one*, 16(4), e0248410. [https://doi.org/10.1016/s0738-3991\(02\)00127-1](https://doi.org/10.1016/s0738-3991(02)00127-1)
- Dai, L., Yu, X., & Shao, Y. (2020). Effect of a multi-dimensional case management model on anti-retroviral therapy-related outcomes among people living with human immunodeficiency virus in Beijing, China. *BMC Infectious Disease*, 20, 489. <https://doi.org/10.1186/s12879-020-05219-9>
- Davies, M. A., Moultrie, H., Eley, B., Rabie, H., Van Cutsem, G., Giddy, J., ... & Technau, K. (2018). Virologic failure and second-line antiretroviral therapy in children in South Africa—the IeDEA Southern Africa Collaboration. *Journal of Acquired Immune Deficiency Syndromes*, 78(2), 1-7. <https://doi.org/10.1097/NM.0000000000001416>
- Haberer, J. E., Cook, A., Walker, A. S., Ngambi, M., Ferrier, A., Mulenga, V., ... Gibb, D. M. (2018). Excellent adherence to antiretrovirals in HIV+ Zambian children is compromised by disrupted routine, HIV nondisclosure, and paradoxical income effects. *PLoS ONE*, 13(5), e0196237. <https://doi.org/10.1007/s11904-010-0061-5>
- Hershey, M. (2019). Whose Agency: The Politics and Practice of Kenya's HIV-Prevention NGOs. *Africa and the Diaspora: HIV/AIDS - Research and Palliative Care*, 115(90), 1387–1396. <https://doi.org/10.2147/HIV.S9280>
- Kaara, F. (2021). Factors Associated with Loss to Follow-Up of HIV Patients Living with HIV in Kiambu County Referral Hospital. *Cost Effectiveness and Resource Allocation*, 9(5), 1–8. <https://doi.org/10.1186/1478-7547-9-18>
- Luszczynska, A., & Schwarzer, R. (2015). Social cognitive theory. *AIDS and Behavior*, 24(10), 2797–2810. <https://doi.org/10.1007/s10461-020-02822-4>
- Masese, R. V., Ramos, J. V., Rugalabamu, L., Luhanga, S., Shayo, A. M., Stewart, K. A., . . . Dow, D. E. (2019). Challenges and facilitators of transition from adolescent to adult HIV care among young adults living with HIV in Moshi, Tanzania. *Journal of the International AIDS Society*, 22(10), e25406. <https://doi.org/10.7275/q7tc-1153>
- Nachega, J. B., Skinner, D., Jennings, L., Magidson, J. F., Altice, F. L., Burke, J. G., . . . Bassett, I. V. (2018). Acceptability and feasibility of mHealth and community-based directly observed antiretroviral therapy to prevent mother-to-child HIV transmission in South

- African pregnant women under Option B+: An exploratory study. *PLoS ONE*, 13(10), e0206166. <https://doi.org/10.1093/acprof:oso/9780195159226.003.0019>
- Ndungu, P. (2020). Determinants Of Adherence and Retention in Care of Hiv Positive Adolescents in Murang'A County Hospital, Kenya. Nairobi: *AIDS and Behavior*, 24(10), 2797–2810. <https://doi.org/10.1007/s10461-020-02822-4>.
- Omoto, L. N. (2023). Viral Load Testing Outcomes for Children on Nevirapine/Efavirenz Based First Line Antiretroviral Treatment at Selected Health Facilities in Western Kenya. *Journal of Healthcare Leadership*, 13(9), 119–128. <https://doi.org/10.2147/JHL.S300729>
- Parmley, L. E., Hartsough, K., Eleeza, O., Bertin, A., Sesay, B., Njenga, A., . . . Michaels-Strasser, S. (2021). COVID-19 preparedness at health facilities and community service points serving people living with HIV in Sierra Leone. *PLOS one*, 16(4), e0250236. <https://doi.org/10.1177/0734242X13479429>
- World Health Organization (2021). Guidelines: updated recommendations on HIV prevention, infant diagnosis, antiretroviral initiation and monitoring. *World Health Organization* 21(12), 191–417. <https://www.who.int/publications/i/item/9789240065062>